A Neoclassical Realist Study on Space Power Politics: Why Do Space Powers Compete and When Do They Cooperate

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Table of Content

Abstract

This dissertation investigates the strategic behaviors of major space powers through the lens of neoclassical realism, seeking to identify and unpack the drivers behind the strategic changes of these space powers. It argues that shifts in space strategy are primarily driven by changes in relative space capabilities and domestic perceptions of future capability distributions. The former is defined by data on the number of space launches and payload capacity while the latter is determined by three different domestic variables: leadership perception, bureaucratic politics, and fiscal constraints. In sum, the study develops a typology matrix categorizing space powers based on their actual and perceived capabilities. This matrix is applied to a series of case studies covering Cold War rivalries, post-Cold War hegemonic adjustments, China's emergence as a space power, and Russia's strategic decline. Through process tracing and mixed-method analysis, the research identifies key points where strategic behavior diverged due to a combination of relative space capabilities and domestic perceptions on future trends of relative space capabilities.

This study presents a fresh perspective on neoclassical realism in the context of space politics, recognizing the methodological hurdles we face, especially when it comes to applying domestic variables consistently across different cases. It also highlights the challenge of obtaining reliable sources, particularly from opaque regimes. Despite these challenges, the research offers both a valuable analytical framework and meaningful empirical insights, deepening our understanding of space as a vibrant field of great power interactions. Here, cooperation and competition don't stand in opposition to one another; instead, they are shaped by the circumstances we encounter.

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List of Figures

List of Tables

Chapter I Introduction

1.1 Context and Background of Research

This dissertation researches great power behaviors in space and examines major drivers behind space powers' strategic shifts, including the United States, the Soviet Union/ Russia, and China. Space activities have become a prevalent topic in recent years, both in public discussions around emerging private actors such as SpaceX and in academic research on space politics in International Relations (IR). There is an ongoing debate in the IR literature about whether there is a new Space Race between China and the U.S. for the past decade and more.[1] As a part of a broad geopolitical competition between China and the U.S., space's relevance is highlighted by its close association with military capabilities, political prestige, global governance of emerging technologies, and potential economic significance.

Historically, space has been a domain of great power competition, with the Cold War Space race between the United States and the Soviet Union as the most prominent example. The Space Race was primarily driven by a desire for technological and ideological superiority and highlighted space as an extension of the broader geopolitical struggle between superpowers.[2] The launch of Sputnik in 1957 by the Soviet Union and the subsequent race to land a man on the Moon were scientific milestones in space exploration and strategic demonstrations of technological prowess, considering the dual-use nature of space technologies. In the Cold War context, space capabilities were directly tied to national security concerns, with satellite surveillance, communication technologies, and missile defense systems critical elements of great

[1] For example, Harvey, Brian, and Henk H. F. Smid. The New Space Race: China vs. USA. Springer, 2011.; Pekkanen, Saadia M. "Governing the New Space Race." AJIL Unbound 113 (2019): 92–97. https://doi.org/10.1017/aju.2019.16.; Cross, Mai'A. K. Davis. "The social construction of the space race: then and now." International Affairs 95, no. 6 (2019): 1403-1421. https://doi.org/10.1093/ia/iiz190.
[2] Burrows, William E. This new ocean: The story of the first space age. Modern Library, 2010.

power strategies.

Since the end of the Cold War, the dynamics of space politics have shifted significantly. Russia, the United States' former rival, remains a major space power. At the same time, China has emerged as a key player, making significant strides in space exploration, including landing rovers on the Moon and Mars.[3] This has renewed debates on whether the world is witnessing a new space race, particularly between the U.S. and China. Unlike the Cold War, where space competition was largely bilateral, today's space politics involve multiple actors, including private companies, international coalitions, and various nation-states with varying interests and capacities, most notably China.

One critical dimension of contemporary space politics is the collaboration that persists despite terrestrial geopolitical tensions. For example, despite strained relations between Russia and Western powers following the 2014 annexation of Crimea, the Russian space sector continued to engage in cooperative projects with NASA and the European Space Agency (ESA) through missions such as the International Space Station (ISS) and joint lunar explorations.[4] However, following Russia's invasion of Ukraine in 2022, this cooperation significantly diminished but persisted.[5] This background provides a rich context for analyzing why great powers, despite their geopolitical conflicts, sometimes choose to cooperate in space, while in other instances, competition prevails.

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[3] Cheng, Dean. "China's Space Program: A Growing Factor in US Security Planning." The Heritage Foundation Accessed February 6 (2011). https://www.heritage.org/asia/report/chinas-space-program-growing-factor-us-security-planning.

[4] Mauduit, Jean-Christophe. "Collaboration around the International Space Station: science for diplomacy and its implication for US-Russia and China relations." Secure World Foundation, 2017. https://discovery.ucl.ac.uk/id/eprint/10083727/.

[5] Pace, Scott. "Alternative futures for crewed space cooperation after the international space station." Journal of Space Safety Engineering 10, no. 1 (2023): 88-94. https://doi.org/10.1016/j.jsse.2022.11.002.

1.2 Research Problem and the Core Puzzle

The central puzzle driving this research is what motivates great powers to shift between competition and cooperation in space. Despite the overarching trends of great power politics on Earth, space has its relatively independent dynamics, as evidenced by fluctuations in strategic behaviors that are not always aligned with terrestrial geopolitics.[6] The Russian example mentioned earlier highlights this divergence, where strategic behavior in space does not always mirror global geopolitical conflicts.

This dissertation explores the main drivers behind these strategic behaviors in space. Specifically, why do space powers compete in some instances and cooperate in others, even when engaged in geopolitical disputes on Earth? Furthermore, what factors influence these shifts in space strategy? Addressing these questions will help fill gaps in the current IR literature, which often views space as a mere extension of geopolitical rivalries without fully accounting for the unique dynamics of space as a strategic domain.

Hence, the key research questions guiding this dissertation are:

Why do space powers compete, and when do they cooperate?

- Which variables are determinants in strategic shifts between competitive and cooperative stances?
- How do great powers navigate strategic shifts between competition and cooperation in space, and what are the primary factors influencing these shifts?

The primary objective of this research is to develop a deeper understanding of how and why great powers navigate their strategic relationships in space. By analyzing

[6] See Dolman, Everett C. *Astropolitik: Classical Geopolitics in the Space Age*. London: Frank Cass, 2002.; Bowen, Bleddyn E. *War in Space: Strategy, Spacepower, and Geopolitics*. Edinburgh: Edinburgh University Press, 2020.; Deudney, Daniel. *Dark Skies: Space Expansionism, Planetary Geopolitics, and the Ends of Humanity*. Oxford: Oxford University Press, 2020.

historical and contemporary case studies, this dissertation will identify the key drivers behind strategic shifts, offering insights into how space strategy is formulated in response to external pressures and domestic factors.

In the context of neoclassical realism, domestic factors refer to the internal factors that significantly influence how decision-makers perceive and react to external pressures. These factors include the intricate dynamics of bureaucratic politics, the perspectives of influential elites, the characteristics of the governing regime, the sway of public opinion, and the limitations imposed by fiscal constraints. Building upon Ripsman's disaggregation model, this dissertation categorizes domestic variables into three principal areas: (1) leaders' perceptions of their environment and the psychological biases that impact their decision-making; (2) the structure of institutions, which encompasses the relationships between military and civilian sectors as well as potential rivalries within the bureaucracy; and (3) societal elements, such as economic conditions and ideological values that can shape public sentiment.[7] Each of these variables is essential in helping states evaluate their capabilities in space and ultimately shapes the strategies they choose to pursue regarding space policy.

The secondary objective is to contribute to the broader IR literature on space politics by highlighting the unique strategic dynamics in space and constructing a theoretical framework that could work as an analytical tool for understanding space strategies.

This dissertation argues that the combination of relative space capabilities and domestic perceptions, especially perceptions of future distribution of space capabilities, is the crucial variable determining strategic shifts. This argument derives from the four key assumptions synthesized from established works and three hypotheses proposed by this dissertation. This research tested these assumptions through historical and

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[7] Ripsman, Norrin M. *Peacemaking from above, peace from below: Ending conflict between regional rivals*. Cornell University Press, 2016.

contemporary cases. Then, it used these validated hypotheses to construct a theoretical framework as a typology matrix, which can be used as an analytical tool for future research. Hence, this dissertation is an empirical research on strategic shifts of space powers and a theory-building project to contribute to broader IR and space politics research.

1.3 Significance of the Study

This dissertation contributes to the growing body of academic research on space politics, which has become increasingly important as more nations and private actors engage in space activities. Understanding the drivers of great power behavior in space is critical for academic purposes and policymakers and international organizations working on space governance.

First, the study addresses a significant IR literature gap by focusing on space politics' unique dynamics. While many scholars view space as an extension of geopolitical rivalries on Earth, this dissertation argues that space has its strategic momentum that sometimes deviates from broader trends in global politics. The case of Russia and its continued involvement in the ISS, despite sanctions and geopolitical isolation, exemplifies this divergence. This study adds a new dimension to our understanding of space as a distinct strategic domain by identifying the factors that lead great powers to choose cooperation or competition.

Second, the dissertation provides insights into the implications of space politics for global security. As space technologies become more advanced, militarization and potential weaponization of space are growing concerns. Understanding what drives states to pursue competitive or cooperative strategies in space is crucial for anticipating potential conflicts and fostering international cooperation in space governance. The findings of this research could inform future space treaties and policies aimed at preventing the escalation of tensions in space.

Third, this study also highlights the role of emerging actors, particularly China, in shaping the future of space politics. China’s rapid advancement in space exploration, coupled with its geopolitical rivalry with the United States, makes it a key player in the evolving dynamics of space. This dissertation will provide a more comprehensive understanding of how emerging space powers influence the strategic landscape by examining China's space strategy compared to the U.S. and Russia.

However, it is important to mention that while the growing involvement of private actors is reshaping aspects of space activity, their impact remains mediated by state authority and varies considerably across cases. As such, their systemic influence remains emergent rather than transformative. Hence, due to the scope limit of this dissertation, the role of private actors should be discussed in a separate research rather than in this one.

In sum, this research is significant for both scholars and practitioners. It aims to bridge the gap between theoretical IR models and the practical realities of space strategy, offering a nuanced perspective on the challenges and opportunities of great power behavior in space.

1.4 Structure of the Dissertation

This dissertation is organized into ten chapters, including the introduction. Chapter II comprehensively reviews the existing literature, categorizing it into three distinct but overlapping narratives about space politics: space as a strategic domain, space as a global common, and space as an economic frontier. The first narrative is characterized by realist approaches emphasizing space's security and strategic dimensions, especially during the Cold War. The second narrative focuses on the global commons framework, reflecting international cooperation and governance structures on space governance, such as space treaties. The third narrative focuses on the commercialization of space, exploring how private actors and economic incentives are transforming space governance. This chapter identifies gaps in the literature that this dissertation will address, mainly through a neoclassical realist lens, to combine the three narratives into an overarching framework for understanding strategic shifts in space.

Chapter III establishes the theoretical foundation for the dissertation by integrating neoclassical realism with the study of space politics. The framework explores how both systemic pressures, such as changes in relative space capabilities, and domestic political factors, such as perceptions of future space capabilities and political-economic constraints, shape great powers' strategies in space. The chapter also defines critical concepts such as space geography, assets, and capabilities while laying out four key assumptions and three core hypotheses that are tested in the empirical chapters and analyzed in Chapter X. Finally, it proposes a typology for understanding space power behavior, which is also discussed in the last chapter for its implications.

Chapter IV introduces the methodology and data used in this dissertation. This dissertation utilizes process tracing as the primary research method to explore the shifts in space strategies among great powers. Quantitative metrics that reflect relative space capabilities further supplement the process tracing approach. Sources of data for both the qualitative process tracing and quantitative statistics are also introduced in this chapter.

Chapter V to IX are the main empirical cases that this dissertation used to test the core hypothesis, and they are also the subject of the typological analysis in Chapter X. Chapter V traces the trajectory of the U.S. through the Space Race, marking significant shifts between its strategies as an emerging space power towards a balanced space power. This is followed by the case of the Soviet Union during the Cold War, primarily focusing on its strategies as a balanced space power to a declining space power. Then, Chapter VII discusses strategic shifts around the unipolar moment in the 1990s and shifts in U.S. strategies as a space hegemon and how they responded to the rise of China as a space power.

Chapter VIII offers an overview of China’s trajectory as a space power from 1956 to the most recent decade. It traces China’s strategic shift from a pragmatic space power before the 1990s and its shift towards an emerging space power in the following decade. Finally, this chapter offers an insight into the more recent shift of China towards more revisionist strategies that challenge the U.S. as the status quo space power. The last empirical chapter, Chapter IX, examines the unique case of Russia as a declining space power since 1989 and how it has strived to maintain its space capabilities since the 1990s through cooperation with various partners. This chapter focuses on the case of the ISS and Russia’s alignment with China since 2014.

Finally, Chapter X offers discussions and conclusions for the dissertation. It presents key findings and discusses limitations, as well as offering an outlook for future research.

Chapter II Literature Review: Space Strategy, Space Laws, and Commercial Space

2.1 Introduction

Various theoretical approaches have shaped the study of outer space within political science and International Relations, each offering distinct perspectives on the implications of space activities for global politics. From classical realist notions of power and security to liberal concepts of international cooperation and governance, these frameworks provide critical insights into how outer space is understood and managed by different space powers. This literature review will critically examine the key contributions in these areas, highlighting the central debates and identifying gaps this dissertation aims to address. The existing academic literature can be categorized into three main themes: space as a strategic domain, space as a global common, and space as an economic frontier. While distinct in explaining space policy and strategy changes, they also overlap in certain areas, which this chapter will cover.

To summarize the three narratives' central tenets, the conceptualization of outer space as a strategic domain, also called the “space nationalism” school of thought by some,[8] is perhaps the oldest and most influential framework used to analyze space. Since the beginning of the Cold War, space and space technologies have been associated with states' security and strategic interests. Some of the most influential works on space politics derive from this angle of analysis. These scholars focus on the security and strategic implications of space technologies and space activities, especially regarding the militarization and weaponization of space.

Specifically, the conceptualization of outer space as a global common, also called

[8] Moltz, James. *The politics of space security: strategic restraint and the pursuit of national interests*. Stanford University Press, 2011,23.

global institutionalism by some,[9] has also been a central focus in the International Relations literature, reflecting the regime-building process of space governance in international laws and cooperation. Scholars have examined the political dynamics surrounding the efforts to establish international regimes and norms to govern the use and exploration of space, drawing on theories of global governance and international cooperation, such as the core UN space treaties. Literature from this category also tends to possess a certain level of normative tendency, emphasizing the need for collective action to manage shared resources and mitigate the potential for conflict in the space domain.

In contrast, the more recent literature on space as an economic frontier focuses more on the development of commercialization and privatization of space activities instead of collective action through international institutions. As a result of the rise of private actors in space, this relatively new dynamic has led to debates about the balance between state sovereignty, private property rights, and the shared interests of humanity in the exploration and utilization of space resources.

With such vast literature to explore, this chapter aims to comprehensively review the critical theoretical and empirical contributions in space politics and International Relations. The first section will delve into the strategic dimensions of space, analyzing how classical and contemporary International Relations theories have been applied to the space domain. In the second section, the review will focus on conceptualizing outer space as a global common, examining the theoretical foundations and the political dynamics surrounding the governance of space activities. Finally, the third section will explore space exploration's economic and commercial aspects, considering the implications for the international regime and the potential for conflict or cooperation between state and non-state actors.

[9] Ibid.

2.2 Space as a Strategic Domain

Space has long been viewed as a strategic domain for geopolitical competition since the beginning of the Cold War. This origin is deeply rooted in the dual-use nature of space technologies and the history of early space programs within the unique settings of superpower competition between the U.S. and the Soviet Union. This framing of space is deeply rooted in realist International Relations theories and considers space an extension of geopolitical competition on Earth. For proponents of this view, space activities and space strategies all serve the purpose of great power competition, and the early scholars firmly focused on the Cold War. One of the earliest scholars to address the strategic implications of space was Bernard Brodie, who, in the late 1940s and early 1950s, explored the potential of missiles and satellites as components of military strategy.[10] As an influential scholar deeply engaged with nuclear deterrence theories and policies, Brodie's work laid the groundwork for understanding space as an extension of terrestrial military power, emphasizing the importance of technological superiority in maintaining national security, which included space.

As the Cold War started to take shape and intensified, the strategic implications of space became more pronounced. The launch of Sputnik in 1957 by the Soviet Union marked a technological milestone and underscored the strategic potential of space capabilities. Scholars such as Donald Brennan expanded on ideas similar to those of Brodie's, framing space as a crucial battleground in the broader Cold War competitions.[11] Brennan's work on defense policy underscored the importance of satellite technology for surveillance and communication, which were vital for maintaining a strategic edge and framing space as a domain to be controlled through disarmament agreements. These early perspectives highlighted the dual-use nature of

[10] Brodie, Bernard. Strategy in the missile age. Princeton University Press, 2015.
[11] Brennan, Donald G. "Why Outer Space Control?." *Bulletin of the Atomic Scientists* 15, no. 5 (1959): 198-202. https://www.tandfonline.com/doi/pdf/10.1080/00963402.1959.11453961.

space technologies, setting the stage for later discussions on space as a strategic domain.

During the Cold War, discussions on space strategies and space politics were strongly linked to nuclear weapons and deterrence theories, and space capabilities were seen as an augmentation for atomic capabilities. Herman Kahn, another crucial nuclear strategist of the time, addressed the broader implications of space technology for deterrence and escalation in his work On Thermonuclear War.[12] Kahn argued that space-based assets, particularly those related to missile defense and early warning systems, played a crucial role in the strategic calculations of both superpowers. He posited that developing anti-ballistic missile systems and space-based reconnaissance would significantly impact the balance of power, potentially altering the dynamics of nuclear deterrence. Kahn's work contributed to understanding space as a domain where technological advancements could stabilize or destabilize global security, depending on how they were integrated into national strategies.

The strategic domain framework, dominated by security-centric analyses, has long been a cornerstone of space studies. Scholars like James Clay Moltz, Joan Johnson-Freese, and Everett Dolman have contributed significantly to our understanding of space as a critical arena for geopolitical competition and military strategy. However, this body of work tends to narrow the concept of national interests in space, focusing predominantly on military capabilities and the pursuit of political prestige. This approach often overlooks the complex nature of space activities, where economic, scientific, and technological interests are increasingly intertwined with security concerns. Moreover, the emphasis on traditional power dynamics fails to account for the unique characteristics of space, such as its physical properties and the technical challenges inherent in space exploration, which can drive cooperation even among

[12] Kahn, Herman, and Evan Jones. *On thermonuclear war*. Routledge, 2017.

rivals.

In sum, mainstream discussion on space strategies during the Cold War was mainly concerned with achieving or enhancing deterrence through space and arms control to avoid rapid militarization and weaponization of space. The works of these Cold War scholars provide a foundation for understanding the strategic dimensions of space, particularly in terms of military power and control. However, their focus on the military aspects of space strategy often comes at the expense of a more holistic view that includes economic, technological, and diplomatic factors. Also, due to the security-centric view of these scholars, there has been a lack in this literature on how a space program, which includes both civilian and military components, should be developed.

This tradition of viewing space as a strategic domain continued well after the Cold War and progressed to present a more holistic view of space strategies due to new technologies and the evolution of space activities. The continuous militarization and potential weaponization of space only increased in the 21st century, which sparked many new discussions on the strategic importance of space as a strategic domain for security and political competitions. The most representative views came from James Clay Moltz, Joan Johnson-Freese, and others. James Moltz's *The Politics of Space Security: Strategic Restraint and the Pursuit of National Interests* is an important work that examines the evolution of space security from the Cold War era through the early 21st century.[13] Moltz's central argument is that space security has been characterized by a delicate balance between competition and cooperation, with states exercising strategic restraint to avoid escalating conflicts in space. He explores how major space powers, primarily the United States, Russia, and China, have managed their space capabilities to secure national interests while also engaging in diplomatic efforts to

[13] Moltz, 2011.

prevent the militarization of space.

Moltz's analysis is complemented by works such as Michael Sheehan's *The International Politics of Space*, which emphasizes the role of diplomacy and international agreements in shaping space security dynamics in service to national interests.[14] Sheehan argues that space has remained relatively stable due to the shared interest of significant powers in preventing space from becoming an arena of conflict. This view aligns closely with Moltz's emphasis on strategic restraint. Similarly, Bleddyn Bowen's *War in Space: Strategy, Spacepower, and Geopolitics* highlights the continued importance of space for national security but warns of the increasing challenges posed by the rise of new space actors and technologies that could destabilize the current strategic balance.[15]

Joan Johnson-Freese's *Space Warfare in the 21st Century: Arming the Heavens* critically examines the militarization of space and the strategic implications of space-based military capabilities.[16] Johnson-Freese argues that space has become an increasingly vital domain for military operations, defined as "Congested, Competitive, and Contested" with significant implications for global security. She explores the development of anti-satellite (ASAT) weapons, missile defense systems, and other space-based military technologies, arguing that the militarization of space is inevitable and poses significant risks for strategic stability.

Johnson-Freese's analysis is echoed in the works of Everett Dolman's *Astropolitik: Classical Geopolitics in the Space Age*, which applies classical geopolitical theories to space and argues for the strategic necessity of space dominance.[17] Dolman's work is particularly influential in its advocacy for space control to secure national interests, a

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[14] Sheehan, Michael. *The international politics of space*. Routledge, 2007.
[15] Bowen, Bleddyn E. War in space: Strategy, spacepower, geopolitics. edinburgh university Press, 2020.
[16] Johnson-Freese, Joan. *Space warfare in the 21st century: Arming the heavens*. Routledge, 2016.
[17] Dolman, Everett C. *Astropolitik: classical geopolitics in the space age*. Routledge, 2005.

position that underscores the strategic imperatives driving space militarization. Similarly, Colin Gray's *Future Strategy* discusses the importance of space in modern and future military strategy, emphasizing that space control is critical for achieving strategic objectives on Earth.[18] Additionally, Peter L. Hays' works further reinforce the argument that space has become an essential domain for military strategy.[19] Hays examines the development of space-based missile defense systems and other strategic assets, emphasizing the necessity of maintaining space superiority to protect national security. His work aligns with Johnson-Freese's concerns about the risks of an arms race while advocating for the strategic advantages of maintaining dominance in space.

In sum, this literature on space as a strategic domain provides a robust foundation for understanding the importance of space and offers many core concepts for analyzing space strategies. Certain space features, such as the dual-use nature of space technologies and the space domain's congested, competitive, and contested nature, are instrumental for this dissertation. Overall, their work has established a solid theoretical and empirical basis for analyzing space politics, mainly through a structuralist lens that adapted conventional geopolitical and security theories to understand the strategic dynamics of space. The core tenant of this space framing is to view all strategic behaviors in space as pursuits towards national interests, particularly security interests, and to a lesser extent, political interests such as maintaining domestic stability or strategic signaling. However, despite these contributions, several gaps in the literature must be addressed to fully comprehend the complexities of contemporary space politics.

To further understand the approach to space strategies and how space was perceived as a strategic domain, several important historical works made invaluable

[18] Gray, Colin S. *The future of strategy*. John Wiley & Sons, 2016.
[19] See Hays, Peter L. "Space and the military." In *Space and Defense Policy*, 167-218. Routledge, 2009.; and Hays, Peter L. *United States military space: Into the twenty-first century*. DIANE Publishing, 2002.

contributions. For example, William E. Burrows, in his seminal space history work, *This New Ocean: The Story of the First Space Age*, explored how the space race was driven by scientific ambition and strategic necessity during the Cold War.[20] His work emphasizes the dual-use nature of space technologies, where scientific exploration and military strategy are deeply intertwined. The central argument of Burrows' book is that the Space Race was not merely a series of technological achievements but a geopolitical contest between the United States and the Soviet Union. Through space exploration, both superpowers sought to demonstrate their ideological and technological superiority on the global stage. Burrows delves into the military applications of space, highlighting how reconnaissance satellites, missile warning systems, and space-based weapons became crucial components of national security during the Cold War. He also explores the shift towards the commercialization of space and speculates on the future of space exploration.

Burrows emphasized that the United States and the Soviet Union during that period viewed space as a new frontier where dominance could translate into significant geopolitical advantages and gave a well-supported narrative that included many valuable primary sources. His work shed light on how policymakers and strategists perceived space as a domain where the Cold War's ideological and military struggles could be extended. Throughout the 1960s and 1970s, the scholarship increasingly recognized the strategic potential of space assets, particularly satellites, for military purposes such as surveillance, communication, and early warning systems. These technologies were seen as essential components of the national defense infrastructure, leading to the development of doctrines that integrated space capabilities into broader military strategies.

Similarly, Walter McDougall's work *The Heavens and the Earth: A Political History*

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[20] Burrows, William E. *This new ocean: The story of the first space age*. Modern Library, 2010.

of the Space Age provides a comprehensive analysis of how space exploration was deeply intertwined with the geopolitical strategies of the superpowers during this era.[21] McDougall advanced on the historical narrative deeper into the space race's political, ideological, and cultural dimensions. McDougall's work is distinguished by its analysis of the bureaucratic and policy-making processes that shaped the space programs of both nations. He critiques the notion of technological determinism, arguing that political will and strategic decision-making were the primary drivers of the space race rather than technological capability alone.

While the works of both Burrows and McDougall provided invaluable historical context and empirical support for understanding space history and strategy-making processes, they need a structured and systematic theoretical approach to explain how states make strategic decisions in space. About both Burrows and McDougall, this dissertation advances the discourse on space politics by introducing a theoretical framework that integrates the concept of relative space capabilities into the analysis of space strategy. While Burrows and McDougall provide essential historical insights, they must fully explore the strategic mechanisms behind state behavior in space. This research fills this gap by offering a neoclassical realist perspective that systematically analyzes how perceptions of space capabilities influence state behavior. This contribution is significant for IR theory, as it provides a structured approach to understanding space as a strategic domain, where the distribution and perception of capabilities are critical determinants of state action.

2.3 Space as a Global Commons

Conceptualizing outer space as a global commons has also been a significant and enduring focus within the literature on space governance and international law. This

[21] McDougall, Walter A. "Heavens and the earth: a political history of the space age." Johns Hopkins University Press, 1985.

perspective, deeply rooted in the principles of international cooperation and the non-appropriation of space, argues that outer space, like the high seas or Antarctica, should be preserved for peaceful purposes and accessible to all humanity. Scholars advocating this view emphasize the importance of collective management, legal frameworks, and the need to ensure that space remains a shared resource, benefiting all nations equally rather than being dominated by a select few. This poses a noticeable contrast to framing space as a strategic arena discussed in the previous section of this chapter. Firstly, the fundamental principle for this school of thought is to ensure that space remains a domain accessible to all nations for peaceful purposes and that its resources are used for the benefit of all humanity.[22] Secondly, deriving from the international law community and liberal institutionalist theories, the global standard framing is grounded in international treaties and agreements,[23] such as the Outer Space Treaty of 1967, which establishes that outer space is not subject to national appropriation and must be used for peaceful purposes, in opposition to militarization. Thirdly, this framing rejects the idea that Earth-bound geopolitics and sovereign claims should be extended to space.[24] Even for space resources, advocates of this global commons framing argue that they should be used in a way that benefits all humanity. This section will summarize and critically analyze the representative works following this approach.

However, this does not mean that this framing of space as a global commons contradicts the scholars who recognize space as a strategic domain. On the contrary, many scholars in the previous section acknowledge the need for a more robust space governance system to avoid space conflict. This overlap may have originated from the simultaneous development of both narratives and the dual-use nature of space

[22] See Cheng, Bin. *Studies in international space law*. Oxford University Press, 1997., and von der Dunk, Frans. *Handbook of Space Law*. Edward Elgar Publishing, 2015.

[23] Lafferranderie, Gabriel, and Daphné Crowther, eds. *Outlook on Space Law over the next 30 years: Essays Published for the 30th Anniversary of the Outer Space Treaty*. Martinus Nijhoff Publishers, 1997.

[24] See Lee, Ricky. *Law and regulation of commercial mining of minerals in outer space*. Vol. 7. Springer Science & Business Media, 2012., and Hobe, Stephan, ed. *Pioneers of Space Law: A publication of the International Institute of Space Law*. Martinus Nijhoff Publishers, 2013.

technologies. Specifically, the notion of space as a global commons gained significant traction during the Cold War, mainly through the efforts of diplomats and legal scholars who sought to prevent the militarization and national appropriation of outer space. One of the earliest and most influential advocates of this perspective was Arvid Pardo, a Maltese diplomat known for his pivotal role in the negotiations that led to the United Nations Convention on the Law of the Sea (UNCLOS). Pardo extended his advocacy to outer space, arguing that the deep seabed and outer space should be considered the "common heritage of mankind."[25] His work laid the groundwork for the Outer Space Treaty of 1967, which remains the cornerstone of international space law. The Treaty explicitly states that outer space, including the Moon and other celestial bodies, is not subject to national appropriation and should be used exclusively for peaceful purposes. This treaty reflects Pardo's vision of space as a global commons, ensuring that space remains accessible to all nations, regardless of technological capabilities.[26] Following this early principle rooted in the 1967 OST and other international space laws, Bin Cheng is another pivotal figure whose work, *Studies in International Space Law*, has been foundational in framing space as a global commons. Cheng's analysis of the Outer Space Treaty and subsequent agreements underscores the importance of maintaining outer space as a domain free from national sovereignty claims.[27] He argues that the principles established by these treaties, such as non-appropriation, peaceful use, and the obligation to prevent harmful contamination, are essential to preserving space as a global commons. Cheng's work is frequently cited in discussions about the governance of space and the need for international cooperation to manage its use.

Andrew G. Haley, often regarded as the "father of space law" in popular media, also

[25] Pardo, Arvid, and Carl Q. Christol. "The common interest: tension between the whole and the parts." In *The Structure and Process of International Law*, 643-660. Brill Nijhoff, 1983. https://doi.org/10.1163/9789004636224_021.
[26] Ibid, 644-645.
[27] Cheng 1997, 34-37.

contributed significantly to the discourse on space as a global commons during the Cold War. Haley's writings and advocacy were instrumental in shaping the early space law principles that emphasized the non-appropriation of space by any single nation. He argued that space should be used for the benefit of all humankind, reinforcing the idea that it must be governed by international law and kept free from national sovereignty claims. [28]These early scholars were crucial in establishing the legal and normative frameworks that continue to influence our understanding of space as a global commons today. Their efforts ensured that outer space would remain open to exploration and use by all nations rather than becoming an arena for exclusive control by the superpowers.

This approach and call for normative principles extended to more recent literature. As with any global commons, another critical issue for scholars considering space as a global commons is how to avoid "the tragedy of commons."[29] By framing space as a global commons, there is a need for collective actions when governing space. From this perspective, some scholars interpret various dynamics in space politics as shifts between space as a commons and the efforts to infringe or uphold that status.[30] One representative who worked on this was Mai'a Cross. Cross challenges the conventional view that outer space is primarily a domain for national competition and conflict, often associated with the Cold War's Space Race.[31] Instead, she argues that, despite conventional perception, outer space has been characterized by consistent and purposeful cooperation among space actors. She traces this cooperative dynamic back

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[28] Haley, Andrew G. "Space age presents immediate legal problems." In *First Colloquium on the Law of Outer Space: The Hague 1958 Proceedings*, 5-27. Springer Vienna, 1959. https://doi.org/10.1007/978-3-7091-4414-5_2.

[29] Hardin, Garrett. "The tragedy of the commons." In *Environmental ethics*, 185-196. Routledge, 2013.

[30] For this type of perspectives, see Vogler, John. "Global commons revisited." *Global Policy* 3, no. 1 (2012): 61-71. https://doi.org/10.1111/j.1758-5899.2011.00156.x., and Stang, Gerald. *Global commons: Between cooperation and competition*. European Union Institute for Security Studies (EUISS), 2022. http://www.jstor.com/stable/resrep06840. And Cross, Mai'A. K. Davis. "Outer space and the idea of the global commons." *International Relations* 35, no. 3 (2021): 384-402. https://doi.org/10.1177/00471178211036223.

[31] Cross, Mai'A. K. Davis. "Space security and the transatlantic relationship." *Politics and Governance* 10, no. 2 (2022): 134-143. https://www.ssoar.info/ssoar/handle/document/79635.

to the 1920s and 1930s Spaceflight Movement, which was transnational and collaborative, advocating for the peaceful use of space decades before the necessary technology existed. This perspective differs from the perspective of framing space as a strategic domain. It draws attention to the more cooperative and non-security aspects of space politics that many have neglected.

Contemporary literature is bifurcated into two approaches for a collective action problem, such as governing space. One is international institutionalists, who emphasize the importance of institutions and international laws. In his writings on space diplomacy, Peter Martinez also advocates for treating space as a global common. Martinez has developed international guidelines for space activities, particularly in his role with the United Nations Committee on the Peaceful Uses of Outer Space (COPUOS). He argues that effective space diplomacy requires recognizing the global nature of space and building consensus on issues like space debris management and the long-term sustainability of space activities.[32] The critical issue for these scholars is that the peaceful status of space should be maintained through the international legal system and international institutions, which fits the institutionalist theories derived from neoliberal theories.

However, some other scholars have also examined and explored the alternative, which is governing space through international norm-based national laws. National laws and regulations are pivotal in translating international space governance frameworks into actionable and enforceable rules at the country level, a point underscored by Oltrogge and Christensen in their analysis of space governance in the new space era. They emphasize that while international treaties and guidelines, such as those developed by the United Nations and the Inter-Agency Debris Coordination Committee (IADC),

[32] Martinez, Peter. "The UN COPUOS guidelines for the long-term sustainability of outer space activities." *Journal of Space Safety Engineering* 8, no. 1 (2021): 98-107. https://doi.org/10.1016/j.jsse.2021.02.003.

provide essential overarching principles, it is the role of national regulatory agencies to implement these frameworks through binding regulations.[33] For example, in the United States, the Federal Communications Commission (FCC) plays a crucial role in managing the radio frequency spectrum and licensing satellite operators, ensuring that practices such as post-mission disposal of satellites are enforced to mitigate space debris. Similarly, the Federal Aviation Administration (FAA) is responsible for the safety regulation of commercial space launches and reentries, which is essential for protecting public safety and the space environment. However, Oltrogge and Christensen also highlight the challenges posed by the differences in national regulatory approaches, noting that while some countries have developed comprehensive regulatory frameworks, others have less developed or fragmented regulations, leading to inconsistencies in enforcing international norms. This disparity can create significant challenges in ensuring a globally cohesive approach to space governance, particularly as the number of space actors grows and diversifies.

The role of national laws in space governance has been extensively analyzed by other scholars, who agree on their importance but also point out the complexities involved. In his book National Space Legislation in Europe, Frans von der Dunk argues that national laws are essential for ensuring compliance with international obligations and promoting the sustainable use of outer space. He discusses the challenges of harmonizing national laws across different jurisdictions, especially within the European context, where multiple countries with varying legal traditions must coordinate their space activities[34]. Similarly, Ram S. Jakhu, in his work *Regulation of Space Activities: The International Perspective*, examines how national laws regulate commercial space activities and ensure alignment with international norms. He

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[33] Oltrogge, Daniel L., and Ian A. Christensen. "Space governance in the new space era." *Journal of Space Safety Engineering* 7, no. 3 (2020): 432-438. https://doi.org/10.1016/j.jsse.2020.06.003.

[34] von der Dunk, Frans G., ed. *National space legislation in Europe: issues of authorization of private space activities in the light of developments in European space cooperation*. Vol. 6. Martinus Nijhoff Publishers, 2011.

highlights potential conflicts between national regulations and international law, particularly when national interests diverge from global governance goals.[35] These scholars underline the necessity of solid national regulatory frameworks that enforce international agreements and address their respective space industries' specific needs and challenges, ensuring that these activities contribute to global sustainability rather than undermining it.

2.4 Space as an Economic Frontier

In recent decades, there has been a growing literature regarding space politics and space strategies that frames space as an economic frontier, also called “new space” literature. Briefly speaking, the "new space" era is characterized by the growing involvement of private actors in space exploration, resource extraction, comprehensive satellite services, new technologies, and new conventional actors. The new space literature regards this shift as a fundamental change in the traditional state-centric view of space, presenting it as an economic frontier where private enterprises play a central role in shaping space policies and strategies.[36] Therefore, the "new space" literature focuses on outer space's economic potential, commercial activities' regulatory and legal challenges, and broader global governance and security implications.

The origin of commercialized space did not start in recent decades but way earlier, during the Cold War. In his book *After Apollo? Richard Nixon and the American Space Program*, Logsdon examines the transition from the Apollo program to the space shuttle era, highlighting the increasing involvement of private contractors and the shift towards more commercially viable space activities. He argues that this transition marked the beginning of the "new space era,” where economic considerations became

[35] Jakhu, Ram S., ed. *National regulation of space activities*. Vol. 5. Springer Science & Business Media, 2010.
[36] See Vernile, Alessandra. *The rise of private actors in the Space Sector*. Cham: Springer, 2018., and Jakhu, Ram S., and Joseph N. Pelton, eds. *Global Space Governance: an international study*. Cham: Springer, 2017., and Buthe, Tim. "Governance through private authority: non-state actors in world politics." *Journal of International Affairs* 58, no. 1 (2004): 281-291.

central to the development of space policy.[37] Logsdon's work underscores the importance of understanding the financial drivers behind space activities, particularly in U.S. space policy, which has increasingly favored commercial partnerships and developing a competitive space industry.

Deriving from this view, one central piece of the literature is Daniel Deudney's *Dark Skies: Space Expansionism, Planetary Geopolitics, and the Ends of Humanity*, which critically examines the implications of space expansionism. This book serves as a warning against space expansionism. It considers the current wave of privatization and commercialization of space and expanded activities from conventional state-space actors as the symptom of space expansionism. Deudney argues that the commercialization of space, while opening up new economic opportunities, also brings about significant risks, particularly concerning environmental degradation and the potential for exacerbating geopolitical tensions.[38] He warns that the drive to commercialize space could lead to a new form of colonialism, where powerful states and corporations dominate space resources, potentially leading to conflict and the exclusion of less powerful actors from the benefits of space exploration. Deudney's work highlights the need for robust international governance mechanisms to manage the economic activities in space and ensure that they contribute to global equity rather than deepen existing inequalities.

Similar to his critical approach to new space, the growing commercial activities in space have also been discussed by Yun Zhao in his work on space commercialization and the development of space law. Zhao traces the evolution of space law, noting that the original legal frameworks, such as the Outer Space Treaty, were primarily designed to govern state activities and did not fully anticipate the rise of private space

[37] Logsdon, 2015.
[38] Deudney, 2020.

enterprises.[39] He argues that the rapid commercialization of space, such as spanning telecommunications, remote sensing, space tourism, and asteroid mining, has outpaced the development of international regulations, leading to a legal vacuum in which commercial actors operate with significant freedom. According to Zhao, this lack of comprehensive regulation poses risks to the sustainability of space activities and the equitable distribution of space resources.

In his Handbook for New Actors in Space, Christopher D. Johnson addresses the challenges faced by new entrants into the space sector, both state and non-state actors. Johnson emphasizes the importance of understanding the existing legal frameworks and soft laws' role in guiding new space actors' behavior.[40] He notes that hard laws, such as the treaties developed under the United Nations, provide a foundation for space governance. However, soft laws and best practices developed by industry groups are increasingly important in the new space era. These soft laws, while non-binding, play a critical role in shaping the behavior of private companies and ensuring that their activities do not undermine the collective interests of the global community. Philip De Man contributes to this discourse with his analysis of the commercialization of space in legal and policy contexts. In his works, De Man discusses the challenges of regulating space mining and the ownership of space resources in currently under-regulated areas. He argues that the lack of clear legal frameworks for resource extraction in space creates a situation where the most influential actors, states or private corporations, can potentially monopolize space resources, leading to conflicts over access and ownership.[41] De Man calls for developing new international agreements that specifically address the commercial exploitation of space resources

[39] Zhao, Yun. "Space commercialization and the development of Space Law." In *Oxford Research Encyclopedia of Planetary Science*. 2018. https://doi.org/10.1093/acrefore/9780190647926.013.42.
[40] Johnson, Christopher D. "Handbook for new actors in space." Broomfield, CO: Secure World Foundation, (2017). https://commons.erau.edu/db-cso-351-spring2019/7.
[41] De Man, Philip. "State practice, domestic legislation and the interpretation of fundamental principles of international space law." *Space Policy* 42 (2017): 92-102.

and ensure that these activities are conducted in a manner that benefits all of humanity, which resonates with the international institutionalists' arguments.

Other than this debate on challenges posed by private actors and the call for institutional efforts, there has also been an argument that incorporating more private authorities into space governance is a viable solution to the collective action problems.[42] The core argument is that private authorities could serve a purpose in governing international affairs due to the absence or retreat of public authority in novel economic domains, technological complexity, and ideological shifts like neoliberalism.[43] Some scholars say this phenomenon is traditionally a state-dominated space governance domain, increasingly influenced by private entities and public-private partnerships (PPPs). This shift is marked by the growing importance of transnational conglomerates, which are taking on more significant roles in space programs, including human-crewed spaceflights and the development of dual-use technologies that blur the lines between military and civilian applications. As perhaps the most prominent "new space" actor, SpaceX is analyzed as an example by Eligar Sadeh. Sadeh explores the pivotal role of Public-Private Partnerships (PPPs) in advancing the development of space launch systems in the United States, focusing on the collaboration between government agencies like NASA and private companies. Sadeh outlines two primary PPP models: traditional contracting by negotiation, where the government covers costs plus profit, and acquiring commercial items, which shifts more financial risk to the private sector.[44] The article highlights successful applications of these models in programs like NASA's Commercial Crew and Cargo initiatives, where partnerships with companies such as SpaceX have led to significant

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[42] Cutler, A. Claire, Virginia Haufler, and Tony Porter, eds. *Private authority and international affairs*. Suny Press, 1999.
[43] Buthe, Tim. "Governance through private authority: non-state actors in world politics." Journal of International Affairs 58, no. 1 (2003): 281-291. https://www.jstor.org/stable/24357925.
[44] Sadeh, Eligar. "Public private partnerships and the development of space launch systems in the United States." *Astropolitics* 13, no. 1 (2015): 100-115. https://doi.org/10.1080/14777622.2015.1014245.

advancements in space technology while minimizing government risk. However, Sadeh also discusses challenges, particularly in managing costs and ensuring high technical performance, noting the potential for escalating costs, termed the "acquisition death spiral," if not carefully managed.[45] The article emphasizes the need for streamlined regulatory practices and effective oversight to balance innovation and safety. It concludes that while PPPs have been crucial for progress in U.S. space launch systems, ongoing challenges must be addressed to ensure their continued success.

Overall, the "new space" literature represents a significant shift in the discourse surrounding space politics and strategy, emphasizing the economic potential of outer space as an emerging frontier. This body of work reflects the growing involvement of private actors in space activities, ranging from satellite deployment and resource extraction to space tourism and beyond. Unlike the traditional state-centric models that dominated earlier discussions, the "new space" era is characterized by the increasing influence of private enterprises and the strategic partnerships they form with national governments. These developments have led to a rethinking of how space is governed and regulated, with significant implications for international relations and global security.

However, while the "new space" literature provides valuable insights into the economic dimensions of space activities, it also reveals significant gaps in the current governance frameworks. The existing literature often focuses on the financial benefits of commercialization without fully addressing the broader implications for global equity and security. The increasing role of private actors while driving innovation also raises concerns about accountability and potential conflicts over space resources. Furthermore, there is a tendency within the literature to overlook the unique strategic imperatives of space as a domain, treating it as an extension of terrestrial geopolitical

[45] Ibid,105.

competition rather than as a distinct arena with its own set of challenges and opportunities.

In conclusion, while the "new space" literature has expanded our understanding of the economic frontier of outer space, it also highlights the need for a more comprehensive approach to governance. This approach must integrate the interests of both state and non-state actors, address the gaps in legal and regulatory frameworks, and ensure that space activities are conducted in a manner that benefits all of humanity. The critical assessment of this literature underscores the importance of developing governance structures that can adapt to the rapidly evolving space landscape, balancing economic development with the principles of sustainability and international cooperation. However, despite the proliferation of commercial activity in policy discourse, empirical evidence suggests that private actors' actual strategic autonomy and systemic impact remain limited, especially outside the U.S.

2.5 Critical Assessment

The literature on space politics and strategy has developed across several distinct frameworks, each offering valuable insights into space governance and utilization dynamics. These frameworks—space as a strategic domain, space as a global common, and space as an economic frontier—form the foundation of academic discourse on the subject. However, despite the depth and breadth of these discussions, significant gaps remain, particularly in their ability to address the impact of domestic political and economic dynamics on space strategies.

Firstly, these works are predominantly security-centric, which leads to a relatively narrow definition of national interests in space. Focusing heavily on military and geopolitical considerations, these scholars often equate national interests in space solely with pursuing security and strategic dominance. While useful for specific analyses, this approach overlooks the broader array of interests that nations might pursue in space, including economic development, scientific research, and technological innovation. For example, space-based resources, such as minerals from asteroids or lunar water ice, are increasingly critical for future economic growth and energy security. However, these non-military interests are often underrepresented in security-focused analyses, leading to an incomplete understanding of what drives state behavior in space.

Secondly, the emphasis on security has led to the conflation of space interests with broader geopolitical interests on Earth. This perspective assumes that space strategy is merely an extension of terrestrial geopolitical competition, where actions in space are driven primarily by the desire to gain or maintain strategic advantages on Earth. While there is undoubtedly a strong connection between space and terrestrial geopolitics, this view neglects the unique logic of space strategies shaped by space's physical properties and the materialistic requirements of space programs. For instance, the problem of space debris poses significant risks to military and civilian satellites, necessitating international cooperation that might not align with traditional geopolitical rivalries. The successful management of the International Space Station (ISS), which involves collaboration between former Cold War adversaries, illustrates how space interests can sometimes transcend Earth-bound geopolitical conflicts.

Thirdly, the existing literature tends to focus primarily on actual space capabilities on the system level, often underestimating the critical role of perceptions of these capabilities in shaping strategic decisions, predominantly shaped by perceptions and other political or economic factors. While Dolman and others have extensively analyzed the importance of accumulating and projecting space power, they often assume that strategic shifts directly correlate with the actual distribution of capabilities. However, in many cases, the domestic perception of these capabilities—especially relative capabilities—drives strategic behavior. For example, China’s successful anti-satellite (ASAT) tests in the 2000s showcased its capabilities in specific areas of space warfare. Still, they did not necessarily indicate a substantial leap in its overall space capabilities. Despite this, the United States perceived these tests as a significant challenge to its space dominance. This led to a heightened sense of threat and a more competitive strategic response than warranted. While a few scholars used neoclassical realist frameworks to fit this gap, most of these works focused on specific case studies or a specific period.[46]

This response was driven more by the perception of the potential threat to U.S. space superiority than by the balance of space power between the two nations. Such misperceptions can escalate tensions and lead to strategic shifts that might not align with the actual capabilities on the ground, illustrating the importance of understanding how domestic perceptions shape space policy decisions. This focus on perceptions of capabilities rather than just capabilities reveals a more complex dynamic where states might act aggressively or defensively based on perceived threats or opportunities, irrespective of the actual balance of power. The literature's failure to fully engage with these psychological and political dimensions results in an incomplete understanding of how space strategies are formulated and adjusted in response to natural and perceived changes in the strategic environment.

In conclusion, while the existing literature has provided a solid foundation for understanding space strategy, its security-centric focus, the tight coupling of space and terrestrial geopolitical interests, and the emphasis on actual capabilities leave significant gaps. These gaps include a limited understanding of how national interests in space extend beyond security concerns, underestimating the unique strategic logic of space as a domain, and failing to fully account for how perceptions of relative capabilities influence strategic decisions. Addressing these gaps is essential for a more

[46] See Pollpeter, Kevin. "Neoclassical Realism as a Framework for Understanding China's Rise as a Space Power." In *The Oxford Handbook of Space Security*, 2023.; Schreiber, Nils Holger. "Man, State, and War in Space: Neorealism and Russia's Counterbalancing Strategy Against the United States in Outer Space Security Politics." *Astropolitics* 20, no. 2-3 (2022): 151-174. https://doi.org/10.1080/14777622.2022.2143043.

accurate and holistic understanding of contemporary space politics and strategy, which is the gap that this dissertation seeks to fill.

The global commons framework, rooted in liberal institutionalism and international law, offers a contrasting perspective by advocating for the collective management of space to preserve it as a resource for all humanity. This approach has been instrumental in shaping key international treaties, such as the Outer Space Treaty, and promoting space as a domain that should remain free from national appropriation and militarization. However, global commons literature has struggled to adapt to the rapid commercialization of space and the rising influence of private actors. The focus on maintaining space as a peaceful and accessible domain often underestimates the challenges posed by the profit-driven motivations of private enterprises, which can conflict with the ideals of equitable resource sharing and long-term sustainability. Additionally, the global commons framework has been slow to address the regulatory gaps that emerge as private companies increasingly take on roles traditionally held by states.

In sum, framing space as a global common has been a dominant narrative in space governance, international relations, and space diplomacy discourse. This approach emphasizes that outer space, like the high seas or Antarctica, should be preserved peacefully, accessible to all nations, and managed through collective action and international cooperation. While this framing has contributed significantly to the development of international space law and has helped prevent the militarization and national appropriation of space, it also has notable limitations and gaps that need to be addressed, especially in the context of the rapidly evolving space industry. One of the strengths of the global commons approach is its ability to foster international collaboration and promote the equitable sharing of space resources. It has laid the foundation for crucial treaties such as the Outer Space Treaty of 1967, which enshrines principles like non-appropriation and the peaceful use of outer space.

Nonetheless, the global commons approach also has significant limitations, particularly its ability to adapt to the changing dynamics of space activities. One of the critical gaps in this literature is its underestimation of the growing influence of private actors and the commercialization of space. As scholars like Henry R. Hertzfeld and Christopher D. Johnson have pointed out, the rise of private space companies such as SpaceX and Blue Origin challenges the traditional governance structures primarily designed for state actors.[47] The global commons approach emphasizes international cooperation and collective management. Still, it often fails to address the complexities introduced by commercial interests driven by profit motives rather than equitable sharing and sustainability principles.

This gap is becoming increasingly evident as private companies take on more prominent roles in space exploration, resource extraction, and space tourism, creating potential conflicts between commercial goals and preserving space as a global common. As a result, this has pushed certain space powers to abandon certain international institutions in some instances, which Chapter III will elaborate on. Consequently, this is also why many scholars have called for updating international space laws or strengthening national laws and regulations for private space activities. However, the core issue remains regarding whether there is a contradiction between extracting space resources and the non-appropriation principle upheld by international institutionalists, which is being addressed by the third approach to understanding space strategies and political-economic dynamics.

The "new space" literature represents a more recent effort to capture the complexities introduced by the commercialization of space. This body of work highlights the transformative impact of private actors on space governance and the shift toward

[47] Hertzfeld, Henry R. "The state of space economic analyses: real questions, questionable results." *New Space* 1, no. 1 (2013): 21-28., and Johnson, Christopher D. "Handbook for new actors in space." (2017). https://commons.erau.edu/db-cso-351-spring2019/7.

viewing space as an economic frontier. While this literature provides critical insights into the economic potential of space activities and the challenges of regulating an increasingly privatized space sector, it also has limitations. The focus on financial benefits and the role of private authority in space governance often comes at the expense of broader considerations of global equity and security. While these insights are valuable, they only offer a glimpse into one aspect of space politics that has recently emerged. To understand space as a complex system, the incorporation of the strategic and institutional angel is also important.

In critically assessing these bodies of literature, it becomes evident that they each contribute essential pieces to the puzzle of space politics, but they also leave significant gaps. The security-centric focus of the strategic domain framework limits its applicability in understanding the full range of state interests in space. While vital for promoting international cooperation, the global commons framework is increasingly outpaced by the realities of a commercialized space sector. The "new space" literature, though insightful in its analysis of economic trends, often fails to integrate these with the broader strategic and geopolitical context.

This dissertation addresses these gaps by proposing a more integrated approach to understanding space politics and strategy. By incorporating a neoclassical realist perspective, this research will examine how actual and perceived space capabilities influence state behavior, providing a more nuanced analysis that bridges space's strategic, institutional, and economic dimensions and, more importantly, the systematic and domestic levels. Hence, this research seeks to fill this critical gap by providing an integrated analysis considering the space system and domestic-level challenges in the 21st century. This approach aims to contribute to a more holistic understanding of space politics and offers practical insights for policymakers navigating the evolving landscape of space activities.

Chapter III: A Neo-Classical Realist Framework for Great Power Politics in Space

3.1 Introduction

This chapter will establish the theoretical framework for analyzing great power politics in space, and it will be tested by the empirics presented in the later chapters. The theoretical foundation for this dissertation is rooted in neoclassical realism, a framework that blends systemic factors with domestic variables to explain state behavior.[48] Neoclassical realism evolved from structural realism by adding the domestic dimension, acknowledging that while the international system shapes states' foreign policies, domestic factors such as leaders' perceptions and state institutions also play a critical role in translating systemic pressures into concrete strategies.[49] This approach addresses gaps in purely structural theories by accounting for the complexities of decision-making processes within states, especially regarding sectors highly dependent on international competition and domestic capabilities, such as space strategy.

Neoclassical realism is uniquely equipped to address the interaction between systemic pressures and domestic considerations in space. The theory accounts for how space actors respond to shifts in relative space capabilities by modifying their space strategies, a theme central to this dissertation. As space technologies evolve and relative space capabilities fluctuate, states must continually reassess their approach to maintain a competitive edge or decide when cooperation is more advantageous. This dynamic process of strategy adjustment reflects the neoclassical realist assertion that states' behavior is influenced by both their external environment and internal factors.

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[48] Rose, Gideon. "Neoclassical Realism and Theories of Foreign Policy." *World Politics*, 1998.
[49] Lobell, Steven E., Norrin M. Ripsman, and Jeffrey W. Taliaferro, eds. Neoclassical Realism, the State, and Foreign Policy. Cambridge: Cambridge University Press, 2009.

States must not only consider the relative space capabilities of their competitors but also weigh the political and economic costs of either maintaining or altering their strategies. For example, during the Cold War, the U.S. and Soviet Union engaged in a competitive space race, partly motivated by their respective domestic political environments, demanding demonstrations of technological superiority.

Specifically, it allows for analysis beyond the systemic power distribution in space, in this case, space capabilities, addressing how internal political structures, leadership decisions, and, most importantly, domestic perceptions of space capabilities influence state behavior. Space is a highly strategic and competitive domain where states constantly balance their interests with those of other global actors.[50] This is particularly true when considering that space technologies are inherently dual-use, meaning they have both civilian and military applications, and their development is often shrouded in secrecy.[51] Thus, the ambiguity surrounding the intentions of space actors creates fertile ground for misperception and threat inflation, a key focus of neoclassical realism.[52] In particular, the dual-use nature of space technologies means that states may perceive advancements by their rivals as potentially hostile, prompting competitive strategies even without overt military threats.[53]

Neoclassical realism can address the interaction between systemic pressures and domestic considerations in space. While sometimes criticized as lacking in theoretical structures and ambiguous paradigmatically, it still rationalizes complex foreign policy questions through multilevel analyses.[54] In the case of this dissertation, the theory accounts for how space actors respond to shifts in relative space capabilities by

[50] Moltz, James Clay. "The changing dynamics of twenty-first-century space power." *Journal of Strategic Security* 12, no. 1 (2019): 15-43. https://www.jstor.org/stable/26623076.
[51] Pražák, Jakub. "Dual-use conundrum: Towards the weaponization of outer space?." *Acta Astronautica* 187 (2021): 397-405. https://doi.org/10.1016/j.actaastro.2020.12.051.
[52] Meibauer, Gustav, Linde Desmaele, Tudor Onea, Nicholas Kitchen, Michiel Foulon, Alexander Reichwein, and Jennifer Sterling-Folker. "rethinking neoclassical realism at theory's end." *International Studies Review* 23, no. 1 (2021): 268-295. https://doi.org/10.1093/isr/viaa018.
[53] Pražák, 2021.
[54] Meibauer et al, 2021.

modifying their space strategies. As space technologies evolve and relative space capabilities fluctuate, states must continually reassess their strategy to maintain a competitive edge or decide when cooperation is more advantageous.

This dynamic process of strategy adjustment reflects the neoclassical realist assertion that states' behavior is influenced by both their external environment and internal factors. States must not only consider the relative space capabilities of their competitors but also weigh the political and economic costs of either maintaining or altering their strategies. For example, while the Space Race was a key feature of the Cold War competition, it did not mean constant investment into space technologies. Different leaders in both the U.S. and the Soviet Union had different approaches or strategic tendencies throughout the Cold War, producing policy variations. While the strategic designs of the Eisenhower administration for U.S. space strategy had a long-lasting impact, it wasn't until the Kennedy-Johnson administration that the U.S. started to invest in space as a significant strategic domain.[55] Structuralist analyses of overall space capabilities do not explain this fully because the relative space capabilities of the two space powers did not change drastically during this period, from the Sputnik moment to the decision to land humans on the moon. Hence, a neoclassical realist framework that considers domestic factors is necessary for rationalizing and understanding such strategic changes.

Therefore, this dissertation chapter develops a framework that integrates neoclassical realism to explain the critical research question of space strategy shifts, exploring how states formulate their space policies in response to shifts in relative capabilities and domestic perceptions of relative capabilities. The framework rests on several assumptions that will be elaborated in the following sections. First, the international legal regime governing space has limited enforcement power, making state actors the

[55] Logsdon, 1995.

dominant force in space strategy. While treaties such as the Outer Space Treaty of 1967 provide a framework for peaceful exploration and use of space, the lack of a binding enforcement mechanism allows for significant flexibility in interpretation and implementation by states (UNOOSA 1967). As a result, states often act in ways that prioritize their national security and economic interests, even when these actions strain the limits of international norms.

Second, space assets' vulnerability and dual-use nature complicate the strategic environment. Space technologies such as satellites and rockets can serve both civilian and military purposes, blurring the lines between peaceful and aggressive uses of space. This ambiguity creates significant challenges for arms control and cooperation in space, as states may perceive any increase in a rival's space capabilities as a potential threat, even if those capabilities are ostensibly for civilian purposes.[56] The inherent vulnerability of space assets, which are difficult to defend and highly susceptible to interference, further exacerbates these concerns, leading states to adopt defensive postures and pursue redundancy in their space systems to mitigate risks.[57]

Third, the primary goal of all space actors is to ensure free access to space and maintain the security of their space assets. In a neoclassical realist framework, this goal is tied to relative gains. States seek to enhance their space capabilities to secure their access and deny potential adversaries the ability to achieve a decisive advantage. This competition for relative space capabilities mirrors the broader security dilemma faced by states in other strategic domains, where the actions taken by one state to enhance its security often lead to insecurity in others.[58]

Based on these four core assumptions, this chapter establishes a few hypotheses about

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[56] Dolman 2002.
[57] Gottfried, Kurt, and Richard Ned Lebow. "Anti-satellite weapons: Weighing the risks." *Daedalus* (1985): 147-170. https://www.jstor.org/stable/20024983.
[58] Mearsheimer, John J. *The tragedy of great power politics (Updated edition)*. WW Norton & Company, 2003.

space strategy choice and develops a typology matrix to further elaborate on space power behaviors. The remainder of this chapter is organized as follows. Section 3.2 defines key concepts underpinning the neoclassical realist approach to space politics, including space geography, resources, assets, and capabilities. Section 3.3 explores why states are interested in pursuing space capabilities and how these interests align with national security and economic development goals. Section 3.4 discusses the dual-use nature and vulnerability of space assets, emphasizing the security risks posed by the militarization of space. Finally, Section 3.5 delves into how relative space capabilities and space power perceptions of relative capabilities shape states' decisions to compete or cooperate, offering insights into strategic choice outcomes.

By applying neoclassical realism to the space domain, this dissertation offers a comprehensive framework for understanding the complexities of space politics. The emphasis on systemic and domestic factors allows for a nuanced analysis of how states navigate the challenges of space strategy, balancing competition with cooperation in a rapidly evolving technological environment. Ultimately, this framework provides a valuable tool for analyzing the future trajectory of space governance and the potential for conflict or cooperation in this critical domain.

3.2 Defining Space for International Relations

How do we define space? Who has access to space? How do those actors operate in space? How are they governed? These are some of the questions that need to be answered before we have an in-depth discussion about international politics in space. In this part of the chapter, six key concepts will be defined: space geography, space resources, space actors, space assets, space strategy, and space capability.

3.2.1 Space Geography

The outer space appears to be an intuitive term widely used in academic and popular contexts. Unlike Galileo, modern astronomy has given us a vast map of the solar system we live in. In general, outer space refers to space beyond the earth's dense atmosphere. However, the only two relevant geographical locations to this project are Earth orbits and other celestial bodies within our solar system because they are where most space actors are operating now and where space actors will operate.

Table 1 Different Standards for the Boundary of Space

Altitude	**Reasoning**	**Further Explanation**	**Adoption**
80 km	Roughly the height where Aerodynamics ceases to work.[59]	This was defined through the famous X-15 project of the U.S. military. The X-15 aircraft switches from aerodynamic control systems to atmospheric propulsion systems at this height.	US Military, NASA, NACA
100 km	The Karman Line[60]	An aircraft at this altitude must travel faster than orbital velocity to obtain enough lift to support itself.	Fédération Aéronautique Internationale
122 km	The Entry Interface[61]	The height where atmospheric drag becomes noticeable	NASA

[59] Evans, Michelle. The X-15 rocket plane: Flying the first wings into space. U of Nebraska Press, 2013. p.90.

[60] Darrin, Ann, and Beth L. O'Leary. Handbook of space engineering, archaeology, and heritage. CRC Press, 2009. p.84.

[61] Richardson, Erin, Michelle Munk, Bonnie James, and Steven Moon. "Review of NASA In-Space Propulsion Technology Program Inflatable Decelerator Investments." In *18th AIAA Aerodynamic Decelerator Systems Technology Conference and Seminar*,1603. 2005. https://arc.aiaa.org/doi/pdf/10.2514/6.2005-1603

As shown in Table 1., there is no clear boundary for space; hence, distinguishing what counts as “air space” and what counts as “outer space” has been a matter of debate for the past. The Kármán line, as shown in the table, is the commonly recognized “starting point” of space by international laws[62]. Therefore, adopting this legal definition, anything above the Kármán line can be considered a part of space. Moving above the Kármán line comes Earth’s orbits, which most space assets use now. According to the definition given by the European Space Agency, there are mainly six types of orbits around Earth, and each type suitable for certain types of missions, namely Geostationary orbit (GEO), Low Earth orbit (LEO), Medium Earth orbit (MEO), Polar orbit and Sun-synchronous orbit (SSO), Transfer orbits and geostationary transfer orbit (GTO), Lagrange points (L-points)[63]. LEOs are the most commonly used among these types of orbits for satellites and space stations. LEOs orbit between 1000km and 160km in altitude, and LEO is also where most space disputes happen and will most likely continue to be so.

Other than Earth’s orbits, other celestial bodies in the solar system are also where the interest in space lies. This could range from our moon to other planets, planetoids, and asteroids. As discussed in the next section, these celestial bodies contain valuable resources for all space actors and, thus, are also crucial for this project. While there is no clear definition in international laws about celestial bodies, the term itself is all-encompassing. For space exploration and potential exploitation soon, the moon is the most likely location where space actors would operate on relatively large scales and the first celestial body to experience long-term human presence. Hence, the moon will be one of the prominent geographical locations for this project.

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[62] Dolman, Everett C. "Geostrategy in the space age: An astropolitical analysis." *The Journal of Strategic Studies* 22, no. 2-3 (1999): 83-106.
[63] European Space Agency. 2020. *Types of orbits*. [online] https://www.esa.int/Enabling_Support/Space_Transportation/Types_of_orbits

3.2.2 Space Resources

Resources in space can take a wide variety of forms, including material and spatial resources. The most commonly mentioned form of resources in space is perhaps material resources, which can be used both in space and on Earth. Most material resources can be found on celestial bodies. Take the moon as an example; the potential resources on the moon include Solar-implanted volatiles, Helium-3, water, oxygen, metals, silicon, various rare earth elements, thorium and uranium, and so on[64]. Other than some rare earth elements and radioactive materials, most can be easily found on

Earth. As pointed out by many, the best way to use the resources on the moon is In Situ Resource Utilisation (ISRU)[65]. The cost of transporting large amounts of materials between Earth and Lunar is too high and will not be able to create actual value. However, using materials available on the moon to sustain itself can be cost-effective for establishing a moon base[66].

Moreover, it is also essential as a reservoir site for propellent. As noted by many, the hydrogen and oxygen products of water and ice deposited on the moon can power reusable launching vehicles for the lunar surface[67]. This further lowers the cost of traveling between Earth and Mars and operations on Earth orbit. If realized, this mode of refueling spacecraft could increase the demand for lunar-derived liquid hydrogen and liquid oxygen to 450 metric tons annually, generating $2.4 billion worth of annual revenue. Understanding this, China's CNSA and NASA expressed interest in

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[64] Crawford, I.A., 2015. Lunar resources: A review. *Progress in Physical Geography*, *39*(2), pp.137-167.
[65] Crawford, *supra note*, 2015.
[66] For an example of that, see Zubrin, R., 2019. Moon Direct: A Cost-Effective Plan to Enable Lunar Exploration and Development. *AIAA Scitech 2019 Forum*,. Or Miller, C., Wilhite, A., Cheuvront, D., Kelso, R., McCurdy, H. and Zapata, E., 2015. Economic assessment and systems analysis of an evolvable lunar architecture that leverages commercial space capabilities and public-private-partnerships. *NexGen Space LLC under flagrant from NASA*.
[67] For scientific research on this topic, see:Siegfried, W.H. and Santa, J.E., 2000. Use of propellant from the moon in human exploration & development of space. *Acta Astronautica*, *47*(2-9), pp.365-375.; Crotts, A., 2014. *The new Moon: Water, exploration, and future habitation*. Cambridge University Press.; Kornuta, D., Abbud-Madrid, A., Atkinson, J., Barr, J., Barnhard, G., Bienhoff, D., Blair, B., Clark, V., Cyrus, J., DeWitt, B. and Dreyer, C., 2019. Commercial lunar propellant architecture: A collaborative study of lunar propellant production. *Reach*, *13*, p.100026.

exploiting this advantage. China's Yu'tu-2 rover, which landed on the moon in 2019, was equipped with a particular scientific payload, the Advanced Small Analyzer for Neutrals (ASAN), to analyze the composition and determine the formation of Lunar water[68]. The moon is only one example of the resource potential of other celestial bodies in our solar system; the numerous celestial bodies within our solar system can provide even more. As discussed in the latter sections, material resources are one of the main drivers for states' interests in space.

Other than material resources, spatial resources are another vital space resource largely ignored by public concern. Spatial resources can be defined as desirable locations or areas of space that could be necessary or advantageous for space activities. This could include desirable orbits around celestial bodies, especially around Earth, and locations such as celestial bodies themselves. Such locations and areas of space can be advantageous for accessing material resources or conducting scientific research. For example, the moon is essential as a forward base for further space exploration and, more importantly, a starting point for a broader space infrastructure network. Due to its low gravity compared to Earth, it is much easier to construct large-scale space infrastructures on the moon. As early as the 1980s, scholars started conceptualizing and researching the feasibility of using the moon as a forward base for Mars missions[69]. The announcement of the Artemis Program[70] and the Chinese space program seems to confirm their intention of doing so. Hence, the rush for the moon is essential for further competition towards other celestial bodies in the solar system. Space objects launched from the moon are also more accessible than those launched from Earth due to the gravity well of the blue planet.

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[68] Xin, Ling. "What China's Mission to Collect Rocks from the Moon's Far Side Could Reveal." *Nature*, April 30, 2024. https://www.nature.com/articles/d41586-024-01056-x..

[69] Mendell, W.W., 1985. *Lunar bases and space activities of the 21st century*. Lunar and Planetary Institute.

[70] NASA, "Artemis Plan: NASA's Lunar Exploration Program", National Aeronautics and Space Administration, Sep 2020. https://www.nasa.gov/sites/default/files/atoms/files/artemis_plan-20200921.pdf.

As stated in the previous section, Earth's orbits, mainly LEOs, are widely used by various space assets. However, the number of usable orbits is not limitless due to issues such as space debris. The possibility of a collision between space objects has risen as the number of space objects increases. When such a collision happens, it creates even more debris. It thus increases the likelihood of space collisions exponentially, creating a self-sustaining cascade and rendering LEOs unusable until the debris field deorbits gradually in the following decades. This is called the Kessler Syndrome[71]. Hence, spatial resources such as LEOs have been declining. With further activities conducted and infrastructure built into space in the future, spatial resources such as obits and celestial bodies will become increasingly valuable. This dynamic will be explained in later sections. Overall, there are two types of space resources: material and spatial.

3.2.3 Space Actors

The concept of space actors is closely associated with space activities. Space actors are entities capable of conducting space activities independently. There have been a wide variety of categorizations for outer space activities performed by different types of actors and with somewhat different goals. They can be divided into three categories, which include space-space activities, space-Earth activities, and on-Earth activities, depending on the location or coverage of the activities[72]. A typology of space activities can also be found in Table 2 if divided by function. To become a space actor, an entity must be able to conduct at least one type of space activity independently. This could include state actors, commercial actors, and civilian scientific actors.

The most crucial space actors are nation-states and state agencies because they possess the most space capabilities and autonomy. Since the Cold War, the United States and Russia have been the leading space powers. Alongside the United Kingdom, France,

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[71] Kessler, D.J., Johnson, N.L., Liou, J.C. and Matney, M., 2010. The Kessler syndrome: implications to future space operations. Advances in the Astronautical Sciences, 137(8), p.2010.
[72] Smith, Michael V. Ten propositions regarding spacepower. Montgomery, AL: Air University Press, 2002.

and later the European Union (EU), they can be considered the established space powers whose space capabilities were developed to a high level before 1991. While China also launched its satellites during the Cold War, China's modern space program did not start until the end[73]. Hence, China and other states, such as India, can be considered emerging space actors. This difference between the two types of state space actors will reappear in the theoretical framework later in this chapter. Regardless, all these actors can develop their own space assets and launch them into orbit independently. At the same time, state actors are the only type of actors who can have a direct system-level impact on the governance and legal systems of space and will likely continue to be so in the foreseeable future.

Table 2 Types of Space Activities[74]

	Description	***Objectives***
Science	Orbital satellite observation and planetary probes	Increase knowledge of the cosmos and earth
"Manned"	Humans in orbit and six moon visits	Exploration, prestige, and biomedicine
Military	Missiles, satellites, and antisatellite weapons	Increase national security
Utility	Satellites for communication and navigation	Economically valuable services

[73] Erickson, Andrew S. "China' s space development history: A comparison of the rocket and satellite sectors." Acta Astronautica 103 (2014): 142-167.
[74] Deudney, 2020, 16.

Regime	Treaties and practices to regulate space activities	Reduce conflict and permit orderly use

However, private commercial actors are gaining a more and more critical role in space activities. Nonetheless, private actors will remain secondary for a long time in terms of their role and the level of autonomy they have in space politics. A good example is the story of OTRAG, which started in Germany in 1975 and has a similar outlook to SpaceX today. It once had several launch sites worldwide, including in Germany, Zaire, and Libya, and it successfully tested its rockets several times in its Libyan test site[75]. The company's founder, Lutz Kayser, intended to offer a cheaper, inexpensive alternative to the state-dependent launch services provided by NASA or Arianespace[76]. Much similar to today, the project attracted the attention of hundreds of private investors, and Kayser was able to employ Dr. Kurt H. Debus, the former director of NASA's launch operation center, as the company's Chairman of the Board[77]. More impressively, Dr. Wernher von Braun, who started NASA and the U.S. space project, was the company's chief scientific advisor[78]. 1977, they had their first test in Zairian and a second in 1978. Zairian President Mobutu Sese Seko was invited to a failed launch the same year.

However, the company started to face political pressure very quickly since it began to have tests for its OTRAG rocket. The biggest opposition came from the USSR and France, who claimed that Germany, private entities or not, should not be allowed to possess long-distance rocket technology. This led to political pressure mounted on the Zairian government to force the closure of the launch facility. Further pressure on the Western German government came down from the very top of French and Soviet

[75] McDougall, Walter A. "The Scramble for Space." *The Wilson Quarterly (1976-)* 4, no. 4, 1980: 71-82. https://www.jstor.org/stable/40255998.
[76] Ibid.
[77] Ibid.
[78] Ibid.

political leadership. French President Giscard d'Estaing and Soviet leader Leonid Brezhnev issued a personal communique to the Western German government to shut down OTRAG operations in Germany, which forced the company to move to Libya[79]. Eventually, the company had to close and leave Libya in 1987 due to political restrictions, which led Muammar Gaddafi to forcefully take over the facilities and equipment in the hopes of using them. This led to a massive loss for OTRAG's German investors because there was no way to get those assets back[80].

The story of OTRAG is intriguing, for it did not have any state backing; however, the company aimed for complete space operational capacity and was eventually oppressed by governments worldwide and its own government. On the other hand, as a precursor to SpaceX, it was also little-known among the public and had little public support. This case demonstrated that private actors, even with full space capability, cannot survive without state actors' support and have little international agency. However, they are becoming more important, and their relationship with state actors is more dynamic and nuanced. This point will be discussed in further detail later in this chapter. Nonetheless, we will mainly focus on three main state actors and the private actors associated with them: the US, Russia, and China.

3.2.4 Space Assets

The concept of space assets is relatively straightforward as defined by international laws. Space assets can be understood as medians for space actors to access space and resources. This concept is closely related to "space objects," defined in Article I of the Liability Convention, which states that "space objects include parts of a space object as well as its launch vehicle and parts thereof." According to their purposes, there are

[79] Vinocur, J. "Enigmatic West German Rocket Concern Finds a Home in Libyan Desert," New York Times, March 11, 1981, Section A, Page 6, https://www.nytimes.com/1981/03/11/world/enigmatic-west-german-rocket-concern-finds-a-home-in-libyan-desert.html.

[80] Frank, A., Wilhelm, M. and Schlechtriem, S., 2019. 60 Years DLR Lampoldshausen-The European Research and Test Site for Chemical Space Propulsion.

three kinds of space assets: satellites, space stations, and habitats on other celestial bodies. The combination of different types of space assets can be considered space infrastructures[81]. Space infrastructures, similar to infrastructures on Earth, are physical systems that can provide the means to connect, communicate, and control space assets to perform or improve the performance of various space activities.

While it is clear that the concept of space assets does not concern natural space objects such as meteors, this is still not a particularly clear definition. The term space object could still refer to a wide range of things, ranging from rocket parts in the launching stage to a screwdriver accidentally dropped by an astronaut[82]. Moreover, Article VIII of the Outer Space Treaty (OST) wrote that the state that launched the pace object "shall retain jurisdiction and control over such object" cannot abandon the object it launched[83]. All space assets, whether launched by a state or private actor, are considered assets of the state actor who launched it.

Space assets have two key characteristics: dual-usability and vulnerability. Dual-usability is associated with the dual-use nature of space technologies; they can be used for civilian and military purposes. More specifically, civilian space activities are interested in space for their commercial and scientific value. At the same time, the military is interested in space because of its potential for improving C3I (Command, Control, Communications, Intelligence) efficacy and possibly weapon-carrying capability[84]. While the modern economy relies on space technologies and assets, the military depends on the same technologies. The field of dual-use technologies has been growing steadily to become a comprehensive collection. A relatively complete list of

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[81] Piskorz, D. and Jones, K.L., 2018. On-orbit assembly of space assets: A path to affordable and adaptable space infrastructure. *The Aerospace Corporation*.
[82] Lyall, Francis, and Paul B. Larsen. *Space Law: A Treatise*. 2nd ed. New York: Routledge, 2017. https://www.taylorfrancis.com/books/mono/10.4324/9781315242712/space-law-francis-lyall-paul-larsen.
[83] See Article VIII of the Outer Space Treaty.
[84] McDougall, 1985.

these can be found in the still-updating Wassenaar Arrangement[85]. To name a few, technologies such as communication satellites, remote-sensing, and navigation are commonly used by civilian and military space activities, making the distinction between military and civilian space capability inseparable.

The second characteristic of space assets is their vulnerability. The physical nature of space determines this. Firstly, to escape Earth's gravity, an object has to be accelerated to an incredible speed of at least 11.2 kilometers per second, called Earth's escape velocity. Any object with even very little mass can become highly destructive at that speed. Hence, the survivability of space assets is generally very low, and the cost of maneuvering to evade collision with another space object is usually high[86]. Additionally, unlike the environment on Earth, space also provides very few means for cover and concealment. Hence, space assets are highly detectable. Consequently, to threaten the safety of a space object, there is little need for deploying any weapon. For example, between 1945 and 2013, 61 anti-satellite weapon tests were conducted by the US, Russia, and China[87], and recently, in 2019, India also conducted a successful test, and the majority of these tests were successful. In a war scenario, the destruction or disabling of an opponent's space assets could increase the advantage of a combatant, making them valuable and vulnerable targets. In sum, space assets and the space infrastructure they form are both dual-use and vulnerable.

3.2.5 Space Strategies

Space strategies can be defined as how a space actor could choose to achieve its goals

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85 Wassenaar Arrangement. "The Wassenaar Arrangement on Export Controls for Conventional Arms and Dual-Use Goods and Technologies." http://www.wassenaar.org.
Referenced in Handberg, Roger. "Dual-use as unintended policy driver: The American bubble." *Societal impact of spaceflight* (2007): 353-368.

86 Jafri, A. and Stevenson, J.A., 2018. *Space Deterrence: The Vulnerability-Credibility Tradeoff in Space Domain Deterrence Stability*. NSI, Inc. Boston United States.

87 Krepon, Michael, and Sonya Schoenberger. "Annex: A Comparison of Nuclear and Anti-satellite Testing, 1945-2013." *Antisatellite Weapons, Deterrence and Sino-American Space Relations* (2013): 131-137. http://www.jstor.com/stable/resrep10894.12.

in space and how it deals with other space actors. The most distinct types of space strategies are competitive strategy and cooperative strategy. A competitive space strategy usually means increasing space spending and activity intensity and seeking to build space infrastructures exclusive to their competitors. A collaborative space strategy usually means decreasing space investments and space activity intensity and making space infrastructure inclusive. Thus, a competitive strategy is a revisionist strategy that seeks to increase relative space capabilities, and a cooperative strategy is a strategy to maintain the status quo. However, space strategy differs from a grand strategy and is relative to other space actors. In other words, one space actor can be cooperative towards another space actor and competitive towards another. Therefore, the more actors there are in space, the more complicated space strategy becomes.

This definition is drawn from traditional geostrategies of space, which focus mainly on the military aspects of space dating back to the 1980s, potentially due to the Strategic Defense Initiative. These geostrategies of space are divided into four potential doctrines: the sanctuary doctrine, the survivability doctrine, the high-ground doctrine, and the control doctrine. Different ways were devised to deploy military power in space[88]. Later works developed on this paradigm with a few reductions and additions, which were discussed in the previous chapter. The agreed-upon definition for space strategy is that space strategy is the use or the threat to use of force through space assets to achieve political aims[89]. This definition of space strategy serves the purpose of winning a military conflict within or through space but does not provide any provisions for the larger international political arena. Also, as the following sections will reveal, space and space technologies are dual-use. Hence, the distinction between military and civilian space domains cannot be separated. Consequently, a

[88] Lupton, David E. *On Space Warfare:*. Montgomery: Air University Press, 1988.
[89] See Lefebvre, Jean-Luc. *Space strategy*. John Wiley & Sons, 2017. For a more detailed coverage of various definitions of space strategy.

space strategy should not merely cover the military aspects of space. Still, it should also cover the overall approach towards all space activities to achieve army and politico-economic goals.

In order to enhance the neoclassical realist framework for understanding space strategy, this study brings in domestic factors as key intervening influences. Inspired by the work of Ripsman, this paper focus on three main ways in which domestic elements shape strategic decision-making: (1) how political leaders perceive potential threats or opportunities in space; (2) the rivalries and collaborations that occur within military and civilian agencies; and (3) the financial and resource limitations that dictate how national priorities around space programs are established.[90] These domestic variables act as both cognitive and material lenses, shaping our interpretations of external developments, such as China's ascent and technological advancements, and guiding them into an actionable national space strategy.

3.3 Four Core Theoretical Assumptions and the Core Hypotheses

With the key concepts sorted, this section will discuss the core theoretical assumptions, drawing from realist theories in International Relations to answer the research question of why space actors change their space strategies and how they do so. Space is not a domain that is independent of geopolitics on Earth. On the contrary, space activities are the products of Earth-bound international, but at the same time, they create their domain that could influence the strategies of space actors. Therefore, the main argument we make here is that the essential objective for space actors to operate in space is to ensure their access to space and its resources and consequently ensure the security of its space assets. Hence, relative space capabilities are the key independent variable that determines an actor's choice of space strategy due to an action-reaction

[90] Ripsman, 2016.

mechanism. In short, space actors are prone to choose cooperative strategies when their relative space capabilities are balanced, and the cost of increasing relative gains is high. Any change in the balance of space capabilities can spark a shift in space strategy.

Space actors are motivated to change their strategy by changes in relative space capabilities or the expectations of relative gains from space activities. However, these two aspects are, in fact, inseparable because the only way to raise relative gains in space is through an increase in space capabilities, which makes space capabilities the critical, independent variable. Therefore, diminishing relative space capabilities can also cause security and politico-economic concerns for established space powers such as the U.S. and Russia. Thus, they will act accordingly to change their space strategies to remain more competitive. Contrarily, emerging actors are motivated by similar reasons, such as increasing their space capability and thus increasing their space security and relative gains. As a result, space actors will change their strategies between competition and cooperation according to the changes in relative space capabilities.

When their space capabilities are balanced, space actors could cooperate to achieve higher relative gains. They could also compete for space security and higher gains when their space capabilities change. We argue that technological development is one of the main drivers for space capability change due to the technology-intensive nature of space activities. Hence, the first concern for all space actors is to ensure their relative advantage in space capabilities because only through their space capabilities can they ensure their space security and relative gains from space activities.

Similar to the neorealist assumptions for significant power conflicts, these assumptions alone do not ensure that space actors would naturally choose to compete constantly, and in fact, they do not; it is the combination of all these assumptions that leads toward a pendulum swing between cooperative and competitive space strategies. Changes in space capabilities always derive from technological advancement, which can be influenced by state policies, especially in highly state-centric industries such as the space industry. Under the circumstance of losing relative space capabilities and relative gains, these assumptions provide solid incentives for space actors to choose a competitive space strategy to maintain their relative space advantage. Contrarily, when all space actors can maintain their relative space capabilities, either through stagnation of technology or a long-term stalemate of competition in space, they would choose to cooperate to preserve the status quo.

3.3.1 Assumption 1: The Inability of International Space Laws to Restrain Space Actors

The first fundamental assumption is that international space laws and institutions have limited constraints on space actor behaviors. While international legal instruments such as the Outer Space Treaty (OST) and associated norms aim to regulate space usage, an ongoing debate exists regarding their effectiveness. Major space powers frequently push these boundaries, reinterpreting or bypassing these frameworks whenever their strategic interests are at stake. This dissertation adopts a neoclassical realist perspective on international law. Instead of seeing legal instruments as independent constraints, it regards them as contextually activated tools, whose relevance hinges on elite perceptions, domestic political utility, and systemic incentives. Therefore, international law is not excluded from the analysis; rather, it is understood as a secondary causal mechanism, and its effect is contingent on how states interpret and mobilize it.

Hence, international law does not function as an exogenous constraint on national space strategies; instead, it serves as a tool that states strategically wield to further their own interests. From a neoclassical realist standpoint, legal frameworks become meaningful when they resonate with domestic priorities and the perceived threats recognized by influential stakeholders.[91] Rather than enforcing a one-size-fits-all approach, these legal instruments undergo interpretation through the lenses of individual state institutions, the incentives tied to reputation, and overarching strategic goals.

To be more specific, firstly, international laws and institutions have minimal constraining effect on state behavior in space and lack enforcement power. Secondly, international space laws are outdated and unable to solve current space disputes due to the emergence of new space technologies and space actors. As discussed in the previous chapter, there are currently five main treaties governing space activities, including the 1967 Outer Space Treaty, the 1968 Rescue Agreement, the 1972 Liability Convention, the 1975 Registration Convention, and the 1969 Moon Treaty. They were designed to form a governing system that promotes the peaceful use of space as a "common heritage" of mankind. Among these treaties, the most important ones are the OST, the Liability Convention, and the Moon Treaty. The OST is providing the guiding principles for resolving international disputes related to space, which is covered by the Liability Convention, and also provides guidelines for exploiting space resources on other celestial bodies, which is covered by the Moon Treaty. Governing these treaties are various institutions within the United Nations, such as the United Nations Offices for Outer Space Affairs (UNOOSA), and the United Nations General Assembly (UNGA). Other UN institutions, such as the International Telecommunication Union are also involved in space affairs, but usually play a supportive role.

One of the most prominent explanations for the absence of a space war or armed conflicts and the existence of space cooperation during the Cold War derives from liberalist theories. The explanation provided by liberal theories argued that it was the

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[91] Ripsman, Norrin M., Jeffrey W. Taliaferro, and Steven E. Lobell. *Neoclassical realist theory of international politics*. Oxford University Press, 2016.

development of technology and the consequent development of international institutions that fostered different preferences on space strategy, and the involvement of various supra-state and sub-state actors created a more cooperative environment for space cooperation overtime[92]. It is true that the involvement of both primary and secondary space institutions had an impact of space actors' behaviors in space and their space strategy making process. However, it does not change the fact that states are the most powerful space actors and international space laws and institutions only have a limited effect on their behaviors.

An example is the use of the Liability Convention for space dispute arbitration. Since 1957 to 2019, there are about 38 publicly reported space disputes between different space actors, and the actual number could be far higher[93]. However, the Liability Convention and UNOOSA, an international treaty and institution designed for this type of arbitration was only used once in 1978, when a Soviet Satellite, Kosmos 954, deorbited and crashed in Canada. Though the satellite crashed in a remote area, the nuclear power source used by the satellite was not burned-out during re-entry and scattered 65 kilograms of radioactive materials over a vast area around the crash site. To remedy the damage caused by this crash and subsequent radioactive contamination, a massive clean-up operation was conducted over an area of 124,000 square kilometers. Canada filed for a claim for the cost of the cleanup operations using the Liability Convention after refusing to accept Soviet assistance. In this case, Canada was able to invoke its right as a claimant state and placed liability on the Soviet Union as the launching state, and began diplomatic procedures as the Liability Convention stated.

[92] For liberal analysis on space politics, see: Brown, Trevor. "Soft power and space weaponization." Air & Space Power Journal 23, no. 1 (2009): 66. https://www.proquest.com/docview/217789348?pq-origsite=gscholar&fromopenview=true&sourcetype=Scholarly%20Journals.; Sadeh, Eligar. *The politics of space: A survey*. Routledge, 2010.; Stuart, Jill. "Unbundling sovereignty, territory and the state in outer space: Two approaches." In *Securing Outer Space*, 16-31. Routledge, 2009.

[93] V. Dadwal & M. Macdonald, "Arbitration of Space-related Disputes: Case Trends and Analyses", paper with preliminary results presented to the 71st International Astronautical Congress (IAC) CyberSpace Edition, International Institute of Space Law (IISL), 62nd IISL Colloquium on the Law of Outer Space, IISL Young Scholars Session, 12-14 October 2020.

The dispute dragged on for almost three years until 1981, not around whether compensation should be paid or not, but on the amount of the compensation. Eventually, Canada accepted a 3,000,000 Canadian dollars settlement.[94]

While this resolution was in accordance with the spirit of the Liability Convention of resolving disputes through diplomatic channels, it did not follow the claims procedure laid out in the Liability Convention strictly. While the convention provided the framework for the negotiations, both parties did not follow the process of one-year time limit for initiation the process[95]. Also, due to the absence of a claims commission, Canada had to pursue the recovery of the compensation by itself without help from any international institutions, which is seen by some as a flaw in the current liability regime[96]. Nonetheless, there is no rules within international space laws determining the process of recovering space dispute compensation and further prosecution if the process was not smooth. In other words, the convention in real practice serves as more of a recommendary guidance for states to reach diplomatic solutions over liability issues regarding space disputes, and it does not provide binding procedures that disputing states have to follow.

Furthermore, the most relevant international treaty for future space exploration and resource exploitation is perhaps the 1979 Moon Treaty, since it lays out guidelines for state behaviour on other celestial bodies. However, none of the major space actors today who successfully completed self-launched human spaceflight signed or ratified it, namely the United States, Russia, and China. Hence, since its inception in 1979, it had little to no binding effects on the behaviour of those space actors. The reason was that the "common heritage" language within the Moon Treaty could hinder their access on the Moon, and prevent resources extraction or any other form of space activities

94 Reynolds, Glenn, and Robert Merges. *Outer space: Problems of law and policy*. Routledge, 2019., 179–189.
95 Diederiks-Verschoor, 1989.
96 For example, see Lampertius, James"The Need for an Effective Liability Regime for Damage Caused by Debris in Outer Space." *Mich. J. Int'l L.* 13 (1991): 447.

they deem necessary[97]. The result was the emergence of state-level space laws heralded by the U.S. in the form of the 2015 Space Act and the soon-to-be-released Artemis Accords, which stress on bilateral cooperation and state-centric agreement on a non-binding code of conduct[98].

A final reason for arguing against the governance efficiency of international space regimes is its inability to govern private space actors. Since private actors are not subject to international law but domestic laws, they are represented on the international level by their states, and are governed domestically by their states. Hence, it is not completely true to argue that international space laws lack provision on private actors. The problem is that within the UN-state-private hierarchical structure, the UN institutions have no enforcement power over states and thus consequently have no power on private actors[99]. Contrarily, state actors have full jurisdiction over their own private actors, which makes them the dominant space actor.

Therefore, much like the anarchy argument for realist theorists, the space domain is another field dominated by state actors, where international institutions and international laws only have extremely limited or no power over state behaviour in space. That is not to argue, however, that international space laws and associated institutions have no role to play in the international politics related to space. They worked as an instrument for implementation of desirable space strategies, as well as providing mechanisms for state actors to negotiate and discuss space affairs.

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97 See UN resolution 2779 (XXVI) of 29 November 1971, which initiated the debate on an international treaty for the moon, as well as resolution 2915 (XXVII) of 9 November 1972, 3182 (XXVIII) of 18 December 1973, 3234 (XXIX) of 12 November 1974, 3388 (XXX) of 18 December 1975, 31/8 of 8 November 1976, 32/196 A of 20 December 1977 and 33/16 of 10 November 1978, in United Nations. “Moon-Agreement”, UNOOSA. https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/moon-agreement.html; and United Nations. "Travaux Préparatoires: Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (Moon Agreement)." 1979. https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/travaux-preparatoires/moon-agreement.html.

98 Deplano, Rossana. “The Artemis Accords: Evolution or Revolution in International Space Law?” *International and Comparative Law Quarterly* 70, no. 3 (2021): 799–819. https://doi.org/10.1017/S0020589321000142.

99 Hertzfeld, Henry. "Current and future issues in international space law." *ILSA J. Int'l & Comp. L.* 15 (2008): 325-335. https://heinonline.org/HOL/LandingPage?handle=hein.journals/ilsaic15&div=20&id=&page=

In conclusion, legal framewokrs and international norms are treated here not as structural variables but as second-order mechanisms, whose salience depends on how systemic stimuli are perceived and interpreted by domestic actors. In some contexts, states may deploy legal norms to reinforce alliance cohesion, resist normative encroachment by rivals, or enhance their international legitimacy. In others, they may ignore or circumvent legal regimes entirely. The model thus treats international law as an instrument strategically selected and employed by major space powers, thus making it an intervening variable, especially for status quo actors in the system. This will be further explained in Chapter VI and Chapter IX.

3.3.2 Assumption 2: The Inseparability of Military and Civilian Space Capabilities

The second fundamental assumption is that space and space resources are valuable to all space actors for both security and politico-economic reasons, and this dual value can not be separated from each other. This assumption is based on the fact that space technology and consequently space assets are dual-use in nature. Hence, to increase the relative gains from space, a space actor has to develop certain technologies such as launch vehicles, remote sensing, navigation, as well as complicated electronic and computer systems. These systems, however, can be used for both military and civilian purposes. Therefore, no matter what intention a space actor had, an increase of space capabilities by a space actor can be regarded by other actors as a potential threat to their own space security.

In the very beginning of the Cold War, there was no such concept of dual-use technology, because the initial intention of both the United States and the Soviet Union was that their space programs should be controlled by their militaries. Civilian involvement in space, in whatever form it was, should be subordinate to state agencies and serve a military purpose[100]. Purely civilian-purposed space activities started by a series of academic researches on launch vehicles or communication satellites orbiting Earth[101]. Starting from the 1940s to the 1960s, the reality of space was that the militaries have almost total control over technological development process related to space, and they were the main funder of any space related research in civilian institutions.

The emergence of civilian space activities came from the contractor-based approach of technology development in the US. The U.S. Air Force (USAF) has a long history of using subcontractors to develop technologies they deem valuable. This approach was welcomed by the U.S. government and fits the ideological proclivities as well, and the Soviet Union, on the other hand, did not adopt this approach due to ideological reasons. Consequently, this approach to space technology development gave birth to a burgeoning private space sector, which included universities, science institutions, private companies, and attracted substantial funding as well[102]. As a result of this proliferation of space technologies, the private sphere started to gain benefits from space related research. One example of that was the application of aerodynamic research conducted for the U.S. space program, which was later used widely within the commercial airplane designs regardless its initial intentions[103]. This intertwined relationship between the military and civilian aspect of space technology continued for decades until now, and naturally spilled to space activities as well.

During the 1950s, USAF was not the sole state actor who was trying to develop a space program. One of the even more famed projects, the Army Ballistic missile Agency team led by Wernher von Braun, was also developing its own launch system, and

[100] McCurdy, Howard E. *Space and the American imagination*. JHU Press, 2011.
[101] Logsdon, John M., and Linda J. Lear. *Exploring the Unknown: Selected Documents in the History of the US Civil Space Program*. Vol. 1. NASA, 1995.
[102] Burrows, 2010.
[103] Handberg, 2007.

claimed in 1956 that it could launch a satellite to orbit before the Soviets[104]. This proposal was denied by the Eisenhower administration on the grounds of its unnecessity[105]. However, after the first soviet launch in 1957 and the failed launch of Vanguard in the same year, which was led by the Naval Research Lab, the army's project was approved by the administration and von Braun's team delivered in 1958 with the first U.S. satellite, Explorer 1, in 1958.

Although the U.S. space project was primarily dominated by the military during the 1950s and early 1960s, the dual-use aspect was still present. Evident by Explorer 1, the satellite project was not to broadcast a repetitive signal but to conduct scientific research on the Van Allen radiation belt, which provided valuable scientific data[106]. This relationship and the dual-use concept became more prominent with the establishment of NASA. Interestingly, Eisenhower's intention of establishing NASA as a civilian institution was not for the purpose of furthering space explorations and expanding the benefits of space activities. Actually, historian agree that Eisenhower did not want to create a dedicated space agency but was forced to do so under domestic pressure, and he intentionally took space programs away from the military to gain better budget control over space programs[107] -- otherwise the military will ask for budget growth with the excuse of national security anytime they want.

Nonetheless, even under the unwilling Eisenhower administration, NASA and the Department of Defense (DoD) maintained a close relationship, albeit with smaller funding for space projects from time to time[108]. Intentionally or unintentionally, the establishment of NASA as a civilian agency furthered the expansion of dual-use

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[104] Launius, Roger D. "The historical dimension of space exploration: reflections and possibilities." *Space Policy* 16, no. 1 (2000): 23-38. https://doi.org/10.1016/S0265-9646(99)00055-7.
[105] Logsdon, Lear, and Launius, 1995.
[106] Burrows, 2010.
[107] Erickson, Mark. *Into the unknown together: The DOD, NASA, and early spaceflight*. Air University Press, 2005.
[108] Ibid.

concept for space in the US, because it does not only serve military purposes. However, the technology and even the personnel remained almost the same. Von Braun, the previously lead of the Army's space launch project became the first director of NASA's Marshall Space Flight Center and continued his work of the Saturn rocket there[109].

Within the initial chaos of the "Sputnik Crisis" between 1957 and 1958, one thing became clearer and clearer, which is that the difference between "military space technology" and "civilian space technology" was made with political intention, and the only actual distinction is the intention of its users. In fact, the technology remained largely the same from military to civilian domains, in regards of the delivering system, computer system, aeronautics, and various other functions such as communication and navigation and so forth, with minor differences in specifications due to the requirement of specific missions[110]. In general, military space assets used more durable and reliable technologies, with higher survivability compared with their civilian counterparts, and this trend still holds true today. After several decades of outsourcing, the tie between the private space sector and U.S. military remains extremely close. Companies such as Boeing and Lockheed & Martin formed a joint venture, the United Launch Alliance (ULA), in 2006, which was responsible for the majority of space launches for the U.S. military, especially USAF while also participated on commercial space activities[111]. Additionally, similar trends are not limited to the United States, but could also in China and Russia, which will be discussed in extensive length in later chapters.

Since the distinction is purely based on user intention, this created the causes for international competition due to misinterpretation or rational calculation. Specifically, any change in space capabilities, regardless of their initial intentions, would be

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[109] Ibid.
[110] Handberg, 2007.
[111] Kovacic, William E. "Competition policy retrospective: the formation of the United Launch Alliance and the ascent of SpaceX." *Geo. Mason L. Rev.* 27 (2019): 863. https://heinonline.org/hol-cgi-bin/get_pdf.cgi?handle=hein.journals/gmlr27&section=30.

understood as a growth in space-related military capabilities. This idea was drawn from a crucial realist assumption that intention is not something can be known with certainty, due to the impossibility of offensive power and defensive power. Moreover, states can never be certain about other states' intentions, and be sure that offensive actions will not be taken by another actor[112]. This dynamic is even more prominent in the space domain, due to the dual-use nature of space technologies as we discussed. Hence, losing in relative space capability becomes a security issue for state actors, regardless the other space actor's intention of increasing its space capabilities.

3.3.3 Assumption 3: Free Access to Space as the Primary Goal for Space Actors

The third fundamental assumption is that the primary goal for all space actors is the free access to space. Ensuring access to space is the core tenant for any space strategy, because access to space is the first step for gaining benefits from space activities. Intuitive as it is, the concept of "free access to space" contains several requirements, especially the development of space capabilities. Firstly, to gain access to space, a space actor must have access to launch vehicles and other space assets, either through independent development or cooperation with other space actors. Secondly, a space actor also needs to ensure the security of its space assets, from both artificial and natural threats. Thirdly, space actors will also seek to ensure their access to valuable areas in space, including both around Earth and on other celestial bodies.

The first requirement, access to space assets, can be divided into two types of accesses. One is through independent development of space capabilities, which includes the development of space technologies and building space assets that are dual use in nature. Another option is to cooperate with another space actor, thus only develop a part of the technologies required or simply use the services provided by another space actor.

[112] Mearsheimer, 2003.

The second option is much cheaper than the first, obviously, but all three major space powers, the US, Russia, and China, did not choose to rely on this option, and all developed their own space infrastructure even though they cooperated with each other in certain areas. For example, since the end of the Cold War and later the suspension of the space shuttle program, NASA has been one of the largest clients for Roscosmos, the Russian state corporation and counterpart to NASA, mainly outsourcing supply missions to the ISS, which in itself has been regarded as a shining example of international cooperation in space[113]. However, at the same time, there has been little substance in this cooperative relationship regarding ISS other than NASA hired Roscosmos as a cargo driver. None of the core technologies regarding space were exchanged, and we did not see reliance of space capability development between the U.S. and Russia. On the contrary, Russia and the U.S. both retained their core space technology and space security to themselves. In the case of ULA, it is still the largest space service provider to USAF, while new U.S. companies such as SpaceX are becoming more and more involved.

A similar case can be found on China with the issues around the Global Positioning System (GPS). While China has been relying on GPS for both commercial and military purposes, it still invested a huge amount of funds and resources into developing their own positioning system, Beidou. The reason behind this choice is obvious, that China wants to ensure its access to space by not relying on a foreign service provider, not to mention a provider from a potential competitor. These cases will be discussed more extensively in later chapters, but the core argument here is that for major space powers, they are unwilling to rely on other space powers to access space when they are capable of developing their own space capabilities. As we will describe in later chapters, this priority of freedom of access has been constantly mentioned in the US, Russian, and

[113] Badikov, G. A., E. B. Mazurin, and R. M. Khamukov. "Commercialization of the ISS Experiments." In *AIP Conference Proceedings*, vol. 2318, no. 1. AIP Publishing, 2021. https://doi.org/10.1063/5.0036002.

Chinese context during domestic discussions and international negotiations[114], and developing their own space capability and thus getting a relative advantage is the only way of ensuring that free access.

This priority of developing independent space capabilities brings us to the second aspect of free access to space, which is to ensure the security of space assets. This is at the core of conventional definition for space security, which is "the secure and sustainable access to, and use of, space and freedom from space-based threats"[115]. Due to the dual-use nature of space technologies, there has been no rule preventing space actors from developing capabilities in space that can threaten the space asset of another space actor, and such an ability would be extremely hard to counter[116]. Hence, space actors are motivated to develop such capabilities to counter or deter a threat in the absence of an effective international regime and a specific standard. This situation provides an environment for competition between space actors to happen. When a space actor starts to lose its relative advantage in space capability or an emerging space actor starts to see a wider relative disadvantage, they will start to implement more competitive space strategies, unless they are uncapable of doing so.

This was what China did since the 1990s, because it sees itself in a disadvantageous position relative to the U.S. in terms of relative space capabilities, and it eventually chose to do whatever it can to catch up with the US. Consequently, as we will show in later chapters, this is also the explanation towards the U.S. rush for Artemis program to land on the moon after Apollo 17, because it felt unsecure about the diminishing relative capability it has. Additionally, the incapability to compete is also a possible situation which happened to Russia right after the end of the Cold War. This led to the

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[114]Krepon, Michael, Theresa Hitchens, and Michael Katz-Hyman. Preserving freedom of action in space: realizing the potential and limits of US Spacepower. Stimson Center., 2022.

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[115] Jessica West, ed., *Space Security Index 2016* Kitchener: Pandora Print Shop, 2016.

[116] Johnson-Freese, Joan, and David Burbach. "The outer space treaty and the weaponization of space." *Bulletin of the atomic scientists* 75, no. 4 (2019): 137-141. https://doi.org/10.1080/00963402.2019.1628458.

U.S. adopting a more non-competitive approach towards Russia and even cooperated with Russia as we briefly described. However, now that China is becoming an emerging competitor to U.S. space supremacy, Russia as another re-emerging space actor chose to cooperate with China very closely in order to increase its relative advantage to the US. Essentially this is similar to a security dilemma but different in the sense that it is about security but not survival, and it is not only about security but also ensuring political and economic gains from space activities. Due to the dual-use nature of space technologies and the physical nature of space, these two interests are inseparable.

Finally, due to the contested and congested nature of space, as we discussed in the previous section, there is also a need for space actors to ensure access to certain geographical areas in space. These places in space are mainly certain orbits around Earth and certain areas on other celestial bodies. For state actors the best way to ensure access and eventually full control of a certain geographical area is through sovereignty. This has been the practice on Earth in modern history, but it won't work in space because all major space actors signed the OST which prevents that from happening. On the other hand, while orbits around Earth are fairly regulated and there is no imminent risk of a conflict, activities on other celestial bodies are another matter. Since none of the main space actors signed the Moon Treaty and there are no specific rules on conducts on the Moon, both the U.S. and China are using this opportunity to establish favorable terms for themselves.

3.3.4 Assumption 4: Space Activities are Long-term Endeavors with Severe Latency to Policies

A key aspect of neoclassical realism is that states do not only react to present actual conditions but also make strategic decisions based on their perceptions of dynamics in the international system.[117] In the context of space strategy, this aspect is critical because space is a domain defined by long-term investments, emerging technologies, and evolving geopolitical realities. States must anticipate future developments in space to ensure that they maintain their competitive edge or, conversely, engage in cooperative behavior when future trends indicate that cooperation would yield greater benefits. Therefore, space actors' perceptions of the future, particularly regarding technological advancements, geopolitical shifts, and economic opportunities, play a significant role in shaping strategic choices.

Neoclassical realism suggests that state leaders' perceptions of future trends can influence their assessments of the international environment, guiding their policy decisions even before tangible changes occur.[118] These perceptions are particularly significant in the space domain, where strategic decisions often involve long-term commitments to technologies or infrastructures that may not yield immediate results but can dramatically alter the balance of power in the future. For example, the U.S. decision to invest in private space ventures like SpaceX reflects a forward-looking approach, where policymakers anticipated that the commercial sector would play an increasingly dominant role in space exploration and technological innovation.[119] By supporting these private actors, the U.S. positioned itself to maintain leadership in the future commercial space economy, demonstrating the influence of perceived future trends on current strategy.

Perceptions of future technological breakthroughs are especially potent drivers of competitive strategies in space. Space powers, particularly established actors like the United States, Russia, and China, are acutely aware that technological leadership in space could determine their broader geopolitical influence. These states perceive space

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[117] Rose, Gideon. "Neoclassical Realism and Theories of Foreign Policy." *World Politics* 51, no. 1 (1998): 144–72. https://doi.org/10.1017/S0043887100007814.
[118] Ibid.
[119] Sadeh, Eligar. "Space strategy in the 21st century." *Space Power and Politics. London: Routledge Ltd* (2013).

not only as a domain of scientific exploration but as a future arena of military and economic competition.[120] As a result, they often adopt competitive strategies when they believe their rivals are likely to achieve significant technological breakthroughs. For instance, China's rapid development of its space program, including its advancements in lunar exploration and space station construction, has been driven by a perception that technological superiority in space will translate into geopolitical power in the coming decades.[121] In response, other space powers like the United States have accelerated their competitive strategies to preempt or counterbalance China's rise.

Anticipations of future geopolitical trends also shape space strategies. The prospect of new space actors entering the competition, the increasing role of private enterprises, or the possibility of future conflicts over space resources all factor into states' strategic calculus. For example, Russia's military investments in space can be partially explained by its anticipation of a future where space becomes increasingly militarized. Russian leaders perceive space as an essential domain for national security, and the country's recent emphasis on developing anti-satellite (ASAT) technologies and other military space capabilities is informed by their view that future conflicts may extend into space.[122] Russia's strategy reflects a belief that maintaining a competitive military presence in space will be necessary to secure its geopolitical interests in the long term.

Economic trends in space, particularly regarding the future commercialization of space, also significantly shape state behavior. Space is increasingly being viewed as an economic frontier, with immense potential for profit in areas such as satellite services, space tourism, and asteroid mining.[123] States anticipating the economic potential of

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[120] Grego, Laura. "A History of Anti-Satellite Programs." *Union of Concerned Scientists*, 2011. https://www.ucsusa.org/sites/default/files/2019-09/a-history-of-ASAT-programs_lo-res.pdf.
[121] Handberg, Roger, and Zhen Li. *Chinese space policy: A study in domestic and international politics*. Routledge, 2006.
[122] Bowen, 2020.
[123] Deudney, 2020.

space are likely to adopt strategies that foster private sector growth and innovation, as seen in the United States' heavy investment in public-private partnerships with companies like SpaceX, Blue Origin, and others.[124] These partnerships are not just about immediate gains but are rooted in a long-term vision of maintaining U.S. dominance in the global space economy. The Artemis Accords, a set of international agreements for lunar exploration, also reflect the U.S.'s strategic anticipation of future economic and strategic competition over lunar resources.[125]

Perceptions of future space governance structures are another essential factor influencing state strategies. States may choose a cooperative strategy if they believe future trends favor multilateral governance and international cooperation. The formation of space governance frameworks, such as the Outer Space Treaty or the emerging norms around space debris management, provides an example of how states can anticipate future needs for cooperative structures and adjust their strategies accordingly.[126] For instance, the U.S. and Russia's longstanding cooperation on the International Space Station (ISS) was partly driven by a recognition that pooling resources and expertise would yield more significant scientific and political gains than unilateral action.[127] This cooperation was not just a reaction to present constraints. Still, it was also informed by both states' perceptions of the long-term benefits of maintaining a peaceful and cooperative space environment.

On the other hand, perceptions of future competition over space resources, such as asteroids rich in rare minerals or lunar water deposits, may lead states to adopt more aggressive strategies. For example, China's lunar exploration efforts, including its Chang'e program, reflect its strategic anticipation that control over lunar resources

124 Sadeh, 2013.
125 Stine, Deborah D. "US Civilian Space Policy Priorities: Reflections 50 Years After Sputnik." (2007).
126 Launius, Roger D. *Apollo's Legacy: Perspectives on the Moon Landings*. Smithsonian Institution, 2019.
127 Ibid.

could provide a critical advantage in future economic and geopolitical competition.[128] As technological advancements make resource extraction from celestial bodies more feasible, states that perceive themselves as future beneficiaries of these resources will likely adopt competitive strategies to secure early access. Conversely, states that believe such competition may lead to conflicts or instability may push for establishing new international legal frameworks to govern the exploitation of space resources, thus adopting cooperative strategies.[129]

In sum, the perception of future trends, whether in technological breakthroughs, geopolitical competition, economic potential, or governance structures—plays a pivotal role in shaping space strategy. Space actors, particularly great powers, know that their strategic choices today will have long-term consequences for their position in the future global order. Neoclassical realism's emphasis on state perceptions allows us to understand why states may choose to compete or cooperate in space based on their expectations of future developments. As space becomes an increasingly contested domain, the ability of states to accurately perceive and anticipate future trends will be critical in determining their success in securing both their strategic and economic interests in space.

3.4 Core Hypotheses

This section presents a set of core hypotheses derived from the theoretical framework of neoclassical realism, which will be tested in the following empirical chapters. These hypotheses address how states formulate space strategies in response to changes in relative capabilities, technological advancements, emerging space powers, and perceptions of future trends. Drawing on the theory's emphasis on systemic pressures and domestic factors, the hypotheses reflect the complex interplay between

[128] Handberg and Li, 2006.
[129] Johnson-Freese, 2016.

competition and cooperation in space. The empirical chapters offer detailed case studies that validate these hypotheses, demonstrating how space actors adjust their strategies to maintain security, economic interests, and geopolitical influence in a rapidly evolving space domain.

Hypothesis 1: Changes in relative space capabilities trigger balancing behavior for space powers to maintain competitiveness.

When a state perceives a decline in its relative space capabilities, it is likelier to adopt balancing strategies to protect its strategic interests and maintain its influence in space. The theoretical foundation of this hypothesis is the works of neoclassical realists such as Lobell and Ripsman, as well as defensive realists such as Waltz. [130][131] This hypothesis is rooted in their theories' argument that states prioritize security and prestige in an anarchical international system and that a perceived decline in capabilities threatens both. The United States, for instance, when it experiences a decline of relative power (perhaps due to China's increasing capabilities in lunar exploration and anti-satellite technology), may engage in policies aimed at technological innovation, increased defense spending, or the establishment of new space norms to safeguard its strategic position. This hypothesis is tested in Chapter VII and Chapter VIII, which examine the U.S. response to Soviet ASAT capabilities and China's rise as a space power, respectively. The U.S. response is mainly competitive, marked by the development of space capabilities or alliance-building behavior like the Artemis Accord to balance against the leading competitor, demonstrating how the U.S. seeks to counteract perceived shifts in the balance of space capabilities.

Hypothesis 2: A stable distribution of space capabilities between major powers leads to cooperation to maintain stability and, thus, relative advantage.

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[130] Lobell et al, 2009.
[131] Waltz, Kenneth N. *Theory of International Politics*. Reading, MA: Addison-Wesley, 1979.

Space powers will likely pursue cooperative strategies when their relative capabilities are balanced, as competition costs may outweigh the benefits.[132] In the space domain, such balance fosters cooperation to avoid unnecessary escalations that could jeopardize the security of space assets. For example, the collaboration between the United States and the Soviet Union in the 1970s when space capabilities were balanced, and international cooperation on the ISS in the 1990s when the U.S. achieved a hegemonic status on space capabilities. Chapter VI empirically explores this hypothesis by focusing on space cooperation initiatives, particularly between the European Union, Russia, and the U.S., which engage in joint projects despite underlying geopolitical tensions. These cases validate that balanced capabilities promote cooperative frameworks like those that sustain the ISS or satellite navigation systems like Galileo. Chapter VII also investigates cooperation options under different types of space capabilities distribution through the case of ISS.

Hypothesis 3: Perceptions of future space capability trends influence shifts toward preemptive balancing space strategies.

Space actors' perceptions of future technological advancements and their anticipated impact on the strategic balance are critical in shaping space strategies. When states perceive that future trends may enhance their position, they may opt for a competitive approach to capitalize on them. Conversely, if future technological developments destabilize, states might favor cooperation to mitigate risks and promote governance frameworks that ensure long-term stability. This assumption is grounded in neoclassical realism's emphasis on the role of perceptions in decision-making.[133] For instance, U.S. perceptions of Chinese future space capabilities pushed the U.S. to act with preemptive measures to isolate the Chinese space program with measures like the

[132] Rose, 1998.; Schweller, Randall L. *Unanswered Threats: Political Constraints on the Balance of Power*. Princeton: Princeton University Press, 2006.
[133] Rose, 1998, 144-172.

Wolf Amendment even when the actual gap in relative space capabilities remained relatively the same. This hypothesis is explored in Chapter 8, where the empirical analysis delves into how states adjust their space strategies in response to emerging technologies, such as space mining and advanced satellite networks. It tests how different actors view the strategic value of these future technologies and the extent to which they are willing to compete or cooperate based on these perceptions.

3.5 Towards a Typology of Space Powers and Strategies

Based on these four assumptions and proposed hypotheses, a typology of space power behavior can be developed to map fundamental space strategy shifts throughout history further and provide insights into potential future developments. As stated, ensuring free access to space requires the development of space capabilities and relative advantage in space capabilities. Only then can a space actor have better access to space resources and avoid threats from other space actors. This is made harder due to space's contested and congested nature and the dual-use nature of space activities. When the four core assumptions are combined, relative space capabilities become the core independent variable influencing space actors' choice of space strategy. Consequently, as later chapters will demonstrate, the interaction between different space actors capable of developing their space capabilities is usually competitive on the system level. However, space actors could be non-competitive or cooperate to compete with another space actor with a more significant relative advantage, and they could also cooperate when other space actors are objectively unable to compete with the established space actor.

Table 3 Typology Matrix of Space Powers

	Perceived Increase	***Perceived Balance***	***Perceived Decrease***
Advantage in Space Capability	Space Hegemon	Status Quo Space Power	Stagnated Space Power
Balance in Space Capability	Revisionist Space Power	Balanced Space Power	Declining Space Power
Disadvantage in Space Capability	Emerging Space Power	Pragmatic Space Power	Failing Space Power

Based on the configuration of the current distribution of space capabilities and the perception of future capabilities, this paper attempts to develop a typology of space powers and discuss the strategies associated with different types of space powers, as shown in *Table 3*. The matrix presented here categorizes space powers into various types based on their perceived relative space capabilities and how they might adjust their strategies accordingly. Understanding these categories can help elucidate the strategic choices made by space actors in response to shifts in the balance of space capabilities.

1. Space Hegemon: A space power with an advantage in space capability that perceives an increase in its relative capabilities. This type of actor will likely pursue an assertive strategy reinforcing its dominance. This could involve expanding its space infrastructure, investing in cutting-edge technologies, establishing norms, and engaging in cooperations that secure its leadership role. The only case of this would

be the United States during the unipolar moment after the Cold War.

2. Revisionist Space Power: A space actor with balanced capabilities that perceives an opportunity to increase its relative position due to its positive outlook on future space capabilities. These powers might adopt competitive strategies, such as developing new space assets or pursuing expansionist policies to shift the balance of power in their favor. They might challenge existing norms or seek to establish new ones that reflect their growing capabilities. China has been transforming towards this type of space power since 2011.

3. Status Quo Space Power: With an advantage in space capabilities, this actor perceives a balance in its future relative capabilities. It is inclined to maintain the status quo, focusing on preserving its current position rather than pursuing expansionist policies. Such a power is more likely to engage in international cooperation, reinforce existing treaties that stabilize the space domain, and find ways to deny access to space to potential challengers. The United States would be considered a status quo space power if Chinese space capabilities continue to grow towards balance.

4. Balanced Space Power: A power with balanced capabilities and no significant change in its relative position. It will likely pursue cooperative strategies, maintaining existing alliances and ensuring stability. This approach could include joint missions, shared technological development, and mutual security arrangements. Typical cases of balanced space power would be the United States and the Soviet Union in the 1970s after the Apollo moon landing.

5. Pragmatic Space Power: A power at a disadvantage in capabilities but perceiving a balanced situation. It might seek to cooperate with more vital actors to secure its position and gain technological benefits. This could involve aligning with a dominant power or engaging in multilateral initiatives that ensure access to space resources

without provoking competition. A representative example of this type of space power is China's early efforts to become a space power.

6. Stagnated Space Power: An actor with an advantage in space capabilities but perceiving a decline in its relative position. This power might adopt strategies to reverse the decline, such as increased investment in military space capabilities or policies to deter emerging competitors. If China's space capabilities continued to proliferate, it would push the U.S. towards this type of space power.

7. Declining Space Power: A power with balanced capabilities that perceives a decline or stagnation. This actor might face challenges maintaining its position and could respond by either attempting to reinvigorate its space program or aligning with more powerful actors to secure its interests. Since the late 1980s, the Soviet Union and Russia have been considered declining space powers.

8. Emerging Space Power: A power at a disadvantage in capabilities but perceiving an opportunity to rise. Such an actor will likely pursue competitive strategies to enhance its capabilities rapidly. This could involve significant investment in space technology, seeking strategic partnerships, or challenging existing space powers. The Soviet Union in the 1950s, the United States in the 1960s, and China since the 1990s would be considered typical emerging space powers.

9. Failing Space Power: An actor with a disadvantage in capabilities perceives a further decline. This type of actor may struggle to maintain its space activities and could be forced to rely on external assistance or exit the competition altogether. Russia has been moving towards a failing space power since 2014.

This typology offers a structured way to analyze the strategic behavior of space actors by focusing on their relative capabilities and perceptions. It provides a predictive framework for understanding why and when space actors might shift their strategies from cooperation to competition or vice versa. Analysts can anticipate potential space policy and strategy changes by categorizing space powers according to their position in the matrix.

For instance, a space hegemon might be expected to establish international norms that reinforce its dominance. In contrast, an emerging space power might focus on disruptive innovations to challenge the status quo. A declining space power might resort to defensive measures to protect its assets, while a balanced space power may engage in diplomacy to maintain stability. Further, this framework also helps explain strategic shifts over time. For example, the transition of the U.S. from a balanced space power during the Cold War to a space hegemon in the post-Cold War era can be understood through its increasing relative capabilities and the subsequent shift in strategy from cooperative to more assertive policies. Similarly, China's rise as an emerging space power is characterized by a competitive approach to enhance its capabilities and challenge U.S. dominance.

3.6 Conclusion

In this chapter, we have developed a comprehensive framework for understanding the strategic behavior of space actors by integrating neoclassical realism with the specific dynamics of space power. This framework offers a structured approach to analyzing how states perceive and respond to shifts in their relative capabilities in the space domain. By categorizing space powers according to their capabilities and the changes they perceive in the strategic environment, we can better understand why specific strategies are adopted and how they might evolve.

The typology of space strategies outlined in this chapter is particularly valuable in explaining the diversity of approaches seen in global space policy. For instance, the United States shift from a balanced space power during the Cold War to a more assertive hegemon in the post-Cold War era can be traced through its growing relative capabilities and the strategic imperatives that arose from this new position of dominance. This shift was not merely a product of technological advancements but also of the broader geopolitical environment, where the absence of a peer competitor allowed the U.S. to pursue more ambitious goals, such as the Strategic Defense Initiative and the commercialization of space. Similarly, the rise of China as a significant space power can be understood within this framework as a case of an emerging space power employing competitive strategies to close the gap with established leaders. China's significant investments in space infrastructure and its efforts to challenge existing norms reflect a deliberate strategy to enhance its relative position and assert its influence in the global space order. This competitive approach aligns with the characteristics of an emerging space power seeking to alter the balance of power in its favor.

Moreover, the framework's emphasis on the interactions between external pressures and domestic political considerations provides a nuanced understanding of how internal dynamics shape space policy. For example, domestic economic constraints, political stability, and public opinion can all influence a state's ability and willingness to invest in space capabilities, thereby affecting its strategic choices. This perspective highlights the importance of considering international and domestic contexts when analyzing space strategy.

In addition to offering a robust tool for analyzing current space strategies, this framework also has predictive value. By understanding the conditions under which states will likely shift from one strategy to another, we can anticipate potential changes in global space dynamics. For instance, a declining space power might adopt more aggressive measures to protect its assets, while an emerging power might seek to establish new norms that reflect its growing capabilities. These predictions are crucial for policymakers navigating an increasingly complex and contested space environment. The insights gained from this framework will be beneficial as we move into the empirical analysis and case studies in the subsequent chapters. By applying the typology of space strategies to specific historical and contemporary examples, we can test the framework's validity and refine our understanding of space power politics. This will allow us to draw more precise conclusions about the future trajectory of global space governance and the potential for conflict or cooperation in this critical domain.

In conclusion, Chapter III has laid the theoretical foundation for a detailed exploration of space strategy and power dynamics. By integrating neoclassical realism with the unique aspects of space, we have developed a framework that explains past and present behaviors and offers a guide for anticipating future developments. This framework underscores the importance of strategic foresight in space policy as states navigate the challenges of maintaining and expanding their capabilities in an increasingly competitive environment. As we proceed to the case studies, this framework will serve as a lens to analyze space powers' specific strategic choices and assess the implications for space politics.

Chapter IV Methodology and Data Collection

As discussed in Chapter III, this dissertation adopts a neoclassical realist framework to examine how shifts in relative space capabilities and perceptions have influenced space powers' strategic decisions. Neoclassical realism, as an approach that combines structural realist insights with domestic variables, is particularly appropriate for analyzing the complexity and shifts of space strategy. This dissertation employs process tracing as the primary research methodology to investigate the evolution of space strategy among significant powers, focusing on how shifts in relative space capabilities and perceptions of future capabilities influence strategic decisions. Additionally, process tracing is supplemented with quantitative elements of quantified space capabilities measured by several key metrics in historical data of the leading space powers investigated.

To elaborate on the overall methodological design, this chapter will first introduce the reasoning of method selection and the overall research design in Section 4.1. Then, Section 4.2 will discuss the collection of qualitative data for the process tracing in Section, and afterward, quantitative data for space capability measurement in Section 4.3. Finally, Section 4.4 will discuss ethical concerns such as potential selection bias in choosing specific data sources or the limited availability of public information for certain cases.

4.1 Method Selection and Research Design

In the context of space power strategic shifts, neoclassical realism provides an effective lens to examine how changes in relative capabilities affect space powers' strategic choices. States such as the United States, the Soviet Union/Russia, and China adjust their strategies in response to technological capability and perception shifts, often balancing competition and cooperation based on perceptions of security, prestige, and economic benefits. Within this framework, process tracing identifies the causal mechanisms that link these changes in capabilities to specific strategic decisions, providing a granular understanding of how and why states alter their space strategies over time.

Process tracing is qualitative research investigating the causal processes leading to specific outcomes. It focuses on identifying causal mechanisms, which are the intervening processes that explain how an initial cause produces a particular result.[134] This method is beneficial for understanding complex historical and political phenomena where multiple factors interact over time. In this dissertation, process tracing allows for the detailed examination of how specific events, technological advancements, and policy decisions in space strategy unfolded and influenced subsequent actions.

Process tracing is ideal for this research because it enables the study of strategic decisions in space as they evolve, responding to both external threats, such as shifts in relative power among space actors, and internal pressures, such as shifts in perception of future capabilities based on budgetary or domestic political issues. For example, the launch of the Soviet satellite Sputnik in 1957 can be traced as a critical juncture in the development of U.S. space strategy. The event triggered a cascade of decisions in the U.S., including the establishment of NASA and increased funding for space exploration and military capabilities, shaping the broader trajectory of Cold War space competition.[135] Process tracing allows for exploring such pivotal moments and their longer-term impacts on strategic behavior.

Further, Process tracing seeks to uncover the causal mechanisms connecting

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[134] Beach, Derek, and Rasmus Brun Pedersen. Process-Tracing Methods: Foundations and Guidelines. Ann Arbor: University of Michigan Press, 2013.
[135] McDougall, 1997.

independent and dependent variables.[136] In this dissertation, the primary independent variable is the combination of relative space capability and perception of future capabilities. In contrast, the dependent variable is the strategic choice made by the space power. For example, during the Cold War, the United States and the Soviet Union were competing for space dominance, with each space power's space strategies deeply influenced by their perceptions of the other's capabilities and their projection of future trends. The U.S. response to Sputnik, including its accelerated missile development programs and the establishment of new space agencies, can be traced through critical decisions made by political and military leaders, each shaped by concerns over national security and technological superiority.[137] Similarly, China's space capability growth, particularly its investment in anti-satellite (ASAT) technologies and lunar exploration, could also shift U.S. perception towards Chinese future space capabilities as an emerging challenge to its dominance in space.[138] By tracing how China moved from a cooperative space posture in the early 2000s to a more competitive stance by the 2010s, the research uncovers the mechanisms linking relative space capabilities changes to strategic decision-making.

Process tracing typically involves sequential, each aimed at uncovering the sequence of events and decisions that lead to a particular outcome. The research design for this dissertation follows a structured approach to process tracing, ensuring that the causal mechanisms are identified and explained. The first step involves identifying key events that act as turning points in space strategy development. In the case of the U.S.-Soviet space race, critical junctures include the launch of Sputnik, the Apollo moon landing, the Soviet ASAT test, and the end of the Cold War. More contemporarily, China's successful ASAT test and the launch of its lunar exploration program. Each marked

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[136] Beach and Pederson, 2020.
[137] Moltz, 2019.
[138] Bowen, 2020.

significant shifts in the relative capabilities and the domestic perception of the trends such shift indicates. Similarly, for the Soviet Union/Russia, critical junctures include the Apollo moon landing, the announcement of SDI, the end of the Cold War, the ISS, and, more recently, the success of private U.S. space launches. For China, key events include the first Chinese satellite, Dongfanghong-1, the announcement of SDI, and the 2011 U.S. Wolf Amendment. All these key events are critical junctures of strategic shifts identified by the literature and preliminary observation.

Once the critical junctures are identified, the next step is to map out the causal chain that links these events to strategic decisions. This involves analyzing primary and secondary sources, such as government documents, military reports, policy statements, memoirs, public speeches, interviews, etc., to understand the decision-making processes behind fundamental strategic shifts. For instance, the decision to invest heavily in the Apollo program can be traced through archival data since the launch of Sputnik through cabinet meeting records in the archive to the final budgetary approval by Congress. This requires elaborative qualitative work and identifying key evidence for certain causal inferences.

Further, process tracing also requires examining intervening variables, which can mediate the relationship between the initial cause and the outcome. In the context of space strategy, these intervening variables might include leadership perceptions, domestic political pressures, economic constraints, etc. For example, U.S. President John F. Kennedy’s decision to prioritize crewed lunar exploration was influenced by technological and strategic considerations and domestic political concerns about maintaining American leadership in the Cold War.[139] Identifying intervening variables could better understand the causal mechanisms involved and help test competing explanations for the same outcome. For example, while some scholars argue that

[139] Johnson-Freese, 2017.

military concerns drove the U.S. focus on space dominance in the 1980s, others suggest that economic interests and technological innovation played an equally important role.[140] By tracing the decision-making processes behind programs like the Strategic Defense Initiative alongside other space policy directives, this dissertation can evaluate these competing explanations and identify the primary drivers of U.S. space strategy during this period.

Quantitative data on space capabilities will also supplement this qualitative analysis. This is necessary because, for the process tracing analysis, a year-by-year measurement of space capabilities in temporal order is crucial to understanding the timing and the following effects of fundamental strategic shifts. Specifically, while qualitative data can offer a good understanding of the perception of trends and help understand rationales, quantitative data is also needed to map critical moments and processes related to the overall space capabilities. Through this research design, this dissertation can provide a detailed account of how changes in relative space capabilities drive strategic adjustments over time.

4.2 Qualitative Data Collection

The main body of qualitative data includes declassified archival data, secondary sources enriched by interviews and primary evidence, public speeches, news articles, and private diaries or memoirs. These diverse sources allow for a comprehensive understanding of the causal mechanisms linking changes in space power dynamics to strategic decisions for the analysis in the empirical chapters. The empirical chapters draw heavily from declassified U.S., Soviet Union/Russian, and Chinese government documents. In the case of tracing strategic shifts in the U.S., for example, presidential libraries are essential to understanding certain key events, especially during the Cold

[140] Dolman, 2022.

War period. Documents retrieved from the Eisenhower Library and Reagan Library[141] are beneficial. Further, document collections from think tanks such as the Center for Strategic and International Studies (CSIS) also provided critical supplementary documents.[142] These include military and intelligence reports, official correspondence, cabinet meeting minutes, and strategic directives. By tracing the progression of policies, these archives help to identify key turning points in the space strategies of the central space powers. By tracing the progression of policies, these archives help to identify key turning points in the space strategies of the major powers.

However, for Chinese and Russian sources during the Cold War, such primary sources were much less transparent and more challenging to access. However, in recent years, policy papers and directives have become more accessible. Nonetheless, publicly available documents, press releases, and personal memoirs can still collect credible qualitative data. Public speeches and news articles are also essential for understanding the public framing of strategic decisions. Given the importance of public perception in democratic and authoritarian regimes, speeches and media reports help explain the external pressures that shaped policy choices, particularly during the Cold War. This is especially relevant in space competition, where public prestige plays a significant role in decision-making. Memoirs and diaries were selected because they provide a more personal and informal account of participants' decision-making processes of crucial events. These sources often reveal internal conflicts, pressures, and informal discussions not captured in formal archival documents. Their inclusion allows a more detailed understanding of broader strategic decisions through personal experiences.

Further, a significant portion of the analysis relies on secondary sources based on primary sources, mainly books and articles that synthesize archival data, interviews

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[141] Reagan Presidential Library. "Space Policy: Topic Guide." Accessed March 13, 2023. https://www.reaganlibrary.gov/archives/topic-guide/space-policy.
[142] Center for Strategic and International Studies. "Aerospace Security: Documents." Accessed June 14, 2024. https://aerospace.csis.org/documents/.

with key actors, and other primary sources. Authors such as William E. Burrows[143] and Walter McDougall[144] provide important contextual frameworks for understanding space politics during the Cold War. Secondary sources offer a synthesized view of the broader historical context. The reliance on works by scholars such as Burrows and McDougall is justified by their extensive use of primary sources and interviews. These works provide historical context and present competing interpretations of key events, which is critical for testing the robustness of the process tracing methodology. These works are essential for their historical detail and because they provide a structured narrative that aids in identifying causal links between crucial events and strategic shifts . Such works also allow for cross-verifying facts found in the primary archival sources.

The selection of these sources was guided by their relevance to understanding the evolution of space strategy over time, particularly in tracing the processes that led to critical strategic decisions. As a qualitative methodology, process tracing requires a detailed and multifaceted approach to uncovering causal mechanisms. The combination of primary and secondary sources allows for triangulation, enhancing the validity of the findings by corroborating evidence from different types of data. Archival documents provide the most direct insight into official decision-making processes. For example, declassified documents from the U.S. and Soviet Union were crucial for tracing the origins of strategic shifts, such as the U.S. decision to prioritize lunar exploration or the Soviet pivot towards anti-satellite technologies, which can be identified when cross-referencing secondary and primary data.[145] The availability of Chinese archival documents, while more limited, was supplemented by secondary sources that incorporated interviews with Chinese officials and experts.

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[143] Burrows, 2010.
[144] McDougall, 2020.
[145] Sidiqi, 2000a.; and Scowcroft, Brent., "*Scowcroft Memo: Satellite Vulnerability*", March 15, 1976, CSIS Aerospace Security Document Library. https://aerospace.csis.org/scowcroft-memo-sat-vulnerability-mar-1976/.

The credibility of the sources used in this research varies depending on the data type. Archival data is generally considered the most reliable, as it represents the official record of decisions made by state actors. However, the potential for selective declassification and the inherent biases in government records must be acknowledged. For example, U.S. archives may emphasize the success of programs like Apollo while downplaying internal debates and failures. Soviet and Chinese records, due to their highly centralized and secretive nature, may be even more prone to selective disclosure.

Secondary sources, while invaluable for providing context and synthesis, are also subject to the interpretive biases of the authors. The works of scholars such as Burrows and McDougall are widely respected, but their conclusions must be critically evaluated in light of the broader empirical evidence. Similarly, public speeches and news articles, particularly those from authoritarian regimes, often reflect the official narrative rather than the motivations behind policy decisions. Finally, Private diaries and memoirs, while offering unique insights, are perhaps the most subjective sources. These accounts can be influenced by personal biases, selective memory, or the desire to justify past decisions. As such, they must be cross-referenced with other sources to ensure reliability when possible.

In sum, the qualitative data used in this dissertation range from declassified archival documents to private memoirs. Each source type contributes to a more comprehensive understanding of the causal mechanisms underlying strategic shifts in space policy. By triangulating between archival data, secondary sources, public speeches, and personal accounts, this research ensures a balanced and credible approach to process tracing. Their relevance to the research question justifies the selection of these sources, and their credibility is critically assessed to ensure the robustness of the findings. This methodological approach allows for a detailed and nuanced analysis of space strategy, capturing the formal and informal factors that shape vital decisions.

One of the core challenges inherent in researching great power behavior in space is the uneven availability of sources across the three cases examined. While U.S. archives provide a rich body of declassified material, including policy memoranda, NASA records, and presidential directives, the archival availability for Russia (especially post-Soviet) and China remains more limited. For Russia, although some declassified documents exist (e.g., Politburo minutes and design bureau histories), access is fragmented and often mediated through secondary syntheses like those by Siddiqi[146] or Barry.[147] Chinese source material is even more restricted, especially before the 2000s. To address this imbalance, I employed a triangulated source strategy: where official archival data was sparse or inaccessible, I relied on publicly available white papers, leadership speeches, state-run media discourses, and credible secondary sources built on expert interviews. This strategy is consistently applied across all three cases, and documented source types and provenance are presented in a cross-referenced table (Table 4) where possible. While acknowledging that absolute parity of source richness is unattainable, the data collected are functionally comparable in enabling structured process tracing and testing of the typological framework. The analytical weight was therefore calibrated not by volume but by relevance, triangulation, and representativeness of the data in capturing key shifts in space strategy across the three countries.

Domestic variables were identified using process tracing techniques and triangulated from primary and secondary sources. For the U.S., the primary sources mainly come from presidential libraries, the NASA archive, and the CSIS Aerospace Security Document Library. For Russia, due to the Russian language barrier, the original Russian sources were read with the aid of translation software such as Google

[146] Siddiqi, Asif A. *Challenge to Apollo: the Soviet Union and the space race, 1945-1974*. Vol. 4408. National Aeronautics and Space Administration, NASA History Division, Office of Policy and Plans, 2000a.
[147] Barry, Willam, and William Barry. "The missile design bureaux and Soviet manned space policy, 1953-1970." PhD diss., University of Oxford, 1996, pp. 45–54. Available at: https://ora.ox.ac.uk/objects/uuid:f2b8544f-5852-4283-b7ac-892afc6f39ae

Translate, as well as English translation by intelligence services of the U.S.. The main body of primary sources come from CIA FOIA Electronic Reading Room[148] and Russian State Archive of Scientific-Technical Documentation (RGANTD)[149]. For China, where access to such primary sources is limited, I used official white papers published on China National Space Administration website[150], various state media discourses, and expert interviews published in academic and policy literature.

4.3 Quantitative Data Collection

One issue with tracing such processes is the measurement of space capabilities as a key independent variable. Such capabilities are hard to measure accurately. Conventionally, space capabilities are measured through the number of successful space launches, which helps map the intensity of space activities of a particular space power.[151] Nonetheless, this could also be misleading in some cases. For example, the U.S. conducted fewer space launches throughout the Cold War than the Soviet Union. Still, it did not necessarily mean that the U.S. space capabilities were much inferior to that of the Soviet Union. On the contrary, the U.S. conducted fewer space launches for specific periods because of their launch vehicles' powerful payload capacities, durable space assets, and critical technologies such as space shuttles, allowing multiple missions in one launch.[152] Therefore, fewer launches are needed to achieve similar space capabilities.

Hence, to better assess the space capabilities of space certain space powers throughout the timeline between 1958 and 2021, this dissertation used several supplementary

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[148] Central Intelligence Agency, *FOIA Electronic Reading Room*, accessed May 20, 2025, https://www.cia.gov/readingroom/.
[149] Russian State Archive of Scientific-Technical Documentation (RGANTD), *Official Website*, accessed May 11, 2025, http://www.rgantd.ru/.
[150] China National Space Administration, *Official Website*, accessed May 11, 2025, https://www.cnsa.gov.cn/.
[151] Shreve, Bradley G. "THE US, THE USSR, AND SPACE EXPLORATION, 1957-1963." *International Journal on World Peace* 20, no. 2 (2003): 67–83. http://www.jstor.org/stable/20753399.
[152] Erickson, Andrew S. "Revisiting the U.S.-Soviet Space Race: Comparing Two Systems in Their Competition to Land a Man on the Moon." *Acta Astronautica* 148 (July 2018): 376–384. https://doi.org/10.1016/j.actaastro.2018.04.053.

measurements other than the number of successful launches. The most critical measurements are related to launch vehicles because, as discussed in Chapter III, they are vital technologies related to access to space. Firstly, this dissertation uses the theoretical maximum payload capacity of all successful space launches each year. This measurement can reflect a space power's overall space launch capacity regarding the amount of space assets that could be inserted into orbit. Since the payload capacity of the same launch vehicle model is relatively fixed, this metric can work as a proxy for the actual payload capacity of a space power instead of collecting data on actual payload mass, which is inaccessible in most cases.

A few sources are used to collect this data, including the launch vehicle used for each space mission and the payload capacity for each launch vehicle model. The collection and aggregation process of these data used a combination of both official data and private online data. Additionally, since different space launch vehicles were designed to conduct missions in other orbits, this dissertation adopted the payload capacity for the designed orbit. Since low earth orbit (LEO) is the most used orbit for space activities, when a vehicle can conduct missions in different orbits, the payload capacity of LEO is used for calculation. Also, launches and payload information of private space actors such as SpaceX and Blue Origin or Chinese private industry are also included in the national data in the same way they are identified by UNOOSA. This is justified by the fact that on the international level, they are represented by the state government of their country of registration, and they are integrated into a broader national space program.[153]

Other than the number of successful launches and maximum payload capacity, another metric can be calculated based on these two metrics: the average payload capacity of successful space launches. This could also serve as an estimated indicator of the overall

[153] Vernile, 2018.

powerfulness of the launch vehicles a space power deploys. Finally, the launch success rate determines the overall reliability of space launch vehicles. Due to the different designations and different configurations of launch vehicles, it was necessary to cross-reference with multiple sources, including the UNOOSA space object database (one of the most authoritative datasets,[154] the Gunter de Kerbs database (a widely used private database in the space industry),[155] and the Space Track database (one of the most comprehensive private databases, developed by SAIC).[156] Among these three data sources, Gunter de Kerbs' database constituted the base data, and other sources are mainly used for cross-referencing, alongside the official NASA database,[157] Chinese National Space Administration,[158] and CSIS Aerospace Data Repository.[159]

4.4 Discussion and Conclusion

While the research design of this dissertation allows for a thorough examination of the research question on space strategy shifts through process tracing combined with quantitative data, it is essential to acknowledge that there are some inherent limitations in the design and sources used. While process tracing is a helpful tool for establishing causal mechanisms of historical and political phenomena, it often faces data availability and reliability challenges.[160] The article relies primarily on declassified archival documents and secondary sources that combine primary sources, news reports, personal diaries, and memoirs. While these resources are rich, they have comprehensiveness, transparency, and potential bias limitations.

Firstly, a fundamental limitation arises from the selective declassification of archival

[154] United Nations Office for Outer Space Affairs. " Online Index of Objects Launched into Outer Space". https://www.unoosa.org/oosa/osoindex/search-ng.jspx?lf_id=.
[155] Krebs, Gunter D. "Gunter's Space Page." *Gunter's Space Page*. https://space.skyrocket.de/index.html.
[156] SAIC. "Satellite Catalogue." *Space-Track.Org*. https://www.space-track.org/auth/login?s=08.
[157] NASA. "NASA Open Data Portal." https://data.nasa.gov/.
[158] China National Space Administration. "国家航天局宇航产品" [Space Products of the China National Space Administration]. https://www.cnsa.gov.cn/n6758824/n6759008/index.html.
[159] Center for Strategic and International Studies. "Aerospace Data Repository." https://aerospace.csis.org/data/.
[160] Collier, David. "Understanding process tracing." *PS: political science & politics* 44, no. 4 (2011): 823-830.

documents. Government archives, such as those of the United States and China, often reflect the official version of events the government wishes to promote. Key internal debates, political failures, and secret military decisions may be redacted or withheld, resulting in gaps in the historical record. This selectivity mainly affects the reliability of inferences about strategic shifts. For example, Soviet-era documents may exaggerate successful programs while downplaying failures in space missions or military applications.[161] Similarly, American Cold War documents may focus on public achievements such as the Apollo program while minimizing internal political struggles.[162]

Another issue is the reliance on memoirs and personal diaries. These offer unique insights but are open to subjective interpretation. These sources reflect individual perspectives and are influenced by selective memory and the author's desire to justify or reinterpret past decisions. Therefore, these sources need to be critically evaluated alongside other archival data and secondary sources to avoid potential biases. Furthermore, while secondary sources are invaluable in providing historical context, they are still susceptible to the interpretive biases of their authors. Notable scholars such as Logsdon[163] and McDougall have produced extensive syntheses of archival material, but their interpretations must be considered in light of

a wider body of empirical evidence. When secondary sources rely on interviews, the understanding of responses may vary depending on the author's framework, leading to a degree of subjectivity that is not immediately apparent.

As a result of these challenges, it is important to acknowledge a significant

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[161] Sidiqi, 2000a.
[162] Johnson, Stephen B. *The secret of Apollo: Systems management in American and European space programs*. JHU Press, 2006.

[163] Logsdon, John M. *After Apollo?: Richard Nixon and the American Space Program*. Springer, 2015.

methodological limitation of this dissertation: the uneven availability and accessibility of sources across the three case studies. The United States has a substantial advantage in this regard, boasting a wealth of declassified archival records, including National Security Council memos, NASA internal documents, and presidential library materials. In contrast, the Soviet/Russian and Chinese cases face hurdles stemming from limited disclosure and language access barriers. In the case of Russia, while translated Politburo transcripts and select policy papers exist, a considerable number of internal records remain inaccessible, and only a small portion of pertinent literature is available in English. The situation is even more challenging for China, where systematic access to archives is extremely restricted. To navigate these disparities, transparency in source selection has been ensured. This is outlined clearly in Table 4 and the relevant empirical chapters, which detail the types of sources employed for each case. For instance, U.S. case studies predominantly draw on archival documents and elite memoirs, Russian case studies rely mainly on reputable secondary sources such as those by Siddiqi[164] and Barry[165], while the Chinese case utilizes official white papers, leadership speeches, and government documents in Chinese that can be accessed through open databases.

This asymmetry imposes limits on the comparability of the case studies. Rather than obscure these limitations, the source basis for each domestic variable, leadership perceptions, bureaucratic politics, and fiscal constraints, has been explicitly laid out, as shown in Table 4. The structure of the process tracing analysis, combined with transparent documentation of source types, allows for cautious yet meaningful comparative inference. By foregrounding these constraints and demonstrating their impact on the empirical evidence, this dissertation aims to uphold intellectual honesty while producing analytically useful conclusions about variations in space strategy

[164] Siddiqi, 2000a.
[165] Barry, 1996.

across cases.

In conclusion, concerns about potential data reliability issues do not significantly weaken the findings of this dissertation. Process tracing allows for a detailed analysis of event sequences and causal mechanisms, even if full data transparency is impossible by default. This approach's advantage is linking different types of evidence to construct a coherent account of strategic changes in space power policies. Even if the data are incomplete or selective, the triangulation method ensures the overall conclusions' reliability.

Chapter V Emerging Space Power and Competitive Space Strategy During the Space Race

5.1 Introduction

This chapter traces the strategic behavior of emerging and established space powers during significant shifts in space policy of the U.S. from 1957 to 1969 as an emerging space power to its shift towards a balanced power in the 1970s. It analyzes the role of relative space capabilities and perceptions of future technological advancements as key variables driving these strategic shifts. Drawing from the theoretical framework presented in Chapter III, the chapter will evaluate how emerging space powers, in this case, the United States during the early Space Race, responded to changes in relative space capabilities through competitive space strategies. It also looks at the constraints imposed by domestic and international factors, emphasizing the dual-use nature of space technologies and the impact of perception of future trends in space capabilities.

Hypothesis 1 is tested in this chapter. As laid out, space actors are primarily motivated to secure their access to space and maintain the security of their space assets. The assumption that relative space capabilities are the key independent variable determining strategic choice will be tested by tracing changes and decision-making processes of U.S. space strategies in this chapter. In sum, the U.S., in the 1950s, began with a disadvantage in space capabilities compared to the Soviet Union but responded with a competitive strategy that eventually led to its dominance in space.

This chapter uses the U.S. experience to illustrate broader patterns in space strategy among great powers, showing how changes in relative space capabilities and perceptions of future capabilities lead to shifts between competitive and cooperative strategy. As the typology of space powers suggests, emerging powers with a positive perception of their future capability growth tend to adopt competitive strategies when they perceive a gap in capabilities. In contrast, established powers may shift toward cooperation once they have achieved a dominant or balanced position.

In sum, Chapter V builds upon the assumptions and hypotheses laid out in Chapter III and tests the through-tracing of the strategic evolution of the United States from the early Space Race to the post-Apollo period, providing insights into the broader dynamics of space policy among great powers. Through this analysis, the chapter demonstrates how shifts in relative space capabilities and perceptions of future technological trends drive strategic choices, with the U.S. case offering a critical historical example of how these dynamics play out in practice.

5.2 The Emergence of the U.S. as a Space Power: How to Build a Space Program

While various historical accounts have been written on different aspects of the Space Race, the strategic choices behind certain decisions remain under-studied. Contrary to popular imagination, the U.S. started the Space Race in a relatively disadvantageous position compared to the Soviet Union. The conventional narrative describes the Space Race as a competition for technological supremacy and a race to explore space. However, the reality is more nuanced and complicated, especially during the initial stages of the Space Race when there was still a large amount of confusion and uncertainty regarding the potential of space and the impact of developing a space program. As a result, the reasons behind investing vast resources, both material and human, are also complicated and evolved with increased clarity regarding the meaning of space due to the immense competition with the Soviet Union. The consequent strategic decisions and policy directives during the Eisenhower and Kennedy administrations had an enduring influence on the future development of space strategies and space programs. These decisions eventually led to the US’ dominating advantage in the space domain it enjoys until this day.

It could be argued that the Space Race started in 1955, with a press release from the White House stating that the U.S. would launch a satellite into space as a part of U.S. participation in the International Geophysical Year (IGY).[166] This was followed by a similar statement from the Soviet Union four days after the U.S. statement.[167] The critical moment for the onset of the Space Race came in 1957, with the Soviet Union's successful launch of the first artificial satellite, Sputnik I. On 4 October 1957, the Soviet Union launched the R-7 rocket, which was initially designed as an Inter-Continental Ballistic Missile (ICBM), and it carried the Sputnik I satellite into Earth's orbit. It was a simple launch by today's standard, and Sputnik I was a small spherical device that was 58 centimeters in diameter, with a small radio transmitter and a temperature gauge.[168] However, it was still a shock to the American public and officials. According to George Reedy, who was serving as an assistant of Lyndon Johnson at the time, "… like a brick through a plate-glass window, shattering into tiny slivers the American illusion of technical superiority over the Soviet Union."[169] And there was an "illusion" of U.S. technological superiority then, to the extent that a first for the Soviets in space seemed almost laughable, eventually making the "Sputnik Moment" all the more impactful.[170]

This shock in 1957 gave rise to a presumed disparity between the Soviet Union and the U.S. in missile technology, namely the "missile gap," of which J. F. Kennedy was perhaps the most noted proponent during his campaigns. Even during the Eisenhower administration, the U.S. government has contested the " missile gap " as a myth[171]. It should be noted that it might not be true that a Soviet first to launch a satellite indicates

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[166] Dwight D. Eisenhower Presidential Library. "International Geophysical Year (IGY)." Accessed June 1, 2024. https://www.eisenhowerlibrary.gov/research/online-documents/international-geophysical-year-igy.
[167] Siddiqi, 2000a, 146.
[168] Hele, DG King. "Analysis of the orbits of the Russian satellites." Proceedings of the Royal Society of London. Series A. Mathematical and Physical Sciences 253, no. 1275 (1959): 529-538.
[169] Mieczkowski, Yanek. *Eisenhower's Sputnik moment: The race for space and world prestige*. Cornell University Press, 2017, 13.
[170] Ibid,16.
[171] Preble, Christopher A. ""Who Ever Believed in the 'Missile Gap'?": John F. Kennedy and the Politics of National Security." Presidential Studies Quarterly 33, no. 4 (2003): 802.

that the U.S. had inferior technologies, worse education in science and engineering, and was lagging in the Cold War competition with the Soviet Union. However, the popularity of the "missile gap" and the highly intense public outcry regarding Sputnik captured some of the dynamics in the early stages of the Space Race, and the U.S. is at a disadvantage regarding actual space capabilities. The Soviet Union before 1967 enjoyed a higher space capability relative to the US. As shown in Figure 1., the theoretical maximum payload launch capability of the Soviet Union had been essentially higher than that of the U.S. before 1967. These numbers were calculated from the accumulated payload capacity of the launch vehicles successfully launched each year by a given space actor.

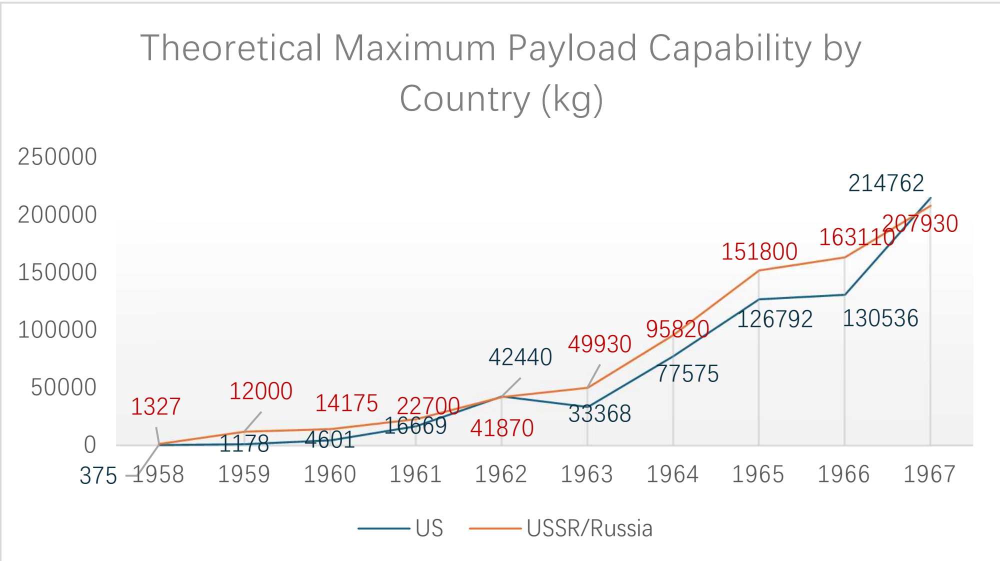

Figure 1 Theoretical Maximum Launch Capability (kg) of the U.S. and USSR, 1958-1967[172]

Western policymakers were also aware of the capacities of the Soviet Rockets. Ronald C. Wakeford, Director of Research at the National Research and Development Corporation in Britain, published an article in 1957 discussing the Soviet rocket engineering progress and was aware of the Sputnik rockets' thrust power and payload capacity.[173] Similarly, in January 1958, Rand Corporation produced a report for the

172 See Appendix.
173 Wakeford, Ronald C. "Soviet Technical Progress." Space Journal 1, no. 4 (1958): 4.

U.S. government to discuss the histories and capabilities of Soviet astronauts, detailing the capabilities of the Soviet rockets.[174] Hence, there was no doubt about what the Soviet Union was capable of regarding space capabilities, and still, it caused concerns. Zbigniew Brzezinski, for example, believed that the Soviets had much more powerful rockets. The Sputnik, a relatively large and heavy satellite compared with the U.S. satellite, indicated more powerful rockets.[175] An evaluation of Sputnik's launch given to President Eisenhower a few days after the launch of Sputnik I noted that the U.S. policymakers did recognize a Soviet lead in space capability:

"To this group, however, even temporary Soviet possession of a clear lead in missile research and technology underlines Soviet potential capacity to compete successfully in fields in which U.S. leadership has been generally taken for granted."[176]

However, as stated in the same evaluation, the Soviets were not seen as dominant in space. This report told Eisenhower that the public impact of the launch of Sputnik was exaggerated by those with "the least scientific and political sophistication," and whether it represented the overall leadership of the Soviet Union in space remains to be seen.[177] This report more or less reflects the attitude of the Eisenhower administration towards U.S. space programs. In a press conference regarding the U.S. program in October 1957, President Eisenhower stated that:

"I consider our country's satellite program well designed and properly scheduled to achieve the scientific purposes for which it was initiated. We are, therefore, carrying the program forward and keeping with our arrangements with the international

[174] Krieger, Firmin Joseph. Soviet Astronautics. RAND CORP SANTA MONICA CA, 1958.
[175] Mieczkowski, 2017. P.19.
[176] The Whitehouse. "Reaction to Soviet Satellite." October 8, 1957. Dwight D. Eisenhower Presidential Library. https://www.eisenhowerlibrary.gov/sites/default/files/research/online-documents/sputnik/reaction.pdf.
[177] Ibid.

scientific community."[178]

In other words, Eisenhower and his advisors viewed the U.S. space program with confidence about its potential. The concern, however, was related to the military aspects of the soviet program. In a cabinet meeting in October 1957, defense officials claimed that the Soviet space program was "an integral part of the Soviet military program," a path the U.S. deliberately did not pursue to avoid accusations of over-flights for potential military applications. Ironically, now it is the Soviets who established over-flight capabilities.[179] On other occasions, Eisenhower also stated that the U.S. space program was "purely scientific," which contrasted the Soviet space program being a part of the Soviet ballistic missile program at that time.[180]

However, that was not wholly true. The initial space programs of the U.S. were closely connected to the U.S. military and the intelligence apparatus. As early as 1951, the RAND Corporation worked with the CIA and the Department of Defense (DoD) to explore the possibility of using satellites for reconnaissance missions.[181] As a result, the Weapon System 117L (WS 117L) program was born to develop an advanced reconnaissance vehicle, considered a top secret.[182] To the defense and intelligence apparatus, the IGY provided a good cover for developing a rocket launch system for WS 117L.[183] Initially, there were three candidates for launch vehicles: the Navy's proposed Viking rocket, a variation of the Army's Redstone missile, and the Air

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[178] The Whitehouse. "Transcript of Press Conference Regarding Launching of Soviet Satellite, October 9, 1957 (pages 2 thru 9 only)." Dwight D. Eisenhower's Papers as President, Press Conference Series, Box 6, Press Conference Oct. 9, 1957; NAID #12024539. https://www.eisenhowerlibrary.gov/sites/default/files/file/nasa_Binder1.pdf.

[179] The Whitehouse "Minutes of Cabinet Meeting." October 18, 1957 (pages 2 and 3 only). Dwight D. Eisenhower's Papers as President, Cabinet Series, Box 9, Cabinet Meeting of 10/18/57; NAID #12024549. https://www.eisenhowerlibrary.gov/sites/default/files/file/nasa_Binder2.pdf.

[180] Killian, James R. "Memorandum to President Eisenhower, Progress Report Regarding Missile and Satellite Programs." December 28, 1957. Dwight D. Eisenhower's Papers as President, Administration Series, Box 23, James R. Killian 1957 (2); NAID #12042591. https://www.eisenhowerlibrary.gov/sites/default/files/file/nasa_Binder3.pdf.

[181] RAND, "Rand Corporation's Reconnaissance Satellite Study." *Project 1947*. 1951. http://www.project1947.com/gr/randrecon.htm.

[182] National Reconnaissance Office, "Memorandum: NRO Staff Records," December 8, 1967, http://www.nro.gov/FOIA/declass/NROStaffRecords/1095.PDF.

[183] Sheehan, Neil. A fiery peace in a cold war: Bernard Schriever and the ultimate weapon. Vintage, 2010.

Force's Atlas rocket.[184] However, all three candidates had their own issues. Viking and Atlas were top priority military programs that the U.S. government did not wish to hinder, and the Army's Redstone rocket, while being the most viable option, has close connections with the Nazi German scientist Wernher von Braun, which would be a risk for publicity.[185] The eventual winner was the Vanguard program, which was being developed by the Naval Research Laboratory (NRL) and was viewed as a scientific rather than military program.[186] Thus, the DoD decided in 1955 to select Vanguard for the IGY.

Initially, Eisenhower did not believe that space was an area where considerable resources should be poured. Other concerns, such as domestic socio-economic issues and geopolitics on Earth, were much more pressing to him.[187] Consequently, he sought to diminish the public concern over space issues by downplaying the importance of the perceived Soviet space advantage and denying that there was a race. Additionally, as a conservative in fiscal policies, he did not want to accelerate the U.S. space program by increasing the spending on space. In a press conference addressing Sputnik in October 1957, he stated:

"There has never been one nickel asked to accelerate the program. Never has it been considered as a race, merely an engagement on our part to put up a vehicle of this kind during the period that I have already mentioned."[188]

However, records show that after the shock of the Sputnik Moment, the Eisenhower administration did indeed push the Vanguard program. The result was a series of failed launches of Vanguard rockets. Out of the 11 attempts between 1957 and 1959, only

[184] Green, Constance McLaughlin, and Milton Lomask. Project Vanguard: The NASA History. Courier Corporation, 2012.
[185] Ibid.
[186] Ibid.
[187] McDougall, 1997.
[188] Eisenhower, Dwight D. "The President's News Conference." *The American Presidency Project*, March 26, 1958. https://www.presidency.ucsb.edu/documents/the-presidents-news-conference-308.

two launches successfully delivered satellites into orbit.

Table 4 Launch record of U.S. Vanguard rocket series[189]

Date	Rocket	Payload	Results
06.12.1957	Vanguard TV3	Vanguard (Test Satellite F)	The vehicle explodes after 2 sec
05.02.1958	Vanguard TV3	Vanguard (Test Satellite G)	Control lost after 57 sec
17.03.1958	Vanguard 1 (TV4)	Vanguard 1 (Test Satellite H)	Success
29.04.1958	Vanguard TV5	Vanguard (X-ray/Environmental Satellite)	Stage 3 failed to ignite
28.05.1958	Vanguard SLV1	Vanguard (Lyman-Alpha Satellite 1)	Failure unknown
26.06.1958	Vanguard SLV 2	Vanguard (Lyman-Alpha Satellite 2)	Failure unknown
26.09.1958	Vanguard SLV 3	Vanguard (Cloud Cover Satellite 1)	Failure unknown
17.02.1959	Vanguard 2 (SLV 4)	Vanguard 2 (Cloud Cover Satellite 2)	Success
13.04.1959	Vanguard SLV 5	Vanguard (Magnetometer Satellite)	Failure unknown

[189] Green, Constance McLaughlin. *Vanguard: A history*. Vol. 4202. National Aeronautics and Space Administration, 1970.

22.06.1959	Vanguard SLV 6	Vanguard (Radiation Balance Satellite)	Failure unknown
18.09.1959	Vanguard 3 (SLV 7)	Vanguard 3 (Magne-Ray Satellite)	Stage 3 failed to separate

The lackluster results of Vanguard gave motivations to develop new rocket systems and to restructure the U.S. space program. Specifically, in March 1958, in a meeting with his close science advisor Dr. James Rhyne Killian, Eisenhower stated that:

"Since 1947, we have used committees in many areas to effect coordination; these have failed badly to give necessary control of activities, including control of money. He said he had asked himself how we should use space activities for our national purposes. It seems to him that military activity on space projects is acceptable in the area of application of knowledge. He feels certain, however, that discovery and research should be scientific rather than military. He felt that there is no problem of space activity (except ballistic weapons) that is not basically civilian recognizing that application of findings may be made to serve military purposes."[190]

The result of this turn towards a more civilian-oriented space program instead of a military-led one served a propaganda purpose as well as a practical scientific purpose. It also does not deny that military applications of space technology developed by a civilian space program can be used for military purposes as well. It was crucial, however, to demonstrate the ideological differences between the U.S. and the Soviet Union by having a different image for their space programs.

[190] Killian, et al." March 5, 1958. Dwight D. Eisenhower's Papers as President, DDE Diary Series, Box 31, Staff Notes March 1958 (2); NAID #12043739. https://www.eisenhowerlibrary.gov/sites/default/files/file/nasa_Binder12.pdf.

5.3 U.S. Strategic Goals and Initial Actions During the Space Race

In the 1950s, rocketry technology and utilization of space science were considered as important factors for the security of the U.S. and the insurance for U.S. advantage in the intensifying Cold War. In the 357th Meeting of the National Security Council concerning "US Objectives in Space Exploration and Science" on March 6, 1958, President Eisenhower was presented with a list of reasons by his advisors for the U.S. to actively engage in developing space abilities. Specifically, it covered a wide range of goals:

"First, natural human curiosity about the nature of the universe; secondly, military considerations; third, U.S. prestige vis-a-vis the Soviet Union and other countries; and fourth, scientific observation and experiment. Space travel thought Dr. Killian, may or may not have material and practical values, but the space programs that would be discussed at this time must, all of them, be based on the above-mentioned four motivating factors."[191]

The record of the meeting indicated that this set of goals was met with agreement from the president and the rest of his team, and then a strategy for the U.S. to build space programs was discussed and agreed upon. The early design of the U.S. space strategy can be traced back to this early plan in 1958, which included several components, namely a phased timeline, military application of space technology, integration of space into public education, scientific utilization of space, and most extensively, the development of space vehicles based on the existing ICBM programs.[192]

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[191] The Whitehouse, "Memorandum of Conference with the President: March 6, 1958," Dwight D. Eisenhower Presidential Library, https://www.eisenhowerlibrary.gov/sites/default/files/research/online-documents/sputnik/3-6-58.pdf.
[192] Ibid.

One of the first and most influential actions taken by Eisenhower was the establishment of The Advanced Research Projects Agency (ARPA) in February 1958 as a research agency under the DoD to develop military technology. ARPA later became The Defense Advanced Research Projects Agency (DARPA), but its mission remained the same: working with academic, industrial, and governmental partners to design and implement research and development initiatives that push the boundaries of technology and science, often extending beyond the immediate needs of the U.S. military.[193] Two of ARPA's most important focuses in the early years were the military space program and the nuclear program, and both were closely tied to advancing rocketry technology.[194] ARPA funded a series of space research projects, including ARGUS, TIROS weather satellites, TRANSIT navigation satellite, and Centaur and Saturn rockets, while also developing ICBMs and anti-Ballistic missiles.[195] Some of these programs were later transferred to NASA, such as the Centaur and Saturn rockets, but DARPA remained an important space research body and a partner to NASA.

A second important act of Eisenhower's administration was the establishment of NASA. Also, in 1958, President Eisenhower urged Congress to create a new agency to establish civilian control of non-military space activities. His science advisor, James R. Killian, recommended using the National Advisory Committee for Aeronautics (NACA) as a basis for this agency. The National Aeronautics and Space Act, which became law in July 1958, created the National Aeronautics and Space Administration (NASA) by transforming the NACA. T. Keith Glennan was chosen by Eisenhower as NASA's first Administrator, while Hugh Dryden, the previous NACA Director, served as his Deputy.[196] After its establishment, NASA took over different space research

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[193] Reed, Sidney G. DARPA technical accomplishments: an historical review of selected DARPA projects. Vol. 2. Institute for Defense Analyses, 1991.
[194] Ibid.
[195] Reed, Sidney G. *DARPA technical accomplishments: an historical review of selected DARPA projects*. Vol. 1. Institute for Defense Analyses, 1991.
[196] McDougall, 1997.

programs from DARPA and the U.S. Air Force and became the leading institution in the U.S. space program. However, as mentioned, Eisenhower did not wish to invest too heavily in space, and the U.S. funding for NASA remained a small fraction of the total U.S. federal spending. From 1958 to the end of Eisenhower's presidency in 1960, although spending on space increased from 0.1% to 0.5%, such an increase was dwarfed by the rapid increase during the Kennedy and Johnson administrations.

Table 5 NASA spending in comparison with the total U.S. federal spending (1958-1968)[197]

Year	**Nasa fed outlay ($ million)**	**Total U.S. fed spending ($ million)**	**Nasa as % of U.S. spending**	**President**
1958	89.19	71,936	0.1	Dwight D. Eisenhower
1959	145.49	80,697	0.2	Dwight D. Eisenhower
1960	401.03	76,539	0.5	Dwight D. Eisenhower
1961	744.30	81,515	0.9	John F. Kennedy
1962	1,257	106,821	1.18	John F. Kennedy
1963	2,552	111,316	2.29	Lyndon B. Johnson
1964	4,171	118,528	3.52	Lyndon B. Johnson

[197] NASA, "Budgets Plans and Reports", NASA. https://www.nasa.gov/budgets-plans-and-reports/.

1965	5,092	118,228	4.31	Lyndon B. Johnson
1966	5,933	134,532	4.41	Lyndon B. Johnson
1967	5,425	157,464	3.45	Lyndon B. Johnson
1968	4,722	178,134	2.65	Lyndon B. Johnson

The US started to increase its spending on space significantly under President John F. Kennedy and President Lyndon B. Johnson. However, the institutional framework and the initial design for the U.S. space strategy remained relatively the same, with a focus on publicizing civilian space exploration for science purposes while exploring military applications for space technologies. Lyndon Johnson's influence on pushing for a more significant investment in space and ensuring U.S. space leadership has been neglected by public narratives on the Space Race. From his time as the Senate Democrat Leader during Eisenhower's presidency and Johnson's Vice Presidency under Kennedy to his own presidency, he took a great interest in space. In the aftermath of Sputnik, Lyndon Johnson saw it as a political opportunity to use the public outcry and gain more political influence, as well as push the U.S. to get a hold of the future.[198] In November 1957, Johnson, as the Senate Majority Leader, called for and chaired a hearing on U.S. satellite and missile programs, and it became the headline of the New York Times on 23rd November 1957.[199] This article stated that:

"As chairman of the inquiry, the Senate Democratic leader reported that it would cover such matters as 'our record of consistent underestimation' of Soviet progress, the government's 'lack of willingness to take proper risks', and 'the absence of a real

[198] United States Congress. "National Aeronautics and Space Act of 1958, As Amended." July 29, 1958. https://history.nasa.gov/40thann/legislat.pdf.

[199] Finney, John W. "Johnson Outlines Broad Agenda for Senate Inquiry on Missiles." *New York Times*, November 23, 1957. https://www.nytimes.com/1957/11/23/archives/johnson-outlines-broad-agenda-for-senate-inquiry-on-missiles.html.

unified war plan."[200]

While some may argue that Johnson's interest in space at this time is mainly based on domestic political concerns, his interest in developing a strong U.S. space program has been consistent in the rest of his political career. Historically, NASA received the highest budget in terms of the percentage of U.S. government spending under Johnson's presidency, and he pushed to enlarge the scope of the U.S. space programs and was one of the most important supporters of President Kennedy's decision to go to the Moon.[201] Eisenhower had no interest in crewed space activities, which was in contrast to Johnson's keen interest in it, to the extent that he once said: "Lyndon Johnson can keep his head in the stars if he wants. I'm going to keep my feet on the ground."[202] Eisenhower eschewed the idea of pursuing space programs for the sake of prestige and viewed the pursuit of space as a matter of science and security and that it should be planned based on the long-term actual gains for the future.[203] Hence, when it comes to the priorities of space budgets, his administration had a clear focus on developing powerful space vehicles. In a 1959 memorandum to Eisenhower, the DoD and NASA both agreed that a powerful and reliable rocket booster should be a top priority for the U.S. space program:

"The nation requires and must build at least one super booster, and responsibility for this activity should be vested in one agency. There is, at present， no clear military requirement for super boosters, although there is a real possibility that the future will bring military weapons systems requirements. However, there is a definite need for super boosters for civilian space exploration purposes, both manned and

[200] Ibid.
[201] Mieczkowski, 2017.
[202] Mieczkowski, 2017. P.144.
[203] Ibid.

unmanned."[204]

This is reflected in other documents as well. For example, in a 1959 NASA budget estimation, there was a clearly stated focus on developing launch vehicles. Under Eisenhower administration's limited space budget, the top two priorities among the five minimum goals were developing a "1.5-million-pound single chamber engine" and "liquid hydrogen technology including the Centaur engine and the proposed 150K engine".[205] Such focus on launch vehicles and the capacity of those launch vehicles has been a key consideration for U.S. space policy makers ever since.

Finally, the aftermath of Sputnik also encouraged a round of discussions regarding science and engineering education among policy circles. There was a clear goal to encourage and attract students to learn those subjects so that institutions such as ARPA and NASA could recruit from this pool of scientific talents. For example, the minutes of a cabinet meeting in 1959 directly linked the drive for better education on science and engineering to Sputnik:

"Dr. Killian first reported on the series of 37 studies made by 27 different panels of the Science Advisory Committee, They covered the large fields of scientific and engineering education, scientific requirements related to national security, and recruitment of scientists and engineers, He stated that in the field of education there has been much improvement since Sputnik and the President's ensuing major addresses."[206]

The result of such discussions gave birth to the National Defense Education Act

[204] Glennan, T. Keith, and Neil H. McElroy. "Memorandum for the President from Administrator of NASA and Secretary of Defense Regarding Responsibility and Organization for Certain Space Activities." October 21, 1959. Dwight D. Eisenhower's Records as President, Official File, Box 770, OF 342 NASA (7). https://www.eisenhowerlibrary.gov/sites/default/files/file/nasa_Binder19.pdf

[205] Goodpaster, Andrew J. "Memorandum for Dr. Kistiakowsky on 1961 Estimates." November 14, 1959. Dwight D. Eisenhower's Records as President, Confidential File, Box 44, NASA (7); NAID #12060425. https://www.eisenhowerlibrary.gov/sites/default/files/file/nasa_Binder9.pdf.

[206] The Whitehouse. "Minutes of Cabinet Meeting." May 15, 1959 (page 2 only). Dwight D. Eisenhower's Papers as President, Cabinet Series, Box 13, Cabinet Meeting of 5/15/59 (1); NAID #12042557. https://www.eisenhowerlibrary.gov/sites/default/files/file/nasa_Binder7.pdf.

(NDEA) of 1958. The NDEA had a twofold objective. The first goal was to supply the country with personnel who were focused on defence. This included providing support from the federal government for foreign language scholars, area studies centres, and engineering students. The second objective was to provide financial aid, primarily through the National Defence Student Loan program, to numerous students who would be joining the increasing numbers of enrolees at colleges and universities during the 1960s.[207]

By the end of Eisenhower's presidency, a clear picture of early U.S. space strategy became clear. Within a focus on gaining powerful space launch capabilities as the top priority and increased spending, the U.S. sought to develop a space program that is managed by a civilian space agency, NASA, supported by and partnered with a military research organization, DARPA, while actively building a pool of talents by the NDEA where the space program can draw from. As later sections of this chapter will discuss, this model of building space capabilities is not limited to the US. China as an emerging space power in the 21st century, also adopted a similar strategy. However, while this framework was maintained until today, significant changes also occurred due to changes in the relative space capabilities the U.S. possesses, which will be discussed in later chapters.

5.4 Expanding the Eisenhower Design and the U.S. Transition to a Balanced Space Power

5.4.1 Road to the Moon

While the U.S. space strategy as an emerging space power originated from the Eisenhower administration, the presidency of John F. Kennedy and Lynden B. Johnson

[207] Urban, Wayne J. More than science and sputnik: the National Defense Education Act of 1958. University of Alabama Press, 2010.

continued and built upon the designs of their predecessor, and eventually achieved the goal of catching up with and surpassing the Soviet Union. The Kennedy and the Johnson administrations spent a lot more on space, but they did so within the framework of the strategic design of the Eisenhower administration. The three focuses remained, launch vehicles, enhancing dual track institutions, and continued support for human resources. However, the scale of investments into the space programs was certainly much larger than that of Eisenhower's administration, with a broader variety of space assets and space missions developed. This further evolution of the U.S. space program partly comes from a natural progression of space technology as well as better knowledge about the applications and limitations of them. However, it came also partly from the competition and external pressure given by the Soviet Union.

In 1961, when John F. Kennedy became the president on the 20th of January, he did not face a better situation when it comes to the relative space capabilities of the U.S. and the Soviet Union. Only a few months after his inauguration, on the 12th of April 1961, Yuri Gagarin became the first human to travel into space. This historic mission, known as Vostok 1, lasted for a little over 108 minutes, during which he orbited the Earth once.[208] This was another shock to the U.S. because it fermented the fact that the Soviets were outcompeting the Americans in space and possesses high space capabilities. Consequently, President Kennedy gave his famous speech to the Congress, aiming to gain approval for a significant increase in the U.S. space budget to land humans on the Moon:

"…I believe that this nation should commit itself to achieving the goal, before this decade is out, of landing a man on the moon and returning him safely to the earth. No single space project in this period will be more impressive to mankind, or more important for the long-range exploration of space; and none will be so difficult or

[208] Burgess, Colin, and Rex Hall. *The first soviet cosmonaut team: Their lives and legacies*. Springer Science & Business Media, 2009.

expensive to accomplish. We propose to accelerate the development of the appropriate lunar space craft. We propose to develop alternate liquid and solid fuel boosters, much larger than any now being developed, until certain which is superior. We propose additional funds for other engine development and for unmanned explorations-explorations ..."[209]

While the goal, as President Kennedy stated, was to land humans on the Moon, other projects were also included. Specifically, his proposal contains an additional $23 million dollars to the development of a rocket capable of reaching the Moon, an additional $50 million dollars for the world-wide communication satellite communication program, and an additional $75 million dollars for the world-wide weather observation satellite network.[210] These proposed increases in budgets would have bloated the American space budget close to $9 billion dollars, working towards a rapid and significant increase in U.S. space capabilities. Most of the budget increases for space, as a NASA budget document detailed, were approved by the Congress and Senate, and most of these budgets were used to purchase equipment and build new facilities for the development of launch systems,[211] which is key to develop space capabilities.

It was also during Kennedy's administration that cooperation on space between the state agencies and civilian scientific research institutions became much closer. The development of a series of subsystems for the Apollo program were contracted out to civilian institutions. These includes the navigation and guidance systems, and the development of these systems was contracted to the Implementation Laboratory of the

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[209] Kennedy, John F. "Text of President John Kennedy's Rice Stadium Moon Speech." September 12, 1962. NASA. https://www.nasa.gov/vision/space/features/jfk_speech_text.html.
[210] Ibid.
[211] NASA. "NASA Historical Data Book: Volume I: NASA Resources 1958-1968." 1962. https://www.nasa.gov/sites/default/files/atoms/files/o45128943_1962.pdf.

Massachusetts Institute of Technology (MIT).[212] While inclusion of civilian institute appeared new for space, it has not been new for the defence industry. The Implementation Laboratory at the MIT had previous experience of developing guidance and navigational systems for the U.S. Navy's Polaris missile program, as well as Air Force's "Thor" and "Titan" programs [213]. The air force missiles also worked as space launch vehicles, which gave the MIT laboratory plenty of experience on internal guidance technology for rockets. This demonstrates the continued dual-track tradition of U.S. space programs.

However, there were still concerns from both the Congress and the industrial sector towards such a move and they were raised in a series of correspondence between NASA and concerned members of Congress, industry representatives and public. One of the questions asked most frequently was why NASA would outsource the development of such an important sub system to a civilian research institution. In reply to such concerns, NASA stated in multiple correspondence that the reason for "not to develop such systems 'in-house'" is based on "review of national capability".[214] In other words, due to constrains on budget and personnel etc., outsourcing the research of spacecraft sub-systems to educational institutions was the most cost-effective option. Consequently, the state-led space program could focus on the development of launch vehicles which they eventually delivered. Additionally, it also fits the strategic designs of the Eisenhower administration in which civilian institutions such as MIT play an important supportive role to the overall space program.

Overall, the direction of the U.S. space strategy remained the same, but the short-term goals became clearer, and investments higher. This effort, eventually paid off with the

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[212] The Whitehosue. "Memorandum for the Vice President." May 15, 1963. John F. Kennedy Presidential Library and Museum, 2-4. https://www.jfklibrary.org/asset-viewer/archives/JFKWHCSF/0652/JFKWHCSF-0652-012.
[213] NASA, "NASA Technical Memorandum 33-138: Summary of Apollo Project Plans." MIT Libraries, Digital Collections. July 22, 1960. https://archivesspace.mit.edu/repositories/2/digital_objects/3354.
[214] The Whitehouse. "Memorandum for the Vice President." May 15, 1963. John F. Kennedy Presidential Library and Museum. https://www.jfklibrary.org/asset-viewer/archives/JFKWHCSF/0652/JFKWHCSF-0652-012

successful launch of Saturn V super heavy-lift launch vehicle. This rocket is a pinnacle achievement in the annals of aerospace engineering, stands as a watermark for US's space capabilities. Developed for the Apollo program, the Saturn V emerged as the primary launch vehicle responsible for propelling American astronauts beyond Earth's confines and onto the lunar surface during the Apollo missions. This powerful rocket, comprised of three distinct stages, each endowed with specialized functions. It was designed to deliver at least 90,000 pounds (41,000 kg) to the Lunar orbit, and estimated to have a Low Earth Orbit (LEO) payload capacity of 261,000 pounds (118,000 kg).[215] This capacity dwarfed all other launch systems of its time, and thus projected U.S. space capacity to its pinnacle in the 20th century.

However, as stated, Saturn V did not happen overnight, on the contrary, the direction of its development was set way ahead of its first launch in 1967. In September of 1945, the U.S. government conducted Operation Paperclip, a program authorized by President Truman, which brought renowned German rocket technologist Wernher von Braun and a cohort of over 1,500 German rocket engineers and technicians to the United States. Initially assigned to the Army's rocket design division, von Braun's early post-war activities primarily involved conveying the principles underlying the German V-2 rocket to American engineers. However, his role expanded significantly in 1957 following the Soviet launch of Sputnik 1 atop an R-7 ICBM, a development that prompted heightened U.S. interest in space exploration.

This shift in focus led the U.S. Army and government to enlist von Braun's expertise, particularly considering his prior work on the Jupiter series of rockets. The culmination of this collaboration was the launch of the Juno I rocket in January 1958, marking the United States' successful entry into space. Von Braun, regarding the Jupiter series as a

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[215] Douglas Aircraft. *Saturn IB / Saturn V Rocket Payload Planner's Guide*. Periscope Film LLC, 2012. ISBN 978-1940453484.

prototype, envisioned it as an early iteration of what he termed "an infant Saturn."[216] The subsequent evolution of rocket technology saw the emergence of the Saturn design, named after the planet, and derived from the earlier Jupiter series. Between 1960 and 1962, the Marshall Space Flight Center (MSFC) meticulously crafted a series of Saturn rockets adaptable for diverse Earth orbit or lunar missions. Notably, NASA's original plan involved the utilization of the Saturn C-3 for Earth orbit rendezvous (EOR) missions, requiring multiple launches for a single lunar mission. Yet, the MSFC proposed the larger C-4, equipped with four F-1 engines in the first stage, an expanded C-3 second stage, and the S-IVB third stage housing a single J-2 engine, capable of achieving the same lunar mission objectives with only two launches.

The pivotal moment arrived on January 10, 1962, when NASA unveiled its ambitious plan to construct the C-5—a three-stage rocket featuring the S-IC first stage, S-II second stage, and S-IVB third stage. This marked the formalization of the Saturn V, a choice solidified by NASA in early 1962 for the Apollo program. Concurrently, the C-1 became the Saturn I, and the C-1B evolved into the Saturn IB. Under the leadership of von Braun and the MSFC team, the Saturn V underwent a distinctive development process, departing from the single-engine design of the V-2 in favor of a multiple-engine configuration. The final design integrated F-1 engines for the first stage and a novel liquid hydrogen propulsion system known as J-2 for the second and third stages. With NASA's endorsement of von Braun's Saturn designs and the establishment of the Apollo space program, the Saturn V project gained momentum.

The configuration settled, NASA shifted its focus to mission profiles, deliberating between lunar orbit rendezvous (LOR) and Earth orbit rendezvous (EOR) for the lunar module. Following extensive studies, James Webb confirmed on November 7th a lunar orbit rendezvous approach. The stages of the Saturn V were designed by von Braun's

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[216] Bilstein, Roger E. *Stages to Saturn: A Technological History of the Apollo/Saturn Launch Vehicle*. Diane Publishing, 1999.

MSFC in Huntsville, with external contractors, including Boeing, North American Aviation, Douglas Aircraft, and IBM, selected for construction. Through this process of Saturn V's development, a clear parallel between the development of the Saturn rockets and the evolution of the U.S. space strategy can be observed. There is a clear linear progression of development from the initial Jupiter rockets to Saturn which started in the late 1950s as a response of U.S. space program under Eisenhower to the Soviet successes. From Jupiter emerged Saturn, which quickly solidified and accelerated under JFK and LBJ administrations. Firstly, the pursuit of a more powerful launch vehicle, as stated in previous sections, was considered a priority. Secondly, its development did not only involve government agencies such as MSFC, but also private entities. Thirdly, 1960 was also the year when doctoral degrees in science and engineering started to increase rapidly, as a result of title IV of the NDEA.[217] Some of these doctoral degrees owners, thanks to the NDEA, had direct or indirect associations with the U.S. space program.[218] This pattern fits the triad of strategies of Eisenhower's design, and was a proof of the success of such a competitive strategy.

5.4.2 The Success of Apollo 11 and The Turn to a Balanced Space Strategy

Saturn V was launched successfully for the first time on November 9, 1967, and performed perfectly.[219] This success test launch boosted the confidence of the U.S. extensively. However they also believed that the moon-landing efforts were also facing serious competition from the Soviet Union. While the Soviet N1 rocket was not yet fully constructed due to previous internal squabbles of the Soviet space apparatus and the death of Korolev, the chief designer of N1, the U.S. intelligence believed that the

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[217] Flattau,E., J. Bracken, R. Van Atta, A. Bandeh-Ahmadi, R. del la Cruz, and K. Sullivan. "The national defense education act of 1958: Selected outcomes (IDA Document D-3306). Retrieved from Institute for Defense Analyses." *Science and Technology Policy Institute website: https://www. ida. org/stpi/pages/D3306-FINAL. pdf* (2006). https://www.ida.org/research-and-publications/publications/all/t/th/the-national-defense-education-act-of-1958-selected-outcomes.

[218] Logsdon, John M. Legislative Origins of the National Aeronautics and Space Act of 1958: Proceedings of an Oral History Workshop: Conducted April 3, 1992: Moderated by John M. Logsdon. No. 258. US Government Printing Office, 1998. https://www.nasa.gov/wp-content/uploads/2023/04/sp-4508.pdf.

[219] McDougall, 1997.

Soviet was not far from launching the rocket. In a presidential brief on December 27th, 1967, intelligence reports stated that:

Recent satellite photography has given us a glimpse of the model (not for certain an exact model) of the huge space booster which the Soviets are expected to launch in the latter part of 1968. A vehicle about 320 feet tall and 50 feet in diameter – a bit shorter and fatter than Saturn V – was seen on one of the two giant launch pads under construction at Tyuratam. The overall size of this object, probably an engineering mock-up to check out the pads and their support facilities, is quite close to what we had estimated. The setting up of this checkout vehicle before structural proportions of the launch area are competed suggests that the Soviets are wasting no time in readying these facilities.[220]

For the US, after all these efforts and significant investment, losing the rush to the moon would be unacceptable. The commander of the Apollo 7 crewed mission recalled that "the timeframe was that we had a real beautiful Cold War going on."[221] This anxiety towards the Soviet moon-landing program was exacerbated by the successful Zond 5 mission, which carried two steppe tortoises to orbit the moon and returned safely in 1968. In a phone call between Wernher von Braun and Foreign Missiles and Space Analysis Center (FMSAC) director David S. Brandwein of CIA, von Braun asked Brandwein about Zond 5, out of interest to the Soviet space program and in preparation with the media. Brandwein stated in the report about this phone call that:

Dr, von Braun then asked me what he could say regarding the Zond 5 flight that was unclassified, I told him that it would be perfectly proper to point to the recovery of an object returning from the moon as a significant milestone in the path to

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[220] Central Intelligence Agency, "Scientific and Technical Intelligence Report: The Space Programs of the Soviet Bloc," March 16, 1962, https://www.cia.gov/readingroom/docs/DOC_0005974192.pdf.

[221] Leonov, Alexei, David Scott, and Christine Toomey. *Two sides of the moon: Our story of the cold war space race*. Macmillan, 2006, 209; French, Francis, and Colin Burgess. *In the Shadow of the Moon: A Challenging Journey to Tranquility, 1965-1969*. U of Nebraska Press, 2007, 230.

a manned lunar landing, but I advised him to avoid suggesting that the Zond 5 booster could support a lunar landing or even a manned lunar orbiter, because it does not actually have the payload capability. I added that I thought it would be perfectly proper for him to make a personal judgment that this flight might well be followed up by another unmanned circumlunar flight and that if it was successful the Russians might attempt a manned circumlunar mission either late this year or sometime next year. [222]

Knowing the actual status of the Soviet crewed moon landing mission at this stage, which will be discussed in the next chapter, Brandwein's assessment that the Soviet Union could have a crewed circumlunar mission in 1968 was too optimistic. On the contrary, in December 1968, Apollo 8 was successfully completed, carrying three astronauts and orbited the moon ten times, and returned safely. The success of Apollo 8 has usually been considered as the turning point where the Soviet Union was not going to reach the moon first, which is also reflected in Soviet sources which will be discussed in more details in the next chapter as well.

Nonetheless, the critical moment came in July 1969 when Apollo 11's Commander Neil Armstrong and Lunar Module Pilot Buzz Aldrin stepped on the surface of the moon. To many, this was the end of the Space Race, and it was perceived as so by the U.S. space apparatus at that time as well. Specifically, it marked that the U.S. achieved the goal set by JFK and LBJ's administrations, and new goals and strategies were needed. After consulting with his Science Advisor Lee A. DuBridge, Nixon released a statement titled "Statement About the Future of the United States Space Program" on March 7th, 1970, which set the direction for the U.S. space strategy in the following

[222] Central Intelligence Agency, 'Memorandum For the Record: Telephone Conversation with Dr Wernher von Braun, Director, Marshall Space Flight Center', 25 September, 1968, CIA CREST, ESDN CIA-RDP71R00510A000200220025-3. https://static.jfklibrary.org/87xa6j6hd2au2u24m8tertk7qi81js7y.pdf?odc=20231115175900-0500.

decade.[223] In comparison to similar statements of previous presidents, such as Eisenhower who was quoted in previous sections, Nixon's statement did not mention the race with Soviet Union, and did not contain clear statement for military application of space technologies.

The three overall goals he proposed for the U.S. space program post-Apollo included exploration, scientific knowledge, and practical application. The overall focus, as he stated, was to utilize space related or derived technologies and innovations for tangible improvements on Earth, as well as expanding human understanding of the universe, and as Nixon put it, "A great nation must always be an exploring nation if it wishes to remain great."[224] With this statement and subsequent actions taken marked a shift from the race to the moon to broader objectives involving scientific, practical, and international dimensions. This shift is more clearly reflected in the six specific goals he stated in the same statement which can be summarized as:

1. Continued Lunar Exploration: Building on the Apollo missions to enhance scientific understanding.
2. Planetary and Universal Exploration: Ambitious plans for uncrewed missions to all solar system planets, including a Mars lander, and the "Grand Tour" of the outer planets.
3. Cost Reduction in Space Operations: Initiatives like the development of reusable space shuttles to decrease the costs associated with space launches.
4. Extended Human Capacity for Space Living: Development of the Experimental Space Station (XSS) to facilitate prolonged human activities in space.

[223] Nixon, Richard, "Richard Nixon: Statement About the Future of the United States Space Program." The American Presidency Project, March 07, 1970. Accessed April 21 2021. https://www.presidency.ucsb.edu/node/240967.
[224] Ibid.

5. Expanded Practical Applications: Development of technologies such as Earth resources satellites to improve environmental and resource management.
6. Enhanced International Cooperation: Promoting shared global engagement in space exploration to accelerate progress and distribute benefits universally.

Overall, these specific goals and the overall goals from the same statement signaled a significant shift in U.S. space strategy. In comparison to previous administrations since Eisenhower, instead of seeing space as a security and foreign policy instrument for competing with the Soviet Union, Nixon shifted to a more inward-looking strategy that focuses on maintaining the current space capabilities and focus more on practical needs. This means focusing less on competition with the Soviet Union and high-profile crewed missions, improve cost efficiency of space activities, focusing on application of space technologies on Earth, and maintain the function of the space program as a foreign policy tool.

From these goals set by Nixon's administration, the third, fifth, and sixth goals are quite different from previous administrations. Firstly, the call for reduction of costs marks a shift from the focus on developing powerful launch vehicles regardless of cost and resource use efficiency. The launch capability that the U.S. had at that time, as Nixon put it, "will provide a reliable launch capability for some time", but "less costly and less complicated" means to deliver payloads is needed.[225] The reason behind such a decision is originated from broader budgetary issues that Nixon's administration was facing. Nixon was elected in 1968 and inaugurated in 1969, and he faced serious challenges domestically and abroad, in the form of high inflation rates, civil unrests, and the Vietnam War, which all required significant financial support from the federal

[225] Ibid.

government. In the perception of the U.S. public and some of the political leaders, the Space Race was done after the success of Apollo 11, and the U.S. lead in space technology is secure.[226] Hence, cutting the costly space budget, which was 4,251 million U.S. dollars and 2.31% of the federal spending in 1969,[227] was a necessary move for the administration.

Tom Paine, the NASA director who assumed his position as acting director in 1968, was initially unaware of the administration's decision on budget cuts for space. He submitted a request for a budget increase in Fiscal Year 1970. This increased budget will initiate an ambitious project to establish a crewed base on the moon and land humans on Mars.[228] His request was denied by the White House Bureau of the Budget, questioning the meaning of continuing to invest in such grand projects of crewed space missions, especially after winning the race to the moon against the Soviets.[229] Such opinion perhaps originated from the opinion of Nixon's space task force, established in 1968 as one of his transition groups as president-elect, chaired by the renowned physicist Charles Townes. In a report the task force gave to Nixon on January 8th,1969, the task force gave their opinions on the future planning for the U.S. space program. Many of the recommendations in this report, including forgoing the space station program, cost reduction, broader international engagement, and focusing on the application of space technologies, became a part of Nixon's actual space strategy.[230] Regarding some crucial questions, the first question being addressed was "Should the U.S. compete with the USSR in space activity?" and the task force's answer was:

We believe it should not do so in detail but that the U.S. effort must be as strong overall as that of the Soviet Union. A decision to compete on this broad scale plays an

[226] Heppenheimer, Thomas A. The space shuttle decision: NASA's search for a reusable space vehicle. Vol. 4221. National Aeronautics and Space Administration, NASA History Office, Office of Policy and Plans, 1999.
[227] https://aerospace.csis.org/data/history-nasa-budget-csis/
[228] Heppenheimer, 1999, p.38.
[229] Ibid, p.39.
[230] Logsdon and Lear, 1995, 501.

important role in fixing the budgetary level of space work at something like the present level.[231]

This response from Nixon's space task force marks the reasoning behind turning to a balanced strategy. Specifically, it shifted from a competition-driven approach or an emerging space power to a strategy focused on the balance and sustainability of a balanced space power. According to the adopted neoclassical realist framework, which emphasizes the interaction between systemic pressures and domestic factors in shaping a state's foreign policy, this shift can be analyzed as a pragmatic adaptation to international competition and internal capabilities and priorities. The task force's recommendation suggests a recognition that while it is necessary to maintain a space program that is competitively robust relative to the Soviet Union, the focus should not be on competing in every specific area. Instead, the emphasis should be on ensuring overall capabilities supporting a wide range of strategic, scientific, and practical outcomes. Further, Nixon's later statement also balanced the perception of the future distribution of relative space capabilities. The U.S. would have enough space capabilities to do a variety of space missions, but there is no need for large-scale spending regardless of investment efficiency.

One representative result was the space shuttles program. Based on the balanced strategy, the original U.S. space station program planned by NASA was tabled in exchange for the space shuttle program. The re-usable space shuttle program became the focus of the development of U.S. space capabilities in the following decade, and its legacy extended to the end of the Cold War and beyond. While the space shuttles contributed much to the U.S. space program until their retirement in July 2011, it was seen in the 1970s by NASA as a compromise for the strategic decisions made for cost-cutting and the tampering of competitions.[232] This was reflected in a series of

231 Ibid,501.

232 Heppenheimer, 1999, p,62.

congressional hearings between NASA and Congress about the budget for the space program and how it should be spent.[233] Eventually, the result was that the space program was delayed, and its size significantly shrank. However, the space shuttle program was kept intact. Instead of being used mainly as a support vehicle to solve the logistical challenges for the space station, it was reframed as a mobile working platform for a variety of space missions and an "intermediate space station." [234]

The space shuttle decision was made due to the reduced cost of reusing the shuttles and the boosters instead of manufacturing new ones. Additionally, as a flexible vehicle, the space shuttles could carry out multiple missions, including satellite deployment, space station construction, servicing, and scientific research, using the exact vehicle, which was meant to reduce the need for different types of launch vehicles. Further, with a significant payload capacity of up to approximately 29,000 kg, it can potentially reduce the number of launches needed by conducting multiple missions in one launch.[235]

This case reflected the mentality of the U.S. space apparatus turning from a highly competitive strategy to a more balanced one seeking stability. This perspective aligns with the proposed neoclassical realist assertion that external threats or competitions influence state behavior. However, domestic political and budgetary realities ultimately shape the scope and scale of that response. Thus, the report reflects an adjustment in policy to optimize national resources and capabilities in a way that maintains strategic parity but avoids the unsustainable expenditures and potential escalations of a tightly contested space race. This approach allowed the U.S. to leverage its technological advantages that supported broader strategic objectives, such

[233] Logsdon, 1995, p.182.
[234] Heppenheimer, 1999, p,46.
[235] Pisano, Dominick A. "Aviation and Space in the Kennedy Years." In *Wings: A History of Aviation from Kites to the Space Age*, edited by Tom D. Crouch, 53-73. Smithsonian Institution, 2003. https://www.nasa.gov/wp-content/uploads/2023/04/wings-ch3a-pgs53-73.pdf.

as enhancing technological infrastructure and fostering international cooperation, thereby ensuring a more stable and multifaceted engagement in space activities.

5.5 Discussion and Conclusion

This chapter traced the evolution of U.S. space strategy in its early years from the late 1950s to the early 1970s, focusing on the transition from a competitive strategy of emerging space power to a more balanced stance. As analyzed throughout this chapter, the shift in U.S. space policy, marked by the successful Apollo landing on the moon, aligns with the neoclassical realist framework in Chapter III. Expressly, it confirms that the strategic behavior of space powers is heavily influenced by their relative space capabilities and their perception of the future distribution of space capabilities.

Specifically, in the early stages of the Space Race, the U.S. found itself at a disadvantage, particularly following the Soviet Union's successful launch of Sputnik-1 in 1957 and a series of firsts that followed.[236] This "Sputnik moment" was a technological shock and a strategic wake-up call, leading to widespread concern about a perceived "missile gap," even when it did not exist. The U.S. response under Eisenhower aligns with hypotheses 1 and 3, as the administration sought to restore the balance of space capabilities through rapid advancements in launch vehicle technology and the establishment of dedicated institutions such as NASA and DARPA. Moreover, space powers confronted with a disadvantage in relative capabilities often resort to competitive strategies to regain parity, especially if they have an optimistic outlook on future capabilities.

The U.S. approach during this time is a testament to this dynamic. As the U.S. steadily gained advantage throughout the 1960s, culminating in the success of the Apollo 11

[236] Mieczkowski, 2017.

moon landing, the Nixon administration began to shift focus from overt competition to a more balanced and sustainable space strategy. As detailed in Nixon's "Statement About the Future of the United States Space Program" in 1970, this transition reflected a new reality: the U.S. had achieved a technological lead, and the costs of continuing a high-stakes competition with the Soviet Union were no longer justified.[237] This case supports hypothesis 2, which states that when relative space capabilities stabilize, space actors favor cooperation and strategic balance over intense competition.

This shift toward balance and focus on cost-effectiveness was exemplified by the Space Shuttle program, which, while maintaining balance in space capabilities, prioritized cost-effective, reusable systems over the costly and singular missions of the Apollo program. The decision reflected domestic budgetary realities and the recognition that future space competition would likely involve more practical, long-term goals rather than high-profile, one-time achievements. In this sense, the Nixon administration's strategy was an early indicator of how the perception of future distribution of space capabilities can influence policy decisions.

Additionally, perceptions of future capabilities also played a pivotal role in shaping U.S. space strategy during this period. As outlined in Chapter III, it is not only the current distribution of capabilities that drives strategic decisions but also the expected future balance. For the U.S., maintaining a technological edge, especially in critical areas such as launch vehicle technology and satellite operations, became the key focus as the Apollo program wound down.[238] Nixon's administration perceived that the U.S. space program could sustain its dominance through investments in reusable systems like the Space Shuttle, thus avoiding the resource-intensive competition that had characterized the previous decade.

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[237] Nixon, 1970.
[238] Moltz, 2019.

While these developments highlight how the U.S. responded to the challenges posed by the Soviet space program. To grasp how U.S. strategy truly adapted, we must consider the internal perspectives that shaped these responses. This analysis comes from the threefold angles of leadership perceptions, bureaucratic politics, and fiscal constraints.

For leadership perceptions, the Eisenhower administration is often seen as hesitant about joining the space race.[239] However, this characterization overlooks the fact that it prioritized reconnaissance capabilities far more than mere symbolic prestige. This approach was formalized in NSC-5520 in 1955, which mandated the use of scientific satellite launches to normalize overflight and to pre-establish U.S. reconnaissance satellites as legitimate tools within the developing space legal framework.[240] Eisenhower's cautious stance stemmed not from a failure to keep pace with advancements, but rather from domestic concerns regarding budget discipline and the need for Cold War stability. In contrast, Lyndon Johnson made bold moves to significantly increase NASA's budget while fervently supporting the Moon landing.[241] His motivations went beyond competing with the USSR; he aimed to gain domestic political support and showcase American technological prowess and democratic values.[242] Johnson's adept manipulation of congressional coalitions to secure funding for Apollo, even amidst escalating conflict in Vietnam, highlights the vital role of elite preferences and legislative strategies in shaping U.S. space policy.

As for bureaucratic politics, the rivalry among the U.S. Army (led by von Braun), the Air Force (under Schriever), and NASA resulted in overlapping and occasionally conflicting technological priorities. These tensions shaped the dual-use nature of early

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[239] McDougall, 1985.
[240] National Security Council (NSC). (1955). NSC-5520: U.S. Scientific Satellite Program. Declassified by Eisenhower Library. Available at: https://aerospace.csis.org/wp-content/uploads/2019/02/NSC-5520-Statement-of-Policy-on-U.S.-Scientific-Satellite-Program-20-May-1955.pdf
[241] Logsdon, 1995.
[242] McDougall, 1985.

American space infrastructure, illustrated by the distinct separation of DARPA programs from NASA's civil mandate. The establishment of NASA in 1958 represented a political compromise aimed at centralizing and civilianizing space activities, while still preserving military influence through the National Reconnaissance Office (NRO) and, later, the Strategic Defense Initiative (SDI).[243] As McDougall has pointed out, many of these dynamics were hidden due to classification issues, leading to historiographical distortions that tend to emphasize prestige competition, overshadowing the more covert aspects of strategic planning.[244]

Finally, Eisenhower's skepticism of entering into a space race driven by prestige led to a focus on very limited spending on space. McDougall notes his strategy as "a policy of deliberate under-reaction" to Soviet space challenges, influenced by balanced budgets and resistance to military-industrial pressures.[245] The May 1955 NSC-5520 directive supported scientific satellites as a political means to legitimize satellite overflights, establishing space as distinct from national airspace.[246] The Eisenhower administration opted for the Navy's Vanguard program over von Braun's ambitious launch plans, favoring a civilian project with a lower profile despite its technical flaws. This cautious fiscal strategy laid the groundwork for the civil-military space framework that subsequent Presidents Kennedy and Johnson expanded upon.

In conclusion, this chapter has demonstrated that relative space capabilities and perceptions of future capabilities drive strategic shifts in space policy. From the U.S. response to Sputnik to the transition from Apollo to the Space Shuttle, the neoclassical realist framework explains how and why space actors adjust their strategies. As new space powers emerge and the dynamics of space exploration evolve, these variables will remain central to understanding the future trajectory of space competition and

243 Siddiqi, 2000.
244 McDougall, 1985.
245 Ibid, pp. 136–140.
246 Ibid, pp. 134–135.

cooperation. The case studies presented in this dissertation reaffirm the importance of balancing domestic constraints with international competition, a balancing act that will continue to define the strategic behavior of space powers in the future.

Chapter VI Soviet Union’s Transition towards a Balanced Space Power and Cooperation in Space

6.1 Introduction

This chapter comprehensively examines the Soviet Union's space strategies from the late 1950s to the 1990s, from an emerging space power (1957-1972) to a balanced space power (1972-1989). It mainly focuses on the 1970s, tracking the Soviet Union’s transition from a balanced space power at the end of the Space Race to a stagnant space power in the 1980s. Analyzing the Soviet Union's strategies and decision-making processes as a balanced space power, it seeks to unpack the broader implications of how relative space capabilities and perceptions of future technological advancements influence strategic shifts. As highlighted in the theoretical framework of Chapter III, the chapter examines how, similar to other major space powers, the Soviet Union's space strategies evolved in response to changes in relative space capabilities, perceptions of future space capabilities, and internal political and economic constraints.

Throughout most of this period, the relative space capabilities of the Soviet Union and the United States remained essentially unchanged. In absolute terms, the Soviet Union and the United States gained significant growth in absolute space capabilities. However, different from the intense competition between the two space powers when they were emerging space powers, cooperation between the two balanced powers became possible, and the establishment of international space laws and treaties accelerated significantly. Scholars widely discussed the reasons for such a shift in the global space competition; most of them attributed the reasons for an easing of space competition to the shifts in broader geopolitical competition, specifically, the détente of the Cold War,[247] or seen as an instrument to regulate broader relations with each other.[248]

This claim, while not incorrect, does not fully capture the interactions between the U.S. and the Soviet Union in space during that period. This chapter will show that while overlaps existed, cooperation between the two superpowers did not entirely align with the broader geopolitical context. Projects like the Apollo-Soyuz Test Project (ASTP) were not solely aimed at easing U.S.-Soviet tensions. Instead, space cooperation and the institutionalization of space treaties predated the détente and continued when other engagements faltered. Thus, while related, space strategies exhibit degrees of independence from broader geopolitical strategies. Examining the specifics of these strategies is essential for understanding the dynamics of balanced space powers and the factors driving strategic choices. Moreover, understanding what facilitated cooperation between these powers can identify future pathways for collaboration in space, testing hypothesis 2 proposed in Chapter III.

While the structural pressures of U.S. competition catalyzed the Soviet Union's early space strategy, the direction and coherence of its response were shaped by internal political priorities, elite perceptions, and institutional rivalries. These domestic variables conditioned how systemic incentives were interpreted, sometimes amplifying strategic urgency, other times muting it. The following analysis considers both external constraints and the internal machinery of Soviet space policymaking.

The first section of this chapter will explore the configuration of the Soviet space program, highlighting how its institutional and political framework shaped space

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[247] Baneke, David, 2014. "Space for ambitions: the Dutch space program in changing European and transatlantic contexts", Minerva(1), 52:119-140. https://doi.org/10.1007/s11024-014-9244-3

[248] Volf, Darina, 2021. "Evolution of the Apollo-Soyuz test project: the effects of the “third” on the interplay between cooperation and competition", Minerva(3), 59:399-418. https://doi.org/10.1007/s11024-021-09435-8

strategy. It traces the evolution of Soviet space capabilities, reflecting how the political and economic system influenced long-term planning. Unlike the competitive approach of the 1950s and 1960s, the Soviet space efforts in the 1970s shifted to pragmatic goals, optimizing resources while sustaining a significant global presence. This adjusted strategy led to key achievements, such as the Salyut space station program, which demonstrated the Soviet focus on long-duration missions and modular station development.

The second section of the chapter will overview the evolution of Soviet space strategies during the Cold War, including a critical analysis of Soviet leaders' perceptions of relative space capabilities amidst U.S. advancements. While the Soviet Union's space strategy was cooperative in some areas, it remained competitive in fields such as space station operations. This balance between competition and cooperation highlights the assumption that states are motivated not only by current capabilities but also by the perceived future trajectory of their space programs.

The third section will examine Soviet-American cooperation as balanced space powers, particularly the 1975 ASTP. This initiative exemplified how, despite geopolitical tensions, the superpowers found common ground in space exploration. It showed that intense rivals could collaborate when their space capabilities were aligned. The chapter will analyze how this cooperation stemmed from détente and reflected strategic calculations about future space capabilities.

Finally, this chapter will discuss the Soviet Union's transition from a balanced space power to a stagnant one in the 1980s. As the economy weakened and internal political pressures increased, its space strategy reflected a diminishing capacity to compete with the United States. This section will examine how domestic constraints influenced the Soviet Union's space policy, leading to a strategic decline that coincided with broader geopolitical shifts. This transition emphasizes the role of relative capabilities and domestic factors in shaping space strategy, as outlined in the neoclassical realist framework in Chapter III.

6.2 The Configuration of the Soviet Space Apparatus

In the 1950s, the Soviet Union's status as an emerging space power was not that different from the US. While the U.S., as an emerging space power, focused on developing powerful launch vehicles, consolidating its space program through the combination of civilian and military institutions, and reinforcing its educational system, as we discussed in the previous chapter, the Soviet Union's early space strategy was quite similar. With a relatively well-established educational system that focuses on math, science, and engineering, and also a clearly stated intention to prioritize robust launch systems for its space programs, it was the institutional structure that made a difference, which is also related to the overall political structure of the Soviet Union.

Key actors include the Ministry of General Machine Building (MGMB), the Soviet Academy of Sciences, various design bureaus, and the military. The MGMB, initially established in 1965, was the primary governmental body responsible for the Soviet space program, overseeing all space activities, including developing and operating spacecraft and launch vehicles. The Soviet Academy of Sciences, as the highest scientific institution, played a crucial role in research and scientific study for space missions. They were involved in planning lunar and planetary missions, analyzing data received from space missions, and coordinating cooperation between the Soviet space program and civilian educational institutions.

On top of all these participating organizations and departments, there was also the Interdepartmental Scientific and Technical Council for Space Research ("the Space Council" henceforth), created in 1959 by the Soviet Central Committee as a subsidiary council under the Soviet Academy of Science.[249] The role of the Space Council was to coordinate all the space efforts and a platform for consultation and decision-making. According to Mikhail Yakovlevich Marov, the first scientific secretary and deputy chairman of the Space Council recalled in 2019:

The important thing is that the council was not a bureaucratic organization - it was an utterly living body. Mstislav Vsevolodovich often took me to visit meetings that took place at the main scientific institutes and enterprises. All issues were resolved on the spot. It was an honor for the designers to present their reports, plans, and methods for their implementation in the presence of Keldysh. This was a truly active participation in the development of projects on which the implementation of our space program depended.[250]

Further, at the heart of the Soviet space endeavor were the design bureaus,[251] each operating as a dynamic center of innovation and manufacture. Expressly, the design bureau, known as "konstruktorskoe byuro" (KB) or experimental design bureau, referred to as "opytno-konstruktorskoe byuro" (OKB), served as the central industrial organization responsible for advancing technology within the Soviet defense industry.[252] Their primary objective was to apply insights from research projects conducted in research institutes to create and enhance prototypes. Once perfected

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[249] Author Anastasia, and Photo by Nikolai. "Anniversary Council on Space Held at the Russian Academy of Sciences." "Scientific Russia" - an electronic periodical, December 12, 2019. https://scientificrussia.ru/articles/yubilejnyj-sovet-po-kosmosu-proshel-v-ran.

[250] Ibid.

[251] The most notable ones for the space program were:

1. OKB-1 (later NPO Energia): Led by chief designer Sergei Korolev, it was responsible for the design of spacecraft and launch vehicles, including the famous R-7 Semyorka rocket and Soyuz spacecraft.
2. TsKBEM: Developed various spacecraft for lunar and interplanetary missions.
3. OKB-586 (Yuzhnoye): Specialized in the design of ballistic missiles and later space launchers.

[252] Engvall, Johan. "Russia’s military R&D infrastructure: A primer." (2021). https://www.foi.se/rest-api/report/FOI-R--5124--SE.

within the design bureau, these prototypes were allocated to factories for large-scale production.[253] In practice, however, the process was often more intricate. Although design bureaus were commonly associated with specific factories, it was not unusual for a design from one bureau to be produced in a factory affiliated with a competing design bureau.[254] This dynamic resulted in inherent competitive tensions within the system, which in some cases provided much-needed innovation for the Soviet space program but also generated impediments at critical junctures due to the rivalry between different design bureaus. OKB leaders remained institutionally semi-autonomous and pursued duplicative programs to retain relevance and secure state support. Barry's study of Soviet space bureaucracies documents how patronage networks and factional competition persisted despite structural reforms.[255]

Additionally, academic institutions, often overshadowed in the narrative, played a critical and active role in challenging the notion of a purely state-centric or government-centric model. Universities and research institutes were essential contributors, engaging in scientific research, pioneering space medicine, and undertaking the comprehensive training of cosmonauts.[256] Institutions such as Bauman Moscow State Technical University (BMSTU), Keldysh Institute of Applied Mathematics (KIAM), Moscow Aviation Institute (MAI), and Lomonosov Moscow State University (LMSU) were directly involved in the Soviet Space program. Keldysh Institute of Applied Mathematics, for example, was famously involved in calculating trajectories for space missions. The institute developed complex mathematical models and computational algorithms that allowed for the precise calculation of spacecraft

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[253] Karpova, Yulia. "Designer socialism: The aesthetic turn in Soviet Russia after Stalin." Unpublished Ph. D. Diss., Budapest: Central European University (2015).

[254] Erickson, Andrew S. "Revisiting the US-Soviet space race: Comparing two systems in their competition to land a man on the moon." *Acta Astronautica* 148 (2018): 376-384.

[255] Barry, 1996.

[256] Siddiqi, 2000a.

trajectories, including launch windows, orbital insertions, and maneuvers necessary for crewed and uncrewed missions.[257] This work was essential for the success of the pioneering missions, such as the Vostok, Luna, and interplanetary probes to Venus and Mars.

Finally, the military was heavily involved in the space program, particularly in military applications of space technology. Like the U.S. space program, the Soviet military was deeply involved and responsible for the initial development of space launch vehicles and cosmonaut training, spacecraft recovery, and launching satellites, among other responsibilities.[258] The Strategic Rocket Forces and the Air Force were deeply embedded in the space program and had representatives in the space program. Further, with the broader Soviet strategic doctrine in mind, the military application of space technologies was also a priority from the outset,[259] much similar to that of the US. Consequently, the Soviet Ministry of Defense maintained a close relationship with, and sometimes control over, the industries manufacturing space and defense hardware. [260]This integration facilitated the development of dual-use technologies, serving civilian and military purposes. From this set of organizations involved, the organizational structure is quite similar to that of the US. Both space programs during the Cold War had solid military influence, collaboration with educational institutions, dedicated research and design bodies, and a collective decision-making process based on expertise. While state planning and budgeting undeniably played central roles, the narrative extends beyond a simplistic top-down approach for the Soviet Union.

[257] Borovin, G. K., A. V. Grushevskii, M. V. Zakhvatkin, G. S. Zaslavsky, V. A. Stepanyantz, A. G. Tuchin, D. A. Tuchin, and V. S. Yaroshevsky. "Space researches in Keldysh Institute of Applied Mathematics of RAS: Past, Present, Future." Mathematica Montisnigri 43 (2018): 101-127.

[258] Linville, Ray"Space and Soviet military planning." Space Policy 2, no. 3 (1986): 234-239. https://www.sciencedirect.com/science/article/abs/pii/0265964686900962

[259] Ibid, 234-235.

[260] Ibid, 237.

Collaborative efforts involving negotiation and coordination with various organizations were inherent in the decision-making process. This nuanced resource allocation and prioritization approach highlighted the dynamic interplay between state directives and organizational autonomy.[261] This professional approach was instrumental in propelling technological advancements, providing flexibility in responding to evolving challenges instead of a mechanical system that follows every directive from the Kremlin. However, internal competition between different design bureaus also significantly negatively impacted the Soviet space program, coupled with interference from the political leadership. Nonetheless, this civilian-military network centered around design bureaus also possessed some autonomy and could influence top-level policy decisions through their expertise.

6.3. Evolution of Soviet Space Strategy

6.3.1 Early Space Strategy: Secrecy, Rapid Development, and Rockets

The focus of early Soviet space strategy can be characterized as "secrecy, rapid development, and rockets."[262] The purpose of the Soviet space program, as stated in multiple official documents and speeches, was to demonstrate technological superiority, expand scientific understanding, enhance military capability, and eventually dominate the space domain.[263] These goals are not that different from those of the U.S. at the time, as discussed in the previous chapter, other than more emphasis on secrecy. Initially, much like any other space program developed in the first few decades during the Cold War, the Soviet space program had a vital military component and military goals in mind. Therefore, the secrecy of the program was highly rigid. Further, to achieve the goal of demonstrating technological prowess and reap political

[261] Siddiqi, Asif A. "Sputnik and the Soviet Space Challenge." University Press of Florida, 2000b.

[262] Siddiqi, 2000a.

[263] Ibid.

prestige, achieving significant "firsts" became the main concern for the space apparatus of the Soviet Union in the Space Race. Moreover, finally, to achieve all these or other scientific goals, developing the capability to reach space became the fundamental need for the program. However, in comparison to their main competitor, the United States, the Soviet Union was in a relatively inferior position in terms of general technological and economic potentials, hence the need for rapid development.

In the 1950s, space exploration was a field in which the Soviet Union had an advantage. This initial advantage in space technology stemmed from the wartime development of long-range rockets developed by the Germans during the war, which provided a foundation for the subsequent development of launch vehicles capable of reaching space.[264] Since this is a fact discussed widely in the literature, we will not delve deep into the historical accounts of this fact. By utilizing its relative advantage in space and achieving significant "firsts," the Soviet Union could maximize its prestige in the competition over technological prowess with the US. This mentality is observable in the declassified Soviet documents.

However, this mentality not only demonstrates the confidence the Soviets had about their space program but also fear towards the overall potential of the US. One of the reasons for the significant investment into space and the development of powerful rockets was the inferior size and quality of the Soviet strategic bomber fleets at the end of World War II.[265] Specifically, Soviet leadership, especially Stalin and Khrushchev, saw ballistic missiles as the solution to the Soviet Union's relatively weaker position

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[264] Chertok, Boris Evseevich. *Rockets and People: Creating a rocket industry*. Vol. 4110. US National Aeronautics & Space Administration, 2006.

[265] Brown, Trevor. "The American and Soviet Cold War Space Programs." Comparative Strategy 30, no. 2 (2011): 177–85. doi:10.1080/01495933.2011.561736.

at the early age of the Cold War.[266] For example, the Soviet R-7 Semyorka, the world's first intercontinental ballistic missile, became the launch vehicle for both Sputnik and Vostok missions. Hence, the need for more complex ICBMs also helped to raise the interest of the Soviet Union in developing a robust space program. Such motivation is not prevalent in the U.S. due to its advantage in strategic bomber fleets. With such a strong association with the military application of dual-use technology such as a space rocket, the reasoning behind the Soviet emphasis on secrecy and rapid development is clearer.

As a result of these three guiding principles, this period saw a series of pioneering achievements, including the launch of the first artificial satellite, Sputnik, in 1957 and the first human, Yuri Gagarin, in space in 1961. These accomplishments were meant to showcase the USSR's scientific prowess and establish its status as a dominant space power, influencing global perceptions and enhancing its geopolitical standing during the Cold War. Soviet leaders were keenly aware of these space achievements' symbolic and strategic value. Hence, the key features of Soviet Strategy in this period can be characterized as an emphasis on secrecy, rapid development, and the prioritization of crewed spaceflight over other scientific objectives, underscoring the strategic intent to leverage space exploration for maximum political and ideological gain.[267]

These key principles led to a strategy focused on high-capacity launch vehicles, which was not drastically different from the U.S. strategy in the same period. In 1958, Korolev and Tikhonravov submitted a document titled "Preliminary Considerations on the Prospects of the Mastery of Cosmic Space," which provided an ambitious vision

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[266] Mathers, J. G. (1998). 'A fly in outer space': Soviet ballistic missile defence during the Khrushchev period. *Journal of Strategic Studies*, *21*(2), 31–59. https://doi.org/10.1080/01402399808437716. And Jackson, William D. "The Soviets and Strategic Arms: Toward an Evaluation of the Record." Political Science Quarterly 94, no. 2 (1979): 243–61. https://doi.org/10.2307/2149850.

[267] Siddiqi, 2000a.

for the Soviet program in 1960.[268] The top priorities stated in the document can be summarized as[269]:

• Investigations using the R-7 and its three-stage modifications, such as the 8K72

• Creation of new, more powerful launch vehicles

• Investigations using these new launch vehicles

• Basic scientific research work for the development of interplanetary technology and search for newer achievements "on the road to the mastery of cosmic space."

At a closer examination, the Soviet vision for its space program was much more ambitious than the U.S. counterpart, with the final goal of sending humans to Mars. One distinctive feature is the emphasis on crewed space missions and developing crewed space satellites and vehicles. This fits the ultimate goal of the Soviet space program, the domination of the space domain. The top leadership mostly adopted Korolev and Tikhonravov's recommendations. In 1959, the Central Committee and the Soviet Council of Ministers issued a decree titled "On the Development of Research Into Cosmic Space."[270] In this document, while acknowledging the previously stated goals for the Soviet space program, it also decreed the start of an organization effort to execute these plans. Thus, the Interdepartmental Scientific-Technical Council for Space Research was created under the supervision of the Academy of Science to supervise and coordinate the Soviet space program alongside many other organizations.[271] This is further enhanced by the fact that the Soviet Union already

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[268] Siddiqi, 2000a, pp206-207.

[269] Siddiqi, 2000a.

[270] Korolev-s-p.ru, "Korolev S.P. Official Website. *Khronika Zhizni I Deyatel'nosti Sergeya Pavlovicha Koroleva* [Chronicle of the Life and Work of Sergei Pavlovich Korolev]." http://www.korolev-s-p.ru/sp02.htm.

[271] Korolev, Sergei, and Mikhail Tikhonravov. "Отчет о Ракетно-Космической Деятельности СССР [Report on Rocket and Space Activities of the USSR]." February 9, 1959. http://sovet.cosmos.ru/sites/default/files/history/2_9.pdf.

had an educational system that heavily emphasized math, science, and engineering.[272] It was evident even in the US, as discussed in the previous chapter.

The early space efforts of the Soviet Union also included a steady increase in spending. In a 1964 CIA report[273], from 1957 to 1964, the estimation of the Soviet spending on space grew from \$0.2 -0.3 billion (\$0.1 billion for the US) to \$2-4 billion (\$6.2 billion for the US). The share of the space spending in the total defense and space R&D budget between 1961 and 1964 grew from 15% (18% for the US) to 30-40% (46% for the US). While the growth rate may not be as rapid as that of the US, the trend is very clear that the Soviet Union, as any other emerging space power in a similar stage of its space program, was determined to increase its space spending to compete with the US. This trend continued until 1972, as shown in Figure 2.

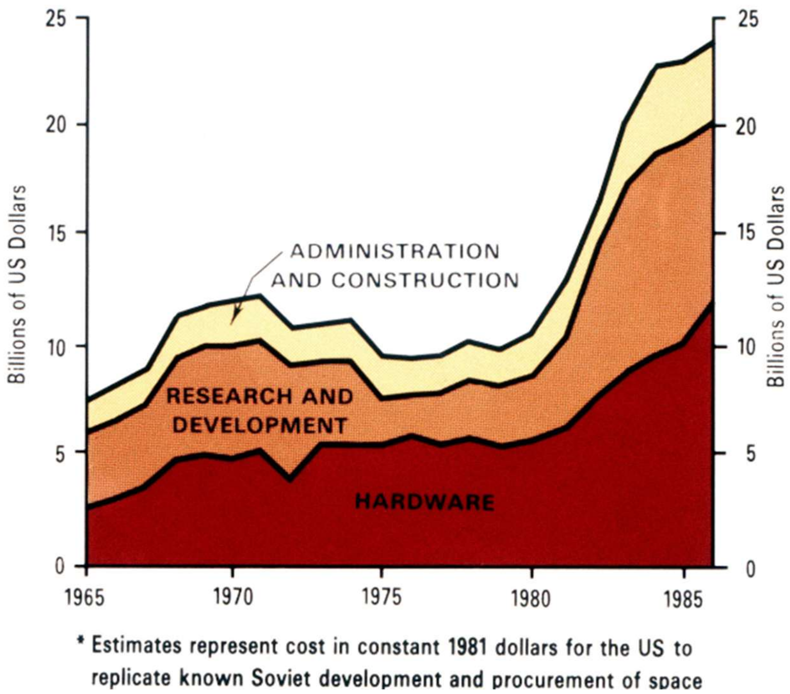

Figure 2 1984 United States Department of Defense chart of Soviet space program costs (1965-

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[272] Kuhn, Betsy. *The race for space: the United States and the Soviet Union compete for the new frontier*. Twenty-First Century Books, 2007.

[273] Central Intelligence Agency, "The Soviet Space Program," January 8, 1968, https://www.cia.gov/readingroom/docs/DOC_0000316255.pdf.

1985)[274]

In sum, Soviet space strategy as an emerging space power shares a lot of similarities with the space strategy of the U.S. in the same period. Both space powers stressed the importance of launch vehicles, increased spending, involvement of both military and civilian institutions, and focused on high-profile crewed space missions. While it was commonly perceived that the Soviet Union eventually lost the space race, this set of strategies still produced astounding results. It significantly raised the space capabilities of the Soviet Union to maintain as an equal to that of the U.S. throughout the larger parts of the Cold War.

6.3.2 The Aftermath of Apollo 11 and the Soviet Union's Transition to a Balanced Space Strategy

Nonetheless, after the early successes and advantages against the U.S. space program, the Soviet space program suffered a series of setbacks in the 1960s, including events such as the Nedelin Catastrophe in 1960 and the crash of Soyuz 1 in 1967.[275] One of the most significant setbacks was the failure of the N1 rocket, which was intended to carry Soviet cosmonauts to the Moon; it experienced a series of failures that ultimately led to the program's cancellation. Several factors contributed to the N1 rocket's failure, encompassing technical, organizational, and political dimensions.[276] Technically, the N1 rocket was plagued by problems with its engine design and reliability. The decision to use a large number of smaller engines (30 NK-15 engines in the first stage) instead of fewer, more powerful engines complicated the rocket's design and increased the

[274] Central Intelligence Agency, "The Soviet Space Program", Febuary 12, 1986, https://www.cia.gov/readingroom/docs/DOC_0000316255.pdf.
[275] Gingerich, David E., Jeffrey S. Forrest, Andrei A. Abiin, and Taletha M. Maricle-Fitzpatrick. "The Russian R-16 Nedelin disaster: an historical analysis of failed safety management." *Journal of space safety engineering* 2, no. 2 (2015): 65-73. https://doi.org/10.1016/S2468-8967(16)30052-0.
[276] Ibid.

potential points of failure.[277] Organizationally, the Soviet space program was hampered by rivalries between different design bureaus and a lack of coordination that could have facilitated more effective problem-solving. The intense secrecy that enveloped the program also prevented sharing knowledge and lessons learned, further complicating efforts to address the rocket's issues. Politically, the desire to beat the United States to the Moon led to rushed timelines and insufficient testing. The result of this impatience is that the N1 rocket was pushed into launch attempts without the comprehensive ground testing that might have identified and resolved its technical problems. All four uncrewed test launches of the N1 rocket failed, preventing the Soviet Union from achieving a crewed lunar landing. For many, this was the end of the Space Race, with a resounding U.S. victory.

However, the actual space capabilities and perceptions of the decision makers of the Soviet space program may be more complicated than common perceptions. This is evident when tracing the Soviet response to the success of Apollo 11 and the subsequent strategic shift for the Soviet space program. The response to the success of Apollo 11 in the Soviet Union had three layers, which offered a full picture of the Soviet perception of the distribution of space capabilities towards the end of the Space Race. On the international level, Soviet officials abroad were not scant about their praises of the Americans' success. On 20 July 1969, the Soviet Union joined the ranks of official well-wishers congratulating the United States. On the following day, Soviet Premier Alexsey Nikolayevich Kosygin took the opportunity afforded by a farewell conversation with former Vice President Hubert H. Humphrey to compliment the Americans on their accomplishment and to express his interest in widening talks with United States officials on the topic of space cooperation.[278] This gesture was part of a

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[277] Chertok, and A. Siddiqi. "Rockets and People Volume IV: The Moon Race." *National Aeronautics and Space Administration Office of Communications History Program Office, Washington, DC* (2011).

[278] Ezell, Edward Clinton. *The partnership: a history of the Apollo-Soyuz test project*. NASA, Nat. Aeronautics and Space Administration, 1978.

broader diplomatic approach during a period marked by détente and the easing of Cold War tensions. Despite the space race rivalry, this acknowledgment was an important diplomatic gesture that recognized the significance of the achievement for all humanity.

Domestically, the Soviet media coverage of Apollo 11 was controlled and mixed. One example is that the Soviet newspaper Pravda featured the Apollo 11 Moon landing on its front page, positioning the story below another piece about collectivism.[279] In the article, an interview with Alexander Pavlovich Vinogradov, a distinguished scientist from the USSR's Academy of Sciences and a Hero of Socialist Labor, was included. Vinogradov remarked on the mission's difficulties before congratulating the astronauts for their remarkable achievement, expressing his hopes for their safe return to Earth. While the landing wasn't broadcast live on Soviet TV, subsequent discussions did include it, showcasing footage of Cosmonaut Konstantin Petrovich Feoktistov offering his congratulations to his American counterparts.[280] Korolev’s program was disrupted by technical challenges and increasing rivalry with Chelomei’s OKB-52.[281] whose competing lunar designs enjoyed temporary political backing which delayed coherent programmatic commitment.

[279] Erickson, Andrew S. "Revisiting the U.S.-Soviet Space Race: Comparing Two Systems in Their Competition to Land a Man on the Moon." *Acta Astronautica* 148 (July 2018): 376–384. https://doi.org/10.1016/j.actaastro.2018.04.053.

[280] Siddiqi, 2000, 141.

[281] Barry, 1996, p. 6.

ПЕРВАЯ ЛУННАЯ ЭКСПЕДИЦИЯ

Комментирует академик А. П. Виноградов

Высадку первых людей на Луну корреспондент «Правды» В. Смирнов попросил прокомментировать вице-президента Академии наук СССР академика А. П. Виноградова.

— Как вы оцениваете достижение экипажа «Аполлона-11»? Какие новые проблемы ему приходится решать по сравнению с предыдущими пилотируемыми полетами к Луне?

— Полет американского космического корабля «Аполлон-11», в результате которого два человека — Нейл Армстронг и Эдвин Олдрин впервые ступили на поверхность Луны, мы оцениваем весьма высоко. Серьезную проверку выдержал космический корабль и его многочисленные системы. Нельзя не восхищаться мужеством и выдержкой космонавтов, которые смело встретили неизвестность. Они впервые совершили посадку на поверхность нашего естественного спутника в лунном аппарате. Не менее сложная и новая проблема — подъем кабины с Луны и стыковка с кораблем, оставшимся на орбите.

Пользуясь случаем, хочу поздравить космонавтов с выдающимся успехом и пожелать им благополучного возвращения на Землю.

— Если вы смотрели телепередачу с Луны во время выхода космонавтов на ее поверхность, то каковы ваши первые впечатления?

— Да, я смотрел эти телевизионные передачи. Сотни лет люди мечтали о полетах к планетам, о том дне, когда человек впервые окажется на Луне. И вот теперь мы стали свидетелями осуществления этой мечты. Благодаря телевидению увидели, как Армстронг поставил свою ногу на поверхность Луны. Наблюдали, как два космонавта передвигались по лунной почве.

Подобные картины пытались представить многие выдающиеся писатели-фантасты. Недавно я участвовал в работе комиссии Академии наук СССР, которая рассматривала предложения о наименовании различных образований на обратной стороне Луны. Среди около 500 новых наименований, главным образом в честь ученых разных стран, космонавтов, есть имена нескольких писателей-фантастов, в том числе Жюля Верна и Г. Уэллса. Комиссия высказалась за то, чтобы увековечить эти имена в названиях лунных образований. Тем самым мы как бы отдадим дань великим мечтам человечества. Но, как всегда, действительность оказалась ярче фантастики...

Во время телепередач я обратил внимание на то, что «ноги» лунного аппарата не вдавились в грунт. Это свидетельствует, что лунный грунт достаточно твердый, прочный. Впрочем, этого следовало ожидать. Советские и американские автоматические станции, совершившие мягкую посадку на Луну, еще раньше дали возможность сделать вывод о прочности лунной поверхности.

— Космонавты собрали образцы лунной породы и должны доставить их на Землю. Что рассчитывает получить наука в результате их изучения?

— Прежде всего ученые смогут определить свойства и состав образцов. Тогда можно будет сравнить лунную породу с типичными породами Земли, а также с метеоритным веществом. Таким образом, выяснится способ образования пород, лежащих на поверхности Луны. Или они вулканические, или какие-то другие. Признаки вещества метеоритного или вулканического происхождения легко диагностируются по химическому составу.

Важна возможность обнаружения органического вещества абиогенного происхождения, то есть возникшего из углерода и других элементов под воздействием космического излучения и ультрафиолетового излучения Солнца. Большой интерес представит определение естественной радиоактивности образцов породы (уран, торий, калий-40) и наведенной — образовавшейся под влиянием ядерных реакций под космическим излучением.

Наконец, определение абсолютного и радиационного возраста пород Луны. Абсолютный возраст укажет время, прошедшее с момента затвердения лунной коры. Радиационный — поможет высчитать, сколько времени эта порода находится на поверхности Луны.

Все эти данные могут пролить новый свет на происхождение Луны, что представляет исключительно важное значение для понимания того, как образовались планеты Солнечной системы.

Космонавтам, кроме того, удалось установить на Луне научные приборы для наблюдений за лунной поверхностью, в частности, сейсмограф. Он, вероятно, поможет ответить на вопрос о колебаниях коры Луны. Если бы они обнаружились, то можно было бы допустить, что тектонические и вулканические процессы на Луне не затихли, что они продолжаются. Это сулило бы далеко идущие выводы. Но с ними пока повременим.

Figure 3 Soviet newspaper Pravada's overage of the moon landing in 1969[282]

The response within the Soviet leadership and among the space program's officials was more complex. While the historic moon landing was reported in Soviet newspapers and on television, it was often downplayed or framed within the context of Soviet space achievements. For instance, Soviet media emphasized that the USSR had achieved the first human spaceflight and other significant milestones before the United States.[283] The aim was to maintain national pride and showcase the Soviet space program's successes, even in the face of American achievements. However, there was still a sense of admiration among the Soviet public and scientific community for the technical accomplishment represented by the Apollo 11 mission.

Initially, there was disappointment and a sense of urgency in response to the United States first achieving a crewed lunar landing.[284] The success of Apollo 11 prompted

[282] Little, Becky. "The Soviet Response to the Moon Landing? Denial There Was a Moon Race at All" Universal History Archive/UIG/Getty Images. Last updated: July 17, 2024. https://www.history.com/news/space-race-soviet-union-moon-landing-denial.

[283] Ibid.

[284] Siddiqi, 2000,142.

introspection and a strategic reassessment within the Soviet space program. Apollo 11's successful landing was not a total surprise for the Soviet decision-makers; the alarming sense of losing the Space Race started to become obvious even before the Apollo landing. On February 11th, the Air Force Commander-in-Chief's Aide for Space Col, General Kamanin, representing the Soviet Air Force within the space program, highlighted the uncertainty regarding the future direction of the Soyuz program, noting in his diary the prevailing confusion about how to move forward.

We have reached a fully absurd [situation]: no man in this country can say what the next flight into space will be. Ustinov does not know this, Keldysh. Smirnov. And Mishin does not know this--generally, no one knows! All my attempts to obtain the composition of plans for piloted space flights from the state lead nowhere: there are no such plans, and it is most unlikely there will be.[285]

The Soviet leadership, including key figures in the space program, began to reconsider their priorities in the wake of Apollo 11. While the N1 lunar rocket program continued for a short time after Apollo 11, its repeated failures and the demonstrated success of the Apollo program led to the eventual cancellation of the Soviet crewed lunar landing efforts. One conclusion drawn after the success of Apollo 11 was that the Soviet Union needed to shift its focus to areas where it could lead, such as long-duration spaceflight (with the development of space stations like Salyut and later Mir) and robotic exploration of the moon, Venus, and Mars.[286] This is evident in both the expert communities and public discussions. Specifically, instead of giving up the race, the Soviet Union conducted a series of missions in response to Apollo 11 to boost confidence in the Soviet space program. One such mission was the success of Zond 7 in August 1969, less than a month after the success of Apollo 11, which took colored

[285] Kamanin, "*I FeelSorry for Our Guys*", Vozdushniy transport 13 (1993): 8-9.

[286] Siddiqi, 2000, 297..

pictures of both the Earth and the moon at varying distances.[287] Commenting on the mood of the Soviet space program leaders, Kamanin commented on the L1 State Commission meeting in September and said: “The success of Zond-7 … gave some encouragement to Mishin, Tyulin, and Afanasyev who were gradually recovering from the shock caused by the failure of the N1 and the brilliant Apollo missions.”[288]

Further, in his conclusions about the failure of the race to the moon, Kamanin concluded in his diaries in September 1969 that it was due to:[289]

1. No qualified Soviet government leadership in space research (Ustinov and Smirnov are a parody of proper management). They operate without rhyme or reason or plan. There is no single direction, no disciplined execution when a decision is finally made.
2. Korolev, Keldysh, Mishin, and Feoktistov are all dedicated to automated spacecraft - 'over-automation'.
3. Korolev and MIshin's rejection of Glushko's engines, and the leadership's rejection of the UR-700 as an alternative.
4. Ustinov and Smirnov's cancellation of the 18 day Voskhod 3 mission, even though the crews had been trained, and the associated pressure on development of Soyuz. This resulted in Soyuz being flown before it was mature, resulting in the death of Komarov and an 18 month delay in crewed flights.

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[287] Harvey, Brian. *Soviet and Russian lunar exploration*. Berlin: Springer, 2007.

[288] Siddiqi, 2000a.

[289] Shayler, D. J. *The Kamanin Diaries: 1960-1971: The Russian Space Programme as Revealed through the Diaries of Colonel-General Nikolai Kamanin*. 2002. http://www.astronautix.com/k/kamanindiaries.html; and Hendrickx, Bart. "The Kamanin Diaries 1969-1971." *Journal of the British Interplanetary Society* 55 (2002): 312-360.

5. Death of Korolev and Gagarin both badly affected morale.
6. Making Mishin head of TsKBEM was a huge mistake. Mishin cannot cope with the huge number of space and missile projects assigned to his bureau.

From Kamanin's perspective, who is one of the crucial insiders to the Soviet space program at that time, the failure of Soviet space program in outcompeting the Americans were not due to inherent technological backwardness or the lack of funding and other materialistic reasons. It seems that it was the poor management and the rivalries between the Soviet design bureaus that contributed the most to the eventual outcome. In other words, the technological failure is the result of management and organizational failure.

This sentiment resonated with the Soviet engine designer Anatoliy Daron, who worked at OKB-456 under Chief Designer of Rocket Engines Valentin Glushko as the lead designer of the liquid propellant rocket engines of the R-7 rocket. In an interview, he also commented on the failure of the N1. He attributed it to the rivalry between Korolev and Glushko, as well as the responsibility of Vasily Mishin's meddling in that relationship, and overall, poor management of the Soviet lunar program due to a lack of purpose:

> *They [Korolev and Glushko] strongly resented each other. I understood both of them. I understood Korolev's position and realized the extent of the harm done by Mishin, but I could not speak to Korolev about it! Not everything can be fully explained. Why, after Armstrong's mission, did work on the N1 continue for four more years?41 Why was a very good, efficient Energiya-Buran system terminated?42 To Glushko's credit, this system flew at the first launch. This was the only time in the history of rocketry when a new rocket flew the first time around and completed an entire flight program. By the way, this was the most expensive system of all. It flew, and then it became clear that it had no mission. This system*

was created without a clear, necessary purpose. History should have taught people not to build systems without a clear purpose. But this conclusion had not been drawn.[290]

While the Soviet Union lost the race to the moon, it did not consider itself lost the broader competition in space. New missions were still conducted in the rest of 1969, and the most prominent ones might be the Soyuz missions of Soyuz 6, 7, and 8. Specifically, the Soyuz 6, 7, and 8 missions, launched in rapid succession in October 1969, were a coordinated effort by the Soviet Union to advance orbital operations, including the first attempts at space welding (Soyuz 6) and complex multi-spacecraft maneuvers (Soyuz 7 and 8). Despite the technological ambition, the missions faced significant challenges. Soyuz 6's welding experiments provided mixed results, which were crucial for future space construction concepts, while Soyuz 7 and 8 failed to achieve their intended docking due to technical issues. These missions underscored the complexities of space operations, contributing valuable lessons to spacecraft guidance, control, and the potential for constructing structures in orbit. Their significance lies in their technological and scientific contributions and their context within the Space Race, showcasing the Soviet Union's commitment to orbital exploration and station construction techniques parallel to the US's lunar ambitions.[291] These endeavors highlighted the challenges of space exploration and set the stage for future international cooperation in space ventures.

With this success, Leonid Brezhnev made a speech in celebration of the Soyuz missions on October 22nd, 1969, and set the tone for the next step in the Soviet space

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290 Gerovitch, Slava. *Voices of the Soviet space program: cosmonauts, soldiers, and engineers who took the USSR into space*. Springer, 2014.

291 Hall, R., & Shayler, D. J. (2003). *The Rocket Men: Vostok & Voskhod, The First Soviet Manned Spaceflights*. Springer-Praxis Books.

program:

Our country has an extensive space program that has been drawn up for many years. We are going our own way: we are moving consistently and purposefully. Soviet cosmonautics is solving problems of increasing complexity...; our way to the conquest of space is the way of solving vital, fundamental tasks, basic problems of science and technology .... Our science has approached the creation of long-term orbital stations and laboratories as the decisive means to an extensive conquest of space. Soviet science regards the creation of orbital stations with changeable crews as the main road for man into space. They can become cosmodromes in space, launching platforms for [lights to other planets. Major scientific laboratories can be created to study space technology, biology, medicine, geophysics, astronomy, and astrophysics.[292]

This speech and a series of related documents and announcements served several purposes. Emphasizing a long-term, extensive space program, Brezhnev underscored the USSR's commitment to an independent path in the space race, distinct from American endeavors such as the moon landing. This approach was marked by a deliberate and methodical progression towards solving increasingly complex scientific and technological challenges, reflecting a broader ideological commitment to advancing human knowledge and capability in space. Brezhnev's vision for the future of Soviet space exploration, which can represent that of the Soviet leadership, centered on the development of long-term orbital stations and laboratories. These were envisaged not merely as scientific outposts but as foundational platforms for an expanded human presence in space, serving as bases for further exploration, including potential flights to other planets.

[292] Siddiqi, 2000a, 712.

The emphasis on using space stations for interdisciplinary research across technology, biology, medicine, geophysics, astronomy, and astrophysics highlighted an understanding of space as a unique environment for advancing a wide range of scientific disciplines. Moreover, by framing the Soviet space program within the socialist ideal of technological progress for societal benefit, the speech strategically positioned space exploration as a critical arena for demonstrating Soviet superiority. Brezhnev's remarks encapsulate a forward-looking perspective that saw space exploration as integral to solving fundamental problems of science and technology, thereby advancing not only the Soviet Union's global standing but also contributing to the broader human endeavor of space conquest.

In sum, this rhetoric signaled a turning point in Soviet space strategy, transforming it from an emerging space power focusing solely on competing with competitors to a more flexible stance in which conducting space missions based on achieving clear goals became the dominant feature.

6.3.3 Balanced Strategy: Perceptions and Capabilities

This transition is also built on the realities of the space capability distribution at that time. Despite the failure of the Soviet crewed moon landing, the overall space capacity at this time is more balanced than many imagined. This is better reflected in the number of successful space launches and the payload capacities of these space launches. As shown in Figure 2 and Figure 3, the U.S. had fallen behind in both categories before 1967. However, with the success of the Saturn V rocket and the consequent success of the Apollo mission to the moon, the U.S. started to surpass the Soviet Union in its potential space capabilities. However, with a drastic decrease in space spending after the successful moon landing, among other strategic concerns discussed in the previous chapter, the number of space launches also started to decrease. The eventual result landed in a balance of space capabilities, with the Soviet Union making more space launches. In contrast, the U.S. made fewer launches and had much higher payload capacities due to its better launch vehicles.

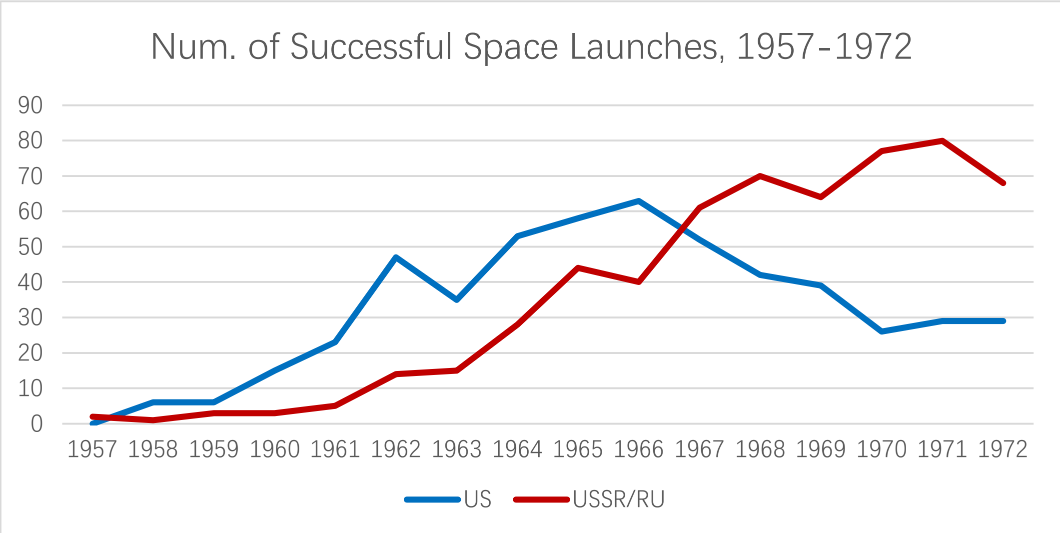

Figure 4 Number of successful space launches of the U.S. and Soviet Union, 1958-1972[293]

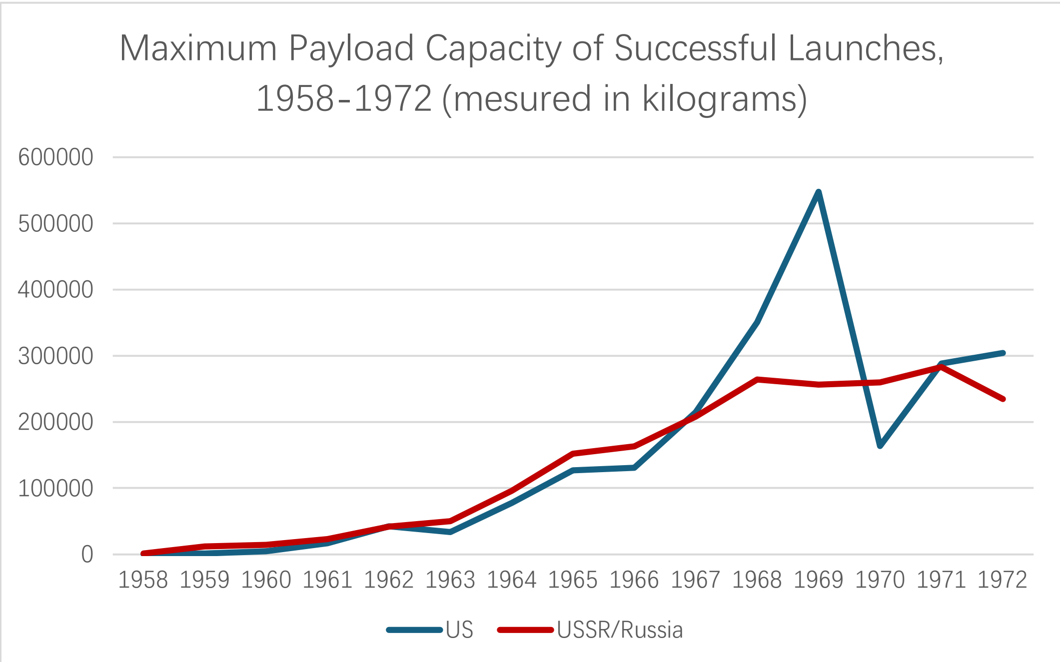

Figure 5 Maximum payload capacity of combined successful launches of the U.S. and Soviet Union,

[293] See Appendix.

1958-1972.[294]

The US's technological superiority in terms of high-capacity rockets was even more evident in the following decade. When considering the average maximum payload capacity of all the launch vehicles successfully launched between 1969 and 1979, as shown in Figure 5, this metric for the Soviet Union remained essentially around 4,000 kilograms, while the U.S. maintained a capacity of about 4,000 until 1976.

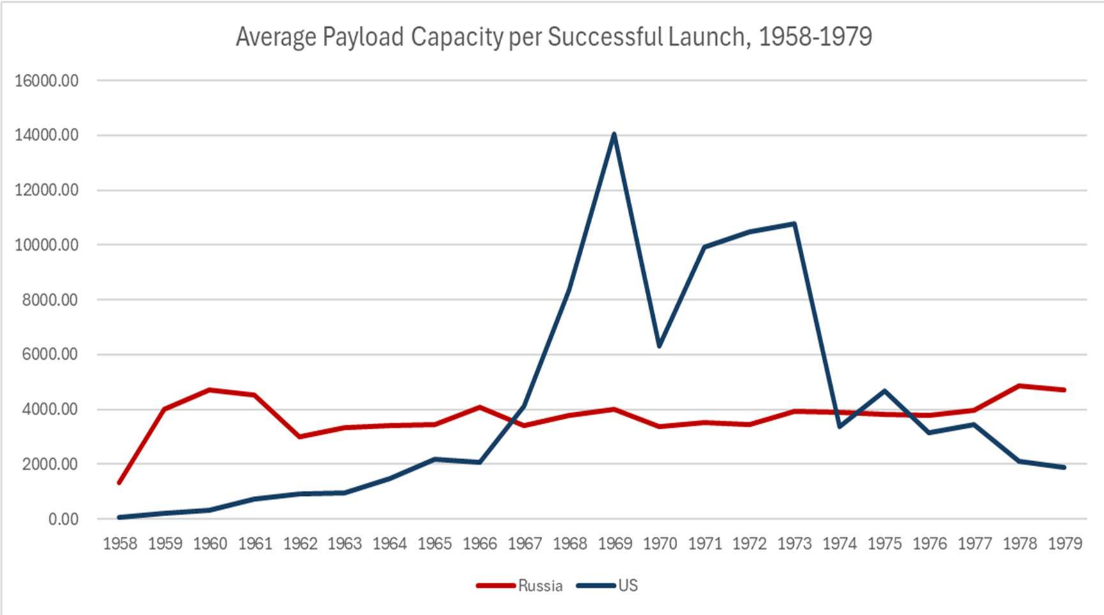

Figure 6 Average Payload Capacity per Successful Launch, 1958-1979 (kg)[295]

Facing this new reality, the mid-1960s to the 1970s saw a gradual shift in the Soviet space strategy. A reassessment of the Soviet space strategies ensued after the success of the Apollo mission. With the U.S. success with the Saturn V rocket and the failure of N1, surpassing the U.S. in developing launch vehicles seemed a futile cause. However, it also seemed that the U.S. showed no signs of developing even more powerful launch vehicles soon, judging from the apparent budget cuts for NASA and

[294] See Appendix
[295] See Appendix

the adequacy of the Saturn V.[296] As shown in some of the declassified Soviet documents, the perception towards the balance of space capabilities of the Soviet leadership was that this balance of payload capacity and number of launches will last for a relatively long period.[297]

Further, to compensate for the technological disadvantage compared to the US and maintain a balance in relative space capabilities, the Soviets employed a simple solution of making more launches into space. This solution paired well with the new focus on space stations in Earth orbit. Between 1969 and 1979, the Soviet Union embarked on an ambitious journey to establish a permanent human presence in space, leading to the development of the world's first space stations under the Salyut program. The program began with the launch of Salyut 1 in 1971, a pioneering endeavor that faced both triumph and tragedy, with the successful long-duration mission of Soyuz 11 marred by the crew's fatal re-entry accident.[298] Subsequent stations, including the military-focused Almaz stations (Salyut 2, 3, and 5) and the scientifically oriented Salyut 4, expanded the scope of orbital research and technology testing despite challenges such as the failed launch of DOS-2.[299] Salyut 4, launched in 1974, resumed the program's scientific missions, while the introduction of Salyut 6 in 1977, with its innovative design featuring multiple docking ports, marked a significant evolution in space station functionality, enabling resupply missions and crew rotations through both crewed Soyuz and uncrewed Progress spacecraft.[300] Technological innovations and scientific milestones characterized the Soviet space station efforts during this decade. Salyut 6 set new standards for space station design and operation, demonstrating the

[296] Sidiqi, 2000a.

[297] Ibid.

[298] Ibid.

[299] Ibid.

[300] Kamanin, 1993, p.21.

feasibility of long-duration space habitation and complex orbital operations.

Overall, this period marked the transition to a more balanced approach in space exploration efforts of the Soviet Union due to the realization of their inability to surpass the U.S. space capabilities anytime soon. Hence, Soviet space strategy at this period is characterized by diversifying goals beyond crewed lunar landings to include more sustainable and scientifically driven missions. The Soviet leadership prioritized space station development, satellite technology advancement, and uncrewed interplanetary exploration, recognizing the long-term value of these endeavors for scientific research and geopolitical influence.[301] This shift underscored the Soviet Union's commitment to maintaining a human presence in space, focusing on long-duration missions that could yield extensive scientific data and demonstrate the USSR's continued leadership in space technology as a balance against the more powerful launch vehicles and more complex satellite technologies. The Salyut program, followed by the development of the Mir space station, started in the 1980s and became central to the Soviet (and later Russian) space strategy, emphasizing the potential of space for scientific exploration and international collaboration.

Further, this focus does not mean the Soviet Union did not advance space technologies in other fields. For example, the Soviet Union also increased its efforts in satellite technology, particularly in areas such as Earth observation, telecommunications, and scientific research. These satellites served multiple purposes: enhancing national security, improving global communications, and expanding humanity's understanding of Earth and its environment. The development and deployment of satellites like the Molniya and Cosmos series highlighted the USSR's capabilities in deploying and operating diverse satellite systems. Recognizing interplanetary exploration's scientific and symbolic significance, the Soviet Union invested heavily in missions to other

[301] Sidiqi, 2000a.

planets, notably Venus and Mars.[302] Missions such as Venera (to Venus) and Mars probe series aimed to gather unprecedented scientific data and showcase Soviet technology's capability to reach and study distant celestial bodies.[303] These efforts reflected a strategic calculation that uncrewed missions, while less dramatic than crewed lunar landings, offered substantial opportunities for scientific discovery and international prestige.

Overall, balanced space strategies can be summarized as diversifying space activities, relatively stable spending on space, and less focus on competition. Adopting a balanced space strategy also reflected an adaptation to the changing geopolitical landscape. With the United States making significant strides in space exploration, particularly with the Apollo moon landings, the Soviet Union sought areas where it could realistically compete or lead, given its resource constraints and strategic priorities. This period also saw increased interest in international cooperation, as exemplified by the Apollo-Soyuz Test Project in 1975, signaling a recognition of the benefits of collaborative efforts in space. By the early 1970s, the Soviet space strategy had evolved from its early focus on competition and achieving dramatic firsts to a more nuanced approach that balanced competition with cooperation, scientific exploration with geopolitical considerations, and crewed missions with unmanned scientific endeavors. This transition was driven by both the successes and setbacks of the early space race, the recognition of the limitations and potentials of Soviet space capabilities, and the desire to sustain a leading role in space exploration amid changing global dynamics. The balanced strategy allowed the Soviet Union to continue making significant contributions to space science and technology, even as the dynamics of the space race shifted.

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302 Burrows, William E. *This new ocean: The story of the first space age*. Modern Library, 2010,208.

303 Kuhn, 2007, 31.

6.4 Balance of Space Capabilities and Cooperation in Space

6.4.1 The Interkosmos program

The Interkosmos program is usually considered a peaceful cooperation between Eastern bloc countries led by the Soviet Union to establish mutually beneficial space cooperation. It is also used as a propaganda program to appear as the leader of the space domain.[304] The governing body for this program is the Council for International Cooperation in the Field of Research and Use of Outer Space for Peaceful Purposes under the Soviet Academy of Sciences, abbreviated as the Interkosmos Council. Later, “Interkosmos” was also appropriated for the satellites launched under the program's purview. As an international program among the Eastern Bloc, Interkosmos is an excellent example of the Soviet space strategy for cooperation with partners.

The origin of Interkosmos dates back to 1965, with a meeting in Moscow of nine different nations from the Eastern bloc, including Belarus, Cuba, Czechoslovakia, the German Democratic Republic (GDR), Hungary, the Mongolian People's Republic, Poland, Romania, and the Soviet Union.[305] It was officially established in 1966. As to establish Interkosmos, the first chairman of Interkosmos and Academician Boris Nikolayevich Petrov described it in an interview with Pravda in 1968:

“Joint work by the scientists of the socialist countries in space physics has been conducted since 1957 when the first artificial Earth satellite was launched. At first, this collaboration was limited to the joint optical observations of the satellite on the ground and investigations based on those results. A new stage on this path was the joint fulfillment of scientific experiments with the help of Soviet satellites and rockets, following the collaboration program between socialist countries in outer space, which

[304] Burgess, Colin, and Bert Vis. *Interkosmos: The Eastern Bloc's Early Space Program*. Springer, 2015,1.

[305] Ibid, p.2.

was adopted in Moscow in April 1967. One of these experiments is being undertaken using the satellite Kosmos-261 in conjunction with geophysical observations on the ground."[306]

Initially, the Soviet Union envisioned a satellite series called "Interkosmos" that served various purposes, including studying physics, Earth observation, and the space environment in near-Earth orbit. The first satellite, Interkosmos-1, was launched in 1969. The satellite was built using a satellite platform designed by OKB-586 (also known as the Yuzhnoye Design Bureau later), with equipment payloads developed and built by the GDR and Czechoslovakia.[307] Specifically, the payload included:

- Solar x-ray polarimeter (USSR);
- X-ray spectroheliograph (USSR);
- Optical photometer (Czechoslovakia);
- X-ray photometer (Czechoslovakia);
- Lyman-α photometer (GDR);
- Telemetric transmitter of the international frequency range with an antenna-feeder device (GDR).

The GDR and Czechoslovakia had significant technological prowess to support the program, especially in optical equipment. In the later Interkosmos satellite series, they continued to contribute to the program, while other participating countries shared the data collected from the satellites and participated in the scientific analysis.[308] The Interkosmos series accumulated 25 launches between 1969 and 1991; the last of the

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[306] Quoted in Burgess, 2015,4. G. I. Petrov (Ed.), Conquest of Outer Space in the USSR (translated from the Russian), Nauka Publishers, Moscow, 1971, citing Pravda newspaper, issue 22 December 1968.

[307] Rockets and spacecraft from Yuzhnoye Design Bureau, 2001 , Spacecraft based on the DS-U3 modification,152-156.

[308] S. M. Smirnov, "Применение статистической теории турбулентности для описания теплообмена при ламинарных потоках [Application of Statistical Turbulence Theory to Describe Heat Transfer in Laminar Flows]," *Geliotekhnika* 3 (2020): 91-97, https://journals.eco-vector.com/0205-9614/article/view/15733/pdf.

series was launched by the Russian Federation in 1994.

Notably, none of the participants had independent access to space, meaning they could not develop and launch space assets using their launch vehicles. This means they depended on the Soviet Union to launch any space asset. According to data recorded by UNOOSA, none of the Interkosmos participants had independent launch capabilities.[309] However, as shown in Table 7., some of the participants did manage to develop independent space assets to be launched by the Soviet Union into Earth orbit, namely Bulgaria and Czechoslovakia (later Czech Republic). This demonstrated the Soviet monopoly over space launch technology in the Eastern bloc. While there was no attempt to actively block any attempt by the Eastern Bloc countries from developing independent space programs in any direct or overt fashion, there has been no access to such abilities for the Eastern Bloc countries.

Table 6 Summary of Interkosmos Participation in All Interkosmos Satellite Series[310]

Mission Name	Year of Launch	Contributing Countries (Roles)
Interkosmos-1	1969	USSR (platform and launch), GDR, Poland, Czechoslovakia (scientific instruments)
Interkosmos-2	1970	USSR (platform and launch), GDR, Czechoslovakia (scientific instruments)

[309] United Nations Office for Outer Space Affairs (UNOOSA). (2024). Online Index of Objects Launched into Outer Space. Retrieved from https://www.unoosa.org/oosa/osoindex/search-ng.jspx.

[310] Avilla, Aeryn. "The Rockets' Red Glare: Interkosmos and the Eastern Bloc", *Spaceflight Histories*, May 17, 2023. https://www.spaceflighthistories.com/post/interkosmos.

Interkosmos-3	1970	USSR (platform and launch), GDR, Czechoslovakia (scientific instruments)
Interkosmos-4	1970	USSR (platform and launch), GDR, Czechoslovakia (scientific instruments)
Interkosmos-5	1971	USSR (platform and launch), GDR, Czechoslovakia, Bulgaria (scientific instruments)
Interkosmos-6	1971	USSR (platform and launch), GDR, Bulgaria, Hungary, Poland (scientific instruments)
Interkosmos-7	1972	USSR (platform and launch), GDR, Czechoslovakia (scientific instruments)
Interkosmos-8	1972	USSR (platform and launch), GDR, Bulgaria (scientific instruments)
Interkosmos-9/Copernicus-500	1973	USSR (platform and launch), Poland (primary payload), GDR, Bulgaria (additional payloads)
Interkosmos-10	1973	USSR (platform and launch), GDR, Poland, Bulgaria, Czechoslovakia (scientific tools)
Interkosmos-11	1974	USSR (platform, launch), GDR, Czechoslovakia (scientific instruments)

Interkosmos-12	1977	USSR (platform, launch), Czechoslovakia, GDR (scientific instruments)
Interkosmos-13	1977	USSR (platform, launch), Hungary, GDR, Poland (scientific instruments)
Interkosmos-14	1975	USSR (platform, launch), Czechoslovakia, People's Republic of Belarus, Hungary (scientific instruments)
Interkosmos-15	1978	USSR (platform, launch), Bulgaria, GDR, Czechoslovakia (scientific instruments)
Interkosmos-16	1977	USSR (platform, launch), Bulgaria, Poland, Czechoslovakia (scientific instruments)
Interkosmos-17	1979	USSR (platform, launch), Hungary, GDR (scientific instruments)
Interkosmos-18	1980	USSR (platform, launch), Vietnam, Cuba, Mongolia, Czechoslovakia (scientific instruments)
Interkosmos-19	1981	USSR (platform, launch), GDR, Hungary, Bulgaria, Czechoslovakia (scientific instruments)

Interkosmos-20	1981	USSR (platform, launch), Czechoslovakia, Hungary, People's Republic of Bulgaria (scientific instruments)
Interkosmos-21	1981	USSR (platform, launch), GDR, Hungary, Czechoslovakia (scientific instruments)
Interkosmos-Bulgaria-22	1981	Bulgaria (platform design and scientific instruments), USSR (launch)
Interkosmos-23/Intershock	1985	USSR (platform, launch), Czechoslovakia, Poland, Hungary, GDR and Belarus (scientific instruments)
Interkosmos-24	1989	USSR (platform, launch), Hungary, Bulgaria, Czechoslovakia, Poland, GDR, and Romania (scientific instruments)
Interkosmos-25	1991	USSR (platform, launch), Vietnam, Cuba, Mongolia, Czechoslovakia (scientific instruments)
Interkosmos-26/CORONAS-I	1994	Russia (platform and launch), Ukraine, and Poland (scientific instruments)

Nonetheless, other than the satellite program, crewed spaceflights under Interkosmos have been more widely discussed. According to Soviet sources, fourteen cosmonauts from Czechoslovakia, Poland, and the GDR arrived at the Yuri Gagarin Cosmonaut Training Centre for further medical examinations in December 1976 after quick and large-scale medical examinations in their home countries.[311] The first foreign cosmonaut that made a flight on a Soyuz spacecraft was the Czechoslovakian cosmonaut Vladimir Remek in February 1978. In the following years, eight more cosmonauts from different Eastern bloc countries visited the Soviet Salyut-6 space station using the Soviet Soyuz shuttles. After 1981, eight more foreign cosmonauts from France (1982, visiting Salyut 7, and 1988, visiting Mir), India (1984, visiting Salyut 7), Syria (1987, visiting Mir), Bulgaria (1988, visiting Mir), Afghanistan (1988, visiting Mir), Japan (1990, visiting Mir), the United Kingdom (1991, visiting Mir), and Austria (1991, visiting Mir) participated in the Interkosmos crewed missions as further extension to friendly nations, and in the case the UK and Japan, as commercial flights.

Table 7 Summary of Crewed Interkosmos Missions Participated by Communist Countries[312]

Launch Date	**Cosmonaut Name**	**Home Country**	**Spacecraft Used (Launch/Landing)**	**Flight Program**
2-Mar-78	Vladimir Remek	Czechoslovakia	Soyuz 28 / Soyuz 28	Visited Salyut-6 station; conducted scientific experiments in space physics and biology.
27-Jun-78	Miroslaw Hermaszewski	Poland	Soyuz 30 / Soyuz 30	I visited the Salyut-6 station, studied Earth resources, and performed medical experiments.

[311] Ibid.
[312] Avilla, 2023.

26-Aug-78	Sigmund Jähn	GDR	Soyuz 31 / Soyuz 29	I visited the Salyut-6 station; my research included material sciences and Earth observation.
10-Apr-79	Georgi Ivanov	Bulgaria	Soyuz 33 / Soyuz 33	Attempted visit to Salyut-6 station; mission aborted due to spacecraft malfunction.
26-May-80	Bertalan Farkas	Hungary	Soyuz 36 / Soyuz 35	Visited Salyut-6 station; experiments in materials science and remote sensing.
23-Jul-80	Pham Tuan	Vietnam	Soyuz 37 / Soyuz 36	Visited Salyut-6 station and conducted biological and Earth resources studies.
18-Sep-80	Arnaldo Tamayo Méndez	Cuba	Soyuz 38 / Soyuz 38	Visited Salyut-6 station; focused on materials science and space manufacturing.
22-Mar-81	Zhugderdemidiin Gurragchaa	Mongolia	Soyuz 39 / Soyuz 39	Visited Salyut-6 station; included geophysical and remote sensing experiments.
14-May-81	Dumitru Prunariu	Romania	Soyuz-40/Soyuz 40	Visited Salyut-6 station, the first space experiment to produce single crystals of a specific profile.

07-Jun-88	Aleksandr Aleksandrov	Bulgaria	Soyuz TM-5/ Soyuz TM-5	Visited Mir station; participated in multiple experiments as a researcher.

This resulted from an expanding Interkosmos program in a meeting in 1970 in Wroclaw, Poland.[313] Based on the agreement from this meeting, ideas for the crewed space missions under Interkosmos were fleshed out. Specifically, the eight participating countries would be responsible for providing their equipment for both uncrewed and crewed space missions. Meanwhile, the Soviet Union oversaw the incorporation of these experiments into satellites. It handled the launches of both the satellites and the crewed spacecraft that were part of the Interkosmos program. However, the details and preparation for the Interkosmos crewed missions did not start until 1976, after the ASTP's success.[314]

The Soviet narrative on this matter is clearly stated by Petrov, the chairman of the Interkosmos council in 1977, before the first flight of Interkosmos:

The countries participating in the "Interkosmos" program do not have a common financial fund. The Soviet Union furnishes to its collaborating partners free of charge the equipment of rocket-propelled technology for outer space. Following its financial capabilities, each country finances the development and construction of equipment and the conduct of experiments it is interested in, makes available the appropriate scientific-technical cadres, etc. Herein lies one of the fundamental distinctions between the collaboration through the program "Interkosmos" and the collaboration, for example, of the ten countries of Western Europe that participate in the European

[313] Burgess, 2015,9-10.
[314] Leonov, A. A. "Полёты за пределы Земли [Flights Beyond Earth]," *Знание* 4 (1980). https://epizodsspace.airbase.ru/bibl/znan/1980/4/4-polety.html.

Agency for Outer Space.[315]

In this paragraph of the article, it was clearly stated that while the cost of the launches and existing equipment on space stations will be free to use for the participating countries, those participants still needed to finance and develop the equipment and experiments they are interested in by themselves. According to the 1977 Agreement on Cooperation in the Exploration and Use of Outer Space for Peaceful Purposes (the Interkosmos program agreement), Article 10 stated that "Scientific results of joint space experiments and research, by agreement between all countries participating in them, can be provided to scientists and scientific organizations and institutions of other countries."[316]

While this data sharing was undoubtedly beneficial to the participating Eastern Bloc countries, it was also beneficial to the Soviet Union in the sense of reducing the cost of developing and conducting those experiments themselves, and it maintained steady control over the space flight missions and selection of programs. Specifically, all the Interkosmos crewed missions had Soviet commanders and were launched using soviet launch sites and vehicles. According to the 1977 Interkosmos agreement, the selection of programs is based on the voting results of the Interkosmos council, a subsidiary council under the Soviet Academy of Sciences. This fits the prediction of H1 in that working with these Eastern bloc countries can help lower the cost of space activities while maintaining control over all space activities through building dependencies, which can minimize the risk of leaking key technologies.

It was also notable that Petrov mentioned the European space programs as another example of international cooperation in space among partners. The program he was

[315] NASA, Translation'of "Kosmicheskiye Orbity Sodruzhestva", Tekhnika i nauka, No. 11, 1977, 10-12. https://ntrs.nasa.gov/api/citations/19780013233/downloads/19780013233.pdf.
[316] Federal Agency for Technical Regulation and Metrology of Russia, "ГОСТ 2.106-96: Единая система конструкторской документации. Текстовые документы [Unified System for Design Documentation. Text Documents]," September 1, 1997. https://docs.cntd.ru/document/1901850.

referring to, based on the description of “ten countries of Western Europe,” would be the European Space Research Organisation (ESRO). While he did not make clear the point of distinction between Interkosmos and ESRO specifically, he was emphasizing the “fraternity” among Eastern bloc countries and the leadership demonstrated by the Soviet Union through providing free access to space in this article.[317] This also fits the statement in H1 in the sense that using space capabilities through international cooperation can, or at least perceived by the leadership of the Soviet space apparatus as such, garner political prestige and project the image of an international leader in space.

Overall, Interkosmos was an example of space cooperation with geopolitical partners and offered opportunities for the Soviet Union and participating allies to develop scientific projects and demonstrate political unity. However, while being a collaborative project, the Soviet Union had fundamental control over Interkosmos, through not only structural political relationships but also through controlling key technologies and infrastructures in the form of rockets, launch sites, and satellite platforms. This pattern is not unique to the case of the Soviet Union; it can also be argued that similar projects of the United States in the form of the International Space Station (ISS) work similarly.[318] This point will be elaborated on in the next chapter.

6.4.2 The 1967 OST vs. The 1979 Moon Treaty

With cooperation with partners discussed, this section focuses on the other type of cooperation in space: cooperation with competitors. As stated, cooperation with competitors is most likely to happen when the space capabilities of the competing space powers are balanced. This is because the risk or the impact of leaked or transferred technology is minimized when the two space powers involved have similar

[317] NASA, 1977.
[318] Cashman, Laura, and Sarah Liebermann. "Space Diplomacy and the International Space Station." *European Review of International Studies* 10, no. 3 (2024): 276-302.

capabilities. With minimizing such a risk as a priority, co-development of significant space assets and infrastructure is usually absent from such cooperation. Low-risk projects like cooperation in the co-construction of governance systems or institutions of space and collaborative civilian projects using existing space assets such as the ASTP would be preferable. These types of cooperation were chosen for cooperation between the Soviet Union and the United States during the Cold War when their capabilities reached balance.

Establishing the UN space treaties is an example of cooperation in developing governance systems on space, with a specific focus on the 1967 Outer Space Treaty and the 1979 Moon Treaty. These two treaties are selected as the most similar cases with variations in their outcome. Specifically, the OST was successfully established as a lex generalis for governing space activities and is widely accepted and used by all space powers. However, the Moon Treaty did not receive the same level of acceptance, even though it was designed as a lex specialis for governing space activities on other celestial bodies.[319] Although it was regarded as one of the major international space treaties under the purview of the UN, none of the central space powers signed or ratified the treaty. Hence, the Moon Treaty's relevancy is significantly minor compared to the OST.

Based on H2 in this chapter and the adopted neoclassical realist framework, this variation can be explained as being caused by shifts in space capabilities and perceptions of future capabilities. When the discussion on developing an international space treaty started to be discussed in 1963, both the U.S. and the Soviet Union, among other countries in the UN general assembly, saw the need to limit the nuclear arms race on Earth in the aftermath of the 1962 Cuban Missile Crisis.

[319] Wilson, James R. "Regulation of the Outer Space Environment Through International Accord: The 1979 Moon Treaty." Fordham Envtl. L. Rep. 2 (1990): 173.

As a result, the General Assembly adopted Resolution 1884 (XVIR) titled Question of general and complete disarmament.[320] This resolution welcomed the statement from both the U.S. and the Soviet Union to “not to station in outer space any objects carrying nuclear weapons or other kinds of weapons of mass destruction.”[321] Both superpowers at this time had a mutual fear of the weaponization of space. This is reflected in the success of the Limited Test Ban Treaty in 1963, which already included a space component. Article 1. a of the Limited Test Ban Treaty clearly states that tests of nuclear weapons should be banned “… in the atmosphere; beyond its limits, including outer space; or under water, including territorial waters or high seas…”.[322] Discussions on a more comprehensive space treaty also started in 1963, a part of a more extensive effort to limit the arms race between the U.S. and the Soviet Union. Preventing the weaponization of space became the beginning of one of the most essential principles in the 1967 Outer Space Treaty. In 1966, discussions on drafting the OST and the Liability Convention gained significant progress in COPUOS, resulting in Resolution 2222 (XXI) of the General Assembly, which confirmed the principles and provisional articles of the OST.[323] At this point in 1966 and 1967, the U.S. and the Soviet Union were already quite close in terms of their space capabilities measured by the number of successful launches and maximum payload capacity of those launches, as well as average payload capacity per successful launch, as shown in Figure 3, 4, and 5. This factor added to the position of both the United States and the Soviet Union on the OST. The Soviet Union's attitude towards the Outer Space Treaty (OST) was generally supportive. Specifically, the OST’s prohibition of placing

[320] Garthoff, Raymond L. “Banning the Bomb in Outer Space.” International Security 5, no. 3 (1980): 25–40. https://doi.org/10.2307/2538418.
[321] United Nations General Assembly, "Resolution 188 (XVIII)," October 17, 1963, https://undocs.org/A/RES/188(4XVIII).
[322] United States, United Kingdom, and Soviet Union. "Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water (Test Ban Treaty)." Signed August 5, 1963. https://www.archives.gov/milestone-documents/test-ban-treaty.
[323] United Nations. "Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies (Outer Space Treaty)." January 27, 1967. https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/outerspacetreaty.html#fn1.

nuclear weapons in space played a significant role, as did its political prestige.[324]

However, discussions on the specifics of the OST were lengthy and complicated, partially because the Soviet legal experts had a different interpretation of the UN Charter and how to conceptualize the militarization of space. Specifically, they believed space could be used for defensive military operations, which was justified under Article 51 of the UN Charter. However, they opposed using space for offensive purposes unless in self-defense.[325] Additionally, the Soviet Union condemned the Western use of spy satellites but reluctantly acknowledged that it was not formally illegal under international law.[326] They called for international agreements to ban espionage from space. By extension to this call, the Soviet Union argued that states have the right to destroy spy satellites based on national sovereignty principles. However, such actions did not imply sovereignty over space.[327]

The Soviet leadership and military experts believed that the U.S. could launch a military attack from space, and the Soviet Union needed the same option to do so or eliminate such possibilities through a binding treaty based on the UN charter.[328] The Soviets viewed space law as a continuum of general international law, advocating for a stable and predictable legal environment to prevent space from becoming an unregulated domain of military conflict. For instance, Gennadi P. Zhukov, a leading Soviet legal scholar, argued that international space law "has developed as a sphere of general international law. Their foundations are identical".[329] Hence, the overall attitude towards the OST that the Soviet Union had was generally supportive, partially

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[324] Burant, Stephen R. "Soviet Perspectives on the Legal Regime in Outer Space: The Problem of Space Demilitarization." Studies in Comparative Communism 19, no. 3/4 (1986): 161–75. http://www.jstor.org/stable/45367420.
[325] Ibid.
[326] Ibid.
[327] Ibid.
[328] Moltz, 2011.
[329] Zhukov, Gennadi P. Kosmicheskoe pravo. Moscow: Izdatel'stvo 'Mezhdunarodnye Otnosheniia', 1966., Quoted in Burant, Stephen R. "Soviet Perspectives on the Legal Regime in Outer Space: The Problem of Space Demilitarization." Studies in Comparative Communism 19, no. 3/4 (Autumn/Winter 1986): 161-175. https://doi.org/10.1016/0039-3592(86)90018-9.

because it facilitated the demilitarization of space and completely demilitarized celestial bodies.

Other than concerns over militarization, changes in relative space capabilities were also changing rapidly in favor of the US. In the mid-1960s, as the United States showcased significant advancements in space technology, mainly through the test flights of the Saturn and CSM launch vehicles in 1966, the Soviet Union perceived these developments as technological achievements and as potential strategic shifts in space capabilities.[330] This perception was deeply embedded in the realist framework, where states are primarily concerned with relative gains and the balance of power. The Soviet response, advocating vigorously for the Outer Space Treaty (OST), can be understood through this lens, highlighting their strategic shifts to mitigate potential threats and ensure a legal binding to prevent space from becoming a competitive military domain.

The advancements in U.S. space capabilities likely intensified Soviet insecurities, prompting them to secure a legal framework that would restrict military uses of space. The presence of a significant new capability, such as a powerful launch vehicle capable of delivering humans to the moon, could potentially destabilize the existing power structure, thereby driving states to seek agreements that preserve their security interests. The OST, which aimed to legally bind nations to utilize outer space exclusively for peaceful purposes, was a mechanism to maintain balance and prevent the U.S. from achieving a unilateral advantage that could be used for military purposes.

From this point, the Soviet push for the OST can be seen as a response to mitigate the risks posed by U.S. technological advancements. This treaty was part of a broader Soviet strategy to prevent the militarization of space, which could have provided the U.S. with considerable strategic leverage. The dual-use nature of space technologies,

[330] Ibid, 164.

where civilian technologies could have military applications, made it imperative for the Soviet Union to advocate for stringent controls through the OST.

In essence, the Soviet Union's support for the OST amid rapid American advancements in space technology was a strategic decision influenced by realist considerations of power and security. This decision was aimed at curbing the U.S.'s potential military capabilities and maintaining a balance of power in space, which aligns with the core assumptions of this dissertation regarding the behavior of states under an international anarchic system.

However, the Moon Treaty had a different outcome regarding its acceptance among space powers. The Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, also known as the 1979 Moon Treaty, is the most recent core treaty for space governance. While it might be the most relevant treaty to the questions discussed in the dissertation, it is also the most irrelevant one in some way – almost all the major space powers, including the US, China, and Russia, are not parties to the Moon Treaty.[331] However, the Moon Treaty is still an essential document of reference to consider how all forms of actors, both state and non-state, should behave on other celestial bodies.

The origin of the Moon Treaty can be traced back to 1970 when Argentina’s representative to COPUOS submitted a "Draft Agreement on the Principles Governing Activities in the Use of the Natural Resources of the Moon and Other Celestial Bodies."[332] Professor A.A. Cocca, the Argentinian representative at COPUOS’s legal subcommittee, intended to pass this proposal to protect the rights and interests of all

[331] United Nations, “Treaty Status”, UNOOSA https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/status/index.html

[332] United Nations General Assembly. *Status and Application of the Five United Nations Treaties on Outer Space*. U.N. Doc. A/AC.105/C.2/L.271 (2008). https://www.unoosa.org/pdf/limited/c2/AC105_C2_L271E.pdf.

states defined in the OST.[333]

Although this proposal did not gain much attention then, it was later followed by a Soviet proposal. It was reviewed and amended by other states, including the U.S. and other developing countries. The 9-year-long debate on the final draft of the Moon Treaty focused on two concepts: the common heritage of mankind and the establishment of an international regime governing all activities on the moon and other celestial bodies.[334] The former concept was opposed by the superpowers at the time. At the time, the Soviet Union wanted to exclude the common heritage language from the final treaty or at least limit it to the moon.[335] This was made clear in the working paper submitted in 1973, stating that the concept of "common heritage" is against the notion of "province of mankind":

> *One of the issues that still remains unresolved in the consideration of the draft treaty relating to the moon is the use of the concept of the "common heritage of all mankind ...... According to the 1967 Treaty on Outer Space, celestial bodies are the province of all mankind. They are available for undivided and common use of all States on earth, but are not jointly owned by them. This is the essential feature of international law.*[336]

The U.S. adopted a similar stance towards the term common heritage, and its concern mainly focused on mineral rights, which is quite similar to its stance regarding deep

[333]United Nations. "Argentina Draft, U.N. Doc. A/AC.105/C.2/L.71 and Corr. 1 (1970)." Reprinted in *Report of the Legal Subcommittee on the Work of the Eleventh Session* (April 10 - May 5, 1972), U.N. Doc. A/AC/105/196 (1977), Annex 1, at 6-7. https://airandspacelaw.olemiss.edu/pdfs/jsl-8-2.pdf.

[334] Marko, David Everett. "A kinder, gentler Moon Treaty: a critical review of the current Moon Treaty and a proposed alternative." *J. Nat. Resources & Envtl. L.* 8 (1992): 293. https://uknowledge.uky.edu/jnrel/vol8/iss2/6; For the actual debate process, see UN resolution 2779 (XXVI) of 29 November 1971, which initiated the debate on an international treaty for the moon, as well as resolution 2915 (XXVII) of 9 November 1972, 3182 (XXVIII) of 18 December 1973, 3234 (XXIX) of 12 November 1974, 3388 (XXX) of 18 November 1975, 31/8 of 8 November 1976, 32/196 A of 20 December 1977 and 33/16 of 10 November 1978 in United Nations. "Moon-Agreement", UNOOSA. https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/moon-agreement.html.

[335] See the Soviet working paper in U.N. Doc, A/AC.105/115, Annex I (B) 7. https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/travaux-preparatoires/moon-agreement.html

[336] Ibid, 1973.

sea mining.[337] Possible prohibition on mining rights imposed by an international institution in the future is seen by U.S. domestic critics at the time as unacceptable. A congressional hearing regarding the common heritage language in the Moon Treaty in 1979 stated that the definition of the common heritage is unclear, but the developing nations fervently support it.[338] The potential for this principle being bent and manipulated to prevent U.S. from conducting commercial activities on the moon[339]. In the eyes of some critics, exploitation of resources in space does not contradict the notion of free access to space.[340]

Eventually, the Soviet Union conceded to this concept in 1979, which pushed the negotiations forward. However, the U.S. and USSR eventually did not sign the treaty due to the inclusion of the common heritage language.[341] Nonetheless, although the Moon Treaty lacks international ratification, it is still an important reference for space governance, especially the governance of space resources and other celestial bodies. Additionally, during the debate around the Moon Treaty, the United States already demonstrated an interest in commercializing space activities on the moon, with a specific focus on mining rights.

This variation in outcomes between the OST and the Moon Treaty can be attributed to the changes in the combination of relative and absolute space capabilities and perceptions for future space development. Firstly, the common heritage concept is not unique to the Moon Treaty. The first article of the OST refers to the space as the "province of all mankind" and it was further developed in the Moon Treaty as the

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[337] Griffin, N.L., 1981. Americans and the moon treaty. J. Air L. & Com., 46. 729. https://heinonline.org/HOL/LandingPage?handle=hein.journals/jalc46&div=32&id=&page=.

[338] U.S. Congress, International Space Activities, 1979, Hearings Before the Subcommittee on Space Science and Applications of the Committee on Science and Technology, U.S. House of Representatives, Ninety-sixth Congress, First Session, September 5 and 6, 1979 – United States. Congress. House. Committee on Science and Technology. Subcommittee on Space Science and Applications. https://www.govinfo.gov/app/details/CHRG-96hhrg53451O.

[339] Ibid, 1979, p.118.

[340] Griffin, *supra note*, 1981,753.

[341] Specifically, Article 11

common heritage.[342] However, mining and commercializing the moon was not a serious concern when the OST was formulated. Plans for establishing a more permanent presence on the moon was considered by both the Soviet Union and the U.S. during the 1950s and the 1960s but did not receive serious investment since the late 1960s and early 1970s. The main reasons for that were the technological constraints and changes in space strategies for both space powers as discussed.

However, by the late 1970s, technological developments on both sides enabled more activities in space. They thus changed the perception of future developments of space activities and the perception of both space powers involved. As a result to this technological development, the forms of space activities underwent extensive expansion. Such expansion reshaped the strategic postures and perceptions of the U.S. and the Soviet Union. Such changes did not directly translate into the number of launches or the payload capacity of successful launches, which sustained a balanced level between these two superpowers. Rather, the change is qualitative because new technologies, more reliable space assets, and more importantly, balanced space strategies that focused on cost-effectiveness of space launches, reduced the need for number of launches. Simply put, more results can be achieved through less efforts.

The development of the Global Positioning System (GPS) in the United States is a perfect example of how space technology started to change broader strategic thinking. Initially made for military navigation, GPS showed that space-based systems could provide vital services for many sectors beyond the military, including business and everyday civilian use. This change made the U.S. see space as a place to gain significant advantages in security and the economy.[343] Simultaneously, new launch vehicles and the growth of space infrastructure showed a significant shift in how both

[342] Tronchetti, Fabio. "Private property rights on asteroid resources: Assessing the legality of the ASTEROIDS Act." Space Policy 30, no. 4 (2014): 193-196. https://doi.org/10.1016/j.spacepol.2014.07.005.
[343] Logsdon 1998,213.

superpowers approached space.

The U.S. Space Shuttle program, aimed at making space travel more regular and cheaper, was a step towards making space more familiar and accessible. The Soviet Union's Proton and Energia rocket series also contributed to the enhancement of the Soviet space capability, with the former becoming one of the most used and reliable rocket series in history, and the latter the heavy-lifting vehicle as a successor to the failed N1 rocket. Further, creating space stations like the Soviet Salyut, Mir, and the U.S. Skylab, indicated a shift towards longer human presence in space. This suggested a future where space was not just a place to visit but a place to live, work, and potentially use for resources. This extended presence showed the importance of understanding and controlling space environments for strategic use.[344]

All these accumulated qualitative changes to space capabilities translated into a positive perception, especially on the U.S. side, to a more positive perception on future space ventures. The chance to use space resources for economic gains, like lunar water or minerals from asteroids, made the U.S. and the Soviet Union hesitant to join international agreements that could limit their future economic opportunities. The shift to seeing space as a source of economic value, not just for science, influenced their position on the Moon Treaty. The heavy investment in technologies such as the Space Shuttle and Burna Shuttle meant they wanted to keep control over space technology and operations, making sharing or limiting capabilities through international agreements less appealing.[345]

In summary, the late 1970s and early 1980s were a turning point where technological advancements in space altered the strategic landscape. These changes led the U.S. and the Soviet Union to focus on national interests in space more than working together,

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[344] Harvey, Brian, and Henk H. F. Smid. *The New Space Race: China vs. USA*. Springer, 2011, 78.
[345] Handberg 2003,87.

affecting the outcome of the 1979 Moon Treaty. This era highlighted a shift in how space was seen and valued, pushing both powers towards strategies that emphasized their interests in this expanding frontier. Compared to the OST, the variation in the outcome of these two treaties regarding their acceptance among the two superpowers was caused by the qualitative changes in space capabilities and perceptions of future space capabilities. With the balance between the two space powers broken, treaties that limits future potential of space capabilities, such as the Moon Treaty and its common heritage principle, will be undesirable for space powers transitioning away from balanced perceptions.

6.4.3 The ASTP and Cooperation with Competitors

The Apollo-Soyuz Test Project (ASTP) in July 1975 marked a significant moment in the history of space, showcasing a remarkable instance of international collaboration between the United States and the Soviet Union during a time rife with Cold War tensions. In this rare case of space cooperation between competitors, the American Apollo spacecraft docked with the Soviet Soyuz spacecraft. It was usually interpreted as a symbol for a mutual commitment to exploring space for peaceful purposes, and as a case study for how space diplomacy helped regulate broader diplomatic relations.[346] However, it was also a common occurrence in the history of space, and there are a plethora of preconditions and details in the process to unpack. In short, it was only possible due to the unique balance in space capabilities and a particular set of perceptions of space that made the ASTP possible.

Specifically, the foundation for the ASTP's success lay in the balanced distribution of space capabilities between the United States and the Soviet Union during the 1970s. As discussed in the case of the space treaties, both superpowers had reached significant

[346] John M. Logsdon, *The Decision to Go to the Moon: Project Apollo and the National Interest* [Chicago: University of Chicago Press, 1998], 212. And Krasnyak, Olga. "The Apollo–Soyuz test project: construction of an ideal type of science diplomacy." *The Hague Journal of Diplomacy* 13, no. 4 (2018): 410-431.

levels of space capabilities. They recognized the unsustainable nature of escalating costs during the Space Race, particularly after the Apollo moon landing, and diminishing returns from their respective unilateral space endeavors regarding political and materialistic gains.[347] This realization led to a strategic reassessment where cooperation became a viable alternative to competition to dampen the space race, thus cutting costs and opening possibilities to cooperate in space for actual scientific collaboration. The balance in capabilities ensured that neither nation felt strategically vulnerable or significantly disadvantaged, thus facilitating an environment conducive to sharing technology and expertise.[348]

Notably, the origin of ASTP did not start after Apollo and balanced reached. The international cooperation ideas started during the first years of the Space Race under the Eisenhower administration, particularly from the science community.[349] The following administrations all had similar interests towards working with the Soviet, while the Soviet science community was also interested but was politically impossible.[350] When cooperation was mentioned again in 1969 after Apollo 11's landing on the moon, it eventually led towards a key moment in the negotiation process in October 1970, when technical representatives met at Star City outside of Moscow to discuss the docking mechanisms and other technical aspects of the mission.[351] After a few negotiations and discussions, the Nixon-Kosygin accords was signed in 1972. By 1973, the project had entered a phase where both nations were deeply involved in detailed planning and coordination of technical specifics, including the design of docking systems and the planning of joint experiments. This collaborative spirit was

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[347] Ezell, Edward Clinton. *The partnership: a history of the Apollo-Soyuz test project*. NASA, Nat. Aeronautics and Space Administration, 1978.
[348] Ross-Nazzal, Jennifer. "Détente on Earth and in space: The Apollo-Soyuz test project." *Organization of American Historians Magazine of History* 24, no. 3 (2010). https://academic.oup.com/maghis/article-abstract/24/3/29/967676.
[349] Mieczkowski, 2017, 13.
[350] Gerovitch, 2014, 105.
[351] Ezell, 1978,86-87.

further evidenced by the negotiations concerning public information plans and the technicalities of shared communication during the mission.[352]

The balance in space capability, as well as the need for détente, were crucial for the feasibility of the ASTP. The mission required technical compatibility and a high level of trust. The development of the Apollo Docking Mechanism (ADM) and the Androgynous Peripheral Attach System (APAS) showcased such trust to cooperate in space technology.[353] This level of collaboration was unprecedented and was underpinned and was primarily negotiated by the science and technology communities on both sides,[354] which also depoliticized the project in terms of actual collaboration on space infrastructure and developing a part of space asset. However, it should also be noted that the ADM and APAS still does not constitute a true co-development of space assets shown in the case of the International Space Station, which will be discussed in the next chapter. Reservations on both sides were still strong regarding co-development of completely new space assets, from both the scientific and political communities.

For example, U.S. Senator William Proxmire was particularly vocal about his concerns, citing issues like the Soviets' ability to control two space missions simultaneously and the technological inferiority of the Soviet space program in comparison to the U.S. These concerns highlighted the potential risks of conducting the joint mission and questioned the adequacy of Soviet command and control capabilities, particularly when another mission (Soyuz 18/Salyut 4) was ongoing.[355] For the Soviets, one key concern was the Apollo's thrusters' potential to disturb the Soyuz spacecraft's attitude during docking maneuvers.[356] The Soviets were worried that the exhaust from the

[352] Ibid,
[353] Gerovitch, 2014, 211.
[354] Portree, David SF. *Mir hardware heritage*. Vol. 1357. Lyndon B. Johnson Space Center, 1995, p.74.
[355] Ezell, 1978, 305-309.
[356] Ibid, p.274.

Apollo's thrusters might affect their spacecraft if the astronauts forgot to shut down the engines after docking. This unease required detailed discussions and reassurances from the American side.

Beyond the engineering challenges, the ASTP was a profound cultural and interpersonal venture. Astronauts and cosmonauts underwent extensive language and cultural training, pivotal for the mission's success.[357] This preparation enabled the crews to conduct necessary communications during their mission. Such language training is often overlooked, but it is still an important part of the ASTP and similar programs due to the need to operate scientific equipment, the spacecraft, and the symbolic cultural exchange during the mission. This exchange's effectiveness facilitated the mission's success and gained political support for détente and further scientific cooperation on both sides.[358]

The joint scientific experiments conducted during the ASTP included solar physics, materials science, and biology studies. These experiments were not merely scientific endeavors but also symbolic gestures of shared intellectual pursuit and the potential benefits of international scientific cooperation.[359] The results of these studies provided valuable understanding of how to collaborate on scientific experiments in space. This aspect of the ASTP underscored the mission's role in advancing human knowledge and fostering a collaborative approach to space exploration. It was used as an asset for promoting further cooperation.[360]

Finally, the geopolitical context of the 1970s, particularly the period of détente, played a significant role in the success of the ASTP. This era was marked by efforts to ease Cold War tensions and foster cooperation between the United States and the Soviet

[357] Ross-Nazzal, 2010, 31.
[358] Ross-Nazzal, 2010, 34.
[359] Newkirk, Dennis. 1990. *Almanac of Soviet Manned Space Flight*. Houston: Gulf Pub. Co.,83.
[360] Ezell, 1978, 305-309.

Union. The balanced distribution of space capabilities during this time facilitated the cooperative venture of the ASTP, making it a strategic manifestation of détente. The mission symbolized the potential shift from confrontation to collaboration in space, demonstrating the role of balanced capabilities in enabling such transitions.[361] The feasibility and attractiveness of cooperation with competitors are highly contingent on maintaining the balance of capabilities. When this balance is disrupted, the incentive for collaboration diminishes, leading to a return to more competitive or unilateral approaches to space exploration. For instance, as space technologies evolved, and the balance of capabilities shifted—particularly with the United States developing more advanced and capable launch vehicles and satellite systems—the dynamics of cooperation changed. The subsequent focus on national interests, such as the U.S. Space Shuttle program and the Soviet Union's Mir space station, highlighted a move towards prioritizing national goals over international collaboration.

The legacy of the ASTP and its lessons continue to resonate in current space policy and international partnerships. The project demonstrated that space, despite intense competition, could also serve as a platform for bridging geopolitical divides and fostering global collaboration. However, this is most feasible when there is a balance in capabilities, where neither party fears being overshadowed or strategically disadvantaged. As the landscape of space exploration evolves, with new actors and technologies entering the arena, the lessons from the ASTP underscore the importance of maintaining a balance to facilitate meaningful and productive international cooperation in space exploration.

6.5 Discussion and Conclusion

This chapter has traced the Soviet Union's strategic behavior as a balanced space power

[361] Siddiqi, 2000, p.539.

during the Cold War, particularly in the 1970s, and its transition toward stagnation in the 1980s. The Soviet Union's space strategy during this period is pivotal for understanding how relative space capabilities and perceptions of future capabilities influenced its strategic shift. By using the theoretical framework established in Chapter III, this analysis affirms that the Soviet Union represents a key case study for examining the dynamics of balanced space powers and the strategic choices they make.

Further, this chapter demonstrates strong support for hypothesis 2, which states that A stable distribution of space capabilities between major powers leads to cooperation to maintain stability. Specifically, in the 1970s, the Soviet Union had achieved a rough parity with the United States in terms of relative space capabilities. After the intense competitions during the Space Race, the Soviet Union shifted its strategy as it entered a period of balance with the United States. This transition to a balanced space power aligns with hypothesis 2 laid out in Chapter III, which suggest that when relative space capabilities between major powers stabilize, competition may give way to cooperation as the costs of maintaining a high-stakes race increase. This hypothesis is supported by the Soviet Union’s role in the Apollo-Soyuz Test Project (ASTP) in 1975, a symbolic moment of cooperation between the two leading space powers.

In terms of capabilities, the Soviet Union maintained an edge in certain areas, such as long-term space station operations, evidenced by the Salyut and later Mir programs, and did not continue to compete with the U.S. in super heavy lifter launch vehicles for crewed moon mission. This chapter describes this period as a period of fluid balance. The Soviet strategy during this period was to maximize available resources by focusing on cost-effective solutions, such as reusability and modularity in their space station program, while the U.S. emphasized similar technological advancements through its Space Shuttle program albeit in a different system. The different directions of investment for the two space powers is further explained by the domestic factors in this chapter and Chapter VII, which also supports the neoclassical realist claims in

Chapter III.

Specifically, analysis shows that domestic factors played a crucial role in shaping how Soviet leaders interpreted and acted on systemic incentives related to space. Each leader chose a different strategic approach based on their own views of space's political significance. For Khrushchev, space was not just a scientific frontier, it was also a key tool in the ideological battle and a means to reinforce his domestic legitimacy. In contrast, Brezhnev shifted focus, prioritizing stability and gradual defense enhancements over ambitious exploration. Meanwhile, the Soviet Union faced increasing economic challenges and leaned towards reform, transforming space policy into a platform for diplomacy and selective collaboration.

Beneath these leadership changes, the dynamics of bureaucratic politics also played a vital role. Unlike NASA and DARPA, the Soviet space apparatus did not possess a cohesive institutional structure that exemplifies the cohesive dual-track division of labor. Instead, it fundamentally operated with various competing design bureaus, whose rivalries often spiraled into factionalism and political patronage. This not only led to redundancy but also created inefficiencies that hindered overall strategic alignment.

Finally, there were also increasing fiscal constraints, especially during the late Brezhnev and Gorbachev years. Large-scale programs like the Energia-Buran program, while impressive, ultimately drained resources without providing significant strategic benefits in return. This budgetary pressure, rising opportunity costs, and the difficulty of incorporating space investments into broader economic reforms meant that even when confronted with external challenges, such as the SDI, the Soviet Union struggled to develop a clear and sustained strategic response.

In sum, this chapter has demonstrated that the Soviet Union in the 1970s provides a clear case of a balanced space power, where relative space capabilities and the perception of future capabilities played critical roles in shaping strategic choices. The Soviet Union's transition from intense competition to a more cooperative and balanced approach reflects the theoretical framework established in Chapter III, which argues that space actors adjust their strategies based on the distribution of relative capabilities, and a stable distribution promotes cooperation between competitors and partners. However, as the Soviet Union's relative capabilities declined in the 1980s, the limitations of its domestic political and economic system prevented it from responding effectively, leading to stagnation, which will be discussed in more details in Chapter IX.

Chapter VII The Unipolar Moment and U.S. Space Superiority

7.1 Introduction

This chapter discusses the rise of the United States as a hegemonic space power during the post-Cold War period, focusing on the unipolar moment since 1991 that followed the collapse of the Soviet Union to around 2011 when the U.S. moved towards a status quo space power. The chapter investigates strategic shifts that accompanied the U.S.'s changes in relative space capabilities and perceptions of future capabilities based on the theoretical framework established in Chapter III. The restraint strategy can largely be linked to changing threat perceptions and strategic calculations. However, neoclassical realism indicates that domestic factors such as leadership perspectives, institutional arrangements, and fiscal politics also influenced how these dominant actors perceived systemic opportunities. Understanding U.S. arms control choices, for instance, requires analysis not only of Soviet capabilities but of domestic bureaucratic disputes and political resistance to militarization at home. This analysis tests all three core hypotheses and investigates how relative space capabilities and perceptions of future technological advancements became pivotal variables that influenced strategic choices and drove the hegemonic transformation of the U.S. in space.

The discussions of this chapter is based on the tracing of the geopolitical context in which U.S. space strategy evolved before and after the collapse of the Soviet Union. Hypothesis 1 suggests that space powers are likely to experience strategic shifts when there are changes in the distribution of relative space capabilities. The absence of a peer competitor in space during the unipolar moment, should provide, the U.S. with an unprecedented opportunity to pursue hegemonic ambitions. With its significant technological lead over other nations, particularly in launch capabilities, satellite networks, and space exploration infrastructures, the U.S. was able to assert its dominance not only through direct competition but also by shaping international norms and institutions to its advantage.

The understanding of space hegemon for this dissertation originates from the works of Steven Lobell,[362] Randal Schweller,[363] and Rober Gilpin.[364] Neoclassical realists define hegemony as a situation in which a state holds predominant power in the international system, but this power is contingent upon both material capabilities and domestic political dynamics.[365] Instead of viewing the pursuit of hegemony as a straightforward result of material capabilities, neoclassical realists argue that domestic politics, elite perceptions, and institutional capacities are crucial in determining whether and how a state will seek and sustain hegemonic dominance.[366] For Gilpin, when a hegemon is in place, the international system experiences order, open trade, and cooperation because the hegemon has both the incentive and the resources to maintain these conditions. However, when the hegemon's power declines, instability and conflict are more likely to arise as other states challenge the hegemonic order, and the provision of global public goods decreases.[367] These views converge on the challenges of maintaining a hegemonic order. While neoclassical realists emphasize that the failure of hegemony often stems from internal weaknesses, overextension, and leadership miscalculations and Gilpin views the decline of hegemony as inevitable due to economic overreach and the rise of challengers.

This dynamic is particularly complicated in space. An important aspect for a space power to achieve hegemony in space is to deny the opponent's access to space while

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[362] Lobell et al, 2009.
[363] Schweller, 2006.
[364] Gilpin, Robert. "The Theory of Hegemonic War." *The Journal of Interdisciplinary History* 18, no. 4 (1988): 591–613. https://doi.org/10.2307/204816.
[365] Lobell et al, 2009.; Schweller, 2006.
[366] Ibid.
[367] Gilpin, 1988.

ensuring the space power's access.[368] However, denying a competitor's access to space in a non-conflict scenario is extremely difficult. Hard denials, such as the use of ASAT measures or destruction of launch facilities, can be considered an act of war and do not serve the purpose of controlling space in peacetime.[369] Consequently, total control over space by a single space power during peacetime is almost impossible, as pointed out by many scholars, and thus should not be pursued as a valid strategy.[370] Therefore, it is almost impossible for the space hegemon to stop externally another great power or even a middle power to gain independent access to space. This was the case of China in the 1960s and Iran in recent decades.

A significant part of this chapter is dedicated to analyzing the formation and implications of U.S. hegemony in space. The concept of space hegemony, as defined in Chapter III and the beginning of this chapter, extends beyond mere technological superiority; it encompasses the ability of space power to influence and control the international space order. The U.S., during the unipolar moment, exemplified this form of hegemony by shaping the rules and norms governing space activities through institutions like the UNOOSA and bilateral agreements and by pushing for favorable terms in arms control agreements related to space. The U.S.'s dominance in space was further enhanced by its ability to project power through dual-use technologies that serve both civilian and military purposes, thus blurring the lines between commercial space activities and national security imperatives.

The final section of this chapter assesses the challenges to U.S. hegemony that emerged in the late 1990s and early 2000s. As outlined in the typology of space powers in Chapter III, hegemonic space powers face inherent difficulties in maintaining their dominance, particularly as emerging powers seek to close the gap in relative

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[368] Ibid, 145-150.
[369] Ibid, 151-152.
[370] Moltz, 2011.

capabilities. The chapter examines the rise of China as a challenger to U.S. space superiority, highlighting how the strategic behavior of the U.S. began to shift from cooperation to competition as it became increasingly concerned about the erosion of its technological lead. This transition aligns with the theoretical predictions of Hypothesis 2, which posits that space powers with declining relative advantages will adopt more defensive and competitive strategies to preserve their status.

7.2 From the ASTP to the ISS: How did the U.S. Transition to a Space Hegemon

7.2.1 Continued Balanced Strategy: 1974-1981

As discussed in the previous two chapters, the U.S. became a balanced space power under the Nixon administration. Several trends became more observable in the following Ford (August 1974 – January 1977) and Carter (January 1977 – January 1981) administrations. Namely, reduced support for developing new launch vehicles, continued efforts to promote international cooperation, and limited responses matching Soviet advances in space capabilities are the features of the U.S.-balanced strategies at the time.

Firstly, new launch vehicles as the key technology to relative space capability did not see significant development. Following Nixon's balanced strategy, the Ford and Carter administrations largely continued the trend of maintaining the fluid balance of space capabilities between the U.S. and the Soviet Union. For both the Ford and Carter administrations, there wasn’t any need to change the relative space capabilities, and they continued to prioritize the cost-effectiveness of space programs.

Leadership preferences and bureaucratic dynamics within the United States played a crucial role in shaping arms control outcomes. Nixon and Kissinger favored strategic stability through mutual deterrence, but they faced opposition from hawkish factions in the Pentagon and conservative members of Congress. Their success in ratifying SALT I and the ABM Treaty was not inevitable; it relied on framing arms control as a fiscally responsible and technologically stabilizing move, particularly after Congressional hearings raised concerns over cost inflation and technological uncertainty.[371] The broader domestic climate of Vietnam War fatigue and inflation further constrained political appetite for high-risk strategic expansion.

Especially in the case of Ford, due to the extraordinary circumstance of his ascension to the presidency as the vice president following the Watergate scandal, much of the space policies remained the same as the previous administration.[372] As a result, between 1974 and 1981, the only new launch vehicles that saw successful development were the Titan III, Delta 2000, and Delta 3000 series. These all started development in the 1960s and are based on previous designs.[373] Compared to the plethora of launch vehicles developed and introduced into service during the 1960s and early 1970s, there is a significant change in the focus of space activities. Further, as shown in Figure 7, for both the U.S. and the Soviet Union, the average payload capacity of successful launches as an indicator for the overall payload capacity of launch vehicles did not change much during this period.

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371 Logsdon, 1995, pp. 122–124.
372 Logsdon, 2015, 212-220.
373 Launius, Roger D., and Dennis R. Jenkins, eds. *To Reach the High Frontier: A History of US Launch Vehicles*. University Press of Kentucky, 2014.

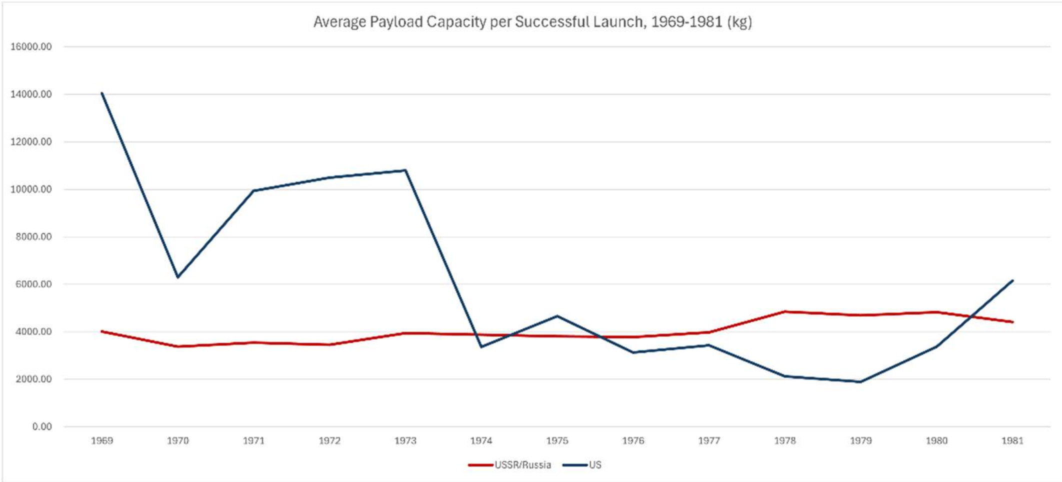

Figure 7 Average Payload Capacity per Successful Launch, 1969-1981 (kg)[374]

That is not to say that space technology did not advance during this period. On the contrary, technologies in specific fields, such as Earth observation, navigation, and communication, saw significant development.[375] The Space Shuttle program received continued support under the Ford administration, and long-range space missions such as the Viking program that aimed to land Viking 1 and 2 probes on Mars also saw success. Nonetheless, programs such as these do not contribute to changes in the distribution of relative space capabilities described in Chapter III, other than the space shuttle launches and the Viking missions. When comparing the number of successful launches and payload capacity of the U.S. and the Soviet Union between 1974 and 1981, there was no significant fluctuation in the general trend.

374 See Appendix.

375 Siebeneichner, 2018.

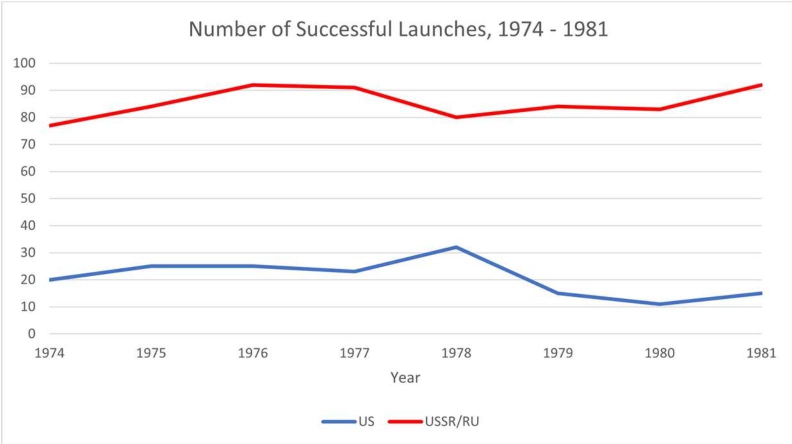

Figure 8 Number of Successful Launches, 1974 - 1981[376]

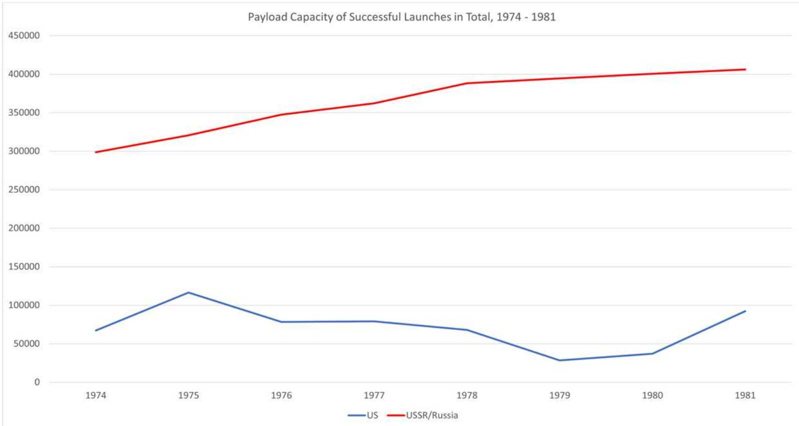

Figure 9 Payload Capacity of Successful Launches in Total, 1974 - 1981[377]

As shown in the graphs, in both metrics, the Soviet Union exceeded the U.S. by a large margin. Intuitively, this seems to contest the idea of a balanced distribution. However, this is attributed to the relatively poor reliability of Soviet space technologies, and the U.S. space and security community was fully aware of it. According to a CIA report on the Soviet expenditure on space programs from 1970 to 1983, one consistent consensus was that the Soviets needed more space launches to complete a mission due to component failures, design efficiency, or limited payload capacity of space launch

[376] See Appendix.
[377] See Appendix.

vehicles.[378] Hence, in the perception of the U.S. intelligence community, the fluid balance between the Soviet Union and the U.S. largely remained stable.

One major event that started to cause destabilization was the Soviet breakthrough in ASAT capabilities in 1976. Then, National Security Advisor and retired Air Force general Brent Scowcroft wrote several memos to President Gerald Ford discussing the issue of satellite vulnerability and the need to develop U.S. ASAT capabilities. In a memo in March 1976, he suggested that after a discussion with Ford and the National Security Council:

"The NSC study is examining three significant areas:

(1) Near-term measures (3.5 years) that can be taken to decrease the vulnerability of our satellites;

(2) Projection of the military use of space over the next15 years, including analysis of the problems of satellite survivability; and

(3) The most feasible options for developing a U.S. anti-satellite capability."[379]

By July 1976, the Ford administration published National Security Decision Memorandum 333 and set the U.S. policy objectives in response to the shifting balance regarding ASAT capabilities:

"The survivability improvements in critical military and intelligence space assets should be predicated on the following U.S objectives:

1) *Provide unambiguous, high confidence, timely warning of any attack directed at U.S. satellites.*
2) *Provide positive verification of any actual interference with critical U.S. military*

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[378] See CIA reports listed in: https://www.cia.gov/readingroom/search/site. Particularly document number 8707, 18617, 22423, 22295, 22196, 22372, and 22339.

[379] Brent Scowcroft, "Scowcroft Memo: Satellite Vulnerability," March 15, 1976, CSIS Aerospace Security Document Library. https://aerospace.csis.org/scowcroft-memo-sat-vulnerability-mar-1976/.

and intelligence satellite capabilities.

3) *Provide sufficient decision time for judicious evaluation and selection of other political or military responses after the initiation of an attempt to interfere and before the loss of a critical military or intelligence space capability.*
4) *Provide a balanced level of survivability commensurate with mission needs against various threats, including non-nuclear co-orbital interceptor attacks, possible electronic interference, and possible laser attacks.*
5) *Substantially increase the resources of an aggressor to successfully interfere with critical U.S. military and intelligence space capabilities.*
6) *Deny the opportunity to electronically exploit the command system or data links of critical U.S. military and intelligence space systems."*[380]

In this memo, the focus of efforts is directed at improving the survivability of space assets to a "balanced" level. These goals focus on the defense rather than the offense, which is consistent with balanced space strategies. There is a clear focus on increasing awareness in space in the case of an attack on space assets and increasing the cost for the opponent to conduct a successful ASAT attack. However, there was no call for increasing space control through increasing space assets or immediately developing significant ASAT capabilities. On the contrary, the expert panel led by Scowcroft concluded in December 1976 that only a limited capability by 1980 was sufficient to maintain the balance.

"The Panel concluded that a limited anti-satellite capability sufficient to conduct six to ten low altitude intercepts within a week and to respond.to a new Soviet launch inside one day, could be developed by the end of CY 1980 using available technology, if sufficient priority is applied. However, unless a clear statement is made, budgetary

380 National Security Council, "NSDM 333- Enhanced Survivability of Critical Space Systems", July 7, 1976, CSIS Aerospace Security Document Library. https://aerospace.csis.org/wp-content/uploads/2019/02/NSDM-333-Enhanced-Survivability-of-Critical-Space-Systems.pdf.

pressures, arms control considerations, and other international policy factors could impede progress in this area. U. S. national policy is made emphasizing the need for antisatellite development."[381]

As Scowcroft and his expert panel pointed out, this limited response is mainly influenced by budgetary constraints and arms control agreements derived from the balanced strategy. Hence, the responses to the Soviet ASAT breakthrough were decided under a fluid balance of relative space capabilities between the U.S. and the Soviet Union. Due to the budgetary constraints and "balanced response" required by the president, developing matching capabilities in the short term was not very likely. The U.S. Air Force had an experimental ASAT program named Program 437. However, it was canceled in 1975 due to repeated failures and accidents.[382] The next generation of systems with ASAT capabilities would be the ASM-135 missile, which did not see actual launches until mid-1985 under Reagan's SDI.[383] Hence, it can be argued that although some in the policy community considered the perceived ASAT gap to be a threat to U.S. security and relative space capabilities, it was still not considered a priority for the overall space strategy, at least not an important enough goal to divert significant resources to pursue immediately. While the decision under the Ford administration was to adopt a limited response to Soviet advances in ASAT, it certainly raised alarms for some policy community members.

Hence, to compensate for the lack of budget and maintain the balance, the U.S. pursued international collaboration with allies and the Soviet Union. The United States strategically fostered these cooperative ventures for the allies to pool resources, share technological advancements, and reinforce its leadership in space.[384] This

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[381] Brent Scowcroft, "Scowcroft Memo: US Anti-Satellite Capability December", December 1, 1976, CSIS Aerospace Security Document Library. https://aerospace.csis.org/scrowcroft-memo-us-asat-dec-1976/.
[382] Hanley, Timothy C. *Historical Overview: Space & Missile Systems Center, 1954-1995*. The Center, 1996.
[383] Nicklas, Brian D. *American Missiles: The Complete Smithsonian Field Guide*. Casemate Publishers, 2012.
[384] Launius, Roger D. "United States space cooperation and competition: Historical reflections." *Astropolitics* 7, no. 2 (2009): 89-100. https://doi.org/10.1080/14777620903073853.

collaboration was part of a broader effort to align allied nations under a shared vision of space exploration, considered essential in the face of the Soviet challenge. This is observable under the Carter administration's national space policy in 1978, which stated further support for the principles of the 1967 OST and stated international cooperation for U.S. interests as a guiding basic principle:

"A. Commitment to the principles of the exploration and use of outer space by all nations for peaceful purposes and the benefit of all mankind. "Peaceful purposes" allow for military and intelligence-related activities in pursuit of national security and other goals.

B. Rejection of any claims to sovereignty over outer space, celestial bodies, or any portion thereof, and rejection of any limitations on the fundamental right to acquire data from space.

C. The space systems of any nation are national property and have the right to pass through and operate in space without interference. Purposeful interferences with operational space systems shall be viewed as infringing sovereign rights.

…

H. The United States will conduct international cooperative space-related activities that are beneficial to the United states scientifically, politically, economically, and/or militarily."[385]

The most prominent U.S. partners in space at this time were European countries. Integrating European space capabilities into U.S.-led initiatives enabled the United States to expand the scope and capability of its space programs under a limited budget. As part of a balanced space strategy, this cooperation could also serve as a stool to

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[385] The Whitehouse, "PD-NSC-37 Carter National Space Policy Declassified", May 11, 1978, CSIS Aerospace Security Document Library. https://aerospace.csis.org/pd-nsc-37-carter-national-space-policy-11-may-1978-declassified/.

strengthen transatlantic relationships.[386] Additionally, by promoting an image of openness and peaceful exploration, the U.S. contrasted its approach with the secretive and militaristic space activities of the Soviet Union, thereby supporting broader foreign policy goals.

Consequently, during the Ford and Carter administrations, the United States and European countries engaged in several significant space programs. One prominent example is the Helios program, a collaboration between NASA and the Federal Republic of Germany (FRD). The program built and launched two probes, *Helios 1* and *Helios 2*, in December 1974 and January 1976, respectively. These probes were designed to study the Sun at close range, providing data on solar processes, wind, and cosmic rays.[387] The United States contributed launch services and support. At the same time, West Germany was responsible for designing and building the spacecraft, as typical in cooperation between a significant space power and its allies. Another notable collaboration was developing and deploying Spacelab, a reusable laboratory space module designed for use on NASA's Space Shuttle missions. The European Space Agency (ESA) signed several agreements with the U.S. in 1973 and pledged to build a pressurized laboratory, a gimballed instrument pointing system, and cargo bay pallets for Spacelab 1.[388] The first Spacelab mission succeeded in November 1983, shortly after the Carter administration, and continued for another 21 missions.

These examples, alongside many others, including the International Ultraviolet Explorer (IUE) Satellite, European Communication Satellites, and many other research programs, illustrate how the U.S. pursued a balanced space strategy during

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[386] Sebesta, Lorenza. "The politics of technological cooperation in space: US-European negotiations on the post-Apollo programme." *History and Technology, an International Journal* 11, no. 2 (1994): 317-341. https://www.tandfonline.com/doi/abs/10.1080/07341519408581869.
[387] Sebastia, 1994.
[388] Siebeneichner, Tilmann. "Spacelab: Peace, Progress and European Politics in Outer Space, 1973–85." Limiting Outer Space: Astroculture After Apollo (2018): 259-282. https://link.springer.com/chapter/10.1057/978-1-137-36916-1_11.

the Ford and Carter administrations. With the additional space capabilities contributed by European allies, the U.S. successfully maintained the distribution of relative space capabilities during this period.

7.2.2 Strategic Shifts and Active Balancing Acts: Reagan Administration

However, U.S. space strategy experienced a significant shift in the following decade between 1982 and 1992. This can be attributed to a shift in perception toward the balance of space capabilities among U.S. policymakers. During the late 1970s and early 1980s, there was a growing perception among U.S. policymakers that the Soviet Union was making significant advancements in space and missile technologies, which could potentially threaten U.S. security and global standing.[389] This perception was heightened by the discussed Soviet efforts to develop ASAT capabilities and the observed numerical gap in space activities. As a proponent of expanding defense spending, Reagan's policy stance coincided with this view. Hence, with the 1980 election, there was a perception shift in viewing space capability balance. Consequently, the Reagan administration responded to the perceived changing balance with several measures, namely the development of launch vehicles, expanding international and commercial cooperation, and further militarizing space through the SDI. This section elaborates on each of these measures.

Firstly, for the first time since the end of Apollo, the development of space transportation systems, including launch vehicles and orbiters as crucial components to space capabilities, became a priority in the 1982 national space policy.[390] During the Reagan administration (1981-1989), several significant space transportation

[389] See Stares, Paul B. "Reagan and the ASAT Issue." (1985): 81-94. https://www.jstor.org/stable/24356363.; And Stares, Paul. "US and Soviet Military Space Programs: A Comparative Assessment." *Daedalus* (1985): 127-145. https://www.jstor.org/stable/20024982.; And Cox, Michael. "Whatever Happended to the 'Second' Cold War? Soviet—American Relations: 1980–1988." *Review of International Studies* 16, no. 2 (1990): 155–72. https://doi.org/10.1017/S0260210500112574.

[390] The Whitehouse, "National Security Decision Directive 42: Reagan National Space Policy Fact Sheet", July 4 1982, CSIS Aerospace Security Document Library. https://aerospace.csis.org/nsdd-42-reagan-national-space-policy-fact-sheet/.

systems were developed or advanced as part of this broader strategy to balance against perceived Soviet space capability growth. The Space Shuttle program continued to be central, with orbiters such as Columbia, Challenger, Discovery, and Atlantis conducting numerous missions despite the tragic loss of Challenger in 1986.[391]

The Titan 34D rocket became an essential heavy-lift vehicle for military payloads, while the Atlas-Centaur rocket was used for various commercial and scientific missions.[392] The administration also laid the groundwork for the Delta II launch vehicle, which, although it did not see its first flight until after Reagan left office, directly resulted from the policies established during this period. The Inertial Upper Stage (IUS) was developed to boost payloads from low Earth orbit to geostationary orbit or beyond, supporting military and civilian satellite deployments.[393] Moreover, Reagan's vision for increasing relative space capability included ambitious projects like the National Aerospace Plane (NASP), also known as the X-30, which aimed to develop a single-stage-to-orbit vehicle as a passenger space liner.[394] Most importantly, in his 1984 State of the Union address, he decided to develop a space station, which eventually evolved into the ISS. The permanently manned space station was initially envisioned as the next step for Apollo but stalled due to budget constraints and a lack of political need to push for it. These programs, especially the heavy-lifting launch vehicles and a return to the space station, certainly marked a turn of overall space strategies reminiscent of the Apollo years, which is also reflected in the U.S. space budget. As Figure 10 Clearly shows, between 1982 and 1988, when the Reagan administration had complete control over the budget, the budget for space activities

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[391] Logsdon, John M., Logsdon, and Laddusaw. *Ronald Reagan and the space frontier*. Palgrave Macmillan, 2018., 76-79.
[392] Ibid,256.
[393] Hays, Peter Lang. *Struggling towards space doctrine: US military space plans, programs, and perspectives during the cold war*. Fletcher School of Law and Diplomacy (Tufts University), 1994.,12.
[394] Chase, R., and M. Tang. "A history of the nasp program from the formation of the joint program office to the termination of the hystp scramjet performance demonstration program." In *International Aerospace Planes and Hypersonics Technologies*,6031. 1995. https://doi.org/10.2514/6.1995-6031.

maintained stable growth, with a significant increase in 1988, as a result of the space station, which is clearly stated in the budget submission document.[395]

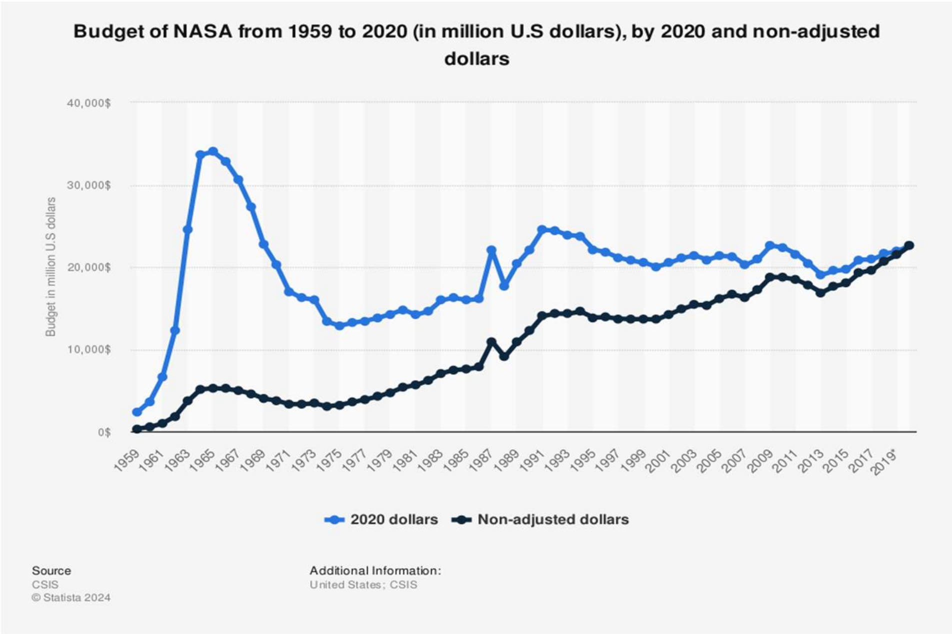

Figure 10 Budget of NASA from 1959 to 2020 (in million U.S dollars), by 2020 and non-adjusted dollars[396]

Secondly, the Reagan administration continued investing in space cooperation through National Security Decision Directive 50. This directive referenced policy decisions made under the previous administrations. It emphasized the benefits of integrating foreign funding in U.S. space programs and the prestige and foreign policy leverage such cooperation provides.[397] Cooperative projects such as the Spacelab and the initial steps for the ISS all reflected this strategic direction.

The administration also encouraged the growth of the commercial space sector through

[395] Congressional Budget Office. *The 1988 Budget and the Future of the NASA Program*. 100th Congress. Washington, D.C.: U.S. Government Printing Office, 1987. https://www.cbo.gov/sites/default/files/100th-congress-1987-1988/reports/doc04a.pdf.

[396] Center for Strategic and International Studies (CSIS). "The History of NASA's Budget." Aerospace Security Project. Accessed September 10, 2023. https://aerospace.csis.org/data/history-nasa-budget-csis/.

[397] The Whitehouse, "National Security Decision Directive 50: Space Assistance and Cooperation Policy", August 6, 1982, CSIS Aerospace Security Document Library. https://aerospace.csis.org/nsdd-50-space-assistance-and-cooperation-policy/.

the passage of the Commercial Space Launch Act (CSLA) of 1984, which aimed to foster private-sector involvement in space activities. The CSLA was an essential piece of legislation that marked the United States' formal entry into the commercialization of space activities, particularly regarding launch services. The Act authorized the licensing of private companies to conduct space launches, which was previously a state-led domain with private-sector support.[398] The reasoning behind the CSLA was clearly stated to increase the launch capability of the U.S., but it was also in line with Reagan's neoliberal economic policies to encourage privatization.

"This administration views facilitating the commercial development of expendable launch vehicles as an important component of America's space transportation program. We expect that a healthy ELV industry, complementing the Government's space transportation system, will produce a stronger, more efficient launch capability for the United States, contributing to continued American leadership in space."[399]

The CSLA significantly bolstered the United States' overall space capabilities by encouraging private sector participation. It diversified the nation's launch options and reduced reliance on government-operated systems, such as the Space Shuttle, which had become increasingly expensive and risk-prone following the Challenger disaster.[400] Moreover, the CSLA allowed the U.S. to maintain and even enhance its launch capabilities in the face of a perceived destabilizing balance in space capabilities. By the late 1980s, American private companies, supported by the framework established by the CSLA, began to offer launch services aimed at being more cost-effective and frequent than the state space apparatus for both domestic and

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[398] See The Whitehouse, "National Security Decision Directive 94: Commercialization of Expendable Launch Vehicles", May 16, 1983, CSIS Aerospace Security Document Library. https://aerospace.csis.org/nsdd-94-commercialization-of-expendable-launch-vehicles/.

[399] Reagan, Ronald. "Statement on Signing the Commercial Space Launch Act." October 30, 1984. Reagan Presidential Library. https://www.reaganlibrary.gov/archives/speech/statement-signing-commercial-space-launch-act.

[400] McLucas, John L. *Space Commerce.* Cambridge, MA: Harvard UP, 1991. P.91.

international clients.[401] In sum, the intention to enhance U.S. space leadership by developing more launch capabilities is clear through investments in new space infrastructures and emphasizing international and commercial cooperation.

Finally, and perhaps the most well-known strategic space program was the SDI. Announced by Reagan in 1983, it was a proposed missile defense system intended to protect the United States from nuclear attacks, particularly from the Soviet Union.[402] SDI envisioned a complex system of ground-based and space-based interceptors, lasers, and other advanced technologies designed to detect, track, and destroy incoming ICBMs.[403] The initiative marked a significant shift in U.S. space strategy from a primarily deterrence-based approach and brought back the gradually fading nuclear focus in the U.S. space program. This program sparked debates within the administration and among congress members, the media, and the policy community.

While the Reagan administration publicly framed the initiative as a technological leap toward deterrence dominance, it faced significant resistance from within the scientific community and Congress. Arms control experts, including former Presidential Science Advisors such as George Keyworth and figures in the Union of Concerned Scientists, cast doubt on the technical feasibility of intercepting ICBMs from space.[404] Congressional budget committees, concerned about federal deficits and the lack of demonstrable progress, responded by curbing funding and mandating oversight mechanisms. As Logsdon notes, the administration was ultimately forced to reframe SDI as a long-term research initiative rather than an immediate deployment program. This concession reflected domestic constraints on executive ambition more than strategic de-escalation.

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[401] Lambright, W. Henry. "Launching commercial space: NASA, cargo, and policy innovation." *Space Policy* 34 (2015): 23-31. https://doi.org/10.1016/j.spacepol.2015.05.005.
[402] Moltz, 2019,191.
[403] Ibid, 192-194.
[404] Logsdon, 2010, pp. 126–129。

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The controversy is understandable due to Reagan's significant budget request of $1.8 billion.[405] The critics of this initiative claimed that there was no need for such a costly program that could quickly destabilize the nuclear deterrence between the U.S. and the Soviet Union.[406] For example, former Secretary of Defence Harold Brown argued that the technological challenges of developing such a multi-layered and high-tech system may be too significant, and the pursuit of such a missile defense system may render the current deterrence strategy based on arms control and restraint less effective and promote a new arms race simultaneously.[407] While much of this restraint can be traced to shifting threat perceptions and strategic calculations, neoclassical realism suggests that internal variables—elite preferences, institutional configurations, and fiscal politics—also filtered how these hegemonic actors interpreted systemic opportunities. Understanding U.S. arms control choices, for instance, requires analysis not only of Soviet capabilities but of domestic bureaucratic disputes and political resistance to militarization at home.[408]

However, these critiques did not change the policymakers in the Whitehouse, and the SDI was re-affirmed in the 1984 National Space Strategy and presented by Reagan himself in 1985. He addressed how the SDI should be presented to Congress, the domestic public, and international allies, and he stated that the core driver for the SDI was to use new deterrence options to handle the increased Soviet offensive and defensive capabilities.[409] Specifically, Reagan's directive indicates a clear perception

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405 Ibid,192.
406 See Jungerman, John A. "The Strategic Defense Initiative: A Critique and Primer." *Institute on Global Conflict and Cooperation* 51, no. 6 (1988): 1273-1299. https://doi.org/10.1080/10357718708444925.; And Blumberg, Avrom A. "The strategic defense initiative: An update and critique." *Global Change, Peace & Security* 1, no. 2 (1989): 75-85. https://doi.org/10.1080/14781158908412713.
407 Brown, Harold. "The strategic defense initiative: Defensive systems and the strategic debate." *Survival* 27, no. 2 (1985): 55-64. https://doi.org/10.1080/00396338508442225.
408 Ripsman, 2016, pp. 43–48
409 The Whitehouse, "National Security Decision Directive 172: Presenting the Strategic Defense Initiative", May 30, 1985, CSIS Aerospace Security Document Library. https://aerospace.csis.org/nsdd-172-presenting-the-strategic-defense-initiative/.

that the balance of space capabilities was shifting in favor of the Soviet Union, particularly in missile and anti-satellite technologies. This perception was fuelled by intelligence reports and analyses suggesting that the Soviet Union was making significant strides in space-based weapons systems, which could threaten U.S. strategic assets and reduce the effectiveness of U.S. nuclear deterrence.[410] By pursuing SDI, Reagan sought to counter this perceived shift by leveraging American technological superiority to regain and maintain strategic advantage in space. Therefore, it can be argued that the SDI was at least presented as a move to counter perceived growing Soviet space capabilities and thus maintain the balance instead of altering it.

Building upon the theoretical framework in Chapter III, the Strategic Defense Initiative (SDI) can be further understood within the context of broader strategic thinking and policy entrepreneurship in domestic U.S. politics. As stated, space strategies are reactive to perceived shifts in the balance of power in space, with states adjusting their approaches to secure or enhance their relative capabilities. Thus, the Reagan administration’s embrace of SDI was not only a response to perceived Soviet advancements in ASAT capabilities but also profoundly influenced by domestic political pressures that could shape perceptions. Specifically, the conservative political environment of the 1980s, characterized by a desire to reassert U.S. dominance after the perceived decline during the 1970s, created a fertile ground for an initiative like SDI. The SDI was seen by the policy community, represented by Secretary of Defense Caspar Weinberger and his team, to regain strategic superiority, reflecting the administration’s concerns that the U.S. was losing its edge in the global power competition.[411] As undersecretary of Defense, Weinberger had access to the

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[410] Prados, John. "The strategic defense initiative: Between strategy, diplomacy and US intelligence estimates." In *The Crisis of Détente in Europe*, 104-116. Routledge, 2008. ISBN: 9780203887165.
[411] Ibid,88.

Whitehouse, particularly National Security Adviser Robert McFarlane, who held a similar view on the need to shift U.S. strategic directions.[412] This resonated with the concern of broader members of U.S. strategic communities that the U.S. was losing its edge.

This perception of the balance of space capabilities, including nuclear capabilities, is quite similar to the dynamics described in Chapter V regarding the "Missile Gap." While the data presented in the previous sections shows that before the announcement of SDI, the relative balance between the U.S. and Soviet space capabilities did not experience a drastic change, it was believed that the U.S. was losing the future distribution. This means that from the perspective of the Reagan administration and hawkish policy entrepreneurs, the U.S. was facing the danger of becoming a declining space power and eventually losing the Cold War. Thus, it is logical to call for more investment into space programs and build new systems to avoid such a scenario.

Therefore, the adoption and promotion of SDI under Reagan can be seen as a clear example of how shifts in perceived relative space capabilities, coupled with domestic political pressures, can lead to significant changes in state space strategy. This case supports the chapter's broader argument that space strategy is highly reactive to changes in international and domestic environments, with states like the U.S. adjusting their approaches to ensure their continued dominance in an increasingly contested domain.

412 Ibid,89.

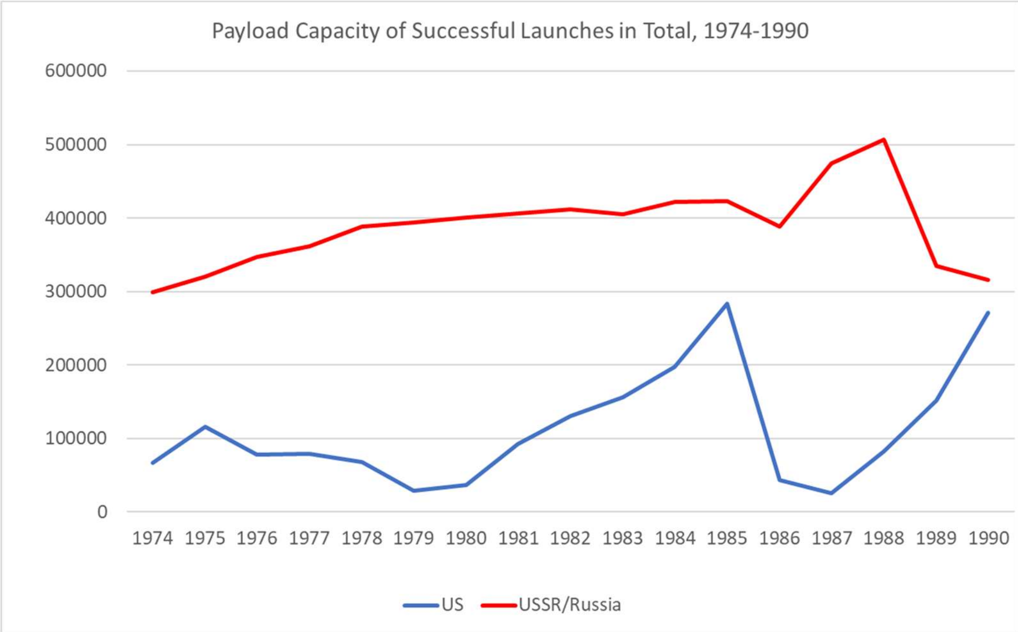

Figure 11 Payload Capacity of Successful Launches in Total, 1974-1990[413]

Regardless, these measures produced significant impacts. As shown in Figure 11, for the first time since the end of Apollo, the U.S. theoretical maximum payload capacity experienced two surges in 1985 and 1989, indicating a much stronger presence in space. As established in previous sections and chapters, due to the technological advantage the U.S. possessed in comparison to the Soviet Union, the U.S. could utilize its space capacities more efficiently. This means the more proactive space strategy the Reagan administration adopted is changing the balance of space capabilities.

In conclusion, the analysis of U.S. space strategy from 1974 to 1989 reveals a significant transition in perception but not actual space capabilities. Evolving U.S. perceptions of the Soviet threat and the broader geopolitical context drove it. The transition from the Ford and Carter administrations' balanced strategy to the more assertive approach under Reagan underscores how external pressures and internal political dynamics shaped U.S. space policy. Essentially, these pressures manifested as an assertive and expansionist strategy aimed at balancing against perceived Soviet

[413] See Appendix.

space capability advantage. This process was caused by changes in policymakers' perceptions and the development of space technologies, consistent with Chapter III's arguments.

These discussions among the political and policy communities in the U.S. eventually culminated in the 1988 National Security Decision Directive 293 (NSDD-293). This document determined the future direction of the U.S. space strategy as a space hegemon, including principles on developing, managing, and using space. These principles are:

"The overall goals of United States space activities are:

> *(1) to strengthen the security of the United States;*
>
> *(2) to obtain scientific, technological, and economic benefits for the general population and to improve the quality of life on Earth through space-related activities;*
>
> *(3) to encourage continuing United States private-sector investment in space and related activities;*
>
> *(4) to promote international cooperative activities taking into account United States national security, foreign policy, scientific, and economic interests;*
>
> *(5) to cooperate with other nations in maintaining the freedom of space for all activities that enhance the security and welfare of mankind; and, as a long-range goal,*
>
> *(6) to expand human presence and activity beyond Earth orbit into the solar system."*[414]

[414] The Whitehouse, "NSDD 293 - Presidential Directive on National Space Policy," February 11, 1988. Federation of American Scientists. https://spp.fas.org/military/docops/national/policy88.htm.

Other than continuing conventional principles, including peaceful use and free access to space, several novelties also exist. Firstly, explicit claims on space as a domain for security have been relatively rare since the Nixon era. Although previous policies acknowledged the national security aspect, NSDD-293 made explicit the need to maintain space superiority as a critical element of national security strategy. This coincided with the SDI and ASAT discussions under Reagan, which re-asserted security at the center of space strategy discourse. The security component of the national space strategy clearly stated that:

"The directive further states that the United States will conduct space activities necessary to national defense. Space activities will contribute to national security objectives by (1) deterring, or if necessary, defending against enemy attack; (2) assuring that forces of hostile nations cannot prevent our use of space; (3) negating, if necessary, hostile space systems; and (4) enhancing operations of the United States and Allied forces. Consistent with treaty obligations, the national security space program shall support such functions as command and control, communications, navigation, environmental monitoring warning, and surveillance (including research and development programs which support these functions)."[415]

These principles, as a final representation of the overall U.S. space strategy under Reagan, paved the way for U.S. space strategy as a space hegemon. In conclusion, the period from 1974 to 1989 highlights a dynamic shift from the limited, balanced strategy since the end of Apollo to the active balancing or even revisionist strategies under Reagan. This shift is caused by both shifts in domestic perceptions among policymakers due to administration turnover and potential shifts in relative space capability distribution caused by growing Soviet technological prowess. The transition from a balanced strategy to a more assertive approach under Reagan underscores how

[415] Ibid.

perceptions of the international balance of power influenced his decision to implement a more competitive space strategy.

7.3 The End of the Cold War and U.S. Space Superiority

The collapse of the Soviet Union in 1991 fundamentally reshaped the geopolitical landscape, including the space domain. With the collapse of its chief competitor, the U.S. found itself in an unprecedented position of hegemony at this unipolar moment. This change in geopolitical dynamics allowed the U.S. to transition from a strategy centered on competition with the Soviet Union to one focused on upholding its hegemony in space. Specifically, the U.S. attempted to do so not by expanding its space programs and further enhancing its space capabilities but through international cooperation and agenda setting. Specifically, U.S. space policymakers faced a completely different distribution of relative space capabilities. Although the new Russian state inherited most of the Soviet Union's space capabilities, the profound impact of the collapse of the Soviet Union decimated its space program. This is very observable in all metrics for space capabilities, such as the ones shown in Graphs 7.5 and 7.6, and this period allowed the U.S. to engage in space activities on its terms, free from the immediate pressures of Cold War competition.

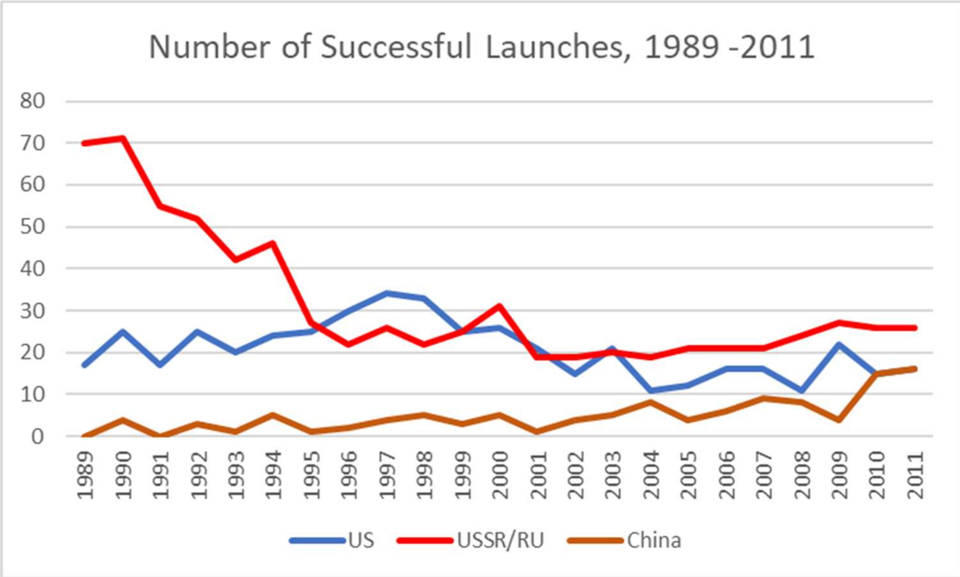

Figure 12 Number of Successful Space Launches, 1989-2011[416]

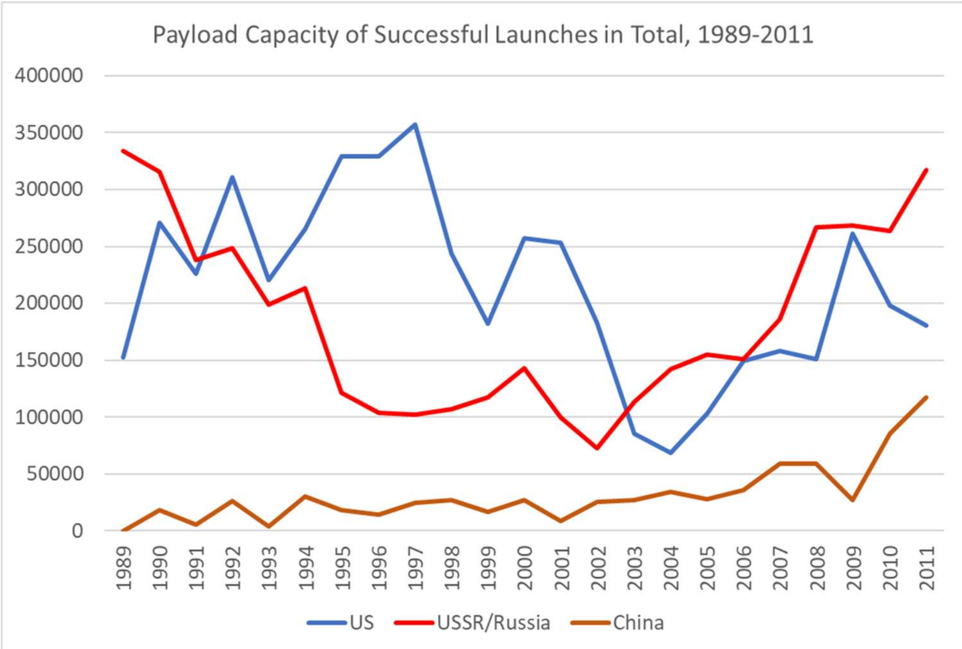

Figure 13 Payload Capacity of Successful Launches in Total, 1989-2011[417]

This is reflected in the series of strategic documents published by the George H W Bush administration between 1989 and 1992 that shaped the United States' space

[416] See Appendix.
[417] See Appendix.

strategy in the post-Cold War era.[418] These documents include NSPD-1 (National Space Policy), NSPD-2 (Commercial Space and Launch Policy), NSPD-3 (U.S. Commercial Space Policy Guidelines), NSPD-4 (National Space Launch Strategy), NSPD-5 (Landsat Remote Sensing Strategy), NSPD-6 (Space Exploration Initiative), and NSPD-7 (Space-Based Global Change Observation). Under previous administrations, space policies and strategies have never been designed in a confirmative and detailed fashion. This further indicated the U.S.'s strategic effort to adapt to the post-Cold War realities.

These policy documents coalesced into a coherent national space strategy by focusing on key themes. They reinforced the U.S.'s commitment to maintaining its leadership in space through enhanced launch capabilities, mainly through commercial space initiatives (NSPD-2 and NSPD-3) and cost-effective space launches. The administration encouraged private sector involvement in space activities, consistent with Reagan's policy. Many of these strategic directions can be considered a continuation of the policies of the Reagan era.[419] The most critical component of the U.S. space strategy from this period was NSPD-4, titled "National Space Launch Strategy."[420] In this crucial document, it was clearly stated that the focus of the U.S. space launch infrastructure should focus on four principles:

"(l) Provide safe and reliable access to, transportation in, and return from space;

(2) Reduce the costs of space transportation and related services, thus encouraging expanded space activities;

(3) Exploit the unique attributes of manned and unmanned launch and recovery systems; and,

[418] See Document Library of CSIS Aerospace Security Archive. https://aerospace.csis.org/documents/.
[419] Moltz, 2019,185.
[420] The Whitehouse, "National Space Launch Strategy", July 10, 1991. CSIS Aerospace Security Document Library. https://aerospace.csis.org/wp-content/uploads/2019/02/NSPD-4-National-Space-Launch-Strategy.pdf.

(4) Encourage, to the maximum extent feasible, the development and growth of U.S. private sector space transportation capabilities which can compete internationally.'[421]

The document then elaborated on the need for new space launch systems, stating that a test of a new launch system needs to be done in Fiscal Year 1993, overseen by the Department of Defense and NASA, and that a 10-year plan for space launch technology development is needed. These plans pushed the test of the reusable Delta Clipper Experimental (DC-X) in 1993 and the birth of the Evolved Expendable Launch Vehicle (EELV) program, which delivered Atlas V and Delta IV and set the foundations for future vehicle development.

Hence, there was a clear drive for further developing U.S. space capabilities, primarily through continued investment into launch system development and support for private launch and other service providers. Cost-effectiveness was still a concern, as stated in NSPD-4; hence, the increase in such investment was not rapid. The U.S. space budget in the 1990s was marked by a stable trend following the high investment of the Apollo era and the subsequent decline in the 1970s. Compared to other periods, the 1990s were notable for maintaining a steady budget for NASA and military space programs but without significant growth relative to prior decades.

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[421] Ibid,1.

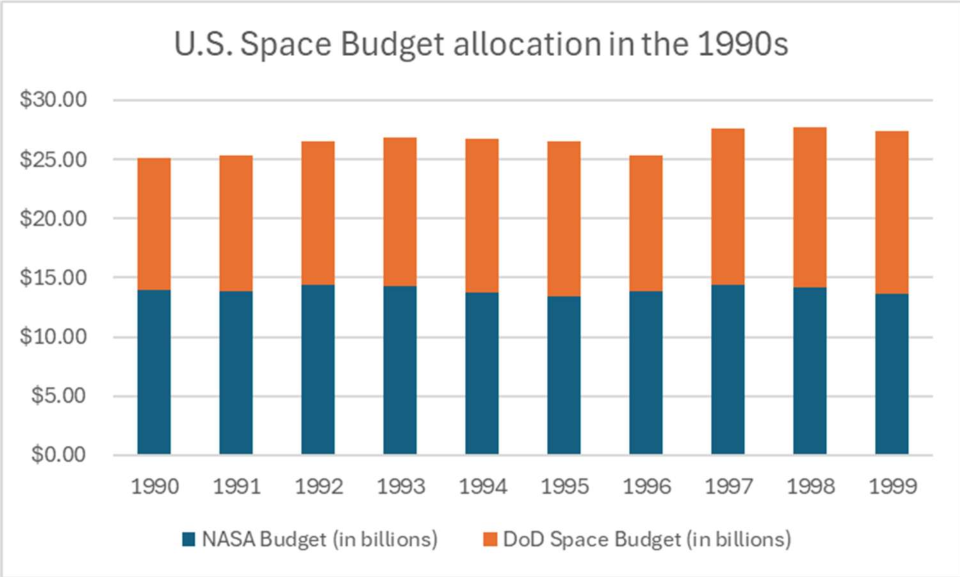

Figure 14 U.S. Space Budget Allocation in the 1990s[422]

Overall, space strategies from this period reflect a desire to expand space capabilities without a sense of urgency compared to the Apollo era. The design of this somewhat restrained strategy can be understood as a lack of external pressure and an optimistic perception of the long-term growth of U.S. space capabilities. Specifically, at this point, there is no clear competitor to the U.S. space capabilities other than a rapidly declining Russian space apparatus and a minimal Chinese space program. Domestically, there was no clear motivation for expanding launch capabilities, but more to gain in further commercialization of space services such as communications networks. Further, the unipolar moment boosted U.S. confidence to a new height, and space is no exception. This is also reflected in the 1996 national space policy of the Clinton administration. This national policy reaffirmed the goal of securing U.S. leadership in space's scientific, security, and economic domains.[423] However, this did not result in an immediate

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[422] Data retrieved from: NASA. "Aeronautics and Space Report of the President." *NASA History Publications and Resources*. Accessed October 2, 2023. https://www.nasa.gov/history/history-publications-and-resources/aeronautics-and-space-report-of-the-president/.; and U.S. Department of Defense, Office of the Under Secretary of Defense (Comptroller). "Budget Materials." Accessed October 2, 2023. https://comptroller.defense.gov/Budget-Materials/.

[423] The Whitehouse, “US National Space Policy”, September 19, 1996. CSIS Aerospace Security Document Library. https://aerospace.csis.org/nsc-49-clinton-us-national-space-policy/.

increase in investment in space. In other words, it was a calculation based on the current distribution of space capabilities and how they perceive the trends of their relative space capabilities. In the case of the Bush administration's space strategy, the end of the Cold War created a unique external environment in which the U.S. sought to solidify its position as the space hegemon.

These ambitions of a space hegemon eventually culminated in the space project that embodied the hegemonic status of the U.S. during this period, which was the ISS. Specifically, the ISS exemplifies the United States' broader strategy to maintain hegemony in space by maintaining a stable distribution of space capabilities in the international system through international cooperation that builds dependent relationships, as discussed in Chapter VI. More specifically, through its leadership in the ISS program, the United States maintains a dominant position, allowing it to dictate the norms of space diplomacy and cooperation while leveraging its technological advantages to enhance soft and structural power. Often viewed as a model of multilateral scientific cooperation, the ISS is an essential tool in the United States' broader geopolitical strategy to maintain dominance in the post-Cold War era.[424] By selectively engaging partners and excluding potential competitors, the United States uses the ISS to consolidate alliances and project global influence, ensuring that the space domain remains a key area of U.S. strategic dominance.

From the outset, the structure of the ISS reinforced the United States' dominance in space. As discussed in the previous section, 1984, U.S. President Ronald Reagan formally announced plans to build a permanently manned space station and invited international partners to join the effort. However, as Reagan's announcement made clear, the United States would lead and control the project, with other nations participating under U.S. guidance. The founding agreement for the ISS, the 1998

[424] Cashman, 2023, 276-302.

Intergovernmental Agreement (IGA), further formalized this somewhat hierarchical structure. For example, the IGA made it clear in Article 3 that the United States, through NASA, would manage and coordinate the station with other cooperating agencies, giving it a leading role in management and operation.[425] It further affirms NASA's leadership role in the ISS program by having the U.S. manage communications services, an essential aspect of space station operations. The United States ensures control over a vital component of the ISS infrastructure. This control reinforces U.S. dominance within the ISS and enables NASA to influence operational decisions throughout the station. Since communications are essential to coordinating scientific experiments, crew safety, and logistics, this provision reinforces the United States' central role in the day-to-day operations of the ISS, thereby supporting its broader geopolitical goals in space.

Empirical evidence of U.S. control over the ISS is also evident in its management and financing structure. As the lead agency for the ISS, NASA provides the majority of funding for the ISS, contributing more than $100 billion since its inception.[426] In contrast, contributions from other partners, such as the European Space Agency (ESA), the Japan Aerospace Exploration Agency (JAXA), and the Canadian Space Agency (CSA), are much smaller, and their participation requires U.S. approval and coordination. This financial gap reinforces U.S. structural power over the ISS because it allows the United States to dictate the terms of cooperation, including which countries can participate and on what terms.[427] In addition, the United States' role as the primary provider of transportation to the ISS, through its space shuttle program

[425] International Space Station Intergovernmental Agreement. *Agreement Among the Government of Canada, Governments of Member States of the European Space Agency, the Government of Japan, the Government of the Russian Federation, and the Government of the United States of America Concerning Cooperation on the Civil International Space Station*, January 29, 1998. https://www.state.gov/wp-content/uploads/2019/02/12927-Multilateral-Space-Station-1.29.1998.pdf.
[426] NASA Office of Inspector General. *NASA's Management of the International Space Station and Efforts to Commercialize Low Earth Orbit*. IG-22-005, November 15, 2021. https://oig.nasa.gov/docs/IG-22-005.pdf.
[427] Margolis, Emily A. "Microgravity, Macro Investment: Overcoming International Space Station Utilization Challenges Through Managerial Innovation." In *NASA Spaceflight: A History of Innovation*, edited by Roger D. Launius and Howard E. McCurdy, 2023.

until 2011 and more recently through partnerships with private companies such as SpaceX, which further emphasizes its leadership role.

Another example of the U.S. space hegemony strategy is China's exclusion from the ISS. China's interest in the ISS began as its space program matured in the late 1990s and early 2000s, following decades of investment in space technology.[428] When China launched its first manned spacecraft, Shenzhou 5, in 2003, China became the third country to achieve independent manned spaceflight after the United States and Russia. This was an essential achievement for China's space programs, and it was then that China expressed interest in joining the International Space Station program. Chinese officials have expressed a willingness to participate in international space efforts, including contributing to the International Space Station, to strengthen international cooperation.[429]

Nonetheless, U.S. concerns prevented China from joining the ISS program despite its expressed interest and proven space capabilities to contribute to the ISS. Given the dual-use nature of many space technologies, the U.S. government has long viewed China's space program closely tied to its military ambitions. Concerns about espionage, technology transfer, and national security led the U.S. Congress to pass the 2011 Wolf Amendment, which explicitly prohibits NASA from entering into bilateral agreements or coordination with China on space projects.[430] Although some international partners, such as Russia and ESA, are willing to engage China in space exploration activities, this change prevents China from participating in the ISS. This exclusion effectively prevents China from cooperating on the ISS, even though China is rapidly developing

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428 Johnson-Freese, Joan. *Space as a Strategic Asset*. Columbia University Press, 2003.
429 Ibid, 13-15.
430 United States Congress. *Department of Defense and Full-Year Continuing Appropriations Act, Public Law 112–10*, Section 539, 125 Stat. 38, April 15, 2011. https://www.congress.gov/112/plaws/publ10/PLAW-112publ10.pdf.

its space capabilities.[431] China's exclusion highlights the strategic nature of U.S. participation in the ISS. While the ISS is conceived as a multilateral scientific endeavor, it consolidates U.S. dominance by preventing emerging powers from acquiring critical space infrastructure and knowledge. Mainly because China was different from Russia as a partner for the ISS in that China's space capabilities had a more positive outlook as an emerging space power while Russia was a declining one.

7.4 Discussion and Conclusion

This chapter traces U.S. space strategies from the 1980s to the early 2010s. By examining strategic shifts in space policy throughout this period, this chapter further underscores the critical role that relative space capabilities and the perception of future technological advancements play in shaping space strategies. The conclusions drawn from this chapter point to fundamental dynamics that illustrate the ascent of the United States as a hegemonic space power and provide a broader understanding of how hegemony functions in the space domain, especially in the absence of conventional territorial or economic control mechanisms. Overall, it provides a case study for the behaviors of hegemons in space and supports all three core assumptions.

The shifts of strategies during this period exemplified the role of domestic constraints in moderating hegemonic ambition. Leadership perceptions of strategic overextension, especially following Vietnam and the Watergate crisis, contributed to bipartisan support for arms control frameworks such as SALT I and the ABM Treaty. These decisions were not solely the outcome of international cost-benefit analysis; they were also responsive to growing Congressional skepticism toward military overreach and

[431] Zhao, Yun. "Legal Issues of China's Possible Participation in the International Space Station: Comparing to the Russian Experience." *Space Policy* 58 (2023): 155–168. https://doi.org/10.1016/j.spacepol.2022.102176.

pressure to formalize limits on emerging space and missile technologies.

Bureaucratic politics further complicated the U.S. strategy. Internal divisions between the Whitehouse and different departments and expert communities on the SDI also shaped the shifts of space strategies under Reagan. As traced in this chapter, key scientific advisors and members of Congress raised concerns about its technical feasibility, fiscal sustainability, and destabilizing strategic implications. Within the Reagan administration itself, senior figures such as George Shultz and Paul Nitze sought to frame SDI less as an operational project and more as a bargaining instrument in arms control negotiations.

Fiscal constraints also played a significant role in shaping U.S. strategic choices during the Cold War arms control period. Throughout the late 1960s and 1970s, mounting budgetary pressure driven by the costs of the Vietnam War, rising domestic welfare costs, and inflation began to take a toll. As a result, the notion of extensive defense expansion became less viable politically. Lawmakers increasingly recognized that large-scale modernization efforts, such as anti-ballistic missile systems and advanced reconnaissance initiatives, were financially burdensome and risked destabilizing global security.

Overall, empirical evidence in this chapter supports all three hypotheses outlined in Chapter III. Specifically, at the heart of the strategic shifts towards hegemony in space observed in this chapter is the idea of the United States' growing relative space capabilities, particularly after the collapse of the Soviet Union. As detailed in earlier chapters, the U.S. gradually gained an advantage in key areas of space technology, such as satellite communications, reconnaissance systems, and advanced launch technologies, which allowed it to successfully maintain a fluid balance with the Soviet Union even when the intensity of space activities dropped after the success of the Apollo landing on the moon. The U.S. further improved its space technologies throughout the rest of the Cold War, focusing on the cost-effectiveness of space programs, exemplified by the space shuttle program, due to domestic economic constraints.

Nonetheless, the U.S. still responded to perceived Soviet attempts to develop space technologies that could disrupt the distribution of space capability balance, namely ASAT technology, and intentions to develop more capable launch vehicles. The response was Reagan's famous SDI program. As a space-based missile defense program, it worked per other initiatives to promote overall space capabilities, particularly commercializing space launch services and re-investing new launch vehicles. These strategic choices align with the predictions of Hypothesis 1. Specifically, for hypothesis 1, both commercialization and development of better launch vehicles aimed at improving U.S. access to space in support of SDI, which ensures the survivability of space assets and overall missile defense. This is a typical case of the dual-use nature of space, as well as space powers' sensitivity to changes in relative space capabilities.

Since the end of the Cold War, the U.S. has faced a situation in which its relative space capabilities have increased significantly due to the collapse of the Soviet Union. Since it perceives no real challenger to its status as the dominant actor in space, it sought to maintain such status through large-scale space infrastructures such as the ISS. This provides further support to both hypotheses 2 and 3. Hypothesis 2 posits that space actors adjust their strategies based on the distribution of space capabilities, with cooperation becoming more likely when the distribution is stable.

While such stable distribution can be achieved through parity, it could also be achieved through hegemonic stability. Hegemonic Stability Theory argues that international order and stability are most likely to be maintained when a single dominant power, or hegemon, provides leadership and enforces the rules of the international system, ensuring cooperation and reducing conflict.[432] This could also be applied here to space strategies. The ISS exemplifies this dynamic by showcasing how space powers, most notably the United States and Russia (elaborated in Chapter IX), chose cooperation over competition when the potential for long-term mutual benefits was evident, and Russia cannot easily change the distribution of space capabilities. However, when faced with China's growing space capabilities and the continuous rise of space power, the U.S. chose to exclude it from the stable order it had constructed.

Deriving from this conclusion, one of the key broader conclusions of Chapter VII is that the nature of hegemony in space differs significantly from traditional terrestrial hegemony. As the chapter highlights, space is characterized by its vastness, lack of clear territorial boundaries, and the dual-use nature of many space technologies. These unique characteristics mean that space hegemony is not about controlling territory or resources traditionally but rather about controlling access to space and the global infrastructure that depends on it. Hegemonic space powers like the U.S. wield influence by maintaining technological superiority and shaping the rules and norms of space activity.

This conclusion also fits with the assumptions laid out in Chapter III, which argue that hegemonic space powers derive their influence from their ability to deny access to space to other actors while securing their access. The U.S.'s ability to set the agenda for international space cooperation, exemplified by its leadership in the International Space Station (ISS) and its exclusion of China from certain space partnerships, illustrates how space hegemony operates. By controlling key technologies and establishing international norms that benefit its strategic interests, the U.S. has maintained its position at the top of the space power hierarchy.

In conclusion, Chapter VII reaffirms the central argument of this dissertation: that

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[432] Gilpin, Robert. *War and Change in World Politics*. Cambridge: Cambridge University Press, 1981.

relative space capabilities and the perception of future space capabilities are the key variables driving strategic shifts in space policy. The U.S. ascent to hegemonic status during the unipolar moment was driven by its ability to capitalize on its growing technological advantage while anticipating and preparing for future challenges. This chapter also expands the concept of space hegemony, showing that it operates differently from terrestrial forms of power and that the unique characteristics of the space environment shape it. This chapter has shown that hegemonic restraint in the U.S. case, and cooperative overtures in the Soviet case, were not solely the product of systemic conditions such as power concentration or technological parity. They were filtered through political debates, fiscal pressure, and bureaucratic coalitions within each state. The decision to limit ASAT deployment or constrain space-based missile defense, for instance, reflected not only realist prudence but also domestic constraints on executive ambition. Neoclassical realism thus clarifies how the internal balance of preferences and institutions shapes when and how dominant powers accept self-binding strategic limits.

Chapter VIII China's Rise as a Space Power: from Pragmatic Space Power to Revisionist Space Power

8.1 Introduction

China's rise as a great power has been extensively discussed in the current literature, and space is a critical component of China's overall capabilities, as a great power is a subfield that requires more attention. China's space program has undergone a significant transformation, from a pragmatic space power since the 1956s to an emerging space power around 1992, and then transforming towards a revisionist space power around 2011. China's early space activities were initially aimed at achieving technological parity with space powers such as the United States and the Soviet Union for its own scientific and defense needs, and space exploration was seen as a by-product of the broader rocket development efforts, focused primarily on national defense, satellite technology, and ground infrastructure construction.[433] However, since the 1990s, China's space policy has gradually expanded to reflect not only its scientific and technological ambitions but also its strategic intention to exert influence in global space governance and challenge the dominance of the U.S. as the leading space power.

This chapter traces China's transformation from a pragmatic space power to an emerging space power, exploring the decision-making process behind the creation of China's space program. Specifically, there was a clear shift in priorities in China's space strategy, especially around the late 1980s and the 2010s. China's early space ambitions, which started in the 1950s, were marked by pragmatic goals, such as launching communication satellites and developing basic spaceflight capabilities. However, there was a significant increase in space efforts in the late 1980s and early

[433] Harvey, Brian. *China's space program: from conception to manned spaceflight*. New York: Springer, 2004.

1990s, exemplified by the “863 Program”. The 863 Program was a vast state program designed to track and develop advanced technologies in various scientific fields.[434] Space technology and space science were listed as its second most significant component. The goals proposed for space in the 863 Program were similar to that of the U.S. as an emerging space power, which included heavy investment in launch vehicles and later a crewed space program (921 program) aimed at putting Chinese Taikonauts on other celestial bodies, alongside many other space technologies.[435] This part of Chinese space history is highly relevant to understanding modern Chinese space strategies since the institutional reforms and planning in the 1990s laid the foundations for the success of the Chinese space program in the 21st century. However, this is usually an overlooked period in literature. Hence, this chapter aims to provide an analysis of why China made such a shift in its space strategies.

Further, in the 2010s, China’s space program saw another expansion after a few successful crewed space missions. China has expanded its space infrastructure significantly in fields such as ASAT capabilities, Earth observation, navigation, lunar and Mars exploration, and ample space infrastructures such as the Chinese Space Station (CSS) program. It was also around this time that China started to expand the scale and approaches to international cooperation in space and wield space as a soft power in its domestic and foreign policies.[436] The rapid expansion is usually attributed to China’s rapid economic growth.[437] While this claim is valid, it does not reflect the whole dynamic in the Chinese space strategy transition, especially not explaining China’s increased efforts in more competitive space strategies. Specifically, a simple

[434] Zhang, Zhihui. "Space Science in China: A Historical Perspective on Chinese Policy 1957–2020 and Policy Implication." *Space Policy* 58 (2021): 101449.
[435] Yuan, Jianping, Yang Yu, Yang Gao, Hengnian Li, Weihua Ma, Xin Ning, Geshi Tang et al. "Three decades of progress in China’s space High-Tech Program empowered by modern astrodynamics." *REACH* 5 (2017): 1-8.
[436] Zhang, 2021.; and Drozhashchikh, Evgeniia. "China’s National Space Program and the “China Dream”." *Astropolitics* 16, no. 3 (2018): 175-186.
[437] Cheng, Dean. "China’s Space Program: A Growing Factor in US Security Planning." *The Heritage Foundation Accessed February* 6 (2011).

increase in Chinese overall economic prowess does not lead to a competitive space strategy that aims to establish leadership in space. Instead of a more cooperative space environment, the competition between China and the U.S. as space powers also shifted Chinese space strategies in a more competitive direction.

Based on the theoretical framework provided in Chapter III, we argue that shifts in relative space capabilities and perceptions of future relative capabilities mainly drove both shifts. The international balance of power did not solely drive these shifts. Internal political leadership, institutional consolidation, and strategic industrial planning have played a decisive role in enabling China to respond coherently to evolving constraints. This chapter is divided into three main sections to elaborate on this argument. Section 8.2 focuses on the historical overview of China's space program, providing a timeline and essential facts to understand the subject of investigation. Section 8.3 provides an in-depth analysis of the first shift of the Chinese space program from a pragmatic space power to an emerging space power around the 1990s. In comparison, section 8.4 investigates the Chinese shift towards a revisionist space power since the 2010s. Finally, section 8.5 will discuss the impact of Chinese space strategic shifts and their geopolitical implications.

8.2 A Brief Historical Review of China’s Space Program: 1956 - 1986

The development of China’s space program demonstrates how a pragmatic space power with limited capabilities overcame technical constraints, political pressures, and strategic requirements to become a capable player in space exploration gradually. From the 1950s to the late 1980s, China’s space policy was characterized primarily by focused strategic planning, extreme caution and secrecy, and a focus on incremental development. This period established vital policies and institutions that shaped China’s space future, such as early efforts in rockets and satellites, the integration of dual-use technologies, and the development of space assets and supporting infrastructure that matched China's space needs.[438] The culmination of this period was the launch of Project 863 in 1986, signaling China's intention to further develop its space capabilities into a more capable space power. This section examines China's entire space program from its inception to 1986, outlining major development stages and how to view China's space program during this period.

China's space ambitions were born in the geopolitical context of the Cold War and were initially driven by military needs. Like other spacefaring nations, China sought to develop its space capabilities due to a strategic need to develop rocket technology that could be used for both military and civilian purposes. The development of China's space industry is directly related to establishing the Fifth Research Institute of the Ministry of National Defense in 1956, which was responsible for rocket and missile technology research and development.[439] Qian Xuesen (钱学森), a Chinese scientist who was a world-leading expert on rocket and missile technologies, played an essential role in developing China's early space industry. Qian's experience working on the U.S. space program, coupled with the significant political support of the Chinese government, laid the foundation for China's space program.

In 1956, Qian submitted a report titled "Opinion on Establishing my country's National Defense Aviation Industry" (建立我国国防航空工业意见书).[440] This document aggregated the development of crucial aviation industry and missile efforts into one overarching program, and he proposed establishing a governing institution to oversee this effort. As he proposed, this institution should be put under the supervision of the Ministry of Defense and should include personnel with scientific, engineering, military,

438 Moltz, 2019.
439 Harvey, 2004.
440 Wang, Wenxiu "A historical review of China's independent development of cutting-edge national defense technology." *Military History* 005 (2014): 42-47.[王文秀. "中国独立自主发展国防尖端技术的历史回顾." *军事历史* 005 (2014): 42-47.] http://hprc.cssn.cn/gsyj/gfs/zggf/201504/P020180413578257526443.pdf.

and political backgrounds.[441] This gave birth to The Fifth Research Institute of the Ministry of Defense (国防部第五研究院), with Marshal Nie Rongzhen (聂荣臻) overseeing it as the head of the Aviation Industry Committee, and Qian as the head and chief engineer of the institute.[442] The Fifth Research Institute is often considered the first dedicated Chinese institute to research space technology. It was a highly militarized and secret project that drew on the best minds of all sectors in China. In comparison to the inception of the U.S. and Soviet space programs, the Chinese space program has been more centralized and militarized from the beginning due to the urgent need to establish its missile capabilities in the wake of the Korean War.

However, during the 1950s, China was highly dependent on Soviet expertise and technological aids, with early collaboration in missile technology being a key feature of Sino-Soviet relations. The Soviet Union provided significant technical assistance, training, and equipment, accelerating China’s missile/rocket development.[443] For example, in 1957, Khrushchev sent several R-2 ballistic missiles to China as a part of the New Defense Technical Accord of 1957.[444] This was the first time China had access to actual ballistic missiles. China obtained these R-2s, which were researched extensively, successfully replicated the R-2 missile, and renamed it “Dong Feng-1” (DF-1).[445] However, the Sino-Soviet split in the early 1960s severed this cooperation, forcing China to rely on its indigenous capabilities. Nonetheless, after a failed launch in 1962, Qian and his team finally successfully replicated the Soviet P-2 missile and launched it successfully in 1964. It was named “Dong Feng-2” (DF-2).[446] Following

[441] Ibid.
[442] Yan, Hui, “A Study on the Construction of National Defense Leadership and National Defense Science and Technology Industry Management System with Chinese Characteristics”, *National Defense* 5 (2017). [颜慧. "中国特色国防领导和国防科技工业管理体制建设初探." *国防* 5 (2017).] http://hprc.org.cn/gsyj/gfs/gfzcs/201712/P020180416412130682189.pdf.
[443] Shen, Zhihua, and Yafeng Xia. "Between aid and restriction: the Soviet Union's changing policies on China's nuclear weapons program, 1954-1960." *Asian Perspective* 36, no. 1 (2012): 95-122.
[444] Zumwalt, James. "China in Space: The Great Leap Forward." *Strategic Review* 28, no. 4 (2000). Accessed November 4, 2023. https://ciaotest.cc.columbia.edu/olj/sa/sa_oct00zum01.html.
[445] Wang, 2014.
[446] Ibid.

the success of the Dong Feng series of ballistic missiles, the first launch vehicle of China, Longmarch-1, started its research in 1965.[447]

Compared to the space program of the major space powers in the 1960s, the Chinese space program was highly pragmatic. Due to technological constraints, Chinese political leadership did not decide to pursue advanced goals such as conducting crewed missions. Instead, the goal was to launch the first artificial satellite after the Soviet Union and the United States, dubbed the "651 Program".[448] This effort succeeded on April 24th, 1970, with the first Chinese satellite, "Dong Fang Hong-1" (DFH-1), successfully launched into orbit with the Long March-1 rocket.[449] This success made China the fifth nation to successfully launch a satellite into space, following the Soviet Union, the United States, France, and Japan. The satellite's scientific and technological contributions were secondary to its symbolic value, as the launch was more about demonstrating China's space capability than advancing scientific research and a propaganda effort to boost Chinese political ideology.[450]

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447 Handberg and Li, 2006., 66-67.

448 Chinese Academy of Sciences, National Space Science Center. "Birth of the First Chinese Artificial Satellite 中国第一颗人造地球卫星的诞生." *National Space Science Center*. Initially published August 1999, lst modified September 6, 2016. Accessed November 14, 2023. http://www.nssc.cas.cn/ztzl2015/zgkjkxzl2015/jnwj/201609/t20160906_4659280.html.

449 Ibid.

450 Handberg and Li, 2006.,68.

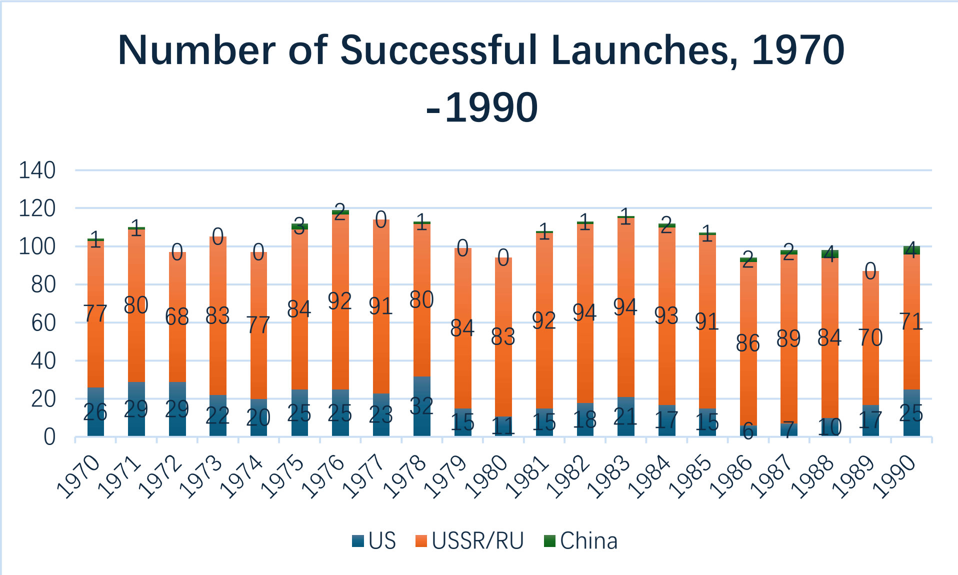

Figure 15 Number of Successful Launches, 1970-1990[451]

In the late 1960s and 1970s, China continued to develop its space program despite domestic upheavals, such as the Cultural Revolution (1966-1976), which disrupted many aspects of Chinese society, including its scientific community. Despite the political and social turmoil, space research was somewhat protected due to its importance to national security. The Long March rocket program continued to receive state support, and China launched a series of communication and weather satellites in the following years.[452] However, these satellites were relatively rudimentary, mainly focused on improving China's telecommunication and weather monitoring capabilities, reflecting the pragmatic aspect of China's space program during this period.

8.3 China's Transformation to an Emerging Space Power

The launch of the 863 Program in March 1986 marked an important turning point in China's scientific and technological development, especially in space exploration. Named after its formulation date, March 1986 (86/3), the program was designed to

[451] See Appendix.
[452] Harvey, 2004.

accelerate domestic innovation in advanced technology and reduce China's dependence on foreign technology.[453] Its goals covered many areas, including biotechnology, information technology, energy, and space. In addition to Project 863, various related programs have expanded China's space ambitions. Notably, Project 921, approved in 1992, aimed primarily at manned space flight, especially sending Chinese astronauts into space in the early 2000s.[454] The launch of these programs marked a clear shift in China's space strategy, from a pragmatic strategy focused on developing basic satellite and rocket capabilities to a more expansive strategy aimed at building advanced independent space capabilities. Project 863 differed from the early stages of China's space program in the 1950s and 1960s, which relied heavily on Soviet technology by focusing on indigenous technological innovations. A combination of technological, strategic, and geopolitical factors guided these changes.

This new direction differs greatly from the security-centric space program during the Cold War. The timing of strategic shifts in China's space policy at this point can be better understood through China's relative space capabilities and trends in future capabilities. As explained in Chapter III, space powers tend to change their strategies when they perceive changes in the relative capabilities of their competitors. For China, the late 1980s and early 1990s were a period of great geopolitical and domestic change, especially as China assessed the potential impact of U.S. strategic defense initiatives such as the SDI.[455] Although the SDI project has been criticized for its technical limitations and high cost, its existence has also raised concerns in Beijing.

This is reflected in the memoirs of Zhang Jinfu (张劲夫), a high-ranking Chinese government official who was also deeply involved in the Chinese space program

[453] Cheung, Tai Ming. *Fortifying China: The struggle to build a modern defense economy*. Cornell University Press, 2013.,56.
[454] Yuan et al, 2017., 4-5.
[455] Moltz, 2019.,134.

throughout his political career.[456] He wrote in 1999, recalling the announcement of the SDI and gave a detailed recount of the decision-making process:

"In 1983, U.S. President Reagan announced the implementation of the Strategic Defense Initiative (SDI), which shocked the world and was called the "Star Wars Plan". It was aimed at the strategic intercontinental nuclear missiles of the former Soviet Union to form a strategic defense deterrence system... This will enable the United States to maintain its leading position in high technology in the face of strong challenges in Western Europe and Japan. Indeed, in the era of world hegemony competition, high technology is the battlefield of strength competition. For this reason, all advanced industrial countries felt this initiative could not be taken lightly. Western European countries jointly proposed the 'Eureka Plan' to develop high technology, Japan has also taken measures to develop high technology, and the former Soviet Union, under President Reagan's tough attitude of insisting on SDI, has proposed measures to develop high technology in addition to taking strategic measures.

What should we do? If we do not take corresponding countermeasures, it will be difficult to maintain the world-renowned national prestige advantage formed by atomic bombs, hydrogen bombs, missiles, and space technology after unremitting efforts in recent years, which will inevitably affect my country's national defense construction and international status. In response to this situation, the National Defense Science and Technology Commission held an expert symposium to analyze the military significance of the U.S. Strategic Defense Initiative and its impact on the world pattern. It analyzed the key technical issues and their reality. It is believed that according to my country's economic strength, in terms of the scale of developing national defense high technology, it cannot be compared with the United States and the Soviet Union. However, like when we developed atomic bombs, missiles, and

[456] People's Daily, "Zhang Jinfu: An Excellent Model of a Communist Party Member." *People's Daily*, February 26, 2013. http://cpc.people.com.cn/daohang/n/2013/0226/c357263-20607265.html.

satellites, we emphasized the word 'have.' That is, we don't care about the quantity, but we must have. Therefore, a consensus was formed at the symposium: we must have limited goals, highlight key points, and carry out high-tech tracking, and the results achieved must also have the effect of driving the whole area. In this way, the cost is only 2% or 3% of that of the United States, but we can maintain my country's international status and influence the balance between the two hegemons."[457]

However, the abrupt end of the Cold War meant that there was another shift in relative space capabilities, as well as shifting interests in space. Specifically, before the 1990s, China's space program was characterized by pragmaticism aimed at obtaining key technologies under severe technological and resource restrictions. However, with the launch of Project 863, China began to invest heavily in developing its technology to improve its space launch capability. This included the continued development of the Long March series of rockets, which would play a key role in ensuring China's ability to independently launch various space assets for a much wider range of missions. In other words, China sought to expand its space program by expanding its space launch capabilities.

Nonetheless, this did not mean the security interests in space disappeared. On the contrary, the Third Taiwan Strait Crisis in 1996 and the First Gulf War shocked Chinese leaders regarding the gap in space capabilities and the role space played in military conflict. During the 1990s, China, like many other countries, used the US-managed GPS for various military purposes, including missile guidance, navigation, and precision targeting. However, China's heavy reliance on U.S. GPS exposed its vulnerabilities during the Taiwan Strait crisis. Given the U.S. strategic interest in supporting Taiwan during the crisis, there was a real risk that the U.S. would deny

[457] Zhang, Jinfu, "请历史记住他们——中国科学家与"两弹一星" [Let history remember them: Chinese scientists and the "two bombs and one satellite"] Jinan University Press, (1999).

China access to GPS signals or limit the accuracy of its services during a major conflict, undermining China's military effectiveness.[458] Thus, The Chinese leaders steeled their resolve to develop their navigation system and ensure independent access to crucial space technology.

The institutional structures of the Chinese space program in the 1990s also signaled a significant space strategy shift. In the early 1990s, China's aerospace industry underwent major institutional reforms, which played a key role in driving China's strategic planning. One of the most significant changes was the establishment in 1993 of the China National Aviation Administration (CNSA) in 1993 and the China Aerospace Science and Technology Corporation (CASC) in 1999. The CNSA was established to oversee China's civilian space program and assumes similar functions to NASA in the United States. The move was part of broader economic and technological reforms aimed at modernizing China's state-owned industries and separating civilian space activities from military oversight.[459] The CNSA is responsible for planning and executing space missions, such as satellite launches, manned spaceflight, and lunar exploration programs. This institutional engagement also served domestic purposes: it legitimized China's leadership's political commitment to peaceful development while reinforcing bureaucratic cohesion between CNSA and the Ministry of Foreign Affairs.

On the other hand, the CASC reformed into a commercialized corporation from the Fifth Research Institute and other institutions, is responsible for developing and commercializing space technologies, such as rockets, satellites, and related

[458] Fisher Jr, Richard D. "“One China” and the Military Balance on the Taiwan Strait." In *The “One China” Dilemma*, 217-256. New York: Palgrave Macmillan US, 2008., 220-222.
[459] China National Space Administration. "《中国的航天》白皮书**(2000 年版)** " Chinese Aerospace Whitepaper (2000 version)]. Last modified April 24, 2020. Accessed April 4, 2024. Available at: https://www.cnsa.gov.cn/n6758824/n6758845/c10006693/content.html.

hardware.[460] This organizational restructuring reflects China's growing commitment to expanding its independent space capabilities and entering the global market. The reforms allow for more efficient management of resources and projects while distinguishing between civilian and military space activities. The role of the China Aerospace Science and Technology Corporation in commercializing space technologies has also facilitated China's entry into the international satellite launch market. By providing launch services to international customers using the Long March series of rockets, these changes are essential to propelling China's transformation from a realistic defense-oriented space program to a more ambitious and strategically motivated space programs.[461] Combining a separation of roles with a clear focus on domestic innovation will help China achieve its goal of self-reliance in space technology, reduce its dependence on foreign expertise, and cement its position as the world's leading space power.

Besides the CNSA and the CASC serving as the more civilian wings of the Chinese space program, the 921 Program remained a military program publicly known as the China Manned Space Program (CMS).[462] The CMS aimed to develop human spaceflight capabilities and establish a long-term human presence in space. The program operates under a three-step strategy: first, sending astronauts into space and returning them safely; second, achieving spacewalks and docking technologies; and third, constructing a modular space station.[463] Key achievements include the Shenzhou missions since 2003, which successfully sent Chinese astronauts into space, and the construction of the Tiangong Space Station which completed in 2021[464]. The

[460] China Aerospace Science and Technology Corporation. "航天科技集团简介" [Introduction to the China Aerospace Science and Technology Corporation]. Available at: https://www.spacechina.com/n25/n142/n152/n174/index.html.
[461] China National Space Administration, 2000.
[462] China Manned Space Engineering Office. "中国载人航天工程简介" [Introduction to the China Manned Space Program]. https://www.cmse.gov.cn/gygc/gcjj/.
[463] Ibid.
[464] China National Space Administration, 2021.

CMS represents a critical component of China's broader space strategy.

With this set up of a three-pronged space program, the Chinese space program transformed from a highly centralized and military-focused space program into a more comprehensive one resembling the U.S. space program. These shifts culminated in the first Chinese space policy whitepaper in 2000.[465] This whitepaper states that a commitment to peaceful exploration, innovation, and international cooperation drives the Chinese space program. Key goals include advancing China's space capabilities to ensure self-reliance in space technology, promoting economic and scientific development, and enhancing national security.[466] The program is committed to fostering innovation in critical areas such as satellite communications, human spaceflight, and deep-space exploration. Additionally, China claims to maintain peaceful use of outer space, prevent its militarization, and contribute to the global governance of space activities. A core principle that could be identified is the pursuit of wider international cooperation. In its policy documents, China stated its goals to share the benefits of space exploration with the international community and engage in joint projects with other space-faring nations.[467]

From this point forward, China has achieved steady growth in space capabilities in critical metrics and significant milestones such as crewed space flight and sending probes and rovers to other celestial bodies. The growth continued until the late 2000s and early 2010, culminating in two significant events that sparked another shift in space strategy: the direct-fire ASAT test in 2007 and the successful launch of the Tiangong-1 space station module in 2011. Additionally, China established retrieval of moon samples in 2011; if successful, it would make China the second country to do

[465] China National Space Administration, 2000.
[466] Ibid.
[467] Ibid.

so.[468] Both events signaled significant capabilities and perceived intentions to alter the distribution of space capabilities, which sparked a response from the U.S. Specifically, the former ASAT test demonstrated the Chinese capability to destroy space assets and deny adversaries access to critical space assets. The Tiangon-1 signaled the Chinese desire and ability to deploy significant space station assets, further pushing the Chinese space program to develop more powerful space launch vehicles.

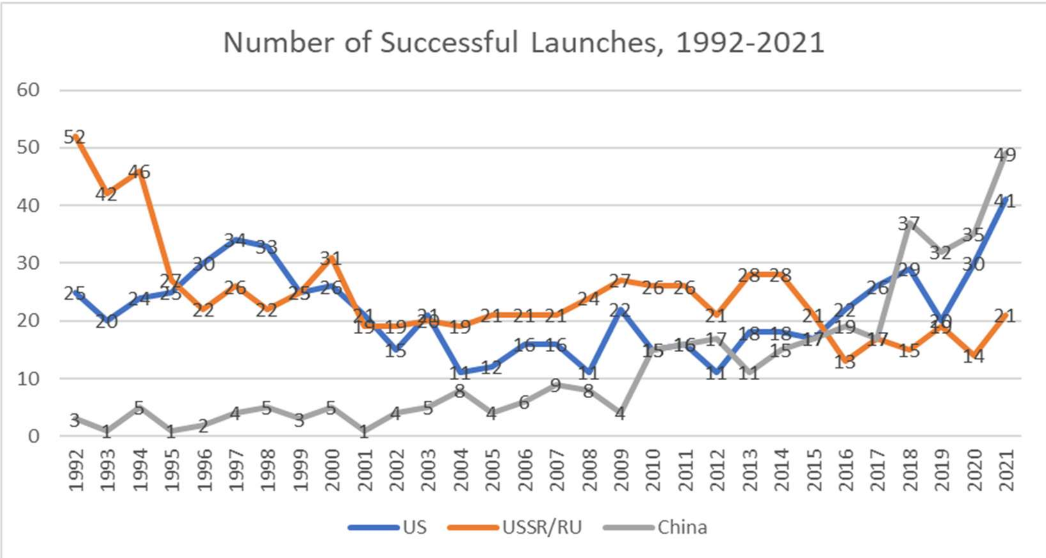

Figure 16 Number of successful launches, 1992–2021[469]

[468] China National Space Administration. "中国探月工程的总体规划 [Overall Plan of China's Lunar Exploration Program]." CNSA, March 26, 2015. https://www.cnsa.gov.cn/n6758824/n6759009/n6759040/c6780422/content.html.
[469] See Appendix.

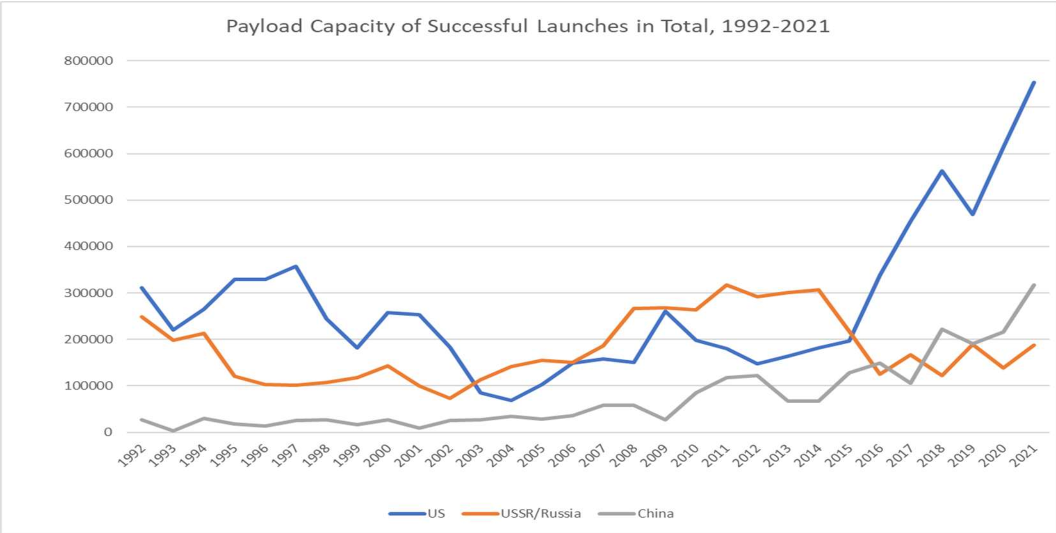

Figure 17 Maximum payload capacity of all successful launches, 1992-2021[470]

The growth of Chinese capabilities is more observable in terms of several key metrics of space capabilities, as shown in Figures 16 and 17. China reached parity with the U.S. in 2011 regarding the number of successful launches. In terms of the maximum payload capacity of all successful launches combined, while the U.S. still had a lead, the gap for this metric also reached the closest point in 2012. Simultaneously, the 2011 Chinese Aerospace Whitepaper announced significant breakthroughs in the development of a new generation of space launch vehicles,[471] which was later revealed to be the Long March-5 heavy-lifting rocket with a Low-Earth Orbit Payload capacity of 25 metric tons (later improved version reached 32 metric tons).[472] In comparison, Long March-5's payload capacity was equivalent to Delta IV Heavy of the U.S. and Ariane 5 ECA of the ESA.[473] Although Long March-5 did not see successful launch missions until 2016, various rocket tests and the design's

[470] See Appendix.
[471] China National Space Administration. "**《2011 年中国的航天》白皮书**" [Chinese 2011 Aerospace Whitepaper], December 29, 2011. https://www.cnsa.gov.cn/n6758824/n6758845/c6772478/content.html.
[472] China National Space Administration. "**《2016 年中国的航天》白皮书**" [Chinese 2016 Aerospace Whitepaper], December 29, 2016. https://www.cnsa.gov.cn/n6758824/n6758845/c6772477/content.html.
[473] See United Launch Alliance. "Delta IV Heavy Launch Vehicle." United Launch Alliance, 2011. https://www.ulalaunch.com/rockets/delta-iv.; and Arianespace. "Ariane 5 ECA User's Manual Issue 5 Revision 0." Arianespace, 2011. https://www.arianespace.com/launch-services/ariane-5-eca/.

performance indicators were publicly available much earlier than in 2011.[474] Hence, 2007-2011 marked another significant shift in Chinese space capabilities and the outside perception of its future capabilities.

Therefore, by 2011, China reached parity with the U.S. regarding its overall space capabilities, especially its launch capabilities, and its payload capacity also reached close parity with the U.S. as well in 2012, as shown in Graph. 3.8. For the Chinese space apparatus and outside observers, there was no reason to predict that Chinese space capability growth would stop, considering the number of planned projects, including the BeiDou navigation system, lunar and Mars missions, and the already tested space station missions. With a balanced distribution of space capabilities and a positive perception of its future growth, China started its transformation into a revisionist space power, which sparked a fierce response from the U.S. as the space hegemon.

8.4 Moving Towards a Revisionist Space Strategy and a New Space Race

Chapter III defined a revisionist space power as a space actor with balanced capabilities that perceives an opportunity to increase its relative position due to a positive outlook of its future relative space capabilities. These space powers might adopt competitive strategies, such as expanding new space assets or pursuing expansionist policies to shift the balance of power in their favor. They might challenge existing norms or seek to establish new ones that reflect their growing capabilities. In the case of space and Chinese space strategies, this has also been observable since 2011, as its space capabilities started to grow significantly and engage more actively

[474] Wang, Lei, and Zhang, Xiangjun. "General Technical Review of Long March 5 Liquid Oxygen Kerosene Engine." *Journal of Deep Space Exploration* 8, no. 1 (2021): 3–16. https://doi.org/10.15982/j.issn.2096-9287.2021.20210003.

in global space governance and space diplomacy. This challenges the existing space hegemon, the United States, and the relatively hierarchical cooperation system it had constructed since the end of the Cold War. Consequently, the U.S. responded quickly with a series of measures, the most influential being the Wolf Amendment.

8.4.1 The Wolf Amendment and the U.S. Response to Chinese Space Capability Growth

The Wolf Amendment, introduced by U.S. Representative Frank Wolf in 2011, prohibits NASA, the White House Office of Science and Technology Policy (OSTP), and the National Science Foundation (NSF) from working directly bilaterally with China.[475] It is a regulation of U.S. law. office. The amendment has been added to the annual federal budget since its enactment. It restricts the use of state funds for cooperation with the China National Ports Administration (CNSA) and other Chinese organizations. The Wolf Amendment was motivated primarily by national security concerns and technological transfer to China. Proponents of the Wolf Amendment argue that the potential risks to national security outweigh the benefits of cooperation, especially given concerns about technology transfer and intellectual property theft.[476]

At the same time, the United States has invested heavily in its space capabilities to ensure competitiveness. This includes NASA's Artemis program, which aims to return humans to the Moon and establish a sustainable presence on the lunar surface, seen as a direct response to China's growing ambitions in space exploration. NASA Administrator Jim Bridenstine directly linked the program to concerns about China's progress, emphasizing that "China has plans to go to the Moon" and that the United States must "take a leading role in space."[477] Additionally, the United States has

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475 U.S. Congress. House. *Department of Defense and Full-Year Continuing Appropriations Act, 2011*. H.R. 1473. 112th Congress (2011). https://www.congress.gov/bill/112th-congress/house-bill/1473/text.
476 Government Accountability Office. 2020. "NASA: Assessments of Major Projects." GAO-20-405. https://www.gao.gov/products/gao-20-405.
477 NASA. "NASA's Artemis Program: Returning Humans to the Moon." 2020. https://www.nasa.gov/specials/artemis/.

invested heavily in the civil space sector, supporting companies such as SpaceX and Blue Origin, which play a key role in lowering the cost of space travel and expanding technological capabilities.[478] These investments help maintain the United States' position as a space research and technology leader while also considering China's growing space infrastructure, including the Tiangong Space Station, which has been fully functional since 2021. The planning of the station started in 2010 by President Hu Jintao (胡锦涛), which initially aimed for a space lab module in 2016, and a full station after 2020.[479] Eventually, the station was completed as planned in 2021.

Further, regulation issues around lunar exploration also pushed the U.S. to promote the Artemis Accords as an international governance system over the moon. The Accords claim to provide a framework for the peaceful, transparent, and sustainable exploration of the Moon, Mars, and beyond and align with the Outer Space Treaty of 1967.[480] Essentially, they are a series of bilateral agreements intended to establish norms and standards of behavior for participating countries. However, China's exclusion from the agreement caused some questions about its legitimacy. One core issue concerns the concept of "safety zones" around areas of operation for participants of the Artemis programs. Russia and China have expressed concerns over the potential for the Accords to monopolize space resources and argue that such matters should be handled through broader multilateral frameworks under the COPUOS.[481] Some Chinese scholars saw it as "…another platform to isolate China in space and make Sino-US space relations even worse."[482]

Furthermore, the U.S. military's response to China's space development has been

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[478] Peeters, Walter. "Evolution of the space economy: government space to commercial space and new space." *Astropolitics* 19, no. 3 (2021): 206-222.
[479] Chinese National Space Administration, 2011.
[480] NASA. "The Artemis Accords: Principles for Cooperation in Space Exploration and Use of the Moon, Mars, and Other Celestial Bodies." 2020. https://www.nasa.gov/specials/artemis-accords/index.html.
[481] Wang, Guoyu. " NASA's Artemis Accords: the path to a united space law or a divided one?." *The Space Review*, August 24, 2020. https://www.thespacereview.com/article/4009/1.
[482] Ibid.

strong, especially since the founding of the U.S. Space Force in 2019. The Space Force is tasked with protecting U.S. interests in space, including monitoring and countering potential threats from Chinese anti-satellite weapons and space-based military systems. The 2020 National Defense Space Strategy highlights China as a significant competitor and emphasizes that China's development of ASAT capabilities poses a direct threat to U.S. and allied space systems.[483] The Space Force is essential to maintaining U.S. military advantage in space, reinforcing the militarization process. This strategic military focus is also evident in increased investments in spatial situational awareness and protection of U.S. satellites, which are essential for military operations and civilian infrastructure.[484]

In sum, the U.S. response to Chinese growth in space capabilities in both civilian and military domains created a less favorable space environment for China. Naturally, China would seek to change such a situation. As stated in the 2021 Chinese Aerospace White Paper, China seeks to create a more open and equitable space environment where access to space and key space technologies is ensured.[485] As a result, China has started a few initiatives accordingly.

8.4.2 Chinese Strategic Shift towards a Revisionist Space Power

Considering the U.S. response to China's successful transformation to an emerging space power, China's space strategy has increasingly exhibited the characteristics of a revisionist power in recent years. Revisionist space powers differ from emerging powers' ability to build international partnerships and influence global space governance because they have already achieved independent access to space. China,

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[483] U.S. Department of Defense. *Defense Space Strategy Summary*. Washington, D.C.: Department of Defense, 2020. https://media.defense.gov/2020/Jun/17/2002317391/-1/-1/1/2020_DEFENSE_SPACE_STRATEGY_SUMMARY.PDF.,7.

[484] Harrison, Todd, Kaitlyn Johnson, and Thomas G. Roberts. *Space threat assessment 2019*. Center for Strategic & International Studies., 2019.

[485] China National Space Administration. "《中国的航天》白皮书(2021 年版) " Chinese Aerospace Whitepaper (2021version)]. Last modified January 8, 2022. Accessed April 4, 2024. https://www.gov.cn/zhengce/2022-01/28/content_5670920.htm.

which once focused on achieving technological parity with the United States and other major spacefaring nations, now aspires to set new rules in space governance and form alternative international networks to break the isolation. Yet China's ability to respond decisively to U.S. restrictions was conditioned by prior domestic investments in R&D autonomy, particularly under the 863 Program. This resilience highlights the role of long-term fiscal prioritization in structuring strategic response options.

This is especially visible in its initiatives, such as the ILRS, the Chinese Space Station, the Beidou Navigation network, increased investment in the private space sector, and its broader space diplomacy efforts. These factors align with China's goal of creating a more open and equitable space environment. This section will elaborate on these projects respectively.

Firstly, the ILRS is a Sino-Russian joint venture and one of the most visible manifestations of China's revisionist space strategy. The ILRS was announced in 2017 and will compete with NASA's Artemis program. According to a memorandum of understanding signed between the China National Space Administration (CNSA) and the Russian space agency Roscosmos, ILRS plans to establish a permanent base on the Moon by the mid-2030s.[486] The station will support scientific research, exploration, and commercial operations, ultimately serving as a base for deep space missions to Mars and beyond. Since its announcement, the currently confirmed national members of the International Lunar Research Station program include China, Russia, Belarus, Pakistan, Azerbaijan, Venezuela, South Africa, Egypt, Nicaragua, Thailand, Serbia, and Kazakhstan, as well as the Asia-Pacific Space Cooperation Organization, the Arab Union for Astronomy and Space Sciences, the Ethiopian Institute of Space Sciences and Geography and more than 30 other institutions.[487]

[486] Li and Mayer, 2023.
[487] Chan, Minnie. "Details of China's Lunar Station Revealed as Project Expands with a Dozen New Partners."

Compared to Artemis, none of the partners of ILRS, except Russia, have independent access to space. Hence, as of 2024, the ILRS has not boosted Chinese space capabilities significantly as the ISS did for the U.S. Nonetheless, the ILRS and the associated agreement still indicate that China is also building a network to promote its vision for international lunar exploration and governance.[488] Hence, the program challenges the existing dominance of the United States and its allies in developing lunar exploration programs and fits nicely into the revisionist framework described in Chapter III.

Secondly, The Chinese Space Station, also known as Tiangong, is another critical element of China's revisionist space strategy. The country built its space station after being excluded from the ISS due to U.S. legislation such as the Wolf Amendment, which prohibits NASA from cooperating with China.[489] The CSS became fully operational in 2022, marking a significant milestone in China's space program.[490] With the decommissioning of the ISS expected by the end of the 2020s, the CSS could become the only operational space station in low Earth orbit, solidifying China's position as a key player in space infrastructure. Consequently, China has invited international partners to participate in the CSS, offering opportunities for countries not part of the ISS program through UN institutions such as UNOOSA.[491] This inclusivity is a strategic move that allows China to build a broad coalition of allies while furthering its vision as a space power. Additionally, the participation of developing countries and emerging space powers in the CSS reflects China's claim to be a more open and equitable power compared to the current system dominated by the U.S., which is

South China Morning Post, September 20, 2024. https://www.scmp.com/news/china/science/article/3277742/details-chinas-lunar-station-revealed-project-expands-dozen-new-partners.

488 Li and Mayer, 2023.

489 Moltz, 2019.

490 Li and Mayer, 2023.

491 Ibid.

consistent with its broader strategic projects, such as BRI.[492] China is positioning itself as a global space diplomacy and governance leader by fostering multilateral cooperation through the CSS.

Similar processes can also be observed in the Beidou Navigation Satellite System case. Since 2012, the BeiDou has been offering alternative navigational solutions to the public in the Asia-Pacific region.[493] After the official commissioning of the BeiDou-3 constellation in 2020, over 120 countries and territories have become users of the BeiDou, according to an official statement by the Chinese government in 2022.[494] As mentioned, Beidou is China's answer to the U.S.-controlled Global Positioning System (GPS), and its completion marks a significant milestone in China's pursuit of strategic independence in space. However, in recent years, Beidou has grown out to be not merely a technical achievement but also a vehicle for China to increase its influence through commercial ventures.[495] It represents China's ability to provide an alternative global navigation system. This has significant geopolitical implications, as countries that rely on Beidou rather than GPS may become more aligned with China's space and technological governance frameworks and have alternatives to crucial space technologies.

A critical milestone in China's efforts to promote Beidou globally was the 7th ICG annual meeting in 2012, hosted in Beijing, China. This event has received extensive official media coverage, and China initiated the International GNSS Monitoring and

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[492] Mujtaba, Hassan, and Usman W. Chohan. *The Space Silk Road (SSR): An Avenue for China-Pakistan Space Cooperation*. Working Paper, Centre for Aerospace & Security Studies, 2021.; and Rab, Abdul, and He Zhilong. "China and shanghai cooperation organization (SCO): Belt and road initiative (BRI) perspectives." *International Journal of Humanities and Social Sciences* 9, no. 2 (2019): 166-171.
[493] BBC News. "China's Beidou GPS-Substitute Opens to Public in Asia." *BBC News*, December 27, 2012. https://www.bbc.com/news/technology-20852150.
[494] CGTN. "More than 120 Countries, Regions Use China's BeiDou-3 Navigation Satellite System." *The State Council Information Office of the People's Republic of China*, August 2, 2022. https://english.www.gov.cn/news/videos/202208/02/content_WS62e8917ac6d02e533532ec8a.html.
[495] Mayer, Maximilian, and Kunhan Li. "Chinas Kooperationspraktiken im Weltraum. Raumstation, Beidou-System und Mondforschungsstation im Vergleich." In *Strategischer Wettbewerb im Weltraum: Politik, Recht, Sicherheit und Wirtschaft im All*, 201-232. Wiesbaden: Springer Fachmedien Wiesbaden, 2024.

Assessment System (iGMAS) at the same time as the event.[496] The enigmas system comprises a series of ground stations, data centers, and analysis centers worldwide, aiming to monitor and track various GNSS systems, including Beidou, GPS, GLONASS, and Galileo, under the UN framework.[497] In the following few years, China has been steadily gaining partners and users for Beidou, initially in Asia, due to the limited coverage of Beidou-1 and Beidou-2. Through that process, China has been projecting an image of an international actor, showing communication type of diplomatic behaviors. Specifically, China uses the ICG meetings and events to make updates on BeiDou to the global space community[498] and has made an active effort to integrate BeiDou into the existing international standardizations[499]. This also means China has been largely transparent about the parameters and specifications of Beidou satellite constellations[500], which is not very different from the case of ILRS and the Chinese space station.

Finally, another critical aspect of China's revisionist strategy is its push to reshape space law and governance. China has long advocated for the peaceful use of space, but its interpretation of this principle differs from that of the United States and its allies. China opposes the militarization of space and advocates for treaties that would ban the deployment of weapons in space, such as its proposal for a "Treaty on the Prevention of the Placement of Weapons in Outer Space" (PPWT).[501] Although the U.S. has rejected these proposals, viewing them as strategically limiting, China continues to

496 Ibid.
497 Ibid.
498 United Nations Office for Outer Space Affairs. *Seventh Meeting of the International Committee on Global Navigation Satellite Systems (ICG), Organized by the Government of China, Beijing, China, 5-9 November 2012.* United Nations, 2012. https://www.unoosa.org/pdf/reports/ac105/AC105_1035E.pdf.
499 Beidou.gov.cn. "中国北斗卫星导航系统公开服务承诺获得国际民用航空组织理事会接受" [The Public Service Commitment of China's BeiDou Satellite Navigation System Accepted by the ICAO Council]. *Beidou Navigation Satellite System*, March 12, 2022. http://www.beidou.gov.cn/yw/xwzx/202204/t20220425_24057.html.
500 Beidou.gov.cn. "BeiDou Navigation Satellite System Ephemeris." *Beidou Navigation Satellite System*. Accessed October 29, 2023. http://en.beidou.gov.cn/SYSTEMS/Ephemeris/.
501 Chow, Brian G. "Space arms control: a hybrid approach." *Strategic Studies Quarterly* 12, no. 2 (2018): 107-132. https://www.jstor.org/stable/26430818.

push for international laws that would constrain space-based military capabilities, considering the relative advantages of the U.S. China's efforts in space law also extend to resource exploitation. Due to the dual-use nature of space technologies, this approach offers a pathway to "tie the hands" of the U.S. in space, and it was perceived so among U.S. policymakers and advisors as well.[502] With projects like the ILRS, China is positioning itself to lead the development of rules for lunar mining and other space resource activities.[503]

In sum, China's space strategy over the past decade demonstrates a clear transition from an emerging to a revisionist space power. Through initiatives like the ILRS, CSS, Beidou, and its extensive space diplomacy, China is expanding its space capabilities and seeking to reshape the global governance of space. These actions align with the theoretical framework presented in Chapter III, as China uses its gradually built-up capabilities in space to build partnerships, set new rules, and constrain the dominance of the existing space powers, particularly the United States. As China continues to assert itself as a revisionist space power, its influence in shaping the future of space exploration and governance will only grow.

8.5 Discussion and Conclusion

China's pathway as a space power began as a pragmatic space power, focusing primarily on modest goals like launching communication satellites and developing fundamental spaceflight capabilities. This period, lasting from the 1950s until the late 1980s, was marked by strategic caution, secrecy, and an emphasis on incremental development. China's early space ambitions were tightly interwoven with its national defense goals and military needs, leveraging dual-use technologies that benefited

[502] Bowman and Thompson, 2021.
[503] Wu, Xiaodan. "The International Lunar Research Station: China's New Era of Space Cooperation and Its New Role in the Space Legal Order." *Space Policy* 65 (2023): 101537.

civilian and military domains. During this era, space exploration was seen as a by-product of broader technological development in rocket and satellite systems, with national security being the primary driver. Despite these modest beginnings, China laid the foundations for its future space ambitions by establishing critical institutions like the Fifth Research Institute of the Ministry of Defense under the leadership of figures like Qian Xuesen, a pivotal figure in China's early space development.

In terms of domestic factors, While China’s space strategy has often been interpreted as a lineard reaction to U.S. containment; instead, it's actual evolution reflects a complex interplay between external constraints and domestic factors. Elite perceptions, particularly under Hu Jintao and Xi Jinping, space development has been seen as both a source of national pride and a step towards rejuvenation. Xi’s focus on making China a great space power reflects a strong political push that influences funding and strategic decisions in the space sector.

The restructuring of China's bureaucratic system has notably influenced its strategic direction. By consolidating the CNSA and integrating civilian and military research through the Science and Technology Commission of the Central Military Commission , the government is streamlining bureaucratic structures to better align space initiatives with national leadership priorities. This approach minimizes the separation between civilian organizations like CASC and CAST and military bodies such as the PLA Strategic Support Force, leading to faster project implementation and effective dual-use technologies. The reorganization of these entities under CMC supervision wasn't just about changing the paperwork—it signified a high-level strategic goal aimed at reducing bureaucratic duplication and ensuring that the institution's work is more in line with the key priorities of the regime.

Fiscal planning has acted as a key factor in China's space endeavors. Since the 2000s, while China has significantly boosted its space budget, this growth has prioritized projects that align with national industrial goals regarding semiconductors, launch vehicles, and navigation systems. In contrast, purely exploratory projects have been limited. The push for local innovation emerged partly from U.S. technology restrictions, especially following the Wolf Amendment and export controls. Yet, this shift was also supported by established domestic investment programs, including the 863 and 973 initiatives.

The findings of this chapter suggest that all three core hypotheses in Chapter III are validated. The central role of relative space capabilities and perceptions of future capabilities is evident in each case analyzed within the chapter. Firstly, hypothesis 1 asserts that changes in relative space capabilities prompt states to engage in balancing behavior. The empirics provided by this chapter support this hypothesis. China's initial space strategy in the 1950s through the 1980s was focused on pragmatic goals, such as achieving basic satellite capabilities and launching communication satellites. During this period, China recognized its substantial technological inferiority compared to the dominant space powers, the U.S. and the Soviet Union. As a result, China’s space strategy revolved around cautious, incremental development aimed at building a foundational capability while avoiding direct competition with more advanced space actors.

However, as China’s relative capabilities grew, particularly after introducing the "863 Program" in the 1980s, its space goals expanded. This program, which aimed at achieving technological breakthroughs across critical scientific fields, laid the groundwork for China to begin closing the technological gap with established space powers. As China’s space capabilities improved, it shifted from a pragmatic to a more expansionist posture, actively investing in crewed space programs, the development of its space stations, and sophisticated satellite systems. The launch of the BeiDou Navigation Satellite System and the construction of the Tiangong Space Station signify China’s determination to compete with and challenge U.S. space dominance. This competitive behavior aligns with Hypothesis 1, as China leveraged its growing relative capabilities to increase its role in space activities and challenge the existing space order .

Secondly, hypothesis 2 suggests that when space powers achieve relative parity or establish some hegemonic stability in space, they are more likely to cooperate to maintain stability. While China's rise has undoubtedly involved significant competition with established space powers, this hypothesis is supported by China’s selective engagement in space cooperation, mainly through international partnerships in space exploration and infrastructure development. As China’s space capabilities expanded in the 2010s, China also pursued collaborative initiatives that highlighted a more balanced approach to its space strategy.

China's partnerships with Russia, particularly in the context of lunar exploration, and its involvement in developing the International Lunar Research Station (ILRS) demonstrate its willingness to cooperate with other major space powers where mutual benefits can be derived. This cooperative behavior is part of China’s strategic calculations to secure a stable position within the global space order, especially as its space capabilities approach parity with the U.S. in certain areas. By forging international partnerships, China is balancing competition with cooperation and positioning itself as a leader in space governance, reflecting the dynamics predicted in Hypothesis 2.

Finally, this chapter also supports hypothesis 3, which emphasizes the importance of perceptions of future space capabilities in driving strategic shifts. It is especially pertinent to China’s transition from an emerging space power to a revisionist space power. China's decision to significantly expand its space program in the 2010s, exemplified by the development of Tiangong and its ambitious lunar and Mars missions, was driven by a long-term vision of becoming a global space exploration and governance leader. Chinese policymakers anticipated that continued advancements in space technologies would enable China to compete with and eventually surpass the U.S. in key strategic areas, particularly in space-based military capabilities and resource extraction from celestial bodies.

This forward-looking strategy has motivated China to adopt a revisionist approach to global space governance, challenging the U.S.-dominated framework with its initiatives, such as the ILRS, which competes directly with NASA's Artemis program. By setting new rules and building alternative frameworks, China is securing its space ambitions and reshaping the international space order to reflect its growing influence. This behavior aligns with the predictions of Hypothesis 3, as China's space strategy is deeply rooted in its perception of future technological advancements and its desire to challenge the status quo.

Overall, China’s rise as a space power supports all three core hypotheses from Chapter III, particularly as it transitioned from a pragmatic to a revisionist space power. China’s increasing relative capabilities have driven competitive and cooperative behaviors, depending on the strategic context. Its perception of future space capabilities, particularly in emerging areas like lunar resource exploitation and space-based military assets, has played a vital role in shaping its strategy. As China continues to assert itself as a revisionist space power, its influence on the future of space exploration and governance will only grow, further validating the theoretical framework of this dissertation. This analysis reveals that China's strategic shifts in space are not merely reactive but are part of a deliberate, long-term vision to challenge existing space powers and reshape global space governance to reflect its rising influence. This conclusion underscores the importance of understanding the dynamics of relative capabilities and future perceptions in shaping the behavior of emerging space powers as China continues to develop its path in space exploration.

Chapter IX Russia's Continuous Decline as a Space Power

9.1 Introduction

This chapter analyzes the strategic shifts in Russia's space policies as it grapples with its relative decline in space capabilities. In the later years of the Soviet Union, particularly since 1989, it has become a declining space power. The case of Russia is somewhat unique. It is perhaps the only case of a significant space power experiencing a continuous decline in relative space capabilities compared to other space powers for more than three decades. However, this does not mean Russia as a space power has lost its relevance. On the contrary, Russian space strategies at different stages of decline offered valuable insights into how space power responds to relative space capabilities changes. Nonetheless, the lack of relative space capabilities and a negative outlook toward future trends would put more structural constraints on Russia than other major space powers.[504] Therefore, it might be the case that domestic factors and perceptions do not play as prominent a role as in the other cases. Instead, the distribution of space capabilities matters more. This is based on the assumptions proposed in Chapter III, especially regarding independent access to space. In other words, as a declining power and stagnated technologies, Russia's future access to space is relatively in more jeopardy than that of the U.S. and China, which would enable relative capabilities to play a more critical role.

Drawing on the neoclassical realist framework developed in Chapter III, the chapter examines how systematic international pressures and domestic perceptions have driven Russia's space strategy from a once-balanced position to a declining status. These strategies' key features included narrowing strategic focus, building wide

[504] Moltz, 2011.

cooperative networks, and maintaining a regulatory presence. The processes of how these strategies were made can offer critical insights into the rationale of declining space powers and thus provide an understanding of Russian space policies in recent years and the potential impacts of such strategies in the ongoing competition in space between China and the U.S.

This chapter seeks to test hypotheses 1 and 3. The case of Russia as a declining power is a definitive case of a decline in relative space capabilities and a negative outlook on future space capabilities. According to hypothesis 1, Russian space policymakers would most likely adopt one or multiple options of three measures due to its disadvantage in space capabilities. Firstly, it can maintain space competitiveness by developing new launch vehicles and other space technologies by increasing space capabilities. However, this pathway is not viable for Russia due to a negative outlook on future trends and domestic constraints on its ability to increase spending on space.

Secondly, Russia could also choose to increase its relative space capabilities through alliance behavior similar to the strategy of balancing in IR theories. It could sustain its space capabilities through external funding or technological transfer by incorporating capable partners like the U.S. and China. This is also more attractive due to the negative outlook on future trends, which offers Russia an option to remain relevant through some dependency on specific aspects of Russian space capabilities by another significant space power.

Thirdly, it could also opt to constrain the growth of space capabilities of the leading competitor if it could not cooperate with it. However, this is hard to achieve, primarily through complex power measures. Due to the dual-use nature of space technologies, any act on eliminating space assets and ground space infrastructures is highly confrontational and may constitute acts of war.[505] Consequently, it should not be

[505] Johnson-Freese, 2019.

considered a priority. Thus, the logical choice would be to constrain space capabilities through other measures such as regulatory and international law. While they only have a limited effect on space powers, they can still provide complications and stall the widening of the capabilities gap to some extent.

To investigate the processes of Russian space capabilities' decline, this section traced three critical periods that pushed Russia to adopt different combinations of these measures. The first critical period was the late 1980s, when the Soviet Union collapsed, which set the foundations for Russian decline as a space power. The second critical period was Russia's inclusion into the ISS, which represented a period in which Russia established a cooperative relationship under U.S. dominance. The third critical period was Russia's increasing exclusion from the U.S. space order after the 2014 Crimea crisis, which led to closer cooperation between the Sino-Russo countries in space.

9.2 The Collapse of the Soviet Union and Russian Decline as a Space Power

When Reagan announced his SDI initiative in 1983, the Soviet space program was still strong regarding its launch capabilities and certain space technologies, especially in space launch services. In 1985, under Gorbachev, the Soviet Union started to provide commercial satellite launch services for Western countries by creating Glavkosmos, the Main Directorate for the Creation and Use of Space Technology for the National Economy.[506] By this time, the Soviet space apparatus was providing a competitive launch service in the international market due to its relatively low cost and reliability.[507] The most significant demonstration of Soviet space capabilities during

[506] Ivanov, Alexei. "Главкосмос СССР как государственное учреждение [Glavkosmos of the USSR as a state institution]." *Cosmos International*, March 2, 2015. http://cosmosinter.ru/colleague/colleague_memory/detail.php?ID=2963.
[507] Moltz, James Clay. "The Russian Space Program: In Search of a New Business Model." *Asia Policy* 15, no. 2 (2020): 19–26. https://www.jstor.org/stable/27023895.

this period was perhaps the Mir orbital station, launched in 1986. Mir was the first modular space station, and its design allowed modules to be added in stages, increasing its complexity and usability.[508] In the late 1980s, the Mir space station flew long-duration missions, including cosmonaut Vladimir Titov's record-breaking 326-day mission, demonstrating the Soviet Union's competent crewed mission technologies.[509]

The Soviet Union also made a breakthrough with its launch vehicles, exemplified by the Energia super-heavy lift rocket. With a payload of 100 metric tons to Low Earth Orbit, its development started in 1976 as a replacement for the canceled N-1 rocket. First, it launched successfully on May 15, 1987, with an experimental payload.[510] It was designed to carry the Soviet Union's space shuttle program, Buran, which also saw successful space flight in 1988.[511] Hence, even in the later years of the Soviet Union, its space capabilities did not decline much. It could be argued that it still maintained a balance in relative space capabilities with the U.S., as demonstrated in the case of Mir, Energia, and Buran.

Nonetheless, the economic crises faced by the Soviet Union towards the late 1980s meant that it could no longer sustain its space program as it had been. The significant costs associated with programs like *Buran*, *Mir*, and interplanetary missions became a heavy burden on the Soviet economy, to 1.5% of the Soviet Union's GDP, totaling around 6.9 rubles in 1989.[512] Therefore, policymakers and outside observers saw that it could not be maintained as it was, leading to a significant budget cut in 1990 to 200-300 million rubles.[513] Such budget cuts were widely supported by the Soviet public, with commentators claiming, "The failure of Phobos 2 damaged space research in the

[508] Harland, David M. *The story of space station Mir*. Springer Science & Business Media, 2007.
[509] Ibid.
[510] Filin, V. M. "Energia launch vehicle: Development history and main achievement." *Acta astronautica* 43, no. 1 (1998): 15-18. https://www.sciencedirect.com/science/article/abs/pii/S0094576597000167.
[511] Hendrickx, Bart, and Bert Vis. *Energiya-Buran: the Soviet space shuttle*. Heidelberg: Springer, 2007.
[512] Harvey, Brian. *The rebirth of the Russian space program: 50 years after Sputnik, new frontiers*. Springer Science & Business Media, 2007., 6-7.
[513] Ibid,7.

eyes of the public. In the general election, several candidates proposed cuts. Failure came badly to people fed on a diet of success."[514] This process of cutting the space budget was accelerated by the broader economic downturn and political instability brought on by Mikhail Gorbachev's reforms of perestroika (restructuring) and glasnost (openness),[515] which lasted even after the collapse of the Soviet Union.

By the time Russia inherited most of the Soviet space capabilities, the space program was not a top priority due to the economic and political turmoil in the early years of the Russian Federation.[516] The U.S. worsened the situation 1992 when it sanctioned Russian space institutions such as Glavkosmos due to a deal with India.[517] Russia agreed to transfer the KVD-1 cryogenic rocket engine technology to India for approximately 250 million USD.[518] Although the technological transfer was technically between two civilian institutions, Glavkosmos and the Indian Space Research Organization (ISRO), KVD-1 could also be used as a dual-use technology on ballistic missiles. Concerned by this transfer, the U.S. intervened and imposed sanctions on both parties, invoking the Missile Technology Control Regime (MTCR). This led to a sharp drop in international orders for Glavkosmos since its main clients were from Western countries.[519] Eventually, the U.S. forced the cancellation of technological transfer and sold the engine equipment.[520]

The subsequent pessimism in the early Russian space apparatus was apparent, resulting in a large-scale exodus of Russian space experts.[521] Without funding, programs such as the Buran space shuttle collapsed quickly in 1993.[522] Throughout the following

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514 Ibid,7.
515 Moltz, 2020.
516 Harvey, 2007,10.
517 Petersen, Charles C. "Moscow, Washington and the missile technology control regime." *Contemporary Security Policy* 16, no. 2 (1995): 44-71. https://arc.aiaa.org/doi/abs/10.2514/2.6943?journalCode=jpp.
518 Jain, Bakhtawar Mal. "India and Russia: Reassessing the Time-Tested Ties." *Pacific affairs* 76, no. 3 (2003): 375-397.
519 Moltz, 2020,20.
520 Ibid,381.
521 Harvey, 2007, 10-12.
522 Ibid.

years, Russia as a space power suffered greatly from continuous budget cuts, brain drain, corruption, and public disinterest, significantly decreasing Russian space capabilities.[523] This is also reflected in the intensity of its space activities, as shown in Figure 18. It indicates that for more than a decade since 1990, the number of successful launches by the Russians experienced a significant and steady decline, while the U.S. started to increase its space activity intensity as the space hegemon. Overall, it is evident that as a space power, Russia could no longer compete with the U.S. on a balanced footing.

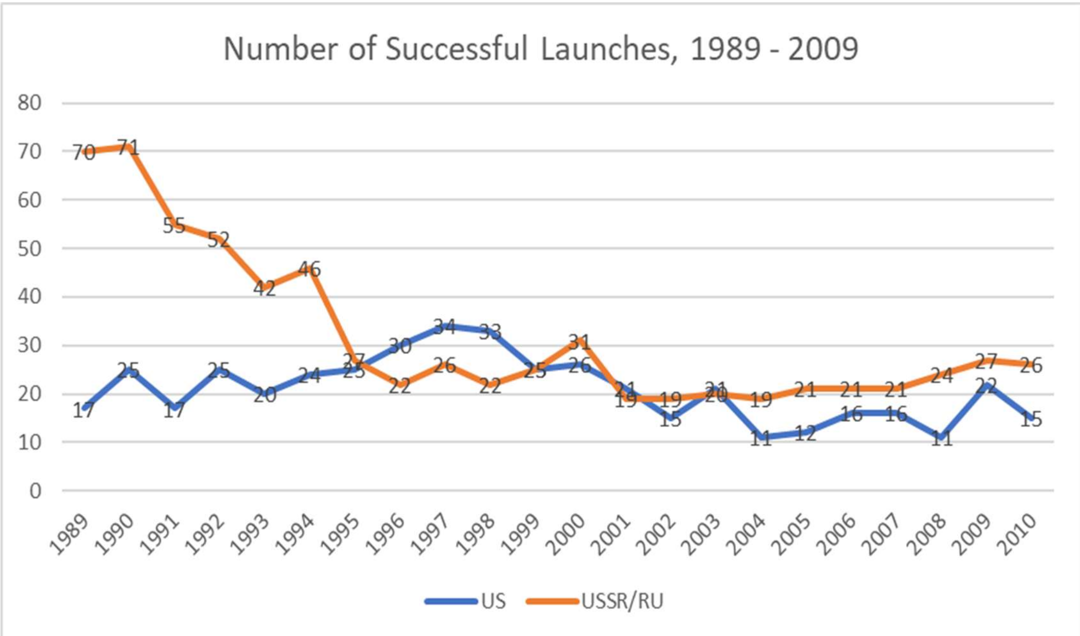

Figure 18 Number of Successful Launches, 1989-2009[524]

Due to this sharp decline in relative space capabilities and a negative outlook on them due to economic constraints, Russia made significant budget cuts in space. However, military space spending remained largely stable for the 1990s, and Russia even made

523 Bowen, 2020.
524 See Appendix.

a few advances in military space technologies.[525] This included continued early warning satellites, communication systems, global navigation systems, and dedicated ground military space infrastructure construction.

The first of the most noticeable features of Russian military space activity in the 1990s was the continuation of the former Soviet Oko satellite program. Although financial problems reduced the number of launches, Russia maintained a fleet of early warning and reconnaissance satellites designed to provide early warning for nuclear strikes.[526] This is accompanied by a continuous effort to launch optical and radar imaging satellites for military reconnaissance. This included satellites like the Don and Yantar series and space telescope Araks, which were maintained to provide real-time intelligence to the Russian military.[527]

Russia also maintained its military communication satellites, such as the Raduga and Gorizont systems, which provided critical communication lines for the Russian military.[528] Similarly, although delayed and hindered by budgetary constraints, Russia continued to develop and maintain the Global Navigation Satellite System (GLONASS), which served both military and civilian purposes.[529] While the system was incomplete in the 1990s, its military importance for missile targeting and navigation remained high on the agenda.[530]

Finally, Russia's military space infrastructure, including launch sites, tracking stations, and control centers, continued to operate throughout the 1990s.[531] However, the infrastructure was also subject to deterioration due to a lack of investment, which led to challenges in maintaining consistent coverage of military space assets. Despite these

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525 Moltz, 2011.
526 Podvig,(2001). Russian Strategic Nuclear Forces. MIT Press.
527 Harvey, 2001, 105-114.
528 Ibid, 115-123.
529 Ibid, 124-131.
530 Johnson-Freese, J. (2007). *Space as a Strategic Asset*. Columbia University Press.
531 Harvey, 2001,207.

challenges, Plesetsk Cosmodrome remained a critical military spaceport, primarily for launching military satellites into low Earth orbit, which received renovations and constant maintenance throughout the 1990s.[532] This base allowed Russia to maintain its military space presence even as Baikonur Cosmodrome in Kazakhstan became less accessible following the collapse of the Soviet Union.

Regarding launch vehicles, Russia did not seek to expand into new space launch vehicle development during this period. Instead, it opted to keep the most economical models of launch vehicles and retired the super-heavy lifter, Energia. Specifically, the Soviet space program was already very cost-effective. It used a series of old, highly reliable launch vehicles: various R-7 models, the R-12 and R-14, the R-36 Tsyklon, the UR-500 Proton, and the Zenit and Energia system.[533] The strategic focus of Russian space policymakers in the 1990s was all about cost-effectiveness due to severe economic constraints following the collapse of the Soviet Union. The Soyuz U, part of the R-7 family, continued to be highly utilized, benefitting from incremental upgrades rather than complete redesigns, which allowed for cost savings.[534] Similarly, despite its toxic fuel, the Proton rocket remained crucial for heavy payloads, with efforts toward the end of the decade to develop the Proton M for greater efficiency.[535] The development of newer vehicles, such as the Angara rocket, intended to be a more versatile and cost-effective replacement for older rockets like Tsyklon and Zenit, faced significant delays due to funding shortages.[536] Thus, Russia's space policy regarding its launch vehicles in the 1990s reflected a pragmatic focus on sustaining its space capabilities within the confines of limited financial resources. Policymakers prioritized maintaining launch capabilities over ambitious new designs, opting to keep costs down

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[532] Ibid, 221-226.
[533] Ibid, 203-205.
[534] Ibid,206.
[535] Lardier, Christian, and Stefan Barensky. *The Proton Launcher: History and Developments*. John Wiley & Sons, 2018.
[536] Morozova, Elina. "Russian Space Launch Program." In *Handbook of Space Security: Policies, Applications and Programs*, 1171-1189. Cham: Springer International Publishing, 2020.

by relying on proven technologies.

In sum, while the collapse of the Soviet Union dealt a severe blow, Russia, as the heir to the majority of Soviet space capabilities, focused on two directions: maintaining military space capabilities related to its strategic nuclear force and its command, control, and communications and optimizing its space launch vehicles to be more cost-effective. This is a representative case of a declining space power that possesses significant absolute space capabilities while declining relative space capabilities.

9.3 The ISS as a Turning Point for Russian Space Strategy

With a rapidly declining space program, the Russian policymakers saw an opportunity to stem the trend in 1993, provided by none other than the U.S. There were broad concerns in the U.S. about the potential proliferation of dual-use space technologies to countries such as Iran or North Korea if the Russian space program entirely collapsed, especially after the KVD-1 transfer, which proved the probability of this outcome. Additionally, not long ago, the Soviet Union, as mentioned in the previous section, was one of the most cost-effective space launch providers in the world; thus, incorporating Russia into the ISS program could potentially reduce the cost of the ISS significantly. Further, it was also seen by the U.S. as an opportunity to gain some control over the direction of Russian space programs, turning them from a more military-focused program to a more civilian-focused one.[537]

As a result, in 1993, then-U.S. Vice-President Al Gore met with then-Russian Prime Minister Viktor Chernomyrdin and announced the participation of Russia as an essential contributor to the ISS project.[538] As a result of this agreement, the U.S. gained access to the Russian Mir space station program and produced the Shuttle-Mir program. Also called “Phase One” (of the ISS), the Shuttle-Mir program was a test of

[537] Ibid.
[538] Ibid.

water the ISS in the sense that it allowed the U.S. crewed space shuttle to dock at the Russian Mir space station and conduct long-duration crewed space missions with Russian cosmonauts.[539] This program provided an essential lifeline for the Russian space industry since NASA spent roughly 472 million USD on the Shuttle-Mir program, which sustained the Russian space industry between 1993 and 1998.[540] After constructing the first ISS module in 1998, Russia continued to participate as the ISS's chief launch service provider and constructor. It received an estimated 800 million to 1 billion USD for constructing the two core modules, Zarya and Zvezda.[541] After completing the ISS around 2011 and the retirement of the U.S. space shuttles, Russia started to work as the crew transport service provider using its old but reliable Soyuz spacecraft.[542] This cost NASA about 350 million USD to 400 million USD annually between 2006 and 2011.[543]

This cooperative posture was shaped not only by systemic incentives but also by Russia's domestic incapacity. The post-Soviet fiscal crisis and the disbandment of centralized space planning made reliance on U.S.-led projects a structural necessity. For Russian policymakers, the ISS and cooperation with the U.S. were a valuable opportunity to re-establish Russia as a relevant space power despite its declining status compared to the Soviet Union. More importantly, Russia's participation in the ISS was not only about maintaining relative space capabilities with outside funding but also an opportunity to secure future stability in terms of capabilities in space through building dependencies. Specifically, since space programs such as the ISS are long-term programs that involve a hefty amount of investment and technological infrastructure,

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539 Ibid.
540 NASA. *Shuttle-Mir: The United States and Russia Share History's Highest Stage*. Washington, D.C.: NASA History Office, 1999. https://ntrs.nasa.gov/citations/20020032691.
541 Catchpole, John E. *The international space station: building for the future*. Springer Science & Business Media, 2008.
542 Moltz, 2001.
543 NASA, "NASA Budget Information, Fiscal Years 2003-2012", NASA Official Website. https://www.nasa.gov/organizations/budget-annual-reports/nasa-budget-information-fiscal-years-2003-2012/

having a cooperative relationship with the U.S. through the ISS could also ensure its future revenue and, thus, space capabilities.

This is evident in a public interview in 2001. Yuri Koptev, who was the head of Roscosmos at the time, said:

"Nobody is going to expel us from the ISS project. The Americans cannot expel us in principle. If the next month we do not launch the vehicle for which Rosaviacosmos has paid 178 million rubles (but has not yet paid up the total sum of 230 million), the crew must be evacuated from the space station. This will be the end of the long-duration missions to the ISS. Moreover, this will be the end of the whole Space Station project! Why? Because the Space Station requires propellant deliveries, the propellant can only be delivered on-board Progresses. ISS cannot be operated without manned spacecraft, the Soyuz TM, either, because they ensure the safety of the space station crew when the Space Shuttle is away. There are no other vehicles that could replace the Progress and Soyuz spacecraft. The production cycle for the vehicles is two years. The production program to support their launch to ISS in 2001 has not yet been paid. As a result, all the memories of lost opportunities will only remain on the pages of newspapers. If there is no cash flow, that will be it for ISS."[544]

In this very open statement, Koptev revealed a crucial part of the Russian rationale for participating in the ISS. Even before NASA's official space shuttle retirement, the Russian Soyuz spacecraft was already the sole transport of the ISS, which would provide Russia with a unique leverage in space cooperation with the U.S. and broader geopolitical and economic relations. It was indeed a success for Russia since it remained in the same role as the chief transport service provider for almost two decades since the ISS's construction in 1998. This became obvious in the aftermath of

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[544] SpaceRef, "Yuri Koptev and Yuri Semenov comments on ISS and Mir" *SpaceNews,* March 16, 2001. https://spacenews.com/yuri-koptev-and-yuri-semenov-comments-on-iss-and-mir/.

the 2014 Crimean Crisis, in which Russia annexed Crimea from Ukraine. Specifically, when faced with international sanctions for its annexation of Crimea, Russian officials stated that they might limit or even halt all Soyuz launches for Western astronauts. An example is Dmitry Rogozin, the head of Roscosmos, who posted on social media: “After analyzing the sanctions against our space industry, I suggest to the USA to bring their astronauts to the International Space Station using a trampoline.”[545]

While the Russian status related to the ISS has been proven a valuable strategic asset, it was diminished by new changes in relative space capabilities. Specifically, U.S. policymakers also took notice of this situation and responded accordingly by resuming the development of new launch vehicles and transports to the ISS, particularly in the private sector. In 2020, SpaceX introduced the Crew Dragon spacecraft as NASA’s partners in the ISS program, which granted the U.S. renewed independent access to the ISS.[546] Consequently, with the advent of the Crew Dragon, NASA no longer had to pay for Soyuz seats, reducing Russia’s revenue from the ISS program.[547] Although this did not mean the cessation of Soyuz missions to the ISS, and it continued to serve as a transport provider, it lost its monopoly and, thus, a vital leverage. Therefore, Russia faced a conundrum again due to its diminished revenue stream and an essential space asset.

This did not, however, spark an immediate pushback from Russia. On the contrary, Vladimir Ustimenko, the spokesperson of Roscosmos, issued a formal congratulatory message to NASA and SpaceX, recognizing the milestone as a “significant achievement” in space exploration.[548] Later, in 2022, a Russian cosmonaut joined two

[545] NBC News. "‘Trampoline to Space’: Russian Official Tells NASA to Take a Flying Leap." *NBC News*, April 30, 2014. https://www.nbcnews.com/storyline/ukraine-crisis/trampoline-space-russian-official-tells-nasa-take-flying-leap-n92616.
[546] Melamed, Avishai, Adi Rao, Olaf de Rohan Willner, and Sarah Kreps. "Going to outer space with new space: The rise and consequences of evolving public-private partnerships." *Space Policy* (2024): 101626.
[547] Ibid.
[548] Foust, Jeff. "Commercial Crew Success Prompts Congratulations and Criticism from Russia." *SpaceNews*, June 1, 2020. https://spacenews.com/commercial-crew-success-prompts-congratulations-and-criticism-from-russia/.

American and one Japanese crewmate for a launch aboard a SpaceX Crew Dragon capsule to the ISS.[549] This further demonstrated Russian intention to remain relevant to the ISS mission and cooperative relations with the U.S. space program, especially in a geopolitical environment where it is increasingly being isolated and, by extension, isolated in the space domain. This trend became more evident since the Russian invasion of Ukraine in 2022, the so-called "Special Military Operation."[550]

In sum, Russia's strategy as a declining space power was largely successful between 1993 and 2014. Recognizing its declined status and the likelihood of continuous decline, Russian policymakers attempted to construct a cooperative relationship with the U.S. in space primarily as a launch service provider for the ISS. This worked well due to the U.S.'s aligned strategies to incorporate the Russian space industry into the new international order through the ISS. However, the geopolitical impacts of the 2014 Crimean Crisis and the 2022 Invasion of Ukraine rendered this cooperative relationship increasingly jeopardized. While such relationships still demonstrated resilience due to the technological dependency of the ISS on Russia's Soyuz spacecraft, the U.S. and its allies are already actively looking for alternatives, especially with the success in the private sector. Consequently, while Russia can still somewhat maintain its role as a partner in space to the U.S., it will not last long. Hence, Russia needs to seek other alternatives.

9.4 Strategic Shifts and Sino-Russo Space Cooperation Since 2014

Faced with increasingly deteriorating relations with the U.S. and European countries

[549] Strickland, Ashley. "SpaceX Crew Dragon Launches Russian Cosmonaut, NASA Crewmates on Space Station Flight." *CBS News*, October 5, 2022. https://www.cbsnews.com/news/spacex-crew-dragon-launch-russian-cosmonaut-nasa-crewmates-space-station-flight/.
[550] Davis, G. Douglas, and Michael O. Slobodchikoff. "Great-Power Competition and the Russian Invasion of Ukraine." *Journal of Indo-Pacific Affairs* 5, no. 4 (2022): 215-226.

as an aftermath of Russia's aggression towards Ukraine since 2014, Russia is faced with a growing danger of reverting to the rapid decline of space capabilities in the early 1990s. While still possessing a reliable launch vehicle fleet and access to crucial space technologies such as navigation and communication systems, its ability to keep up with new technologies in the space domain is seriously challenged externally.[551] Essentially, this would lead to a decline in relative space capabilities. In response to this situation, Russian policymakers adjusted Russian space policy in a three-pronged approach, moving towards a broader strategic shift from previous focuses.

Firstly, Russia implemented a significant institutional change to its space apparatus in 2015, including military and civilian space branches. Specifically, President Putin decreed the establishment of a new space agency, reorganizing the Russian Space Agency and merging it with the United Rocket and Space Corporation to form the Russian State Space Corporation (also known as Roscosmos), which will be responsible for the overarching management of all Russian space activities.[552] Similarly, in the same year, Russia merged the Air Force and Aerospace Defense Forces into the Aerospace Forces responsible for air defense, anti-missile, spacecraft launch, space monitoring, etc.[553] These measures enhanced the Russian government's abilities to control space activities and strategies, in both civilian and military domains, in a more comprehensive and centralized fashion.[554]

A second prong of the adjustment of Russian strategies is the increased independent capabilities and new investment in new space technologies. Specifically, in 2020, during a meeting with Russian space industry representatives, Putin stated that:

"Today, as we agreed, we will focus on specific issues of financing the rocket and space

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[551] Aliberti, Marco, Ksenia Lisitsyna, Marco Aliberti, and Ksenia Lisitsyna. "The External Evolution of the Russian Space Programme." *Russia's Posture in Space: Prospects for Europe* (2019): 55-93.
[552] Ibid,56.
[553] Giles, Keir. *Assessing Russia's Reorganized and Rearmed Military*. Vol. 3. Washington DC:: Carnegie Endowment for International Peace, 2017.
[554] Moltz, 2020.

industry and several key programs in the space sector. Here, of course, we need to proceed from our priorities, which are known - this is the improvement of our space infrastructure, the expansion and qualitative improvement of the orbital grouping of spacecraft, the rhythmic continuation of manned programs, and the creation of a promising line of rocket systems. The share of innovative space technology, products, and services increases."[555]

This goal of achieving qualitative improvements in Russian space capabilities in the civilian domain is accompanied by a similar plan for the military in 2019 to modernize its advanced military technologies, including space technologies.[556] Further, in 2022, the establishment of "Aerospace Innovation Valley" officially opened 2022 as an initiative to promote public-private cooperation in space, significantly facilitating "… universities and scientists working in them - the authors of scientific developments. [This place]... will help them contribute more to creating innovative technologies …"[557]

Finally, the third prong of Russian space strategy since 2014 was the expansion of international cooperation in space, especially with China. Since 2014, Sino-Russian space cooperation has grown significantly, driven by mutual strategic interests in counterbalancing the United States and Europe in space activities.[558] This partnership has evolved, focusing on satellite navigation systems, space exploration, and defense-related space activities. One of the most high-profile projects of the growing cooperation is the integration of Russia's GLONASS and China's BeiDou satellite navigation systems. This partnership in satellite navigation is one of the most

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555 RIA Novosti. "Россия и Китай подпишут меморандум о создании совместной лунной станции." [Putin Names Russia's Priorities in Space] *RIA Novosti*, November 2, 2020. https://ria.ru/20201102/kosmos-1582671106.html.
556 Klein, Margarete. *Russia's Military: On the Rise?*. German Marshall Fund of the United States., 2022.
557 RIA Novosti. "Россия и Китай договорились создать космическую 'Лунную долину'." *RIA Novosti*, February 28, 2023. https://ria.ru/20230228/dolina-1854958133.html.
558 Pollpeter, Kevin, Elizabeth Barrett, Jeffrey Edmonds, Amanda Kerrigan, and Andrew Taffer. *China-Russia space cooperation: The strategic, military, diplomatic, and economic implications of a growing relationship*. China Aerospace Studies Institute, 2023.

prominent examples of their technical collaboration, allowing both countries to maintain global positioning systems independent of the U.S. GPS and European Galileo.[559]

The decision to integrate these systems stems from a combination of strategic and practical needs, as both powers are aware of the risks posed by relying on foreign systems that could be interrupted during geopolitical tension. Russia's willingness to align with China on this front reflects its growing recognition that China has advanced space capabilities and can be a crucial partner in maintaining Russian relevance in global space governance and aligning China and Russia in broader geopolitical domains. Yet these developments occurred under significant budgetary and technological limitations. Despite rising rhetoric, Russia’s strategic reassertion was bounded by institutional bottlenecks and the need to outsource or co-develop critical technologies with China.

More specifically, the geopolitical context of the Ukraine crisis and Western sanctions imposed on Russia in 2014 accelerated this shift.[560] Isolated from many European and American technology markets, Russia sought to deepen ties with China, seeing the latter as an essential partner in maintaining its relative space capabilities in comparison to the U.S. One of the major initiatives is the collaborative effort for lunar exploration through the ILRS program, introduced in Chapter VIII. Russia’s Luna-25, 26, and 27 missions are designed to explore the Moon's surface, with cooperation from China through joint scientific research and technology sharing.[561] For Russia, collaborating with China on lunar exploration offers the chance to regain prominence in space while leveraging China’s technological advancements. For its part, China sees the

[559] Mayer and Li, 2024.
[560] Zhang, Xin. "" Big Triangle" No More? Role Expectation and Mutual Reassurance Between China and Russia in the Shifting US-China-Russia Relations." *Asian Perspective* 47, no. 3 (2023): 443-465.
[561] CNSA, 'International Lunar Research Station (ILRS) Guide For Partnership', cnsa.gov.cn, (2021) http://www.cnsa.gov.cn/english/n6465652/n6465653/c6812150/content.html.

partnership as enhancing its technological capabilities while bolstering its global space presence.

Further, in defense-related space cooperation, Russia and China have engaged in closer coordination on space security and the potential militarization of space. Both nations have opposed U.S. space dominance and have actively lobbied for international agreements to prevent the weaponization of space, particularly in response to the U.S. creation of the Space Force in 2019.[562] Their combined efforts have centered around advocating for international space security norms that emphasize the peaceful use of space while simultaneously preparing their space-based defense systems.

In sum, Sino-Russian space cooperation since 2014 has been marked by a combination of strategic interests mainly driven by shifts in relative space capabilities and a shared desire to counterbalance U.S. and European influence in space. The cooperation has expanded across several fronts, including satellite navigation, lunar exploration, and space security. Russia's strategic shift in space reflects both a recognition of China's burgeoning capabilities and an effort to maintain its space relevance through collaboration with another significant space power against the space hegemon it can no longer work with.

9.5 Discussion and Conclusion

This chapter analyzed Russia's shifting strategies in its relative decline as a space power, exploring how Moscow has managed its weakening position in the competitive international space domain. Through the neoclassical realist framework developed in Chapter III, the chapter highlighted how systemic pressures, domestic constraints, and perceptions of future capabilities have driven Russia's space policy over time. In the

[562] Bowman, Bradley, and Jared Thompson. "Russia and China Seek to Tie America's Hands in Space." *Foreign Policy*, March 31, 2021. https://foreignpolicy.com/2021/03/31/russia-china-space-war-treaty-demilitarization-satellites/.

case of Russia, the former plays a more critical role. Although Russia's space power has steadily declined, this chapter demonstrated that it has leveraged strategic instruments such as its continued participation in the ISS and fostering cooperation with emerging space powers like China to remain relevant in an increasingly competitive domain.

Russia's decline as a space power was first set in motion by the collapse of the Soviet Union, which drastically reduced the financial and industrial resources available to support an ambitious space program. The neoclassical realist theory, particularly the hypotheses proposed in Chapter III, suggests that declining powers will likely adopt strategic measures that balance cooperation and defensive stances to maintain their influence. In this case, Russia's actions have validated Hypothesis 1, which posits that declining relative space capabilities will prompt states to adopt competitive or compensatory strategies. Moscow has continued to engage in cooperative space activities where feasible, such as maintaining its Soyuz program to support ISS missions even in the aftermath of a breaking down of relationships with the West over Ukraine. It has also leveraged cooperation with other space powers, most notably the U.S. and China, to sustain its relevance in space.

Leaders' perceptions of space strategy shifted dramatically between the Yeltsin and Putin eras. Under Yeltsin's time, space was largely seen as a collaborative and scientific field. This perspective was evident in Russia’s partnership with the U.S.-led ISS program and its cooperation with NASA. In contrast, under Putin, space has taken on a new identity, becoming associated with national pride, technological independence, and military importance. This shift became particularly noticeable in the wake of the 2014 Ukraine crisis and the subsequent Western sanctions.

Secondly, institutional decay and reconfiguration further constrained Russia's ability to develop a more coherent and proactive space strategy. The collapse of the Soviet-era design bureau system, paired with the politically motivated restructuring of Roscosmos, led to a lack of clear direction in space programs and poor coordination between agencies. A poignant example of this issue is the appointment of figures like Dmitry Rogozin, who, despite being politically loyal, lacked the necessary technical experience to effectively lead Roscosmos. Hence, much of the stagnation in Russia's space endeavors in the post-Soviet era can be attributed not to a lack of ambition but rather to bureaucratic decay and an inability to restore a functional space-industrial base.

Finally, fiscal constraints limited Russia's strategic actions. After 2010, officials discussed advancing space capabilities and anti-satellite technologies, but funding remained modest and dependent on fluctuating energy revenues. The breakdown of international collaborations with Europe and the U.S. led Russia to adopt a more self-sufficient approach in space. However, this shift did not enhance effectiveness. The partnership with China was driven by economic necessity rather than shared ideologies, as both sought to relieve technological pressures and leverage strengths. This transition reflects limited autonomy due to financial constraints rather than a strategic recalibration.

These domestic variables help explain the episodic nature of Russian space activism, the rhetorical gap between strategic ambition and execution, and the growing reliance on symbolic over functional forms of contestation. In line with this dissertation's broader argument, domestic-level conditions in Russia did not override systemic logic but filtered it into a distinctively constrained and often erratic form of strategic adaptation.

Overall, as Russia's relative capabilities declined, it adopted strategies that fit within Hypothesis 3: perceptions of future technological trends influence whether states opt for preemptive balancing strategies. Russia, perceiving its future space capabilities as constrained due to economic sanctions, technological lag, and reduced government spending, shifted towards cooperative arrangements. The most significant example of this is Russia's strategic role in the ISS program. The ISS was originally a hegemonic project led by the United States, but Russia's continued involvement ensured its relevance, even in a declining capacity. By making the ISS reliant on Russian launch capabilities, particularly with the Soyuz spacecraft, Russia ensured that it remained indispensable for spacefaring nations until the emergence of new platforms, such as SpaceX's Crew Dragon.

This reliance allowed Russia to maintain strategic influence despite its declining capacity. Even as newer actors, such as China, emerge with more advanced capabilities and ambitions in space, Russia has adapted by aligning itself with these powers, forming new alliances and cooperative networks. The Sino-Russian space cooperation following the deterioration of Russia's relationship with the West is a prime example of how Russia seeks to remain relevant as a declining power. This aligns with the theoretical predictions of neoclassical realism, where declining states when perceiving limited prospects, seek alliances and strategic partnerships to counterbalance their limitations.

The ISS is a case study of how declining space power such as Russia has sustained relevance through cooperation and strategic leverage. Russia used the project not only to maintain its access to space and gain economic benefits but also to prolong its significance on the global stage. While the United States dominated the ISS program financially and technically, Russia ensured its role remained vital by making key components of the ISS, such as Soyuz missions, indispensable for the operation and crew rotation. This tactic of making a declining power essential to an international venture is also consistent with the predictions of Hypothesis 2, which states that cooperative strategies become more attractive when a power recognizes its declining relative capabilities.

However, this dependency on Russian services began to erode with the advent of commercial crew vehicles such as SpaceX's Crew Dragon. This marked a pivotal shift in the power dynamics of space cooperation. Russia’s strategic importance in the ISS declined as its monopoly on manned spaceflight ended in 2020. Russian officials acknowledged this loss of leverage, with notable figures expressing concern over the loss of revenue and strategic influence. At this moment, they highlighted the fragility of cooperative strategies dependent on technological monopoly, especially for declining space powers.

In conclusion, the strategic behavior of Russia in response to its decline as a space power underscores the core tenets of neoclassical realism. External pressures, internal constraints, and strategic calculations about future technological trends drive Russia’s space policy. By aligning itself with new partners and maintaining its foothold in international projects like the ISS, Russia has been able to prolong its relevance as a declining space power. As new dynamics in space competition continue to unfold, particularly with China’s rise, Russia’s future space strategy will likely hinge on its ability to adapt to these shifts while leveraging its historical strengths in space technology. This chapter reaffirms the hypotheses in Chapter III, demonstrating how declining space powers can sustain influence through strategic cooperation, even when their relative capabilities are on the wane.

Chapter X Discussion and Conclusion

10.1 Introduction

The primary goal of this dissertation is to examine the strategic shifts in space strategies among great powers, mainly focusing on how changes in relative space capabilities and perceptions of future trends shape these strategic choices. The core research question for this dissertation, as stated in Chapter I, is why and how space powers compete and when and how they cooperate. The central argument, framed through a neoclassical realist lens, posits that space powers' space strategies fluctuate between cooperation and competition based on their capabilities and perceptions of future relative capability changes in space. This theory was tested by examining the space strategies and especially shifts in space strategies of the United States, the Soviet Union/Russia, and China across different historical periods since 1957, providing empirical support for the hypotheses laid out in Chapter III, thus creating a more systematic neoclassical realist theoretical framework for explaining strategic behavior in space.

This chapter will revisit the key hypotheses and assess how the empirical findings from Chapters V through IX might validate or dispute them. The discussion will synthesize these findings to determine whether they validate the assumption theses or present nuanced variations. Furthermore, the chapter will present the results within the broader literature on space strategy, highlighting the dissertation's contributions to IR and space politics. In addition to summarizing the empirical support for the hypotheses, this chapter will also explore the broader implications of the findings for policy and future research. The core argument suggests that the space strategies of states oscillate between cooperation and competition, driven by their capabilities and perceptions of emerging threats or opportunities in the cosmos. This is based on the neoclassical lens this dissertation adopted to construct a theoretical framework for understanding space strategies and space power behaviors. This framework was evaluated by analyzing the space strategies of the United States, the Soviet Union/Russia, and China across various historical epochs, providing empirical evidence for the hypotheses presented in Chapter III.

To achieve these goals, this chapter is structured as follows. First, Section 10.2 will revisit the hypotheses proposed in Chapter III to anchor the discussion in the dissertation's theoretical framework. Section 10.3 discusses the key findings from the empirical chapters and synthesizes and analyzes them to assess the robustness of the hypotheses. Following this section, the research's contribution to theoretical and space policy debates will be discussed in Section 10.4, along with the implications for the future of space-related research in IR and its limitations. Finally, Section 10.5 will conclude the whole dissertation with an outlook for future research derived from this dissertation.

10.2 Revisiting the Hypotheses and Typology

This dissertation aims to develop a neoclassical realist framework to analyze the strategic shifts of major space powers, specifically how states' strategic behaviors are shaped by systemic pressures, such as relative power capabilities in space, and domestic perceptions and processes, such as perceptions of future changes of relative space capabilities based on the domestic political and economic realities. The dissertation introduced three core hypotheses, each aimed to explain shifts in space strategies based on these factors. This section will revisit these hypotheses and clarify their theoretical foundation, demonstrating how they are tested in the empirical investigations in subsequent chapters.

A key insight from comparing different cases is how domestic variables uniquely influence strategic shifts. In the United States, political leaders like President Johnson and competition between agencies played crucial roles in shaping these changes.

Conversely, in China, shifts were predominantly top-down, guided by the alignment between the Communist Party and the military, particularly under organizations like the Central Military Commission and SASTIND. Meanwhile, Russia's path revealed that weakening bureaucratic cohesion and financial struggles can limit strategic choices, even when leadership shows a desire for ambitious change. These differences highlight that while larger systemic factors create the framework, it's the domestic context that truly shapes the narrative and its direction.

10.2.1 Hypothesis 1: Changes in Relative Space Capabilities Trigger Balancing Behaviors

The first hypothesis posits that changes in relative space capabilities lead to balancing behavior among space powers, where states react to shifts in the balance of space power by adopting balancing behaviors. Realism, including neoclassical realism, emphasizes the importance of power in international relations, arguing that states are primarily concerned with maintaining their position within the international system.[563] When a state perceives its power is declining compared to the main competitor, it will adopt competitive measures to restore balance, and their focus is on relative gains.[564] In the context of space strategy, this hypothesis builds on traditional realist assumptions about power distribution and competition. However, it adds a crucial neoclassical realist dimension by considering how domestic perceptions of capability shifts influence decision-making. States may respond to both actual changes in space capabilities and anticipated or perceived changes. Hypothesis 1 is closely related to Hypothesis 3, which will be discussed in detail in the following section.

The empirical chapters provide several examples of this behavior, such as the U.S. response to Soviet advancements during the Cold War, including the "Sputnik Moment"

[563] Lobell and Ripsman, 2009.
[564] Ibid.

in 1957 and successful tests of ASAT weapons in the late 1970s, and a similar situation in 2008 with China's ASAT weapon tests, etc. These cases illustrate how changes in relative space capabilities can prompt states to adopt balancing strategies, which will be elaborated on in section 10.3.

10.2.2 Hypothesis 2: Stable Space Capabilities Foster Cooperation

The second hypothesis argues that when the distribution of space capabilities is relatively stable, either through balance or hegemonic stability, major space powers are more likely to engage in cooperative strategies. This hypothesis stems from neoclassical realism's recognition that cooperation, particularly among rivals, is possible when states perceive that their relative positions are secure and that the costs of competition outweigh the potential benefits. The theoretical foundation of this hypothesis is found in the works of Ripsman, Resnick, and Schweller.[565] [566] [567] This hypothesis diverges from purely structural realist assumptions, which often emphasize constant competition. Instead, neoclassical realism allows for periods of stability where cooperation can emerge, especially when space powers recognize that collaborative efforts can enhance their security or economic interests. Such cooperation is typically aimed at maintaining the status quo, especially when both parties have reached a point of mutual deterrence or capability parity or under a stable hegemony.

The empirical chapters support this hypothesis, particularly in analyzing U.S.-Soviet cooperation during the Cold War. Despite their intense rivalry, the two superpowers found opportunities to cooperate in space, most notably during the Apollo-Soyuz Test Project 1975. This collaboration occurred after both powers had developed significant

565 Ripsman, 2016, 41-42.
566 Resnick, 2010, 144-177.
567 Schweller, 2018, 23-25.

space capabilities, creating a fluid balance where cooperation became more viable.[568] Similarly, Russia's participation in the International Space Station (ISS) partnership in the post-Cold War era reflects how stable capability distribution among major powers can foster long-term collaborative projects in space. In both cases of the Soviet Union and Russia, the decision to cooperate was driven by the distribution of capabilities and domestic perceptions of future changes in relative space capabilities and potential benefits such as reducing costs. However, it was not an option for the U.S. to cooperate with China due to its perception of its future capabilities. In the case of the Soviet Union and Russia, they faced a balanced and, later, declining power whose relative space capabilities could not grow significantly.

10.2.3 Hypothesis 3: Perceptions of Future Space Capability Trends Influence Strategic Shifts

The third hypothesis suggests that perceptions of future space capability trends are also crucial drivers of strategic shifts, particularly preemptive balancing. Neoclassical realism emphasizes that states react to present conditions and consider future power distribution when making strategic decisions. In the context of space, a state's perception of its rival's future space capabilities can trigger strategic shifts, even in the absence of immediate changes in the balance of power.

As stated in Chapter III, this hypothesis's theoretical foundation is the works of Gideon Rose. In his work, Neoclassical Realism and Theories of Foreign Policy, Rose emphasizes how domestic factors, including perceptions of future shifts in the balance of power, influence state behavior and foreign policy decisions.[569] This hypothesis also builds on the idea that the strategic environment in space is highly dynamic, with rapid technological advancements constantly reshaping the distribution of capabilities.

[568] See Chapter VI, section 6.4.
[569] Rose, 1998, 144-172.

States must, therefore, anticipate future trends and adjust their strategies accordingly. For example, suppose a state perceives that its rival is likely to develop new technologies that could shift the balance of space power (such as next-generation launch vehicles or space-based weapons that threaten space assets). In that case, it may preemptively adopt competitive measures to maintain its strategic advantage.

The empirical chapters illustrate this dynamic, particularly regarding U.S. and Chinese space strategies and Reagan's SDI program. The U.S. perception of China's long-term space ambitions, including its lunar exploration program and plans for space-based infrastructure, led to preemptive strategic adjustments to counter China's rise in space. Similarly, China's space strategy has been influenced by its perception of U.S. dominance in space, prompting it to accelerate its space program to close the capability gap. These findings will be talked about more extensively in section 10.3.

10.2.4 Pathways of the Typology of Space Powers and Its Relevance to Understand Space Strategy Rationales

Drawing on the three core hypotheses, Chapter III introduced the typology matrix of space powers.[570] It systematically categorizes space powers based on their relative capabilities and domestic perceptions. Through the different combinations of both variables, this typology offers a direct way of understanding strategic shifts of space powers. This typology reflects the neoclassical realist framework adopted by this dissertation to analyze strategic choices, focusing on how systemic pressures and domestic factors shape state behavior, particularly in complex domains like space, where technological advancements and dual-use assets create unique strategic challenges.

For instance, the U.S. transformed from an emerging space power in the 1950s and

[570] See Table 3 in Chapter III.

1960s to a balanced space power in the 1970s and 1980s, then completed its transformation towards a space hegemon following the collapse in the 1990s, followed by the more recent dynamics created by China's rise as an emerging space power around 2011, pushing it towards a status quo space power. While the U.S. adopted competitive space strategies such as heavy investment in launch vehicles in the 1960s and after 2011, the political dynamics and rationale are quite different in these two periods. As an emerging space power, the focus was securing independent access to space and space resources, while as a status quo power, it was more about maintaining its relative advantages. The progression of space technologies and political-economic realities also changed how the U.S. space program is structured, especially with the increasing privatization of space launch services such as SpaceX.

If the hypotheses hold, this typology could offer a certain level of predictive power in determining future strategic shifts and interactions in space politics. Specifically, identifying different types of space powers can provide insights for scholars and policymakers alike about the potential behaviors of various actors. It also offers potential pathways to a more cooperative space environment through different configurations of space actors in the system. These findings suggest that domestic factors, though often overlooked in traditional realist theories, are essential influences on both the timing and nature of shifts in space policy. Rather than being simple byproducts of larger systemic changes, these factors are vital to understanding the dynamics at play.

10.3 Key Findings: Validation of Hypotheses and Pathways through the Typology Matrix

This section presents the key findings from the empirical chapters (V through IX) and finds that the cases this dissertation traced validated the hypotheses proposed in Chapter III. This section will also thoroughly discuss the strategic behaviors of major space powers, namely, the U.S., the Soviet Union/Russia, and China, and analyze their trajectories within the typology matrix developed earlier in the dissertation. In addition, this section also discusses the broader implications for understanding strategic shifts among space powers based on empirical evidence.

10.3.1 Validation of Hypothesis 1

This hypothesis proposes that relative capability is crucial for strategic shifts among space powers, significantly when it shifts unfavorably. Consequently, this would trigger balancing behavior from the affected space power. While the empirical investigation supports this claim, variations in such balancing behavior could also be identified. Specifically, a space power can balance by either enhancing its space capabilities, building partnerships, constraining the space capabilities of its opponents, or, more commonly, combining these options.

The trajectory of U.S. space strategy during the early Cold War (Chapters V and VII) validates this hypothesis effectively. Initially trailing behind the Soviet Union in the space race and perceiving that a “missile” gap existed, the U.S. took immediate action following the launch of Sputnik in 1957. The Eisenhower administration designed a three-pronged strategy to enhance U.S. space capabilities, including establishing DARPA and NASA, the education schemes designed to create a talent pool for its space program and a central focus on developing launch vehicles that ensure access to space for relative gains.[571] These efforts culminated in the Apollo program, with the U.S. aiming to gain parity and surpass the Soviet Union's lead by landing humans on the moon, which led to significant breakthroughs in launch vehicles and success in the moon landing mission.

Similar balancing behavior was seen again in the case of the Reagan administration’s

[571] See Chapter V sections 5.1 and 5.4.

SDI program in 1983, triggered by Soviet efforts to develop new launch vehicles that would increase its space capabilities and its tests of ASAT weapon systems that threatened U.S. access to space.[572] In response, the U.S. initiated the SDI, a space-based missile defense program to gain military advantage through space. Accompanying this program was a suite of policies to enhance U.S. space capabilities. Compared to the competitive strategies in the 1960s, the Reagan administration's space strategy came with the addition of the privatization of space launch services and broader international space cooperation with geopolitical allies in Europe. These measures paved the way for the U.S. dominance in space after the collapse of the Soviet Union.

The third round of balancing behavior came around 2011, with China's rise as an emerging power.[573] By 2012, China had reached close parity in two important metrics with the U.S.: the number of successful launches and the maximum payload capacity. In addition, it has accomplished crewed spaceflights, tested its ASAT weapon systems, successfully tested a space station module, and planned its lunar missions with a new generation of launch vehicles comparable to the launch vehicle fleet of the U.S. These events marked a severe challenge to the U.S.'s relative advantage. The response from U.S. policymakers was a series of policies aimed at isolating China to prevent technological transfer (the Wolf Amendment), an increased effort to enhance space capabilities through public-private cooperation (support for companies such as SpaceX), and an expansion of international cooperation (through the Artemis program and the associated Artemis Accords).

A similar pattern has been observed in Russia since 2014, other than in the U.S.[574] Due to geopolitical conflicts, Russia has drifted away from Western partners, losing

[572] See Chapter VII Section 7.2.
[573] See Chapter VIII sections 8.3 and 8.4.
[574] See Chapter IX, Section 9.4.

crucial revenues it enjoyed since its participation in the ISS's construction and maintenance. This has decreased its space capabilities, reflected in its number of successful launches and annual maximum payload capacity. Consequently, Russia started to engage more closely with China as a space partner, exemplified by its participation in the ILRS and the cooperation around GLONASS and BeiDou navigation systems. Simultaneously, around 2021, Russia initiated a series of policies to improve its space capabilities by developing a new generation of launch vehicles.

Overall, the empirical cases traced in the empirical chapters strongly supported Hypothesis 1 by investigating abundant qualitative evidence and aligning with the qualitative observations. Hence, it validates the argument that space powers respond to changes in relative space capabilities, whether induced by an external factor or a change in their space capabilities.

10.3.2 Validation of Hypothesis 2

As stated in Chapter III and Section 10.2, Hypothesis 2 argues that a stable distribution of space capabilities can promote cooperation in space. This includes two types of distributions, namely balanced distribution through parity, as discussed in Chapter VI, and stable distribution under hegemonic stability, as discussed in Chapter VII and Chapter IX.

Firstly, Chapter VI traced the cooperation between the Soviet Union and the United States in the 1970s, as exemplified by the ASTP program and collaboration in the institutionalization of space governance in the 1960s and 1970s.[575] These cases supported the first scenario, where cooperation between primary competitors became possible with a balanced distribution of space capabilities. Specifically, by 1972, highlighted by the success of the Apollo moon landing by the U.S. and the continued

[575] See Chapter VI, sections 6.4.2 and 6.4.3.

Soviet advancement in crewed space missions, the superpowers reached a fluid balance. While the Soviet Union maintained a high intensity of space activities and secured an advantage in specific fields, the U.S. also proved its more capable launch vehicles and its advantage in satellite technology and reusable launch vehicles such as the space shuttle program. Under this fluid balance and domestic constraints on both sides, continued competition in space became an unattractive option that could not justify the continuous significant investment. This is supported by primary sources on both sides of the Cold War superpowers, especially those that reflected the rationale of policymakers and experts involved in making space strategies.

Secondly, the second scenario was observed in the case of the cooperation between Russia and the United States since 1993, which has centered around the ISS and lasted until now.[576] The ISS is the only example of long-term space cooperation under a structure of hegemonic stability. The U.S. had a significant advantage in terms of space capabilities and the ability to maintain its leading position as a space hegemon (as defined in Chapter III and Chapter VII). Consequently, the U.S. and Russia saw more benefits in cooperation than competition in space. On the U.S. side, the inclusion of Russia in ISS has significant instrumental and strategic value. Firstly, Russia, as a space power, could still supply the ISS with highly affordable launch and maintenance services, improving U.S. space programs' overall cost-effectiveness. Secondly, by ensuring the survival of the Russian space program, it could also avoid the proliferation of space technologies to rival powers and potential competitors such as Iran, North Korea, China, etc., which could be the case if there was a significant departure of Russian space scientists. This motive also aligns with the argument that space technologies are dual-use. Considering the case of the KVD-1 deal between Russia and India, the technological transfer of launch vehicle technologies affects

[576] See Chapter IX, Section 9.3.

civilian and military space security due to the potential application of launch vehicle technologies on ballistic missiles.

However, as neoclassical realism and hegemonic stability theory suggest, hegemonic order is difficult to maintain. This is particularly prominent in the case of space, as discussed in Chapter VII. Due to the difficulties in constraining other competing space powers' pursuit of space capabilities, the balance of space capabilities can be highly dynamic and need constant maintenance.[577] However, due to domestic constraints, which could be economic and financial challenges or shifts in perceptions due to government turnovers, etc., the stable distribution under a hegemonic order could be disrupted externally by other space powers. A typical example is China's rise as an emerging power since the early 1990s. Similar arguments could also be applied to balanced distribution, as seen in the case of the collapse of the Soviet Union, albeit focusing more on the domestic challenges.

Overall, the empirical cases traced in Chapter VI, Chapter VII, and Chapter IX support Hypothesis 2's argument that a stable distribution of space capabilities promotes cooperation in space. However, it also depends on the type of stable distribution, and due to domestic constraints, it could be disrupted easily through the different mechanisms described above. Nonetheless, the empirical evidence generally supports Hypothesis 2 and could offer directions for future research, which will be discussed in Sections 10.4 and 10.5.

10.3.3 Validation of Hypothesis 3

Hypothesis 3 suggests that a space power's domestic perception also works as an essential variable for strategic shifts, particularly perceptions of future trends of capability changes. Specifically, when a space power perceives that future trends may

[577] See Chapter VII, sections 7.1 and 7.4.

enhance its position, it may opt for a competitive approach to capitalize on it. Conversely, if future technological developments destabilize, states might favor cooperation to mitigate risks and promote governance frameworks that ensure long-term stability. As discussed in Section 10.2.3, this hypothesis aligns with neoclassical realism's emphasis on the role of perceptions in guiding state behavior. Overall, the tracing of empirical cases in Chapters VII, VIII, and IX validates this hypothesis, showcasing how the United States in the late 1970s to 1980s, the late 2000s to early 2010s, Russia since 2014, and China's continuous growth in space capabilities since late 1980s, exemplified by initiatives such as "863 program". This section will discuss these cases respectively.

Firstly, the United States' strategic adjustments in the late 1970s and 1980s illustrate how perceptions of future space capabilities influence strategic behavior. During this period, U.S. policymakers perceived a growing threat from the Soviet Union's advancements in space-based military technology, particularly in developing ASAT capabilities. This perception was driven by intelligence reports suggesting that the Soviet Union invested heavily in ASAT systems and potential space-based missile defense. While these technologies were just in the planning and testing stage, the Reagan administration responded very actively in 1983 with the SDI. As discussed in section 10.3.1, while space powers are sensitive to changes in space capabilities, they care not only about actual materialized space capabilities at the moment but also about long-term projection into the future. This aligns with the assumption that space activities and the growth of space capabilities are long-term endeavors with high latency to policy changes. Therefore, the potential cost of lagging behind a significant shift in relative space capabilities is high. This rationale is supported by the empirical evidence in Chapter VII, particularly observable in the presented views of the defense policy community members who strongly influenced the Reagan administration.[578]

Secondly, in the 2000s, the U.S. closely monitored China's swift progress in space capabilities. Despite China's space capabilities not matching those of the U.S. at the time, American policymakers foresaw the trend of China narrowing this technological gap with continuous success in space.[579] This perception that China would close the gap quickly led the U.S. to implement strategic actions to preserve its space leadership before another “Sputnik moment.” Notably, the Wolf Amendment 2011, which barred NASA from bilateral cooperation with China, was designed to restrict China’s access to cutting-edge space technology and hinder its ability to use international partnerships to boost its space endeavors.

Moreover, the U.S. bolstered its continuous partnerships with the private sector, notably with SpaceX, and initiated the Artemis program in 2017, targeting the reinforcement of U.S. leadership in moon exploration. These initiatives were motivated by the anticipation that China's rapid technological advancement could challenge U.S. supremacy in space in the future. These measures implemented by the U.S. during this timeframe lend support to Hypothesis 3, suggesting that preemptive balancing actions, such as excluding China from significant cooperative agreements and amplifying its space capabilities via public-private partnerships, were efforts to counter the anticipated future challenge from China. This exemplifies how space-faring nations adapt their strategies to expected shifts in capability trends, even without an immediate threat.

Thirdly, Chapter IX presented Russia as a declining space power, and tracing its strategic adjustments also validates Hypothesis 3. As a geopolitical aftermath of Russia’s annexation of Crimea in 2014, previous cooperation with the U.S. in space

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[578] See Chapter VII, Section 7.2.
[579] See Chapter VIII, Sections 8.3 and 8.4.

deteriorated. Due to the ISS's dependency on the Russian Soyuz spacecraft for maintenance and crew rotation, the cooperation did not end immediately and lasted until writing. With the 2022 Russian invasion further spoiling the cooperation, Russian policy had a pessimistic outlook on the future impact of this dynamic on its space capabilities since the existing international partnerships provided essential cash flows for the Russian space apparatus. Should this relationship end, it would significantly harm Russia's capabilities. This is more observable from quantitative statistics presented in Chapter IX.[580] Consequently, while the Soyuz missions to the ISS continued to fly, Russia shifted its policy away from cooperating with the West. It turned to China to potentially sustain its space capabilities through programs like the ILRS and global navigational systems. Additionally, in preparation for a complete severing of space cooperation with the West, Russian leaders have implemented policies and financial incentives to boost Russia's independent space capabilities, focusing on a new generation of launch vehicles and cooperation with civilian academic institutions to boost space research.

Essentially, this case demonstrates how Russia's perception of future space capability trends, both in terms of its technological potential and the opportunities for cooperation with China, influenced its strategic behavior. Although Russia's space capabilities remained constrained compared to those of the U.S. and China, its leadership anticipated future technological developments that could enhance its position, prompting a more competitive and assertive space strategy. This supports Hypothesis 3, as Russia's strategic adjustments were driven by its perception of future opportunities rather than its immediate capabilities.

Finally, China's transition from a pragmatic space power with minimal space capabilities towards the role of a revisionist space power also provides support for

[580] See Chapter IX, Sections 9.4 and 9.5.

Hypothesis 3.[581] As discussed in Chapter VIII, China's leadership has consistently viewed space as a critical domain for advancing its national interests and enhancing its global standing. The launch of the 863 Program in 1986 marked a turning point in China's space strategy, as it sought to develop critical technologies that would allow it to compete with the U.S. and other space powers in the long term. China's strategic focus on self-reliance in space technology, including the development of its crewed space program and the construction of the Tiangong space station, as well as the lunar missions, reflects its perception that future space capabilities will play a decisive role in shaping global power dynamics. China's leadership recognized that U.S. dominance in international space cooperation frameworks, mainly through the ISS and partnerships with Europe, Russia, and Japan, would limit China's ability to influence space governance. This perception drove China to invest heavily in developing independent space infrastructure and expanding its space exploration capabilities, with a long-term vision of becoming a global leader in space, as stated in the official space policies presented in Chapter VIII.

Overall, the empirical cases traced in Chapter VII, Chapter VIII, and Chapter IX support Hypothesis 3's argument that perceptions matter in space strategies, particularly perceptions in the future trends of relative space capabilities.

10.3.4 Tracking Major Space Power Trajectories Through the Typology Matrix

As discussed in the previous sections, the three core hypotheses presented in Chapter 3 are validated by tracing space strategy shifts of the U.S., the Soviet Union/Russia, and China at different historical stages. Hence, it is necessary to discuss further what that means for the theory construction efforts of this dissertation. The typology matrix developed in Chapter III categorizes space powers based on their relative capabilities

[581] See Chapter VIII, Sections 8.3 and 8.4.

and strategic behaviors, ranging from pragmatic to revisionist to hegemonic. The pathways of the U.S., the Soviet Union/Russia, and China can be mapped against these roles, which could provide predictions on the potential directions of these space powers.

Firstly, as shown in Figure 19, the pathway of the U.S. through the matrix is marked by solid arrows, and dotted arrows indicate potential future developments. The U.S. started as an emerging power around 1957 and progressed to become a balanced space power around 1970. It began to move towards becoming a space hegemon in the late 1980s. After reaching this status, it started to move towards a status quo power due to a perceived increase in China's relative space capabilities. From this point onwards, a few potential developments could be marked by dotted arrows.

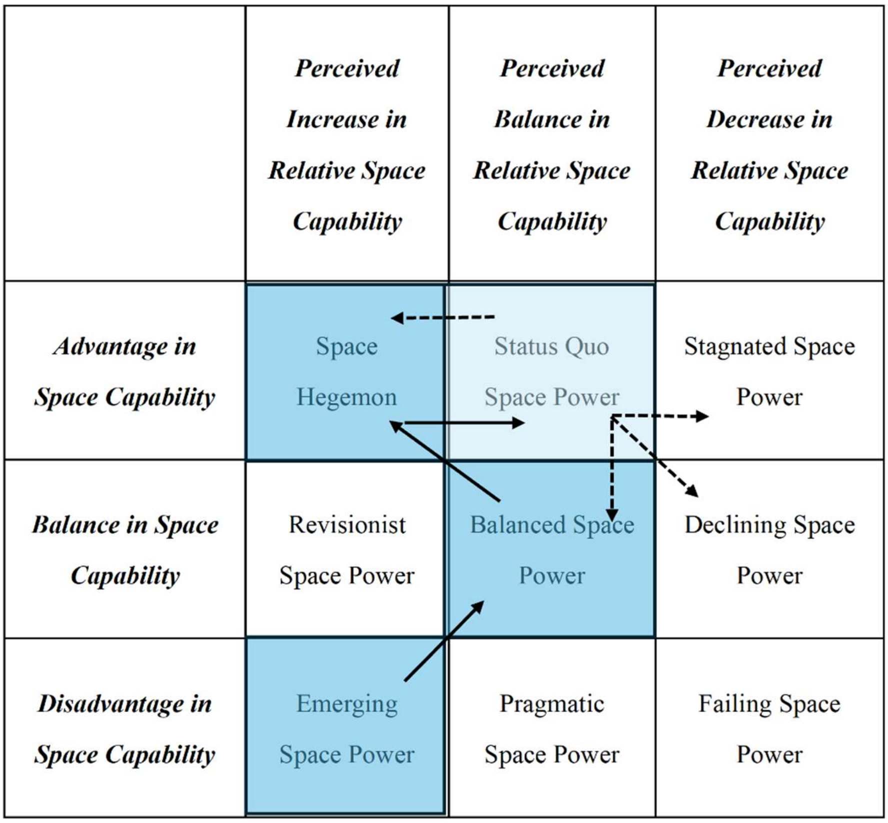

Figure 19 Pathway of the U.S. through the typology matrix

Firstly, the U.S. could re-invest in its space capabilities to the extent that it exceeds the speed of growth in Chinese space capability, reverting to the distribution before China's rise to a revisionist space power. The second possibility is to maintain the current distribution and attempt to maintain its relative space capabilities at the current level. The third possible outcome is that regardless of U.S. efforts to increase its space capabilities, China is still closing the gap, which means that the U.S. would move towards a stagnated space power and eventually lose its advantage and move downward. Additionally, the actual distribution of space capabilities could change dramatically due to extremely rapid increases in its main competitors' relative space capabilities or a dramatic decline. In the case of the U.S., if the U.S. experienced such a dramatic decline in relative space capabilities, it would also move downward to become either a balanced space power or a declining space power.

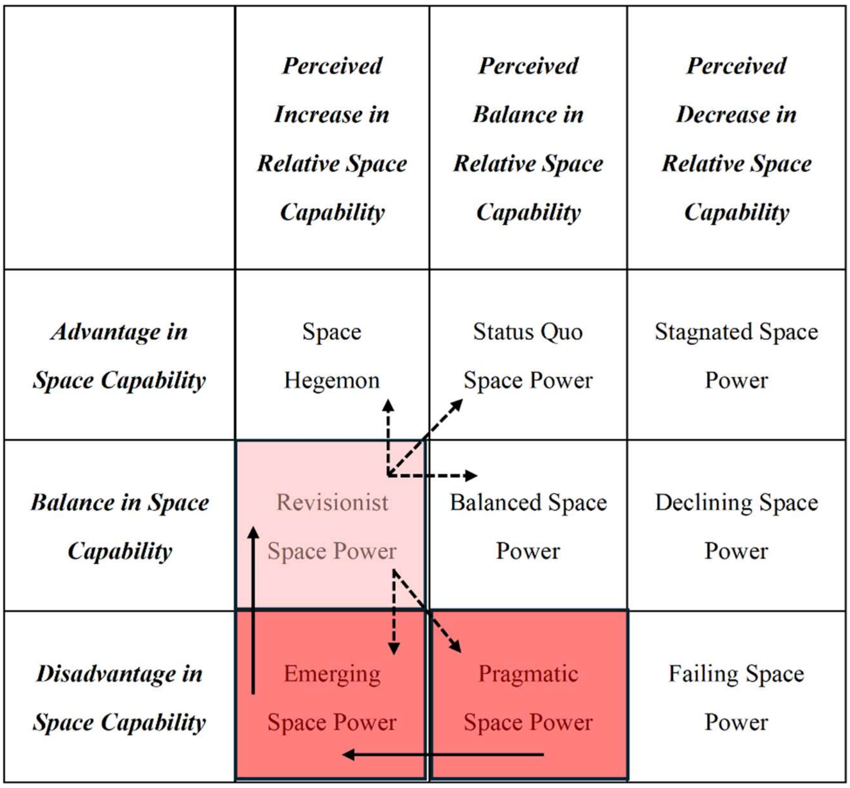

Figure 20 Pathway of China through the typology matrix

A similar analysis could be done for China's cases. China started as a pragmatic space power around 1956, with a perception that its space efforts would not change the gap in relative space capabilities between the U.S. and the Soviet Union in any meaningful way. However, as presented in its various space policy papers and statements from Chinese policymakers (discussed in Chapter VIII), China has consistently set its goal of reaching parity with the U.S. and the Soviet Union/Russia. Hence, it focused on pragmatic and incremental progressions to build an essential space capability. As its space capabilities grew, it gradually shifted left and became an emerging space power around 1992. It started moving toward becoming a revisionist space power around 2011 and reached close parity with the U.S., albeit still essentially an emerging space power. However, due to the renewed U.S. efforts to balance against Chinese growth, there are several possible outcomes for China as a space power.

Firstly, the U.S. might succeed as the status quo power in maintaining the current gap at a stable status, which means China would remain a revisionist power and continue its attempts to change the balance. Or, if Chinese policymakers' perception of future capabilities changed, it could shift right towards a balanced space power, as happened during the Cold War between the U.S. and the Soviet Union. According to Hypothesis 2, this might create a more cooperative space environment.

There is also a second possibility: if Chinese policymakers perceive its future growth potential to be continued to the extent that it exceeds the ability of the U.S. to contain, it might aim to move upward. If it succeeded, China would become either a status quo space power or a new space hegemon, depending on its perception of future distribution. Nonetheless, the U.S. would experience dramatic changes in relative space capabilities and move downward, as described in the previous paragraph. Based on Hypothesis 1, this would undoubtedly trigger a balancing act from the U.S. unless the perception of U.S. policymakers' perception of its future competitiveness is in a negative light. In that case, the U.S. would shift right to become a declining or even a failing space power, as seen in the case of Russia.

Finally, a third scenario would happen if the U.S. managed to revitalize its competitive edge as a space power to the extent that it could shift leftward to remain a space hegemon. In that case, China would stay in a disadvantaged position regarding the actual distribution of space capabilities, potentially shifting right, reverting to its previous position before 2011.

Lastly, the Soviet Union is somewhat of a particular case in its early stages. While the Soviet Union started in 1957 with some relative advantage in terms of its space capabilities, due to the lack of absolute space capabilities, it would be an overstatement to state that the Soviet Union at that stage was a revisionist space power or even a space hegemon. On the contrary, as discussed in Chapter VI, for the more significant parts of the Space Race, the Soviet Union was at a disadvantage, mainly since the 1960 Nedlin Catastrophe due to the loss of personnel and required time and resources to handle the aftermath, which also hampered the Soviet Space program.[582] Hence, the argument can be made that the Soviet Union during the Space Race could be considered an emerging space power.

[582] Gingerich et al, 2015.

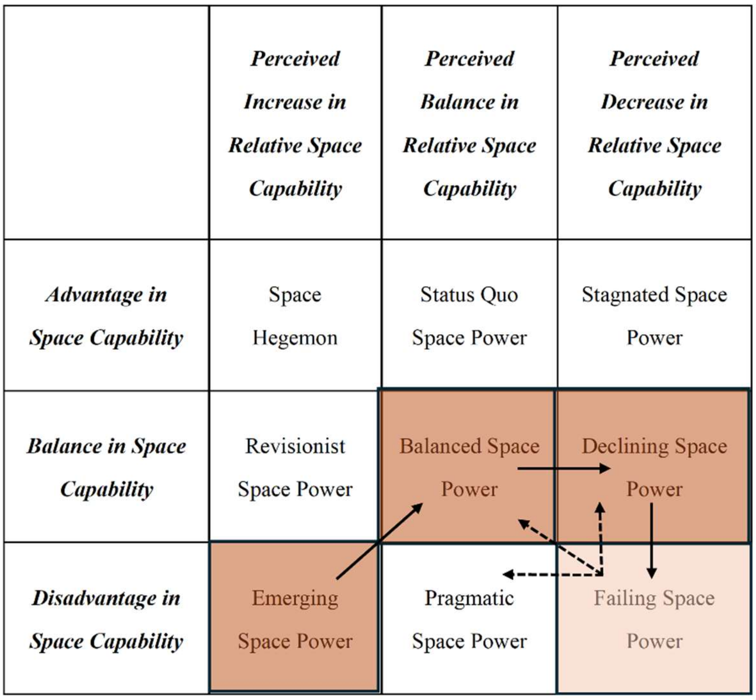

Figure 21 Pathway of the Soviet Union/Russia through the typology matrix

Similar to the U.S., The Soviet Union also reached a balanced space power status around 1972.[583] However, as discussed in Chapter IX, by 1989, the Soviet Union faced severe domestic constraints, pushing it to shift to a declining space power. After the collapse of the Soviet Union in 1991, Russia, as the primary heir to the Soviet Union's space capabilities, continued to decline in the following years, shifting towards a failing space power. However, the turning point in 1993 with the Russian inclusion in the ISS helped Russia maintain most of its space capabilities, preventing it from shifting down wholly. Nonetheless, since geopolitical issues over Ukraine and the consequent deterioration of relationships between Russia and the U.S. and its European allies, Russia is again faced with a trend to shift downward.

Due to its declined status, there is a narrower range of potential outcomes for Russia than for China and the U.S. Firstly, if Putin's efforts to revitalize the Russian space industry succeed, Russia could shift leftward to become a pragmatic space power.

[583] See Chapter VI.

From there, it can gradually build its space capabilities again, particularly with a continued partnership with China. However, it could also fail because it does not change Russia's relative space capabilities and does not increase the projections of its growth potential for the future. In that case, Russia would be stuck in a downward trajectory and become a failed space power with relatively limited space capabilities compared to the U.S. and China.

In conclusion, based on the hypotheses and the empirical cases traced by the dissertation, the typology matrix developed in Chapter III offers a unique insight into the potential direction of the next stage of space competitions between the three major space powers, including the U.S., the Soviet Union/Russia, and China. Undoubtedly, further refinement and theorization are needed to improve this analytical tool for space strategy analysis. Nonetheless, it can directly demonstrate how relative space capabilities and perceptions of future capabilities drove space powers to change their strategies due to different combinations of the two leading independent variables.

10.4 Implications and Limitations

The findings of this dissertation have several significant implications for the field of IR, particularly within the context of neoclassical realism and space politics. The puzzle for this dissertation is: what are the main drivers behind strategic behavior of great powers in space? Deriving from this puzzle, the main research questions this dissertation seeks to answer is why space powers compete and when they cooperate. This dissertation has demonstrated that the strategic behaviors of major space powers, including the U.S., Soviet Union/Russia, and China, are influenced by changes in their relative space capabilities and their domestic perceptions of future relative capabilities. Different combinations of both these system-level and domestic-level variables can produce different outcomes.

This argument has been tested through the three core hypotheses proposed in Chapter

III and delivered a framework in the form of a typology matrix to explain strategic shifts among space powers as an answer to the core research question. By doing so, this dissertation made two valuable contributions, including a contribution to the development of neoclassical realist theory and to space policymaking and analyses. This section will elaborate on both and then discuss the limitations of this research.

Finally, although this dissertation initially suggested that the rise of private actors might indicate a systemic transformation in space governance, the empirical chapters show that their influence remains limited and strongly mediated by state priorities. Private entities like SpaceX or Roscosmos-affiliated firms continue to operate within frameworks defined by national strategies and regulatory structures. As such, this thesis does not claim that private actors have restructured the international system, but rather that they represent a dynamic area of potential change whose significance will likely grow in the coming decades. Future research would be needed to assess whether these actors can indeed shift the systemic character of space politics or if they will remain primarily instrumentalized by state agendas.

10.4.1 Implications for International Relations and Space Politics

Neoclassical realism, combining systemic-level pressures with domestic variables, is a practical framework for analyzing states' foreign policy choices.[584] This dissertation contributes to IR by extending the application of neoclassical realism to the space domain that has been relatively untouched within this theoretical context. Previous IR literature on space has predominantly used neorealism, neoliberalism, and constructivism for analyses. While a few scholars used neoclassical realist frameworks, most of these works focused on specific case studies or a specific period.[585] However,

[584] Lobell and Ripsman, 2009.

[585] See Pollpeter, Kevin. "Neoclassical Realism as a Framework for Understanding China's Rise as a Space Power." In *The Oxford Handbook of Space Security*, 2023.; Schreiber, Nils Holger. "Man, State, and War in Space: Neorealism and Russia's Counterbalancing Strategy Against the United States in Outer Space Security Politics." *Astropolitics* 20, no. 2-3 (2022): 151-174. https://doi.org/10.1080/14777622.2022.2143043.

this dissertation offers holistic research on space strategies across a broad timespan through a novel neoclassical realist framework, filling a unique gap.

By testing the hypotheses on strategic shifts in response to changing space capabilities, this dissertation confirms that relative space capabilities and domestic perceptions of space capability trends are pivotal in shaping space powers' strategic stances. For example, the decisions of the U.S. and Soviet Union regarding missile defense and satellite technologies during the Cold War were driven by immediate threats and perceived future capability distributions. Similarly, China's rise in space was influenced by current capabilities and long-term technological self-reliance goals, demonstrating neoclassical realism's applicability to understanding space power dynamics.

The findings of this dissertation further refine the concept of strategic competition and cooperation within space politics. Traditional IR theories tend to portray these strategies as binary choices made by states in response to relative power shifts. However, the empirical evidence presented here demonstrates that space strategies are more fluid and subject to perceptions and other domestic constraints, particularly when technological breakthroughs are anticipated. This fluidity challenges the more structuralist view of power balancing in neorealism, offering a more dynamic understanding of strategic decision-making in space.

Space is an open domain with high entry requirements due to the difficulty securing independent access to space and the financial costs. Consequently, although space is an open system, it only contains a few prominent actors on the state level. Therefore, space is an ideal domain to work in as a testing ground for theory building and theory testing. The neoclassical framework developed by this dissertation could also be applied to similar domains that feature advanced and dual-use technologies, such as artificial intelligence and cyberspace, or to emerging physical domains, such as the

Arctic regions.

10.4.2 Implications for Space Policymaking

The insights gained from this dissertation also have significant implications for space policymaking. Policymakers can utilize the framework developed here to understand better how shifts in space capabilities and perceptions of future trends influence state behavior. This knowledge can assist in designing policies that encourage cooperation or mitigate risks associated with competitive strategies. The empirical evidence points to the necessity of international governance frameworks that can address the dual-use nature of space technologies and the vulnerabilities of space assets. Policymakers should focus on creating more flexible, adaptive governance structures that account for the current distribution of space capabilities and the perceptions of future technological trends. Current international space laws, such as the Outer Space Treaty, provide foundational governance mechanisms but have struggled to keep pace with new developments, such as the privatization and commercialization of space.

Moreover, as space becomes increasingly congested and competitive, policymakers must prioritize the creation of frameworks that balance security concerns with the need for collaboration. Initiatives such as the Artemis Accords provide models for encouraging international cooperation in areas like lunar exploration. Still, these efforts must also consider the long-term security and political implications of emerging space technologies, including ASAT and space-based missile defense systems. The framework developed in this dissertation highlights how the perception of future technological trends can drive competition even in relative capability stability, suggesting that governance structures should be designed to address these potential preemptive balancing behaviors that could lead to conflicts over space or even in space.

This dissertation offers several recommendations for practical space policy toward a more cooperative and stable political environment in space. For example, space actors should enhance transparency and strategic trust-building measures in space activities to reduce the risk of misperception and inadvertent escalation. Given that the findings support that perceptions of space capabilities are a crucial driver of strategic shifts, increasing transparency about technological developments could help mitigate the tendency toward competitive balancing behaviors, particularly among the major space powers.

Additionally, from cases where space powers succeeded in a space competition, the institutional configuration of space program matters. The dual-track approach (military-civilian) to space programs and public-private cooperation schemes coupled with educational schemes to create talent pool have been proven useful in all three cases. Hence, for emerging space powers, these are dependable pathways to build a capable space program.

10.4.3 Limitations of This Research

The research has made significant contributions, but it is important to recognize several limitations. These limitations are primarily due to the study's scope, data availability, and the dynamic nature of space politics. One significant limitation of this dissertation is its focus on the three major space powers: the United States, the Soviet Union/Russia, and China. While these states have historically been dominant in space politics, the increasing involvement of other space actors, such as India, the European Union, and private companies, means that the landscape of space competition is evolving. By exclusively focusing on these three powers, the research may not fully capture the dynamics of emerging actors in space. This limitation is understandable given the dissertation’s objective to provide a detailed analysis of great power competition in space. However, future projects derived from this research could broaden the scope and include these space actors.

Similarly, analysis primarily focuses on the activities of state actors, particularly concerning the involvement of private entities like SpaceX, Blue Origin, or Landspace within and without the state's space program. As commercial actors play an increasingly significant role in space exploration and satellite deployment, understanding their interactions with state strategies will be crucial for predicting the future of space politics. However, since this dissertation concentrates on state behavior from a neoclassical realist perspective, these exclusions were necessary to maintain analytical consistency at the state level.

Another significant challenge in analyzing space strategies is the inherent secrecy surrounding military space programs and dual-use technologies. Much of the data on space capabilities, particularly those related to national security, are classified, limiting the ability to assess the true extent of space power competition fully. This research has relied on publicly available data, policy documents, and historical case studies. However, it must be acknowledged that some aspects of space competition still need to be made available to scholars.

The dynamic nature of space technology also presents a challenge for long-term analysis. The findings of this dissertation are based on historical and contemporary case studies up to around 2022. Still, the pace of technological advancement in areas such as reusable rockets, space mining, and space-based military systems could significantly alter the strategic landscape in the coming decades. Hence, certain more recent events may not be covered in the analyses. Nonetheless, the theoretical framework developed here offers a flexible tool for analyzing space strategy. On the positive side, this dynamic nature provides abundant case studies for future research, which can further test and improve the findings of this dissertation.

10.5 Conclusion and Outlook for Future Research

The dynamic nature of space power competition and the rise of new actors in this domain necessitate further theoretical and empirical investigations to deepen the understanding of strategic shifts in space. This dissertation also developed metrics and ways to capture space capabilities through quantitative and qualitative assessments, providing a valuable dataset and a collection of sources for future research,

The neoclassical realist framework applied in this dissertation integrates systemic pressures with domestic perceptions to explain strategic behavior in space. Future research could refine this framework by incorporating additional variables, such as technological breakthroughs or shifts in global economic conditions. Specifically, examining the role of domestic political transitions and leadership changes in shaping space policies could yield insights into how internal state dynamics interact with global competition in space. Additionally, expanding the scope of analysis to include emerging space actors like India, Japan, and private space firms would allow for a more comprehensive evaluation of how different political and economic contexts influence space strategies.

Secondly, this research also created a database on space capabilities measured quantitatively. Combined with further theorization of the matrix, it could be possible to translate the theoretical framework into mathematical language to support future quantitative research on space power. It could also serve as a resource for policymakers and international institutions to monitor dynamics in space capabilities.

Thirdly, private companies like SpaceX, Blue Origin, and OneWeb become significant players in space, and their influence on national space strategies requires closer scrutiny. Future research should explore the interaction between private and state actors in shaping space governance and the implications of privatization for strategic competition. Investigating how private companies impact state policies and whether they act autonomously or in alignment with national interests would provide a more nuanced understanding of the evolving space domain. Additionally, scholars could examine the role of public-private partnerships in mitigating the risks of competitive behavior while promoting innovation.

Fourthly, technological advancements in artificial intelligence and space-based weaponry might disrupt the current strategic landscape. Future studies should focus on how emerging technologies will reshape strategic calculations, potentially leading to new forms of competition or cooperation. For example, the rise of AI-driven space capabilities or breakthroughs in quantum communications could lead to shifts in power dynamics, altering traditional space rivalries. Additionally, the impact of dual-use technologies (civilian and military applications) warrants further exploration, particularly in how states manage the ambiguity between peaceful and militarized space technologies.

Fifthly, while this dissertation focuses on the U.S., Soviet Union/Russia, and China, future research should explore the strategies of emerging space powers such as India, Japan, and the European Union. These actors play an increasingly significant role in shaping global space politics, and their strategies may differ from those of the great powers studied here. Investigating how these emerging powers navigate the space domain through independent initiatives or alignment with more considerable space powers could provide new insights into multipolar competition and cooperation in space.

In conclusion, this dissertation's application of neoclassical realism provides a solid foundation for understanding space strategies. However, the rapidly changing nature of space politics—driven by technological advancements, the rising influence of private actors, and the growing involvement of emerging space powers—calls for continued research in this field. Future scholars can build upon this framework to investigate new trends, address governance challenges, and offer policy solutions for managing competition and cooperation in an increasingly complex space environment.

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Appendix: Space Capability Dataset

This file contains all the data collected for this project, with sources in the Excel spreadsheets. Due to its size and format, it would not fit properly in the Word/PDF format. Hence, please use this file:

Kunhan Li_Data.rar

Backup file link can be found here:

https://drive.google.com/drive/folders/1A2faE2MeKIuHW0e8reQ-Qd3BQt7UB-JQ?usp=drive_link