The Fate of the Stars

Power, Legitimacy, and the Governance of Outer Space

Noah Royal Milad

A Thesis in International Relations

2026

Presented to the Faculties of the University of Pennsylvania in Partial

Fulfillment of the Requirements for the Degree of Bachelor of Arts


(Signature)

Dr. Valeriya Kamenova

Abstract

Humanity's oldest political challenge persists: how to govern new frontiers before they descend into competition and conflict. Oceans once open to all became arenas of empire, and the polar regions now strain under rival claims. That dilemma has now moved beyond Earth. Within decades, humans will establish lunar infrastructure, expand orbital operations, and pursue interplanetary exploration. Yet the 1967 Outer Space Treaty prohibits sovereignty while offering limited mechanisms for legitimate authority, leaving a governance vacuum at the center of humanity's next expansion.

This thesis investigates how authority can be constructed and sustained in a legally non-sovereign domain. Drawing on international relations theory and comparative institutional analysis, it examines four governance architectures shaping contemporary space activity: *Centralized Sovereign Governance*, *Legal Normative Governance*, *Networked Governance* through voluntary coordination, and *Integrated Multilateral Governance* through operational partnership. Through comparative analysis of China's space governance model, the Outer Space Treaty regime, the Artemis Accords, and the International Space Station partnership, the study evaluates how these arrangements generate legitimacy, coordination, and conflict management.

The findings show that no single governance architecture is sufficient on its own. Durable authority in space instead emerges through hybrid governance arrangements that combine legal legitimacy, operational interdependence, and flexible participation among diverse actors. By reconceptualizing authority as a function of institutional legitimacy rather than territorial sovereignty, this thesis contributes to the emerging field of space governance. As human activity expands beyond Earth, the governance choices made today will shape whether outer space becomes a domain of cooperative order or a new arena of geopolitical rivalry.

Acknowledgments

This project began long before it became a thesis. It began on the Eastern Shore of Maryland, watching rocket launches rise over Wallops Flight Facility. As a child, I wanted to become an astronaut. I visited NASA, memorized spacecraft, traced flight paths in the sky, and imagined myself among the small group of people entrusted with leaving Earth. At some point I realized that the astronaut corps and the realities of life, including something as ordinary as diapers, would not align with that dream. But the fascination never left, it simply evolved.

What began as a desire to go to space became a desire to understand it. If I could not be the one piloting the mission, I wanted to understand who governs it, who decides, who holds authority, and how humanity carries its politics beyond Earth. More than anything, I wanted to be among the people helping make those decisions, shaping the systems that guide how humanity moves forward into space and becomes part of something greater than any one nation, institution, or individual.

I am especially grateful to Professor Valeriya Kamenova, whose rigor and steady guidance pushed this project to become more than ambition. Her careful reading and insistence on precision strengthened every chapter. More than that, she showed me what thoughtful, serious mentorship in academia looks like. I hope I am fortunate enough to find mentors like her again in the years ahead.

To the University of Pennsylvania and the communities that shaped my thinking, thank you for creating the space to ask large questions about power, order, and responsibility.

Most of all, to my mother. You raised a child who watched rockets from the shore and believed the sky was not a limit. Your strength, resilience, and faith made every step possible. You taught me that leadership is service and that ambition must carry responsibility. Whatever future this work points toward, it rests on the foundation you built.

This thesis is about authority beyond sovereignty. But for me, it is also about a boy on the Eastern Shore who looked up, and never really stopped.

Table of Contents

List of Abbreviations

CNSA - China National Space Administration

COPUOS - United Nations Committee on the Peaceful Uses of Outer Space

COTS - Commercial Orbital Transportation Services

CSF - Commercial Space Federation

DC - Washington, District of Columbia

ESA - European Space Agency

IGA - Intergovernmental Agreement

ILRS - International Lunar Research Station

IR - International Relations

ISS - International Space Station

ISS IGA - International Space Station Intergovernmental Agreement

ITU - International Telecommunication Union

NASA - National Aeronautics and Space Administration

OST - Outer Space Treaty

PPI - Progressive Policy Institute

UN - United Nations

UNOOSA - United Nations Office for Outer Space Affairs

U.S. - United States

U.N.T.S. - United Nations Treaty Series

Introduction

The age of exploration has always carried with it a dangerous question: who rules the frontier? From oceans once deemed ungovernable to polar ice now melting into disputed waterways, history shows that when humanity moves into unclaimed territory, law and power race to catch up. Space is no different, except that this time, the stakes are higher than ever. As states plan lunar bases, corporations sketch Martian colonies, and private actors launch missions once reserved for superpowers, the absence of sovereignty in space leaves one of the greatest puzzles of our era, how to govern what no state can own. This paradox, governance without sovereignty, authority without ownership, forms the core of this thesis. It asks: Which model of non-sovereign governance for space best secures recognized control over people, sites, and shared infrastructure, and why does it lower conflict?

On July 20, 1969, the image of a lone astronaut descending a ladder and stepping onto the Moon flickered across televisions around the world. Neil Armstrong's words, "a giant leap for mankind" instantly became history. Yet, as Armstrong planted the American flag into lunar soil, an uncomfortable truth lingered in the silence, the flag did not mark ownership. The United States could not claim the Moon, nor could any other state. By the terms of the Outer Space Treaty, signed just two years earlier, space belonged to no one, and to everyone. Authority had been suspended in orbit, sovereignty abolished before humanity had even left its home planet. This left humanity in a position unlike any other frontier, the chance to build governance frameworks from the ground up, before entrenched systems of power or property could harden. Space is not simply unclaimed territory; it is a rare opportunity to experiment with institutions on a blank slate, where choices made now will determine how authority, cooperation, and conflict unfold beyond Earth.

That moment was both triumphant and precarious. Humanity had extended its reach beyond Earth, but it had done so without a clear answer to the oldest question of politics: who rules? For decades, the question remained dormant. The Apollo program ended, the Cold War drew to a close, and outer space seemed once again distant, reserved for satellites and science fiction. Governance frameworks like the Outer Space Treaty appeared sufficient, precisely because no one was seriously trying to live beyond Earth. But today, that norm is breaking.

The twenty-first century has ushered in a new era of space activity. In 2019, NASA launched the Artemis program with the goal of landing astronauts on the Moon by the mid-2020s and establishing permanent lunar bases later in the decade. In 2021, China formally unveiled its long-term lunar and Martian settlement plans, outlining ambitions for a lunar research station by the 2030s. Private corporations like SpaceX, Blue Origin, and Axiom now openly advertise the prospect of Mars colonies, orbital stations, and asteroid mining, with SpaceX targeting the late 2020s for initial Mars missions. Dozens of states have joined cooperative frameworks such as the Artemis Accords, while rival alliances envision competing futures for governance. The frontier is no longer hypothetical. Within decades, the prospect of thousands, and eventually millions, of humans living and working beyond Earth is real. And yet the core dilemma remains unresolved: if sovereignty is prohibited, how do we govern?

Rivalry has always haunted space. The Cold War's race to orbit was driven not only by exploration but by the recognition, as Lyndon Johnson put it, that "control of space means control of the world." That logic persists today, with the United States, Russia, and China testing anti-satellite weapons and competing for strategic dominance, raising the risk that the frontier becomes another battlefield rather than a commons.

History offers both inspiration and warning. When humanity expanded across oceans, governance followed sovereignty, empires claimed territories, established laws, and fought wars to maintain them. The polar regions offered a different experiment: Antarctica, preserved under a treaty regime, operates without national ownership but under strict collective governance. The high seas are governed by maritime law, a blend of freedom and regulation that maintains order without state sovereignty. Cyberspace, a more recent frontier, resists centralized control yet is governed through networks of norms, institutions, and protocols. These analogies demonstrate that governance without sovereignty is possible but they also underscore the dangers, without robust institutions, poorly governed frontiers risk competition, fragmentation, exclusion, and conflict, especially when rules remain vague, outdated, or inconsistently applied. The barrier is not that democratic systems are incapable of great projects, history proves otherwise. The real danger comes when ambition is unfocused, when exploration serves bureaucracy rather than a clear purpose, momentum stalls and governance falters.

Space magnifies these risks. Unlike the seas or cyberspace, space settlements will depend on fragile infrastructure where failure is catastrophic. A single dispute over oxygen valves or water supplies could mean the death of hundreds, a conflict not fought with armies but with airlocks. Conflicts over access to ice deposits, lunar landing zones, or orbital slots could ripple across the international system, reigniting rivalries between great powers. Moreover, private corporations, actors with vast resources and little accountability, are now central players in space activity, further complicating questions of legitimacy and control. Governance will also shape how markets unfold in space, whether competition over resources fuels conflict or whether institutions channel activity into stable and productive systems. The stakes are existential. If

humanity fails to design governance for space, it risks exporting the worst of terrestrial politics into a domain where mistakes may be irreversible.

Existing scholarship on space law often focuses on property rights, liability, and resource extraction. Yet these areas do not address the deeper issue of political and institutional control, who sets the rules, who enforces them, and who holds legitimate authority over people, settlements, and shared infrastructure beyond Earth. Questions such as how lunar settlements will be governed, how disputes on Martian soil will be resolved, and how orbital infrastructure will be managed remain unresolved. In a domain where no state can claim jurisdiction, the absence of recognized authority risks turning order into raw power and leaving cooperation fragile and unstable. Too often, research has reduced governance to states and sovereignty, overlooking the ways authority is already exercised by supranational bodies and private actors. A broader view is needed if space is to avoid the weaknesses of past frontiers.

This study proposes that the solution lies in non-sovereign governance models: systems of authority that function without national ownership yet still secure legitimacy and stability. Drawing on international relations theory, comparative legal analysis, and historical case studies, the thesis examines centralized, decentralized, and hybrid models of governance. It evaluates them against two criteria: their ability to provide recognized control over people, sites, and infrastructure, and their ability to reduce the risk of conflict. The argument advanced here is that hybrid governance, combining collective oversight with localized autonomy, offers the strongest foundation for the future of space. By creating rules accepted as binding while allowing settlements to manage their internal affairs, hybrid governance enables disputes to be resolved before they escalate and provides the institutional recognition necessary for stable authority. In

this way, it avoids both the instability of a lawless frontier and the rigidity of sovereignty based control.

The contribution of this research is threefold. First, it reframes space governance around the problem of recognized control without sovereignty. Existing scholarship has made important advances: legal studies have examined questions of property rights, liability, and resource extraction, while international relations scholars have analyzed great-power rivalry, security dilemmas, and the risks of militarization in space. These works clarify the boundaries of international law and highlight the dangers of conflict, but they often treat authority over people, settlements, and shared infrastructure as secondary or implicit. This project places that institutional problem at the center of analysis. Second, it integrates insights from other non-sovereign domains, Antarctica, the high seas, and cyberspace, to identify conditions under which authority can exist without ownership. While prior research has drawn analogies between these regimes and outer space, it tends to do so selectively or without systematic comparison. By examining them together, this thesis both uncovers common mechanisms and clarifies their limits when applied to the space domain. Third, it offers practical recommendations for policymakers, demonstrating how hybrid governance could be implemented through existing initiatives like the Artemis Accords or by developing new institutions under the United Nations. In this way, the project builds on the strengths of existing legal and theoretical scholarship while moving beyond it, offering both conceptual clarity and actionable pathways for governing humanity's expansion beyond Earth.

The significance of this project extends far beyond the academy. For policymakers, it offers a roadmap by identifying which governance models can create recognized authority without sovereignty and by outlining practical mechanisms, such as shared oversight of

resources, dispute resolution frameworks, and coordination through agreements like the Artemis Accords, that can reduce conflict as human presence in space accelerates. For private corporations, it clarifies how authority might function in a domain where ownership is forbidden, showing under what conditions corporate operations could gain legitimacy and recognition. For international institutions, it highlights concrete pathways for cooperation, from expanding existing treaty frameworks to designing new bodies capable of managing shared infrastructure. And for humanity at large, it speaks to a defining question of the twenty-first century: will space be governed by cooperation, or consumed by competition?

The thesis proceeds as follows. Chapter 2 reviews scholarship on space law, international relations theory, and governance in non-sovereign domains while identifying the gaps this study addresses. Chapter 3 outlines the research design, including the comparative framework and case selection. Chapter 4 traces the historical development of space governance from Cold War foundations such as the Outer Space Treaty to contemporary initiatives like the Artemis Accords and China's International Lunar Research Station proposal. Chapter 5 presents the comparative analysis of centralized, decentralized, and hybrid governance models using criteria of legitimacy and conflict prevention. Chapter 6 advances the argument that hybrid governance provides the most durable framework for authority in space. Chapter 7 concludes by reflecting on the broader implications for the future governance of outer space.

Space is no longer a dream of visionaries; it is becoming the arena in which humanity's future will take shape. The choices forged in the coming years will not only influence the trajectory of twenty-first century politics but also define how authority and legitimacy function beyond Earth. Whether this expansion is characterized by cooperation and shared stability, or by fragmentation and competition, will depend on the governance structures we establish now.

Chapter 2: Literature Review - Authority Without Ownership

Humanity's first steps beyond Earth revealed not only the vastness of space but the fragility of the systems that would one day try to govern it. The Introduction chapter ended with a warning: the expansion of human activity beyond Earth will test our deepest assumptions about power, law, and legitimacy. This chapter enters that debate, a conversation spanning international relations, law, and political theory, to understand how authority can function without the shield of sovereignty. It first traces how scholars of global governance have reimagined authority beyond sovereignty, showing that power can persist through legitimacy and consent rather than coercion. It then turns to Earth's non-sovereign frontiers, from Antarctica to cyberspace, to uncover how legitimacy has been sustained where ownership is forbidden. The third section narrows to the specialized literature of space law, power, and fragmentation, revealing a framework strained by geopolitical divergence and private expansion. A fourth section identifies the missing theoretical core, the architecture of authority itself, before advancing a new synthesis: hybrid governance as the most resilient model for sustaining order and recognition in post-sovereign systems. Together, these sections chart the intellectual landscape from which the chapter's central argument emerges, that the future of space governance will depend less on law's reach than on the legitimacy of the institutions that interpret it.

2.1 The search for order beyond sovereignty

The question "who rules the frontier" has haunted every unclaimed domain. Yet in the absence of sovereign borders, power must find new forms. The general scholarship of international relations offers the first insight: authority is not extinguished when sovereignty ends. It mutates. Power can operate through institutions, norms, and structures that produce compliance without

coercion. Scholars of governance have long argued that rule is sustained as much by recognition as by force - that legitimacy itself can generate order. This plural conception of power, one that sees control not merely as command but as the shaping of what actors can imagine or accept, expands the theoretical horizon for any non-sovereign domain.[1] It suggests that outer space, though lawless in ownership, need not be lawless in rule.

This literature reorients how governance is conceived. Kenneth Abbott and Duncan Snidal show that international law is not a binary between binding and voluntary, but a spectrum between "hard" and "soft" legalization.[2] Their insight is crucial: actors choose the strength of rules according to uncertainty, sovereignty sensitivity, and enforcement cost. Space, with its technological unknowns and multi-actor complexity, may therefore require softer, adaptive instruments that evolve into harder law as trust matures. Similarly, Abram and Antonia Chayes reframe compliance not as coercion but as management. Most rule-breaking, they argue, arises from ambiguity, capacity gaps, and lag, not defection.[3] This managerial model offers a map for governing settlements where technical failure and interpretive gray zones will be far more common than willful rebellion.

Beneath these practical insights lies a deeper shift. David Lake's theory of "rightful rules" imagines governance as a relationship, not a contract imposed from above. Authority, he writes, exists when communities accept obligations in exchange for valued order.[4] This notion dismantles the myth of anarchy by showing that hierarchy can be negotiated, that legitimacy is a product of performance and consent, not territory. It is this logic that allows supranational institutions, corporations, and consortia to wield real authority without possessing sovereignty. It

[1] Barnett and Duvall, "Power in International Politics," 39.
[2] Abbott and Snidal, "Hard and Soft Law," 421.
[3] Chayes and Chayes, "On Compliance," 175.
[4] Lake, "Rightful Rules," 587.

is also the logic that could anchor governance among lunar or Martian communities, whose very survival would depend on the legitimacy of the systems that bind them.

But the literature also warns of the paradox of success. As institutions accrue authority, they become visible, and visibility breeds contestation. Michael Zürn describe this dynamic as the politicization of international authority: as rules reach into daily life, citizens and states begin to challenge their legitimacy.[5] Politicization is not decay; it is evidence that power has become meaningful. The challenge for space governance, then, is not to avoid politics but to design systems that can withstand it.

In short, the general scholarship on governance under anarchy paints a strikingly clear message for space. Power can exist without ownership. Law can be soft yet binding. Compliance can arise from transparency rather than punishment. Legitimacy can be earned through recognition and reciprocity. These insights establish the intellectual foundation for a frontier where sovereignty is forbidden but order is indispensable.

2.2 Lessons from Earth's other frontiers

Before humanity extends governance beyond Earth, it must first confront how it has ruled without sovereignty below. The analogues are imperfect but illuminating. From the frozen expanse of Antarctica to the global sprawl of cyberspace, non-sovereign domains reveal both the ingenuity and the fragility of cooperation.

Eytan Tepper describes this pattern as a "big bang" of polycentric governance, in which authority fragments into many overlapping centers rather than one dominant regime.[6] In such systems, law is made, interpreted, and enforced across multiple scales: treaties coexist with

[5] Zürn, Binder, and Ecker-Ehrhardt, "International Authority and Its Politicization," 69.
[6] Tepper, "Big Bang of Space Governance," 485.

corporate standards, and norms diffuse through networks rather than decrees. Polycentricity thrives on redundancy and experimentation - attributes essential for space, where no single sovereign can monopolize rule. Yet it also multiplies the risk of contradiction, duplication, and competition. Without coordination, polycentricity can collapse into chaos.

History confirms this tension. The Antarctic Treaty System, the Law of the Sea, and the governance of cyberspace each embody different arrangements of freedom and constraint. None rely on ownership; all depend on consent. Their endurance comes not from enforcement capacity but from legitimacy and shared recognition. However, their failures, resource conflicts in the high seas, cybercrime, and the fragility of consensus in Antarctic science, remind us that non-sovereign governance must constantly balance openness with order.

Hybridization, therefore, is not merely theoretical. The evolution of space programs themselves reflects it. Studies of NASA's changing governance models show a steady transition from centralized "Legacy Space" programs to diversified "New Space" ecosystems, blending state leadership with private entrepreneurship.[7] In these networks, authority circulates through contracts, norms, and reputation as much as through law. Todd Harrison and Nahmyo Thomas identify NASA's role as a strategic broker, using prestige and partnerships to project power while catalyzing innovation.[8] Matthew Weinzierl traces the same transformation economically, describing how market design and public-private coordination now define the architecture of exploration.[9] Governance, in this sense, is becoming less about command and more about orchestration.

Jack Chaben extends this logic explicitly to policy, arguing that only public-private frameworks can sustain exploration beyond Earth's orbit, yet that such arrangements risk capture

[7] Zancan et al., "Evolving Governance in the Space Sector," 515.
[8] Harrison and Thomas, "NASA in the Second Space Age," 2.
[9] Weinzierl, "Space, the Final Economic Frontier," 173.

without intentional oversight.[10] The implication is that the next frontier of governance will be shared, not divided, between public legitimacy and private capability.

Culture also governs. Barry Buzan's comparison of Star Trek and Battlestar Galactica may appear whimsical, yet it distills a critical truth, that visions of space reflect visions of ourselves.[11] The Federation's optimism and the Colonials' paranoia represent competing imaginaries of power, cooperation versus control. Which story humanity chooses to believe will shape how it builds its institutions. The previous chapter's image of a blank slate captures the same crossroads: will space mirror our best instincts or our worst fears?

Across these mid-range studies, one principle emerges. Non-sovereign governance endures only when authority is shared, adaptable, and legitimate. Too rigid, and it breaks under novelty. Too loose, and it dissolves into rivalry. The balance of these forces will decide whether the Moon becomes another Antarctica or another battlefield.

2.3 The specialized literature on space law, power, and fragmentation

If the analogues offer prototypes, the specialized scholarship exposes the live fault lines. The body of space law that governs humanity's activity beyond Earth was forged in the optimism of the 1960s, when the very idea of settlement seemed distant. The five foundational treaties, the Outer Space Treaty, the Rescue Agreement, the Liability and Registration Conventions, and the Moon Agreement, defined principles of non-appropriation, peaceful use, and international responsibility. They worked because ambition was slow and access was scarce. As Burke-White and Williams argue, that framework now strains under the weight of its own success.[12] Gaps in

[10] Chaben, "Extending Humanity's Reach," 75.
[11] Buzan, "America in Space," 175.
[12] Burke-White and Williams, "Existing Framework for Space Governance."

enforcement, inconsistent satellite registration, and the rise of private actors have rendered the old architecture porous. Space is governed, but barely.

Rossana Deplano shows how the Artemis Accords attempt to patch this gap through adaptive, soft-law mechanisms that reinterpret existing treaties rather than replace them.[13] They translate Cold-War ideals into twenty-first-century pragmatism, safety zones, heritage protection, and open data, functioning as living law. Yet their increased flexibility provokes anxiety. To some, they represent the inevitable modernization of law; to others, a fragmentation of universality. This tension, between adaptability and unity, defines the politics of the new space age.

Beyond law lies the question of resources. Gershon Hasin's work on regime evolution confronts the collision between national legislation and global equity.[14] He warns that unilateral laws granting property rights risk privatizing the commons and resurrecting the logics of empire. His proposed remedy, cooperative regimes modeled on the International Seabed Authority, captures the challenge the previous chapter anticipates: how to reward innovation without igniting enclosure.

Security adds urgency. Paweł Bernat argues that militarization of space is no longer speculative but structural, driven by dual-use technologies and the erosion of treaty constraints.[15] Saadia Zahoor echoes this, identifying definitional ambiguity in "peaceful use" and advocating phased disarmament through transparency and verification.[16] Together they describe a system drifting toward confrontation. What is at stake is not only the weaponization of orbit but the militarization of governance itself, the conversion of law into another arm of strategy. That

[13] Deplano, "The Artemis Accords," 799.
[14] Hasin, "Developing a Global Order for Space Resources," 77.
[15] Bernat, "Inevitability of Militarization of Outer Space," 49.
[16] Zahoor, "Maintaining International Peace and Security," 113.

strategy is already diverging though. Burke-White and Williams diagnose a world where the United States, China, and Russia pursue incompatible governance models: the U.S. through commercialization and minilateral accords, China through sovereignty-infused UN processes, and Russia through obstruction and militarized leverage.[17] The universality once symbolized by the Outer Space Treaty is fracturing into competing normative orders. Each power wields governance itself as an instrument of geopolitical rivalry. This is the "great game" the previous chapter foresaw, a race not to claim territory but to define the rules of legitimacy.

Dimitrios Stroikos and others bridge this fragmentation back to the discipline of IR, situating space as a domain of both soft and hard power.[18] Prestige missions and scientific cooperation coexist with weapon tests and surveillance, creating an arena of dual use politics where the same satellite can symbolize peace or war. The implication is sobering, the governance of space will succeed or fail not on technology but on trust.

Finally, Robert Zubrin's critique of NASA's drift provides a microcosm of the governance problem itself.[19] Institutions lose purpose when bureaucracy replaces mission, and momentum stalls when exploration serves constituencies instead of causes. Governance, like exploration, demands focus. When ambition fragments, order collapses. Taken together, the niche literature describes a world standing at the edge of transformation, treaties aging in orbit, powers diverging, corporations rising, and legitimacy eroding. It confirms the previous chapter's central claim: the law forbids sovereignty, but politics is re-sovereignizing the void through influence and interpretation. The danger is not the absence of rules, but too many rules, each claiming universality.

[17] Burke-White and Williams, "Diverging Strategies for Space Governance."
[18] Stroikos, "International Relations and Outer Space."
[19] Zubrin, "The Mars Decision," 46.

2.4 The academic gap: the missing architecture of authority

Across these literatures, a striking omission remains. Scholars have mapped property rights, analyzed great-power rivalry, and dissected the legal gaps that haunt the Outer Space Treaty regime, yet few have confronted the institutional heart of the question the previous chapter raised: how will legitimate authority over people, settlements, and shared infrastructure actually be recognized in a system that forbids ownership?

Existing research too often treats governance as an appendage of law or strategy, a legal codicil to sovereignty or a geopolitical extension of terrestrial power, rather than as a problem of institutional design in its own right. The analogies most often invoked to explain space, from Antarctica's treaty system to the high seas and cyberspace, are rich but rarely tested through systematic comparison or evaluated for their capacity to sustain legitimacy once human life, not just satellites or research stations, depends on their rules. What has yet to be studied in depth is how these governance models perform when authority must be enacted daily, when decisions about safety, resources, and justice are made under conditions of physical isolation and mutual dependence. The existing frameworks describe law, but not rule; they chart rights, but not the lived recognition that makes those rights real.

This is the void that this thesis seeks to fill. It reframes space governance not as the management of property or the mitigation of rivalry, but as the deliberate construction of legitimacy in a post-sovereign system, an attempt to design "rightful rule" where none can claim to rule by right. By comparing centralized, decentralized, and hybrid models across both terrestrial and extraterrestrial contexts, the study examines how authority can be both recognized and constrained when sovereignty is off the table. In doing so, it turns a legal puzzle into a political one: not who owns space, but who governs it, on what grounds, and with what consent.

The question is no longer whether law will reach beyond Earth, but whether that law will be believed in, accepted, and obeyed when the frontier itself becomes home.

2.5 Theoretical argument: hybrid governance as the architecture of survival

From these debates emerges a theory: hybrid governance offers the strongest foundation for authority without ownership. It fuses collective oversight with local autonomy, a design that mirrors the polycentric realities already visible in Earth's shared domains. In such a system, authority is not a single structure but a layered ecosystem of legitimacy. At the collective level, an international body would coordinate high-externality functions, traffic management, resource extraction near critical volatiles, environmental monitoring, and emergency response. At the local level, individual settlements would govern their own internal affairs, adapting norms to culture, technology, and circumstance. This layered arrangement transforms law into a living system rather than a static charter. It is law as architecture, adaptable, modular, and self-correcting, capable of breathing with the rhythm of human expansion.

Hybrid governance works because it balances two imperatives that every frontier must reconcile, the need for unity and the right to self-determination. Collective oversight provides legitimacy, coordination, and dispute resolution, anchoring settlements within a recognized moral and legal order. Local autonomy generates compliance and innovation through ownership of rules, a sense that communities shape the norms they live by. Together, these forces produce predictability, the oxygen of order in a domain where miscalculation can be fatal. In this way, hybrid governance is not simply an institutional compromise between centralization and freedom; it is a philosophy of survival through shared legitimacy.

As Kenneth Abbott and Duncan Snidal demonstrate, complex systems often begin with soft coordination and evolve toward harder, more formalized law as cooperation deepens.[20] This dynamic, the gradual "hardening" of consensus, allows institutions to remain flexible during uncertainty yet durable as interdependence grows. Abram and Antonia Chayes further show that compliance does not arise from coercion but from clarity, transparency, and capacity building.[21] These mechanisms would be vital in space, where enforcement is logistically difficult and every actor, from states to corporations, must become a stakeholder in maintaining safety and reliability. David Lake's relational theory of authority completes this picture: governance endures when those subject to it perceive it as rightful.[22] Recognition, not coercion, sustains order; consent, not compulsion, stabilizes it. Hybrid governance, by design, cultivates precisely that perception, it makes authority feel legitimate because it is both shared and constrained.

The previous chapter envisioned airlocks and resource valves as the potential fault lines of the next century. Hybrid governance is designed precisely for such proximity risks. By localizing control yet embedding it within collective recognition, it prevents disputes from cascading into crises. It allows for politics, contestation, diversity, experimentation, without dissolving into chaos.

This architecture also draws on insights from democratic theory. As scholars such as Cassandra Steer remind us, legitimacy in space cannot depend solely on governments or corporations but must include the people who live with and through its systems.[23] The notion of a "space citizen" underscores that governance in space will ultimately rest on participation, that authority must be understood not just as technical coordination but as a civic relationship among

[20] Abbott and Snidal, "Hard and Soft Law," 421.
[21] Chayes and Chayes, "On Compliance," 175.
[22] Lake, "Rightful Rules," 587.
[23] Steer, "Building the Space Citizen Model."

those who depend on shared infrastructure. In hybrid governance, this democratic impulse reinforces the collective layer's legitimacy and ensures that the rules shaping settlements are not only efficient but representative, embedding human consent within institutional design.

Through this lens, hybrid governance becomes more than an administrative solution, it is a moral framework for coexistence in environments where interdependence is total. The stakes are intimate, a dispute over oxygen valves or landing rights could become a conflict over survival. By localizing control yet embedding it within collective recognition, hybrid systems prevent these disputes from cascading into crises. They provide procedures for de-escalation before violence or sabotage can take root. They allow for politics, contestation, negotiation, and diversity, without collapsing into anarchy. They build flexibility into stability, ensuring that settlements can adapt to technological and cultural change without severing their link to shared norms.

In essence, hybrid governance institutionalizes the same duality that has always sustained human cooperation: autonomy within accountability. It envisions a frontier where authority flows not from domination but from consent, where rules are dynamic and legitimacy is continuously renewed through participation. As humanity begins to live beyond Earth, the success of this model will depend on whether it can turn law into a living structure, one capable of holding together not only systems and settlements, but the fragile promise of civilization itself.

2.6 Hypotheses and implications

From this synthesis follow five testable expectations:

1. *Recognition Effect:* Non-sovereign systems that combine collective oversight of shared, high-risk infrastructure with local autonomy for internal affairs are more likely to earn

recognition from diverse actors than purely centralized or fully decentralized regimes. Oversight builds trust in common safety and dispute mechanisms, while local control strengthens participation and compliance. Together, they create a sense of "rightful rule" grounded in reciprocity rather than hierarchy.[24]

2. *Conflict Reduction*: Hybrid governance arrangements will experience fewer escalatory disputes over shared resources when jurisdictional boundaries and monitoring mechanisms are clearly defined. By clarifying who manages what, and by embedding communication and transparency protocols, such systems transform potential flashpoints into managed coordination problems rather than crises.[25]
3. *Legalization Ratchet*: Soft-law instruments rooted in continuous cooperation, accords, memoranda, and technical standards, will align behavior faster in emerging mission areas than formal treaties. However, as authority expands and legitimacy becomes more contested, these soft frameworks must gradually "harden" into binding law to preserve credibility and prevent fragmentation.[26]
4. *Market Spillover*: Public-private ecosystems that emphasize open standards, transparent performance metrics, and clear role definitions will spread cooperative norms more effectively than closed, proprietary models. Because other actors depend on interoperability and shared access, open systems naturally become templates for governance, diffusing legitimacy through participation rather than enforcement.[27]
5. *Rivalry Containment*: Institutions that institutionalize routine transparency, notification, and verification for dual-use or potentially military operations will reduce misperception

[24] Lake, "Rightful Rules," 587; Chayes and Chayes, "On Compliance," 175.
[25] Zahoor, "Maintaining International Peace and Security," 113; Burke-White and Williams, "Existing Framework for Space Governance."
[26] Abbott and Snidal, "Hard and Soft Law," 421; Deplano, "The Artemis Accords," 799.
[27] Chaben, "Extending Humanity's Reach," 75; Weinzierl, "Space, the Final Economic Frontier," 173.

and deter coercive signaling near shared assets. When information is public and procedures are predictable, even strategic competitors have incentives to resolve disputes through institutions instead of through escalation.[28]

Each hypothesis traces a mechanism through which recognition and legitimacy stabilize interaction in a post-sovereign order. Each is measurable through observable practices: adherence to common procedures, frequency of cooperative resolutions, incidence of coercive escalation, and diffusion of shared norms.

2.7 Conclusion: toward a politics of the stars

The literature reveals both the lineage and the limits of our political imagination. From Earth's oceans to its orbits, humanity has built regimes that govern what no one can own. Yet none face stakes as unforgiving as space. There, governance will be tested not in parliaments but in pressure domes; legitimacy will not be an abstraction but a condition of survival.

The next chapter takes up this task methodologically. It designs the comparative framework through which centralized, decentralized, and hybrid models will be evaluated against the two criteria that now define the problem: the ability to generate recognized control and the capacity to lower conflict. Where history offers analogies, analysis will supply precision. The aim is not to predict a single future, but to identify which forms of order can keep humanity alive, and human, when the frontier becomes home.

[28] Bernat, "Inevitability of Militarization of Outer Space," 49; Burke-White and Williams, "Diverging Strategies for Space Governance."

Chapter 3: Research Design - Designing Governance in the Void

As the literature reveals, the struggle to govern space is more than a question of law or policy; it is a reflection of humanity's oldest political dilemma, how to create order where none exists. Theorists of international relations, from realists to constructivists, have long wrestled with this tension between anarchy and authority, between the freedom of states and the need for stability. Yet in outer space, these questions acquire a sharper, almost existential edge.[29] There are no borders to defend, no ground to claim, only the vast emptiness where sovereignty dissolves and legitimacy must be invented anew. Having traced the intellectual architecture of this problem, the next step is to design a framework capable of testing it. This chapter therefore turns from theory to method, constructing a comparative design that examines how different governance systems , from hierarchical sovereignty to decentralized law, from networked collaboration to hybrid interdependence, attempt to build recognizable authority in a realm without rulers.[30]

Architecture of the Research Design

This thesis adopts a comparative qualitative research design centered on four case studies, each representing a distinct model of governance in outer space. It investigates how authority and legitimacy are exercised in a domain defined as non-sovereign, and how competing frameworks attempt to stabilize that paradox.

The design assumes that space governance is not merely about compliance or coordination, but a test of whether political order can exist without sovereignty. Accordingly, the

[29] Barnett and Duvall, "Power in International Politics," 39; Lake, "Rightful Rules," 587; Zürn, Binder, and Ecker-Ehrhardt, "International Authority and Its Politicization," 69.
[30] Abbott and Snidal, "Hard and Soft Law," 421; Tepper, "Big Bang of Space Governance," 485; Zancan et al., "Evolving Governance in the Space Sector," 515.

study is organized not by geography or institution but by governance model, tracing how law, power, and legitimacy interact in four contrasting regimes: *Centralized Sovereign Governance*, *Legal Normative Governance*, *Networked Governance*, and *Integrated Multilateral Governance*. Each model embodies a different response to the same conditions, anarchy in space and the absence of a world government to enforce rules or allocate ownership.

A qualitative approach is most appropriate because the study involves interpretive concepts, legitimacy, recognition, and authority, that cannot be meaningfully quantified.[31] This design enables deep process tracing, discourse analysis, and comparative reasoning. It also incorporates semi-structured elite interviews with policymakers, legal experts, and practitioners directly involved in shaping the regimes examined. Together, these methods create a multi-layered analysis of how authority is constructed, perceived, and sustained in the governance of outer space.

3.1 Comparative Framework

The core of this design lies in a structured, focused comparison of four governance models. The cases were selected for their theoretical representativeness rather than geographic diversity, each embodying a distinct logic of authority and legitimacy. This typological approach allows the identification of causal mechanisms linking institutional design to perceived legitimacy, the dependent variable of this study.

[31] Lake, Rightful Rules, 589; Chayes and Chayes, "On Compliance," 176.

Table 1. Comparative Architectures of Authority Beyond Sovereignty

Governance Type	Representative Case	Analytical Focus	Validity Type
Centralized Sovereign Governance	China's Tiangong & International Research Lunar Station	National autonomy and capability-based legitimacy	Internal
Legal Normative Governance	Outer Space Treaty	Legal norms and collective restraint	External
Networked Governance	Artemis Accords	Soft law, norm diffusion, and coalition legitimacy	External
Integrated Multilateral Governance	International Space Station	Joint authority and institutional interdependence	Internal/External

This table encapsulates the logic of the research design: four governance models, four representative cases, each embodying a distinct mechanism for exercising authority beyond sovereignty. Together, they form a structured comparison across the primary architectures of space governance, centralized, legal normative, networked, and integrated multilateral systems. Though these regimes differ in how they construct legitimacy, all operate within the same structural environment: the Outer Space Treaty and the broader international system. This shared foundation enables a coherent comparison of how hierarchy, law, coordination, and interdependence function under common constraints. The typology thus balances theoretical diversity with contextual consistency, deepening both analytical precision and comparative insight.

Each model also aligns with a major tradition in International Relations theory, reflecting a different vision of how order emerges amid anarchy.[32] Centralized Sovereign Governance

[32] Lake, Rightful Rules, 587; Abbott and Snidal, "Hard and Soft Law," 421; Tepper, "Big Bang of Space Governance," 485; Zürn, Binder, and Ecker-Ehrhardt, "International Authority and Its Politicization," 69.

draws from classical realism and neorealism, where power and hierarchy form the bedrock of legitimacy.[33] Authority here is asserted through dominance and performance, the ability to command outcomes becomes the justification for control. Legal Normative Governance, by contrast, embodies the ideals of liberal institutionalism and English School pluralism, envisioning cooperation as a product of shared norms rather than coercion.[34] Legitimacy flows from restraint and reciprocity, the belief that even in an anarchic system, states can uphold rules for the collective good.

Networked Governance reflects the logic of global governance theory and complex interdependence, where authority is decentralized and relational.[35] Power circulates through overlapping institutions and coalitions, producing legitimacy through transparency and inclusion. Finally, Integrated Multilateral Governance synthesizes these traditions, the efficiency of realist hierarchy, the normative order of liberal law, and the adaptability of constructivist networks. It represents a pragmatic architecture blending capability with cooperation to sustain stability in a domain where sovereignty cannot exist.[36]

Together, these four models trace the philosophical spectrum of governance beyond Earth, from the pursuit of order through power to the pursuit of legitimacy through shared purpose. They translate abstract theories of international politics into lived experiments in authority, each a human attempt to build order in the void where no sovereign can reign.

[33] Allison, "Destined for War?," 9.
[34] Chayes and Chayes, "On Compliance," 175; Abbott and Snidal, "Hard and Soft Law," 421.
[35] Tepper, "Big Bang of Space Governance," 487; Zancan et al., "Evolving Governance in the Space Sector," 516.
[36] ISS Intergovernmental Agreement, 1998; Zancan et al., "Evolving Governance in the Space Sector," 515.

3.2 Constructing the Comparative Cases

Each case was chosen not simply as an example but as a living expression of a governance model tested against the vacuum of authority that defines outer space. Together, they allow this study to trace how different architectures of order, rooted in power, law, cooperation, and interdependence, seek to build legitimacy. Through these cases, the research follows humanity's ongoing experiment with authority beyond Earth, revealing how institutional design becomes both a mirror of terrestrial politics and a rehearsal for governance among the stars.

3.2.1 Case 1: Centralized Sovereign Governance - China's Model of Space Authority

The first case examines China's Tiangong Space Station and the planned International Lunar Research Station (ILRS) as embodiments of Centralized Sovereign Governance, a model defined by hierarchy, capability, and state command. These projects represent China's most assertive effort to project an alternative order in space, one rooted not in multilateral law but in the self-reliance of national power.[37] Though China formally adheres to the Outer Space Treaty (OST) and its principle of non-appropriation, it reinterprets these constraints through a doctrine of functional occupation and strategic autonomy.[38] While it cannot claim territory, it seeks to establish de facto authority through continuous presence, infrastructure, and control. Authority flows hierarchically from the Chinese state, embodied in the China National Space Administration (CNSA) and the People's Liberation Army Strategic Support Force, which manages military dimensions of space activity.[39]

This model treats technological mastery and sustained performance as the primary sources of legitimacy, capability substitutes for consensus, and leadership is justified by

[37] Burke-White and Williams, "Existing Framework for Space Governance."
[38] Stroikos, "International Relations and Outer Space."
[39] Bernat, "Inevitability of Militarization of Outer Space," 49

achievement. The Tiangong station symbolizes China's ambition to rival and ultimately surpass the ISS's symbolic dominance, while the ILRS, developed with Russia and select partners, extends this hierarchical logic outward, forming a Sino-centric orbit of cooperation.

Analytically, this case reveals how sovereignty adapts under non-sovereign conditions, showing the persistence of hierarchy, exclusion, and control. China's approach functions as a form of "sovereignty performance," a projection of capability designed to generate legitimacy through visibility rather than consent. Process tracing will examine how China's institutional design, investments, and rhetoric reinforce its legitimacy claims through dual-purpose partnerships, parallel legal norms, and integration of governance with national rejuvenation narratives under Xi Jinping.

Ultimately, this model transforms the OST's legal vacuum into a site of functional sovereignty. It demonstrates that even in a legally anarchic environment, order can be built through hierarchy and influence, a political philosophy that tests whether control can exist without ownership and whether legitimacy can rest on capability alone.[40]

3.2.2 Case 2: Legal Normative Governance - The Outer Space Treaty System

The second case explores the Outer Space Treaty (1967) and its companion agreements as the foundation of Legal Normative Governance, a system defined by consent, restraint, and reciprocity. Drafted at the height of the Cold War, the OST was humanity's first attempt to codify political order in a frontier without rulers. It relies not on enforcement but on mutual recognition, transforming law into the fragile scaffolding of cooperation beyond Earth.[41] Reinforced by the Rescue Agreement (1968), Liability Convention (1972), and Registration Convention (1975), the

[40] Hasin, "Developing a Global Order for Space Resources," 79.
[41] Stroikos, "International Relations and Outer Space."

OST established space as a global commons, "the province of all humankind." Under this framework, sovereignty and appropriation are prohibited, weapons of mass destruction are banned, and exploration must serve all nations. The OST thus embodies the paradox of international law: a system of rules without a ruler.[42]

Here, legitimacy is constructed through reputation and restraint.[43] States comply not because they are compelled, but because adherence signals reliability and moral standing. The OST's five-decade endurance and near-universal ratification illustrate the stabilizing power of shared norms, even without enforcement. Yet its flexibility also invites fragmentation. Ambiguities surrounding "peaceful use," commercial activity, and national responsibility allow adaptation but strain coherence as private actors and new powers reshape the frontier.[44]

Analytically, the OST provides both the legal foundation and conceptual baseline for all subsequent governance models. Every other framework, hierarchical, networked, or hybrid, responds to or reinterprets its core principle: that space must remain free from national ownership. Process tracing will track its evolution from Cold War idealism to adaptation amid privatization, while discourse analysis will assess how compliance endures through mechanisms like reciprocity and reputation.[45]

Ultimately, the OST system mirrors liberal international order itself, governance through law, not coercion. Its endurance shows that norms can generate stability even in the absence of centralized authority, though its fragility now exposes the limits of idealism in a multipolar, commercialized space age.

[42] Burke-White and Williams, "Existing Framework for Space Governance;" Hasin, "Developing a Global Order for Space Resources," 77.
[43] Chayes and Chayes, "On Compliance," 175.
[44] Zahoor, "Maintaining International Peace and Security," 114.
[45] Burke-White and Williams, "Existing Framework for Space Governance."

3.2.3 Case 3: Networked Governance - The Artemis Accords

The third case examines the Artemis Accords, a voluntary framework launched by the United States in 2020 and now encompassing more than forty nations.[46] The Accords exemplify Networked Governance, where authority emerges from cooperation among states, agencies, and private actors rather than from a single institution or binding treaty. Legitimacy arises from transparency, participation, and alignment, a shift from hierarchy to relational governance.

Unlike the OST's universalism, the Artemis framework advances a modular order. Signatories commit to principles such as peaceful exploration, interoperability, and avoidance of harmful interference while retaining autonomy in implementation. Authority is thus constructed through coordination and consensus rather than legal compulsion, a system of "governance through alignment." By joining, states gain access to NASA's infrastructure and data while endorsing a shared moral and political alignment.[47] The Accords diffuse U.S.-anchored norms across a network of partners, illustrating the logic of network power: shaping rules through participation's gravitational pull.[48]

Process tracing and discourse analysis will examine how the Accords evolved from policy tool to governance network, tracing how legitimacy is constructed through performance and partnership rather than enforcement. The case also offers a counterpoint to the OST, where the OST aspires to universality, Artemis accepts pluralism, reflecting a world where legitimacy derives from coalition-building.[49]

While flexible, this openness also creates fragility: the system's cohesion depends on the credibility of its leader and the perceived benefits of participation. Should those erode,

[46] Deplano, "The Artemis Accords," 799.
[47] Abbott and Snidal, "Hard and Soft Law," 422.
[48] Tepper, "Big Bang of Space Governance," 485.
[49] Deplano, "The Artemis Accords," 799; Tepper, "Big Bang of Space Governance," 488.

legitimacy may fracture.[50] Still, the Artemis framework represents a profound evolution in authority under anarchy, cooperation as strategy rather than idealism, and legitimacy built through connectivity rather than control.

3.2.4 Case 4: Integrated Multilateral Governance - The International Space Station (ISS)

The final case examines the International Space Station, the most enduring experiment in multilateral governance beyond Earth.[51] The ISS embodies an Integrated Multilateral Governance model, combining sovereignty with interdependence. Each partner retains jurisdiction over its own modules under the Intergovernmental Agreement (1998), yet all depend on shared funding, command systems, and technological cooperation to sustain the station.[52]

This case bridges theory and practice, demonstrating that hybrid governance, blending state authority, legal codification, and institutionalized cooperation, can produce durable legitimacy across ideological divides. The ISS stands as both precedent and prototype, showing that collaboration under anarchy can endure through structured interdependence rather than through hierarchy or law alone.[53] Its validity is both internal and external: internally, it reveals mechanisms of shared authority; externally, it provides an empirical foundation for theorizing future regimes.

[50] Zürn, Binder, and Ecker-Ehrhardt, "International Authority and Its Politicization," 69.
[51] ISS Intergovernmental Agreement, 1998; Zancan et al., "Evolving Governance in the Space Sector," 516.
[52] ISS Intergovernmental Agreement, 1998.
[53] Chayes and Chayes, "On Compliance," 175; Lake, Rightful Rules, 587.

3.3 Data Collection Methods

3.3.1 Conceptual Definitions

The dependent variable in this study is recognized control and legitimacy, understood as the degree to which an actor's authority in outer space is accepted as rightful by other participants. Recognition will be assessed through observable markers such as participation in governance arrangements, adherence to treaty obligations, and the absence of formal protest, as well as through perceptions documented in interviews and policy discourse. These indicators capture both behavioral acknowledgment and the narratives through which actors confer or withhold legitimacy.

The independent variable is the governance model, defined as the institutional and normative configuration that structures authority under the non-sovereign constraints of the Outer Space Treaty. Each model embodies a distinct pathway through which legitimacy is constructed, whether through capability, legal codification, coalition-building, or interdependence. Operationalizing these models allows the study to trace how different architectures of rule attempt to stabilize authority where sovereignty cannot exist.

3.3.2 Data Sources

The analysis relies on a structured body of primary and secondary materials that together capture the legal foundations, institutional practices, and evolving governance strategies shaping contemporary space politics. Primary sources include the core treaty framework developed under the United Nations: the Outer Space Treaty, the Rescue Agreement, the Liability Convention, the Registration Convention, and the Moon Agreement. To these are added the Artemis Accords, which function as a major soft law instrument and a central case of adaptive governance, as well

as the ISS Intergovernmental Agreement, which provides one of the few operational models of long-term multilateral rule-making and joint jurisdiction in space. National legislation and policy documents such as the U.S. Commercial Space Launch Competitiveness Act and NASA's formal guidance on recommended practices supply additional evidence for how states interpret their obligations and define authority beyond sovereignty.

Institutional records from the United Nations Committee on the Peaceful Uses of Outer Space (COPUOS), together with mission statements and regulatory documents issued by NASA, ESA, CNSA, and UNOOSA, offer direct insight into how major actors articulate legal standards, negotiate fragmentation, and operationalize norms. These materials help trace where consensus holds and where divergent governance strategies emerge, especially across domains such as resource rights, registration practices, safety standards, and responsibilities for debris mitigation.

The secondary scholarship grounds the analytic framework. Foundational work on international law and governance, including Abbott and Snidal on hard and soft legalization, Chayes and Chayes on compliance, and Lake on relational authority, situates space governance within broader patterns of rule formation and legitimacy. Research on power, competition, and fragmentation by Barnett and Duvall, Allison, Freeland, Tepper, and Zurn provides the theoretical scaffolding for understanding why authority without territorial sovereignty produces unique forms of contestation. Studies focused specifically on space, such as Deplano's analysis of the Artemis Accords, Zahoor on militarization, Bernat on strategic inevitabilities, Hasin on resource governance, Burke White and Williams on diverging great power strategies, and Zancan and colleagues on evolving governance models, supply domain specific evidence for how these theoretical dynamics manifest in practice. Additional contributions from Weinzierl, Zubrin, Chaben, and Steer highlight the economic, institutional, and civic dimensions of the new space

age, extending the inquiry beyond state centered models toward hybrid public private ecosystems and emerging forms of global participation.

Together, these sources establish a comprehensive evidentiary base for assessing how authority, legitimacy, and institutional design are being constructed in a domain where sovereignty cannot be claimed, yet rules must still be made, interpreted, and enforced.

3.3.3 Interviews

The theoretical architecture outlined above must ultimately be evaluated against the perspectives of actors who operate within the space governance system itself. To assess whether the patterns identified in the comparative analysis are reflected in practice, this section draws on three elite interviews conducted in early 2026 with individuals working across different institutional vantage points within the space policy community. The interviewees include Jack Kiraly, Director of Government Relations at The Planetary Society; Dr. Neil Orion, former Pentagon official involved in national security debates over space during the Strategic Defense Initiative period; and Mary Guenther, Head of Space Policy at the Progressive Policy Institute.[54] Together, these perspectives represent civil advocacy, national security strategy, and policy development within government-facing institutions, providing insight into how authority, legitimacy, and coordination are understood by practitioners operating inside the contemporary space governance system.

3.3.4 Limitations of Data Collection

The primary limitations stem from uneven access and institutional opacity. Chinese policy materials may be difficult to obtain, and certain agencies restrict interviews or public

[54] Dr. Neil Orion is a pseudonym used to protect the interviewee's anonymity.

commentary. These gaps will be mitigated through triangulation, comparing interview insights with treaty language, institutional reports, and independent analyses. Although qualitative data limit the scope for broad generalization, they offer the interpretive depth necessary to examine legitimacy in a domain defined by legal ambiguity and political experimentation.

3.4 Data Analytical Methods

3.4.1 Process Tracing

Within each case, process tracing will reconstruct how governance frameworks emerged, how rules were articulated or contested, and how legitimacy claims took shape. This method uncovers causal pathways that link governance design to recognized authority.

3.4.2 Content and Discourse Analysis

Documents and interview transcripts will be examined through content and discourse analysis, focusing on key terms such as peaceful use, safety zones, coordination, and jurisdiction. These narratives reveal how actors justify authority and how legitimacy is framed within each governance model.

3.4.3 Cross-Case Comparison

A structured comparison across the four cases will assess how each governance model balances authority, legitimacy, and cooperation. This synthesis tests the broader proposition that legitimacy, rather than power alone, anchors stability in non-sovereign environments and identifies the conditions under which hybrid governance appears most resilient.

3.4.4 Methodological Limitations

As with all qualitative work, causal inference is interpretive. Findings are intended to build theory rather than generalize universally. The pace of change in space policy presents an additional challenge, as shifts in national strategy or commercial capability may alter governance dynamics during or after data collection. Even so, the combination of process tracing, document analysis, and elite interviews offers a strong foundation for understanding how authority is constructed in a legally anarchic frontier.

3.5 Conclusion

Together, these methods support a comparative inquiry into how different architectures of governance attempt to generate legitimate authority where sovereignty is prohibited. By integrating case studies, interview evidence, and discourse analysis, the research design positions the study within the central tension of international relations: the search for order without a sovereign. The aim is to clarify whether governance beyond Earth can be both stable and legitimate, and what institutional form such governance must take as humanity expands into the wider solar system.

Chapter 4: Origins of the Space Order

This chapter traces how space governance moved from a small club of rival superpowers writing universal treaties to a crowded, fragmented, and commercially driven order. The chapter closes by drawing out the historical mechanisms that set up the four governance models analyzed in Chapters 5 and 6.

4.1 Cold War Rivalry And The Birth Of A Legal Commons

The governance of outer space began as a problem of stabilizing Cold War rivalry. Early spaceflight was an extension of nuclear competition. The launch of Sputnik in 1957 raised fears that orbit would become a platform for nuclear attacks and global surveillance. The United States and the Soviet Union both needed reassurance that the other would not deploy weapons of mass destruction overhead, yet neither was willing to concede strategic advantage on Earth.

The first multilateral response was the emerging body of United Nations Treaties and Principles on Outer Space, centered on the 1967 Outer Space Treaty (OST). Together with the 1968 Agreement on the Rescue of Astronauts and the Return of Objects Launched into Outer Space, the 1972 Convention on International Liability for Damage Caused by Space Objects, and the 1975 Convention on Registration of Objects Launched into Outer Space, these instruments built a skeletal legal order. They outlawed national appropriation, framed space as a domain for "peaceful purposes," created liability rules, and required registration and assistance to astronauts. They were negotiated in a world of superpower dominance and only a handful of launching states, yet framed as rules for all humanity.[55]

[55] Outer Space Treaty, 1967.

The structure of this early regime reflected what Abbott and Snidal describe as a choice about the hardness of law. States opted for relatively hard legalization on a few core points, such as non-appropriation and liability, while leaving many questions, including specific military uses and resource rights, vague or unaddressed.[56] This mixed design limited sovereignty costs while establishing credible commitments where both sides feared catastrophic escalation.

The architects of the space treaties were not legislating in a vacuum. They drew on an emerging model for governing areas beyond national jurisdiction, most notably the 1959 Antarctic Treaty. The Antarctic regime froze territorial claims without resolving them, promoted scientific cooperation, and embedded demilitarization principles. It provided a precedent for governing a frontier through shared rules rather than sovereign division.[57] The OST translated that logic into orbit, designating outer space as a domain "for the benefit and in the interests of all countries," and prohibiting national appropriation.

From the beginning, therefore, international authority in space took a particular form. The United Nations Committee on the Peaceful Uses of Outer Space (COPUOS) and associated treaty bodies exercised what Barnett and Duvall call institutional power, shaping outcomes indirectly through general rules and procedures, while states retained compulsory power through their launch capabilities and national programs.[58] The early regime did not resolve who would govern future settlements or private activities. It created a minimal legal framework that could stabilize superpower rivalry.

[56] Abbott and Snidal, "Hard and Soft Law," 421-56.
[57] Antarctic Treaty, 402 U.N.T.S. 71.
[58] Barnett and Duvall, "Power in International Politics," 39-75.

4.2 Building Law Without Sovereignty

The foundational treaties answered the most urgent Cold War questions but left open deeper issues of authority and distribution. Who could control activities on celestial bodies, extract and sell resources, and set safety, environmental, and operational standards for a growing number of actors.

Two additional instruments tried to push the regime toward a more complete order. The 1979 Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (the Moon Agreement) sought to define lunar resources as the "common heritage of mankind" and called for an international regime to govern exploitation. It echoed debates over seabed resources and the deep sea, but it never attracted major spacefaring states.[59] By the end of the twentieth century, it remained largely symbolic.

In practice, the United Nations Treaties and Principles on Outer Space remained the core of the hard law regime, while a growing array of non-binding declarations, national legislation, and technical standards developed around it. Abbott and Snidal's spectrum of hard and soft legalization helps explain this pattern. Faced with sovereignty sensitive issues and technological uncertainty, states often chose soft law instruments that allowed experimentation and unilateral initiative while avoiding formal treaty revision.[60]

Compliance with this hybrid regime followed the dynamics that Chayes and Chayes describe in their managerial model of international law. Violations were relatively rare and usually stemmed from ambiguity or capacity gaps rather than deliberate defection.[61] Registration of objects was incomplete, resource provisions were contested, and reporting was inconsistent,

[59] Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, 1363 U.N.T.S. 3.
[60] Abbott and Snidal, "Hard and Soft Law," 421-56.
[61] Chayes and Chayes, "On Compliance," 180

but the core norms of non-appropriation and peaceful use held. Instead of coercive enforcement, transparency, consultation, and diplomatic pressure were the primary tools.

Lake's account of relational authority clarifies what kind of authority this regime created.[62] States accepted constraints on their behavior in exchange for a predictable environment and the political order that multilateral rules provided. They did not delegate comprehensive legislative power to any central body, yet they consented to a form of legitimate rule making and dispute management in a domain where sovereign control was formally prohibited. Authority beyond Earth was therefore relational and negotiated rather than hierarchical.

Over time, the conditions sustaining this arrangement began to change. More states acquired launch capabilities. Commercial actors emerged as independent centers of expertise and capital. The number of satellites exploded. The foundational treaties proved surprisingly resilient, but their broad language made them an increasingly thin foundation for a thickening web of activities. That tension between a static legal core and dynamic practice set the stage for militarization and commercial transformation.

4.3 Militarization, Security Logics, And The Limits Of The First Space Age

Even as the OST enshrined "peaceful purposes," military rationales permeated the first space age. Satellites quickly became integral to reconnaissance, early warning, navigation, and communication. Bernat argues that militarization, understood as the use of space assets for force enhancement, became structurally inevitable once space systems were woven into terrestrial military operations.[63] Almost every major satellite system was dual use.

[62] Lake, "Rightful Rules," 602.
[63] Bernat, *Inevitability of Militarization of Outer Space*, 49-54.

Zahoor shows how the early treaties left key security issues undefined. The OST banned weapons of mass destruction in orbit but did not clearly prohibit conventional or dual use weapons, nor did it specify which kinds of military activity were incompatible with "peaceful purposes."[64] Anti-satellite tests, co-orbital inspection technologies, and rendezvous proximity operations exploited these gaps. States could legally justify activities that other states perceived as threatening, eroding trust and raising the risk of miscalculation.

In strategic terms, outer space became another theater in what Allison, drawing on Thucydides, describes as the structural stress between rising and ruling powers.[65] He focuses on the broader United States China competition, but his logic applies directly to space. As China developed its own launch systems, navigation constellations, and anti-satellite capabilities, the risk that small incidents, such as collisions or interference with satellites, could escalate increased. Military technologies and interdependence magnified the stakes.

Stroikos highlights how space activities became tightly coupled with traditional security dilemmas. Satellites were critical enablers of both nuclear deterrence and conventional precision strike. Their vulnerability encouraged preemption doctrines and worst case planning.[66] At the same time, international institutions like COPUOS lacked enforcement tools and were limited by consensus procedures, which allowed any major power to block more intrusive transparency or arms control measures.

From the perspective of Barnett and Duvall's taxonomy, security politics in space revealed the limits of institutional power. Rules and norms shaped expectations but did not prevent states from pursuing capability development when they saw vital interests at stake.[67]

---

[64] Zahoor, "Maintaining International Peace and Security," 114.
[65] Allison, "Destined for War?," 11-18.
[66] Stroikos, "International Relations and Outer Space."
[67] Barnett and Duvall, "Power in International Politics," 39.

Structural power, rooted in technological and economic capacity, and compulsory power, expressed through national military programs, continued to dominate. The early legal order constrained open weaponization but could not fully demilitarize the domain.

By the end of the twentieth century, outer space was deeply militarized even though nuclear weaponization had been avoided. The regime had managed to prevent nuclear weapons in orbit and had channeled competition into recognizable patterns, but it had not resolved the underlying rivalry or clarified how authority would function if conflict spread into orbit. That unresolved tension carried into the era of commercialization and New Space.

4.4 From Legacy To New Space: Markets, Partnerships, And National Laws

If the first space age was defined by superpower rivalry and state led megaprojects, the second space age has been defined by commercialization, partnerships, and the entrance of new actors. Harrison and Thomas describe this shift as NASA's transition from a vertically integrated operator to a broker and partner in an increasingly congested and contested environment.[68] They argue that NASA must focus on technically demanding missions beyond low Earth orbit while leveraging partnerships with private firms and foreign agencies to sustain broader activity.

Weinzierl provides the economic logic under this institutional evolution. He shows how governance in the space economy expanded from establishing markets, through public private partnerships, to refining and tempering those markets in order to address externalities and distributional concerns.[69] Programs like Commercial Orbital Transportation Services repositioned NASA as a customer that purchases services, while private firms assumed greater risk and innovation roles.

[68] Harrison and Thomas, "NASA in the Second Space Age," 5.
[69] Weinzierl, "Space, the Final Economic Frontier," 173.

Zancan and colleagues track this evolution within NASA programs, identifying three governance models that have coexisted and overlapped: a Legacy Space model based on government owned infrastructure and cost plus contracts, a Transitional Space model that blended those contracts with growing international collaboration, and a New Space model centered on service oriented procurement and risk sharing with private partners.[70] Contemporary programs such as Artemis embody a polycentric architecture in which multiple governance logics operate simultaneously.

These shifts were accompanied by national legislation that pushed the outer space regime toward recognition of private rights. The United States Commercial Space Launch Competitiveness Act signaled a significant departure from the early non-appropriation consensus by recognizing private ownership of extracted resources, even while denying sovereignty over celestial bodies.[71] Hasin, writing on regime evolution for space resources, warns that such unilateral moves risk undermining the OST's core principles and generating legal conflict if other states adopt rival interpretations or respond with competing laws.[72]

Zubrin's critique of NASA as a vendor driven rather than mission driven agency highlights another side of this transformation.[73] He argues that constituency politics and cost plus contracts have produced programs designed around sustaining contractors rather than advancing clear exploration goals. For this thesis, his argument matters less as an engineering proposal and more as a diagnosis of institutional incentives. If governance structures reward inertia and fragmentation, they may undermine the legitimacy and effectiveness of any emerging authority in space.

---

[70] Zancan et al., "Evolving Governance in the Space Sector," 516.
[71] U.S. Commercial Space Launch Competitiveness Act, Pub. L. No. 114-90, 129 Stat. 704 (2015).
[72] Hasin, "Developing a Global Order for Space Resources," 77.
[73] Zubrin, "The Mars Decision," 63–67, 46–60.

At the same time, new cooperative instruments emerged at the program level. The Intergovernmental Agreement on the International Space Station (ISS IGA) created a complex, treaty-based governance structure for a shared orbital facility. It allocated jurisdiction by module, created joint decision bodies, and defined dispute resolution procedures. The ISS IGA showed that states could build *Integrated Multilateral Governance* that went far beyond the thin norms of the OST. It also created a precedent for managing mixed civil, commercial, and security concerns in a shared infrastructure.[74]

Public private partnership frameworks, such as those analyzed by Chaben, can be read as an attempt to harness both state authority and market dynamism.[75] They sit at the heart of what this thesis later calls hybrid governance. Governments provide legitimacy, long term funding, and regulatory frameworks. Firms contribute innovation and efficiency. Yet without careful design, these arrangements risk regulatory capture, unequal access, and concentration of benefits.

By the early twenty first century, therefore, the governance of space had moved beyond the simple picture of state treaty making. It had become a dense institutional landscape in which national laws, intergovernmental agreements, public private contracts, and soft law guidelines, including NASA's recommendations to space faring entities, interacted in ways that both complemented and strained the original United Nations treaty framework.

4.5 Fragmentation, Polycentric Governance, And Competing Architectures

This evolving landscape is what Tepper describes as the "big bang" of space governance. He argues that the stagnation of formal treaty making after the 1970s and the failure of the Moon Agreement pushed space governance toward multiple parallel centers of rule making.[76] COPUOS

[74] ISS Intergovernmental Agreement, 1998.
[75] Chaben, "Extending Humanity's Reach," 75–98.
[76] Tepper, "Big Bang of Space Governance," 485.

and the foundational treaties remain a core, but they now coexist with national licensing regimes, technical standards bodies, industry associations, and program specific agreements.

Burke White and Williams show how great power strategies have accelerated this fragmentation. In their analysis of the existing framework, they emphasize that the five United Nations treaties, including the OST, Rescue Agreement, Liability Convention, Registration Convention, and Moon Treaty, are durable but obsolete in key respects.[77] They leave gaps on issues such as mega constellations, rendezvous operations, and private resource extraction, and they lack enforcement tools.

In their discussion of diverging strategies, Burke White and Williams argue that the United States, China, and Russia are now using governance processes as instruments of competition rather than exclusively as venues for cooperation.[78] The United States has championed the Artemis Accords, a series of non-binding agreements that articulate principles for lunar exploration, resource extraction, and safety zones. These accords rely on hard OST commitments but supplement them with soft law concepts, such as safety zones around operations and voluntary commitments on debris mitigation and interoperability.

Deplano suggests that the Artemis Accords introduce a form of adaptive governance. Instead of trying to anticipate every future contingency in binding treaty language, they establish principles and procedures that can evolve through practice.[79] At the same time, they function as subsequent practice that may influence the interpretation of the OST under the Vienna Convention on the Law of Treaties, potentially reshaping hard law through repeated soft law

[77] Burke-White and Williams, "Existing Framework for Space Governance."
[78] *Ibid.*
[79] Deplano, "The Artemis Accords," 799–819.

action.[80] Critics, especially in Russia and China, see them as an American-centered attempt to lock in favorable rules without multilateral consent.

China has advanced its own model through United Nations forums and its Belt and Road space initiatives, emphasizing sovereignty-based governance and control over infrastructure. Russia has leaned on obstruction in multilateral settings and on military signaling. Together, these strategies create overlapping and sometimes incompatible architectures.

NASA's recommendations to space faring entities, including its partner guidelines and implementation of Artemis principles, operate as another layer of soft governance. They influence behavior through technical standards, data sharing expectations, and partnership conditions rather than through formal legal obligations.[81] In Abbott and Snidal's terms, they are soft law tools that can be adjusted quickly and tailored to specific missions, but their legitimacy depends on perceptions of NASA and United States leadership.[82]

As Zürn, Binder, and Ecker Ehrhardt suggest, expanding international authority invites politicization.[83] As NASA, COPUOS, and other institutions exercise greater rule making and interpretive authority, publics and states may challenge their decisions and the distributional consequences of their rules. Debates over Artemis, the Moon Agreement, and national resource laws already reflect this dynamic.

Polycentric governance, in Tepper's sense, is therefore both a response to and a driver of fragmentation.[84] It allows flexible adaptation and experimentation, but it also creates rival normative orders and raises questions about who gets to define legitimate authority. This chapter's historical narrative shows how we arrived at a situation in which several architectures

[80] Vienna Convention on the Law of Treaties, 1155 U.N.T.S. 331.
[81] Deplano, "The Artemis Accords," 800.
[82] Abbott and Snidal, "Hard and Soft Law," 421-56.
[83] Zürn, Binder, and Ecker-Ehrhardt, "International Authority and Its Politicization," 71.
[84] Tepper, "Big Bang of Space Governance," 485.

of governance coexist and compete, preparing the ground for the structured comparison in Chapter 5.

4.6 Cultural Imaginaries, Space Citizens, And The Politics Of Legitimacy

Institutions and treaties do not operate in a cultural vacuum. Buzan's reading of Star Trek and Battlestar Galactica as mirrors of American identity illustrates how visions of space exploration encode broader political narratives.[85] Star Trek projected a confident, liberal, outward looking United States that saw itself as the core of a benign federation. Battlestar Galactica's darker vision reflected post 9/11 anxieties about survival, technology, and militarization.

These cultural imaginaries matter for governance because they shape how publics and leaders understand the purpose of going to space and what kind of order they consider legitimate. A polity that imagines itself as a guardian of an inclusive federation may support multilateral, rights oriented governance. A polity that imagines itself as a besieged remnant may prioritize security and unilateral control.

Steer's space citizen model pushes this insight further by arguing that individuals, not just states and corporations, must be recognized as stakeholders in space governance.[86] She notes that billions of people depend daily on satellite infrastructure yet have no formal voice in governing it. Her framework calls for multi stakeholder, global, inclusive, and intergenerational participation. It highlights the democratic deficit of an order in which a small number of states and firms define rules that affect everyone.

The rise of a space citizen discourse intersects with Zürn and colleagues' account of politicization. As authority in space becomes more visible, and as its distributive effects become

[85] Buzan, "America in Space," 175-180.
[86] Steer, "Building the Space Citizen Model."

clearer, publics and civil society are likely to challenge purely technocratic or elite driven governance models.[87] Such contestation can erode legitimacy, but it can also force institutions to adapt and broaden their basis of support.

Historically, then, the evolution of space governance has not only been about treaties and technologies. It has also been about the stories societies tell about space and about who is imagined as part of the political community that space governance serves. Those narratives will matter as states and other actors design future governance arrangements for lunar bases, resource extraction, and settlements.

4.7 Historical Lessons For Architectures Of Authority

This chapter has traced the evolution of space governance from a small group of superpowers negotiating universal treaties to a polycentric and contested architecture involving states, corporations, institutions, and emergent space citizens. Several historical lessons emerge that structure the comparative analysis in Chapter 5.

First, early treatymaking shows that even under intense rivalry, states can construct hard law regimes that stabilize expectations, but they tend to do so selectively. They harden rules where shared catastrophe is obvious, such as nuclear weapons in orbit, and soften or omit rules where sovereignty costs are high or technology is uncertain.[88] This pattern recurs in contemporary debates over resource rights and safety zones.

Second, militarization has proven structurally resilient. The OST and related treaties prevented certain forms of weaponization, but they did not remove security logics from space. As Bernat, Zahoor, Allison, and Stroikos each in different ways suggest, technological

[87] Zürn, Binder, and Ecker-Ehrhardt, "International Authority and Its Politicization," 69–106.
[88] Abbott and Snidal, "Hard and Soft Law," 421-56.

interdependence and great power transition pressures make space a persistent arena for strategic competition.[89] Any governance architecture that ignores this will likely fail.

Third, commercialization and New Space have redistributed power among actors. Public private partnerships, national resource laws, and program specific agreements have given firms and agencies new roles as governors, not just implementers.[90] The ISS IGA and similar arrangements show that Integrated Multilateral Governance is possible, but Zubrin's critique reminds us that institutional incentives can easily drift toward self preservation rather than mission clarity.[91]

Fourth, the shift toward polycentric governance has created both opportunity and risk. As Tepper and Burke White and Williams argue, multiple overlapping governance centers allow experimentation and adaptation, but they also generate rival architectures and normative orders.[92] The Artemis Accords, national resource laws, and NASA operational guidelines all exemplify this dynamic.[93] Deplano's analysis shows that soft law in this environment can gradually reshape the interpretation of hard law, blurring the boundary between the two.[94]

Finally, authority in space has become increasingly politicized and contested. Following Lake, we can see that authority beyond Earth is relational, built on exchanges of order for compliance.[95] Following Zürn and colleagues, we can see that as that authority grows, so does contestation over who exercises it and in whose interests.[96] Steer's space citizen model and

[89] Bernat, *Inevitability of Militarization of Outer Space*, 49-54; Zahoor, "Maintaining International Peace and Security," 114; Allison, "Destined for War?," 11-18; Stroikos, "International Relations and Outer Space."
[90] Weinzierl, "Space, the Final Economic Frontier," 173-92; Zancan et al., "Evolving Governance in the Space Sector," 516; Chaben, "Extending Humanity's Reach," 75–98.
[91] Zubrin, "The Mars Decision," 63–67, 46–60.
[92] Tepper, "Big Bang of Space Governance," 485; Burke-White and Williams, "Existing Framework for Space Governance;"
[93] NASA, *Artemis*.
[94] Deplano, "The Artemis Accords," 805.
[95] Lake, "Rightful Rules," 599.
[96] Zürn, Binder, and Ecker-Ehrhardt, "International Authority and Its Politicization," 84.

Buzan's cultural analysis highlight that legitimacy will depend not only on legal design but also on whether emerging architectures resonate with broader societal values and identities.[97]

These historical lessons set the analytical agenda for the next chapters. Chapter 5 uses them to structure a comparative analysis of four concrete governance models: a Centralized sovereign architecture, a legal normative treaty-based architecture, a networked soft law architecture, and an integrated multilateral architecture. Chapter 6 then builds on that analysis to develop the thesis that a consciously designed hybrid architecture, one that combines hard and soft law, centralized and decentralized mechanisms, and state and non-state participation, offers the most promising way to exercise authority without ownership beyond Earth.

[97] Steer, "Building the Space Citizen Model;" Buzan, "America in Space," 175-180.

Chapter 5: Comparative Analysis - Architectures of Authority

This chapter compares four governance architectures in outer space to evaluate how authority is produced and stabilized under conditions of legal non-sovereignty, technological asymmetry, and geopolitical competition. Rather than treating space governance as a purely legal problem, this analysis approaches it as a political process in which authority must be constructed and behaviorally validated in the absence of territorial sovereignty. The objective is to assess how different institutional designs generate recognized authority under contemporary conditions of rivalry, commercialization, and institutional fragmentation.

5.1 Analytical Framework and Criteria

The central dependent variable is recognized authority. Authority is defined here as the degree to which actors behave as though a governance arrangement possesses the legitimate right to set rules, allocate roles, and resolve disputes. Authority therefore exists not when rules are articulated, but when actors comply with them even when compliance imposes costs or constrains autonomy.[98] To operationalize recognized authority, the chapter employs two evaluative criteria that capture both normative acceptance and practical performance.

1. The first criterion is legitimacy. Legitimacy refers to the extent to which actors perceive a governance arrangement as appropriate, fair, and entitled to rule within the environment it seeks to regulate.[99] It is measured through multiple indicators, including breadth of participation, durability of commitment over time, rhetorical endorsement by states and institutions, and demonstrated willingness to align national or commercial activities with

[98] Lake, "Rightful Rules," 586.
[99] Zürn, Binder, and Ecker-Ehrhardt, "International Authority and Its Politicization," 69.

shared rules and expectations. Importantly, legitimacy is not equated with universality. As Zürn, Binder, and Ecker-Ehrhardt demonstrate, authority can be recognized within bounded communities even in the absence of global consensus, provided rules are perceived as procedurally fair and functionally necessary.[100] Legitimacy in this framework is therefore contextual and practice based rather than purely formal.

2. The second criterion is conflict reduction capacity. This refers to the ability of a governance system to manage disagreement, prevent escalation, and maintain stability in the face of competing interests. Conflict reduction capacity is assessed through indicators such as the presence and use of dispute resolution mechanisms, clarity of jurisdictional responsibility, institutional responses to historical stress events, and the degree to which governance structures reduce incentives for unilateral action or defection. This criterion draws on compliance theory, which emphasizes that durable cooperation emerges not from coercion but from institutional arrangements that align incentives, expectations, and long-term interests.[101] Rather than assuming conflict is absent, this analysis evaluates whether governance arrangements channel conflict into manageable, rule bound forms or instead allow disputes to harden into fragmentation or rivalry.

Each case is coded along these same indicators to enable systematic cross case comparison. By holding the issue area constant and varying institutional design, the chapter isolates how different architectures of authority shape behavior, stability, and recognition over time. This comparative strategy follows a structured, focused comparison logic, allowing the analysis to move beyond description and toward explanation.[102]

[100] Zürn, Binder, and Ecker-Ehrhardt, "International Authority and Its Politicization," 67.
[101] Chayes and Chayes, "On Compliance," 180.
[102] Stroikos, "International Relations and Outer Space."

5.2 Case 1: Centralized Sovereign Governance

China's Tiangong and the International Lunar Research Station

The *Centralized Sovereign Governance* model is most clearly illustrated by China's space infrastructure, particularly the Tiangong space station and the planned International Lunar Research Station. Although formally constrained by international legal prohibitions on territorial sovereignty in outer space, this model approximates sovereign authority through centralized control, exclusionary access, and hierarchical command structures. Rather than seeking authority through shared norms or multilateral consensus, this architecture consolidates decision making within a single political system and projects authority outward through infrastructure, standards, and operational dominance.[103]

Institutionally, Tiangong operates under a vertically integrated governance structure in which strategic planning, operational rules, and partner participation are determined by state authorities embedded within China's domestic political and bureaucratic apparatus. Authority flows unidirectionally from central leadership to implementing agencies, producing a governance environment characterized by clarity, predictability, and administrative enforcement. For example, access to Tiangong is contingent upon adherence to Chinese mission protocols and technical standards, with crew selection, experiment approval, and docking procedures centrally authorized by the China Manned Space Agency rather than negotiated multilaterally. International experiments hosted aboard Tiangong must conform to Chinese operational requirements and are integrated under Chinese command authority, reinforcing the hierarchical structure of governance within the station architecture.[104] Scholars of space governance note that

[103] Deplano, "The Artemis Accords," 798.
[104] Harrison and Thomas, "NASA in the Second Space Age," 9-11; Zancan et al., "Evolving Governance in the Space Sector," 518-522.

such centralized architectures trade inclusivity for efficiency, enabling rapid decision making while limiting external contestation.[105]

This structure produces what can be described as functional sovereignty. As Burke-White and Williams argue, authority in contemporary space governance increasingly flows from control over systems and standards not territory itself.[106] Control over access to critical space assets functions as a substitute for sovereignty, allowing governance without formal jurisdiction.

Legitimacy within this model is derived primarily from performance rather than participation. Reliability, continuity of operations, and demonstrated technological competence serve as the principal sources of authority recognition. This aligns with broader findings in governance scholarship that performance can generate compliance even under asymmetric power conditions.[107] Participation signals acceptance of authority in exchange for access, rendering legitimacy instrumental rather than normative. For example, Pakistan and members of the Asia-Pacific Space Cooperation Organization have participated in Chinese-led missions and satellite programs under Chinese technical standards, aligning operational procedures with China's governance framework in exchange for launch access and technological cooperation.[108]

Conflict reduction within this architecture is achieved through exclusion rather than institutional mediation. By limiting participation and avoiding shared command structures, the system structurally minimizes internal disputes. Potential conflicts are preempted by centralized authority not resolved through negotiated procedures. However, this stability is inward facing. While conflict is suppressed within the system, exclusionary governance reinforces broader geopolitical segmentation. Rather than producing convergence around shared rules, this model

[105] Harrison and Thomas, "NASA in the Second Space Age," 4.
[106] Burke-White and Williams, "Existing Framework for Space Governance."
[107] Chayes and Chayes, "On Compliance," 181-183.
[108] Harrison and Thomas, "NASA in the Second Space Age," 9-11; Burke-White and Williams, "Existing Framework for Space Governance."

encourages the formation of parallel governance systems as excluded actors seek alternative architectures in which to operate.[109]

A concrete illustration of exclusion as a governance mechanism is the 2011 Wolf Amendment, which prohibits NASA from engaging in bilateral cooperation with Chinese state entities without congressional approval.[110] This restriction effectively barred China from participation in the International Space Station partnership. In response, China accelerated the development of its own modular space station, Tiangong, and later advanced the International Lunar Research Station in cooperation with Russia. Rather than integrating into the existing multilateral architecture, exclusion incentivized the construction of a parallel governance infrastructure. Authority was consolidated internally while systemic fragmentation increased externally.

Empirically, the Centralized Sovereign Governance model exhibits high internal authority but limited external recognition, stabilizing governance within the system while failing to generate legitimacy beyond participating partners. Non-participants may recognize the system's effectiveness while rejecting its authority as appropriate for governing shared space domains. This pattern suggests that while Centralized Sovereign Governance can succeed in system building and operational control, it struggles to produce authority that is widely recognized in a pluralistic and competitive international environment.

Overall, this case demonstrates that authority in outer space can be constructed through centralized control and infrastructural dominance even without formal sovereignty, but that

[109] Bernat, *Inevitability of Militarization of Outer Space*, 49-54.
[110] Harrison and Thomas, "NASA in the Second Space Age," 9-11; U.S. Congress, Department of Defense and Full-Year Continuing Appropriations Act

exclusionary governance stabilizes authority internally while accelerating fragmentation at the systemic level.

5.3 Case 2: Legal Normative Governance

The Outer Space Treaty System

The *Legal Normative Governance* model is anchored in the Outer Space Treaty and its associated agreements, which together constitute the foundational legal framework governing human activity in outer space. This architecture represents governance through law, reciprocity, and shared restraint rather than centralized enforcement or hierarchical command. Authority within this model is derived not from coercive capacity or infrastructural control, but from collectively recognized legal principles that define acceptable behavior in a non-sovereign domain.[111]

Authority in the treaty system emerges through mutual recognition of legal obligation among states. Compliance is sustained through reputational incentives, expectations of reciprocity, and the long term strategic benefits of cooperative restraint. As Chayes and Chayes demonstrate, international regimes can produce high levels of compliance even in the absence of enforcement when rules are perceived as legitimate and mutually beneficial.[112] During much of the Cold War and post Cold War periods, the Outer Space Treaty constrained state behavior despite intense geopolitical rivalry, suggesting that legal authority can stabilize conduct even under conditions of strategic competition.

The durability of the Outer Space Treaty regime illustrates the strength of legitimacy rooted in near universality. Nearly all spacefaring states have formally endorsed its core

[111] Stroikos, "International Relations and Outer Space."
[112] Chayes and Chayes, "On Compliance," 181.

principles, including non-appropriation, peaceful use, and the use of space for the benefit of all humankind.[113] These norms shaped behavior even during periods of militarized rivalry, reducing incentives for overt territorial claims or the weaponization of orbit. For instance, although major spacefaring powers have developed and tested anti satellite capabilities, they have avoided the formal deployment of weapons in orbit and continue to frame military space activity within the Treaty's peaceful use language rather than openly repudiating its constraints. Legal restraint persists rhetorically and behaviorally even as strategic competition intensifies.[114]

However, the empirical limits of this model have become increasingly apparent under contemporary conditions. The rise of commercial actors, ambitions for space resource utilization, and divergent interpretations of non-appropriation have exposed the rigidity of static legal norms. The treaty system lacks institutional mechanisms for rule adaptation, clarification, or enforcement in response to novel practices.[115] As technological capabilities have advanced and economic incentives intensified, interpretation has replaced compliance as the dominant mode of engagement with the treaty framework.

Rather than openly rejecting the Treaty, states increasingly reinterpret its principles while advancing national legislation or minilateral arrangements that stretch its constraints.[116] The 2015 U.S. Commercial Space Launch Competitiveness Act illustrates this pattern of strategic reinterpretation. While reaffirming adherence to the non-appropriation principle of the Outer Space Treaty, the Act grants U.S. entities rights to possess and sell resources extracted from celestial bodies.[117] This legislative move did not formally repudiate the treaty, yet it expanded the

[113] Zahoor, "Maintaining International Peace and Security," 114.
[114] Zahoor, "Maintaining International Peace and Security," 113-118; Bernat, *Inevitability of Militarization of Outer Space*, 49-54.
[115] Hasin, "Developing a Global Order for Space Resources," 76.
[116] Deplano, "The Artemis Accords," 798.
[117] Hasin, "Developing a Global Order for Space Resources," 77-83; U.S. Commercial Space Launch Competitiveness Act,

practical meaning of non-appropriation by distinguishing territorial sovereignty from resource ownership. Legal authority remained rhetorically intact while behavioral practice evolved beyond original treaty expectations. The treaty retains symbolic authority as a normative reference point, yet increasingly fails to discipline conduct in contested areas such as resource extraction, safety zones, and commercial exploitation.

From a conflict reduction perspective, the treaty system performs unevenly. It remains effective at establishing baseline restraint and signaling shared red lines, but struggles to manage disputes once interests diverge. The absence of formal dispute resolution mechanisms and the ambiguity of jurisdictional responsibility limit the system's ability to prevent escalation under conditions of stress.[118] Rather than channeling conflict into institutional processes, the treaty often leaves disputes unresolved, incentivizing unilateral clarification through action not just agreement. For instance, debates within the UN Committee on the Peaceful Uses of Outer Space over space resource utilization have persisted for years without binding clarification, as states disagree over whether resource extraction constitutes appropriation under Article II of the Treaty. The absence of a formal adjudicatory mechanism has left these disputes politically negotiated rather than institutionally resolved.[119]

Comparatively, the Legal Normative Governance model excels at generating legitimacy through inclusivity and shared principles, but its capacity to produce durable authority declines as technological complexity and political fragmentation increase. Authority rooted primarily in universality and restraint proves vulnerable when governance must evolve in response to new actors, new technologies, and contested interpretations.[120] The Outer Space Treaty system

[118] Bernat, *Inevitability of Militarization of Outer Space*, 45-53.
[119] Hasin, "Developing a Global Order for Space Resources," 77-83; Zahoor, "Maintaining International Peace and Security," 113-118.
[120] Zürn, Binder, and Ecker-Ehrhardt, "International Authority and Its Politicization," 90-95.

therefore illustrates both the power and the limits of law as a source of authority in non-sovereign environments.

The Outer Space Treaty system shows how law can stabilize behavior by shaping expectations, reputational incentives, and perceptions of appropriate conduct in a non-sovereign domain. This authority erodes when legal rules fail to adapt to changing technological and economic conditions. Without mechanisms for evolution, clarification, and conflict management, normative authority increasingly operates at the level of rhetoric rather than behavior. In such contexts, law continues to structure discourse while losing its capacity to discipline action, allowing fragmentation and unilateralism to advance beneath the surface of formal compliance.

5.4 Case 3: Networked Governance

The Artemis Accords

Networked Governance is most clearly exemplified by the Artemis Accords, which organize cooperation in outer space through voluntary alignment rather than binding universality or centralized command. Unlike treaty based regimes that seek legitimacy through formal legal obligation, or sovereign models that derive authority from hierarchical control, the Artemis Accords generate authority through participation, practice, and operational coordination.[121] Authority in this architecture is constructed horizontally, emerging from repeated interaction among aligned actors rather than imposed through law or coercion.[122]

States opt into the Artemis framework based on shared interests, access to missions, and alignment with a set of operational norms governing exploration, transparency, interoperability, and safety. Participation is selective and intentional. States join not because they are legally

[121] Deplano, "The Artemis Accords," 798-803.
[122] Stroikos, "International Relations and Outer Space."

compelled to do so, but because inclusion offers tangible benefits such as mission integration, technological collaboration, and influence over emerging standards.[123] Authority is relational, produced through networks of cooperation that reward alignment and marginalize non-participation without formally excluding actors from space itself.[124]

Legitimacy within this model emerges through repeated participation. As states coordinate missions, share data, and follow agreed practices, norms become internalized through use and compliance becomes habitual rather than deliberative.[125] In this sense, the Artemis Accords operate as a living governance framework, evolving through action rather than amendment.

The primary strength of this architecture lies in its flexibility and adaptability. The modular design of the Accords allows for rapid expansion as new partners join and new practices emerge. Between 2020 and 2024, the Artemis Accords expanded from an initial group of signatories to include more than thirty states across Europe, Asia, Latin America, and the Middle East. Countries such as the United Arab Emirates, Japan, Brazil, and India opted into the framework through bilateral agreements with the United States.[126] This expansion demonstrates how authority within Networked Governance spreads through voluntary alignment and political signaling rather than treaty ratification. Unlike treaty based systems, which often struggle to adapt to technological change, the Artemis framework can incorporate novel activities such as lunar surface operations, resource coordination, and commercial partnerships without renegotiating foundational rules.[127] This adaptability enhances legitimacy among participants by signaling responsiveness to real operational needs.[128]

[123] Harrison and Thomas, "NASA in the Second Space Age," 6-9.
[124] Abbott and Snidal, "Hard and Soft Law," 444-447.
[125] Chayes and Chayes, "On Compliance," 178-181.
[126] Deplano, "The Artemis Accords," 812-815.
[127] Zancan et al., "Evolving Governance in the Space Sector," 520-523.
[128] Tepper, "Big Bang of Space Governance," 493-498.

However, authority within this system is inherently conditional. The central role of the United States introduces asymmetry in agenda setting, norm definition, and benefit distribution. While the framework is formally voluntary, leadership influence shapes priorities, timelines, and interpretations.[129] Authority therefore depends heavily on the credibility, consistency, and perceived fairness of leadership. If leading actors are seen as privileging national interests at the expense of shared governance, legitimacy erodes rapidly.[130] Authority in Networked Governance is thus contingent rather than entrenched.

From a conflict reduction perspective, the Artemis Accords exhibit mixed performance. Within the network, coordination mechanisms reduce friction by clarifying expectations and aligning practices among participants.[131] Disputes are often preempted through shared planning and transparency rather than resolved after the fact. NASA's requirement that Artemis partners publicly release scientific data and coordinate lunar surface activities through safety zones illustrates this preemptive logic. Under Section 11 of the Artemis Accords, partners agree to provide notification of the location and general nature of operations that could generate harmful interference, effectively operationalizing Article IX of the Outer Space Treaty through coordinated deconfliction practices. Safety zones function not as territorial claims but as transparency mechanisms designed to prevent conflict through advance coordination, reducing the likelihood that operational overlap escalates into political dispute.[132] However, the framework lacks robust mechanisms for managing conflict beyond the network. Non-participants are neither bound by nor meaningfully engaged with the Accords, limiting their capacity to prevent broader systemic fragmentation.[133]

---

[129] Deplano, "The Artemis Accords," 812–815.
[130] Burke-White and Williams, "Existing Framework for Space Governance."
[131] Chayes and Chayes, "On Compliance," 181–183.
[132] Deplano, "The Artemis Accords," 812–815.
[133] Zürn, Binder, and Ecker-Ehrhardt, "International Authority and Its Politicization," 90-93.

Moreover, the absence of formal dispute resolution procedures constrains the Accords' ability to manage high stakes disagreements, particularly among major powers. While the framework is effective at coordinating aligned actors, it does little to reduce conflict between competing governance blocs.[134] Authority is therefore strong within the network but weak at the system level. The Accords stabilize cooperation among partners while simultaneously contributing to governance bifurcation. Russia and China have publicly rejected the Artemis framework, characterizing it as politically aligned rather than universal. In parallel, they have advanced the International Lunar Research Station as an alternative coordination platform.[135] The coexistence of Artemis and ILRS illustrates how networked authority consolidates internally while clarifying geopolitical boundaries externally.

Empirically, the Artemis Accords demonstrate that authority in outer space can be generated through voluntary alignment and operational practice without relying on universal legal obligation.[136] This authority remains fragile, sustained by continued participation, leadership legitimacy, and perceived fairness rather than institutional lock in.[137] Should geopolitical competition intensify or leadership commitment falter, the authority of the network risks rapid erosion.

This case illustrates that Networked Governance can generate meaningful authority through voluntary alignment, operational practice, and adaptive coordination, while simultaneously exposing the fragility of authority that lacks binding enforcement and system wide inclusion. Flexibility allows authority to emerge quickly under conditions of technological

[134] Bernat, *Inevitability of Militarization of Outer Space*, 50–52.
[135] Burke-White and Williams, "Existing Framework for Space Governance," 49-54.
[136] Abbott and Snidal, "Hard and Soft Law," 451–453.
[137] Tepper, "Big Bang of Space Governance," 510–514.

change, yet the absence of binding mechanisms leaves this authority vulnerable to fragmentation across a divided international system.[138]

5.5 Case 4: Integrated Multilateral Governance

The International Space Station

Integrated Multilateral Governance is most fully realized in the International Space Station, which represents the most institutionally dense and behaviorally robust governance architecture yet constructed in outer space. Unlike treaty based regimes that rely primarily on normative restraint, or networked frameworks that depend on voluntary alignment, the ISS embeds authority directly into material cooperation, shared command structures, and irreversible operational interdependence.[139] Authority is produced through institutional design that binds actors together in ways that make unilateral action materially infeasible.[140]

The ISS governance architecture rests on a layered legal and institutional foundation composed of intergovernmental agreements, memoranda of understanding, and implementing arrangements that allocate responsibility across partners. Decision making authority is formally distributed across national space agencies, with defined competencies over modules, crew responsibilities, and operational systems. Crucially, no single participant retains autonomous control over the station as a whole.[141] The system is intentionally designed to fragment control while integrating function, ensuring that mission success depends on sustained cooperation among all partners.

[138] Stroikos, "International Relations and Outer Space."
[139] Ibid.
[140] Lake, "Rightful Rules," 587–592.
[141] Chaben, "Extending Humanity's Reach," 82–85.

Authority within the ISS is embedded rather than imposed, emerging from structural dependence rather than external enforcement alone. Crew safety, mission continuity, and system functionality require adherence to shared procedures, timelines, and technical standards.[142] Defection is not merely normatively costly, but operationally destructive. This design converts authority from an abstract claim into a lived constraint, producing behavioral compliance through necessity rather than persuasion.[143]

Legitimacy in this model emerges through both participation and performance. The ISS includes a diverse set of partners with varying capabilities, political systems, and strategic interests, yet governance has remained remarkably stable across decades. The system has demonstrated durability through periods of intense geopolitical strain on Earth, including sanctions regimes, diplomatic crises, and military conflict.[144] Following Russia's 2014 annexation of Crimea and the imposition of U.S. sanctions, terrestrial diplomatic relations deteriorated sharply. Despite this rupture, joint ISS operations continued uninterrupted. NASA and Roscosmos maintained crew exchanges, launch coordination, and shared maintenance responsibilities.[145] Institutional interdependence insulated orbital cooperation from terrestrial conflict, demonstrating that authority within the ISS is embedded in operational necessity rather than political alignment. Even after Russia's 2022 invasion of Ukraine, ISS collaboration persisted. While public rhetoric escalated and sanctions expanded, astronauts continued joint missions and shared station command rotations.[146] The high material costs of defection and the

[142] Chayes and Chayes, "On Compliance," 182–186.
[143] Barnett and Duvall, "Power in International Politics," 55-60.
[144] Harrison and Thomas, "NASA in the Second Space Age," 9-11.
[145] Harrison and Thomas, "NASA in the Second Space Age," 9-11; Zürn, Binder, and Ecker-Ehrhardt, "International Authority and Its Politicization," 92-96.
[146] Lake, "Rightful Rules," 600-605; NASA, "NASA Signs Agreement for Roscosmos to Fly Astronaut; NASA, "Despite Tensions on Earth, International Space Station Cooperation Continues."

technical interdependence of station modules constrained political escalation, reinforcing the embedded nature of authority within the ISS architecture.

Importantly, legitimacy here is not derived solely from inclusivity or normative consensus, but from demonstrated fairness in rule application and benefit distribution. While capabilities are unequal, governance procedures ensure that roles, access, and responsibilities are clearly defined and consistently applied.[147] Predictability and procedural equity reinforce perceptions that the governance arrangement is appropriate and entitled to rule, even when outcomes are asymmetric. Authority is therefore sustained not by equality of power, but by equality of obligation within the system's rules.

From a conflict reduction perspective, the ISS represents the most effective model among the cases examined. Disputes are managed through formalized procedures rather than ad hoc negotiation or unilateral action.[148] Jurisdictional responsibilities are clearly delineated, and mechanisms exist for resolving disagreements without escalating to institutional rupture. Because operational failure imposes immediate and shared costs, actors are strongly incentivized to resolve conflict internally and avoid externalizing it politically.[149]

This capacity for conflict containment is a direct function of interdependence. Within the ISS architecture, conflict is structurally absorbed. Disagreements are transformed into technical, procedural, or managerial problems rather than strategic confrontations.[150] Integrated Multilateral Governance requires long time horizons, high levels of trust, and significant upfront investment. It is institutionally complex, administratively burdensome, and slow to replicate.[151] These constraints limit its scalability, particularly in more competitive or commercially driven

[147] Zürn, Binder, and Ecker-Ehrhardt, "International Authority and Its Politicization," 84–88.
[148] Chayes and Chayes, "On Compliance," 188–191.
[149] Burke-White and Williams, "Existing Framework for Space Governance."
[150] Barnett and Duvall, "Power in International Politics," 60-63.
[151] Zancan et al., "Evolving Governance in the Space Sector," 518-520.

environments. Yet precisely because of these costs, authority within the ISS becomes deeply entrenched. Exit is difficult and defection materially prohibitive.[152]

Empirically, the ISS provides the strongest evidence that durable authority in outer space emerges when governance architectures bind actors together materially rather than relying solely on law, norms, or leadership. Authority in this model is not dependent on universality, performance alone, or voluntary alignment. It is produced through enforced cooperation embedded in physical systems and shared risk.[153]

Taken together, this case demonstrates that Integrated Multilateral Governance offers the most stable architecture of authority under conditions of non-sovereignty. While difficult to construct and costly to maintain, it shows that authority beyond Earth can be sustained when institutions transform cooperation from a choice into a structural condition of survival.[154]

5.6 Cross Case Synthesis

Cross case comparison reveals clear tradeoffs between legitimacy, enforcement capacity, and durability across the four governance architectures. No single model resolves the challenge of producing recognized authority in a legally non-sovereign domain, and each architecture exposes distinct vulnerabilities..[155]

Centralized Sovereign Governance maximizes control and operational clarity by consolidating decision making authority and restricting access. The China centered model produces high levels of internal authority, as rules are enforced through hierarchical command and infrastructural dominance.[156] Compliance is assured through centralized control rather than

[152] Tepper, "Big Bang of Space Governance," 505–508.
[153] Lake, "Rightful Rules," 600–605.
[154] Stroikos, "International Relations and Outer Space."
[155] Zürn, Binder, and Ecker-Ehrhardt, "International Authority and Its Politicization," 69-73.
[156] Burke-White and Williams, "Existing Framework for Space Governance."

persuasion or shared norms. However, authority remains narrowly recognized. Legitimacy is instrumental and conditional, accepted primarily by participants who benefit directly from inclusion. External actors may acknowledge the system's effectiveness while rejecting its authority as appropriate for governing shared space domains.[157] As a result, this architecture stabilizes behavior internally while accelerating fragmentation at the systemic level.

The contrast across cases becomes clearest under conditions of stress. Exclusion from the ISS partnership contributed to China's development of Tiangong. Reinterpretation of the Outer Space Treaty enabled unilateral resource legislation. The Artemis Accords expanded rapidly yet solidified geopolitical blocs. Only the ISS sustained cooperation through armed conflict between major partners. These observable outcomes demonstrate that institutional design directly shapes how authority responds to rivalry.

Legal normative governance, by contrast, prioritizes legitimacy through universality, shared principles, and reciprocal restraint. The Outer Space Treaty system demonstrates that law can generate authority even in the absence of enforcement, particularly when norms are widely internalized and aligned with collective strategic interests.[158] For decades, this framework constrained state behavior and reduced escalation despite intense rivalry. Yet this authority proves increasingly fragile under contemporary conditions. As technological capabilities expand and actor diversity increases, static legal norms struggle to adapt.[159] Without mechanisms for clarification or dispute resolution, normative authority weakens behaviorally even as it persists rhetorically. Legitimacy remains high, but the capacity to discipline conduct erodes.

Networked Governance occupies an intermediate position between hierarchy and law. The Artemis Accords generate authority through voluntary alignment, repeated practice, and

[157] Bernat, *Inevitability of Militarization of Outer Space*, 49–54.
[158] Chayes and Chayes, "On Compliance," 175–180.
[159] Hasin, "Developing a Global Order for Space Resources," 77-83.

operational coordination among like minded actors.[160] This architecture is highly adaptive and responsive to technological change. Authority emerges quickly and is reinforced through participation rather than formal obligation. However, authority within this model is contingent. It depends heavily on leadership credibility, perceived fairness, and continued material benefits.[161] The absence of binding enforcement and system wide inclusion limits the framework's capacity to manage conflict beyond the network, contributing to governance bifurcation instead of convergence.

Integrated multilateral governance, exemplified by the International Space Station, produces the most stable and deeply embedded form of authority observed across the cases. By binding actors together through shared infrastructure, irreversible interdependence, and formalized procedures, this model converts cooperation from a choice into a structural necessity.[162] Authority is sustained through material constraint rather than persuasion alone. Legitimacy is reinforced by procedural fairness and consistent rule application, while conflict is absorbed through institutionalized mechanisms.[163] Although costly and difficult to replicate, this architecture demonstrates that durable authority beyond Earth is achievable when governance structures make defection materially prohibitive.

Across cases, three variables emerge as decisive in shaping authority recognition.

1. First, institutional adaptability strongly conditions durability. Governance architectures that evolve through practice retain authority longer than those reliant on static rules.[164] Adaptability allows institutions to respond to new technologies, actors, and incentives without undermining legitimacy.

[160] Abbott and Snidal, "Hard and Soft Law," 444–447.
[161] Deplano, "The Artemis Accords," 812–815.
[162] Lake, "Rightful Rules," 587–592.
[163] Zürn, Binder, and Ecker-Ehrhardt, "International Authority and Its Politicization," 92-96.
[164] Tepper, "Big Bang of Space Governance," 505–510.

2. Second, operational interdependence significantly strengthens authority. Where defection imposes immediate material, safety, or reputational costs, compliance becomes structurally embedded rather than voluntary.[165] Authority is strongest when exit is costly and cooperation is functionally indispensable.
3. Third, perceived fairness consistently mediates legitimacy. Asymmetric governance arrangements can sustain authority if rules are predictable and obligations are evenly applied.[166] When decision making authority or benefit distribution is perceived as arbitrary or self serving, legitimacy declines regardless of performance.

Taken together, the comparative evidence supports the core claim advanced in this thesis: authority in outer space is most likely to be recognized and sustained when governance architectures integrate legal legitimacy, operational interdependence, and adaptive participation. Models that rely exclusively on law, hierarchy, or voluntary alignment remain vulnerable to fragmentation. Durable authority instead emerges from hybrid arrangements that combine norms, institutions, and material cooperation into mutually reinforcing systems capable of withstanding political, technological, and strategic stress.[167]

[165] Barnett and Duvall, "Power in International Politics," 55-60.
[166] Zürn, Binder, and Ecker-Ehrhardt, "International Authority and Its Politicization," 84-88.
[167] Stroikos, "International Relations and Outer Space."

Chapter 6: Argument and Implications - The Architecture of Survival

This chapter advances the central claim of the thesis: durable authority in outer space does not emerge from law alone, hierarchy alone, or voluntary alignment alone, but from hybrid governance architectures that integrate legal legitimacy, operational interdependence, and adaptive participation. Building on the structured comparison in Chapter 5, it synthesizes the empirical findings into a broader theoretical argument about how authority can be constructed and sustained in legally non-sovereign environments. Rather than ranking the four cases, the chapter treats them as revealing distinct mechanisms of authority production. The question shifts from which model performs best in isolation to which institutional combination enables authority to endure under rivalry, commercialization, and technological change. The argument that follows is that authority is most stable when governance transforms cooperation from a preference into a structural condition of survival.

6.1 Recognized Authority in a Non Sovereign Domain

The central dependent variable of this thesis is recognized authority. Authority here is not treated as a formal legal status or as a declaration embedded in treaty text.[168] It is treated as a behavioral condition. Authority exists when relevant actors act as though a governance arrangement possesses the legitimate right to set rules, allocate roles, and resolve disputes within a given domain. It is present not when rules are articulated, but when those rules structure conduct,

[168] Lake, "Rightful Rules," 587–613.

especially in moments where compliance imposes costs, constrains autonomy, or forecloses strategically advantageous unilateral action.

This distinction is crucial in outer space. Because sovereignty and territorial enforcement are legally foreclosed, authority cannot rest on ownership or coercive dominance.[169] In a domain where no actor can consolidate jurisdiction through possession or monopoly of force, authority must instead be produced through recognition.

Recognition is observable. It is revealed in sustained institutional participation, in the willingness of actors to align behavior with shared expectations, and in the deference shown to established procedures when disputes arise.[170] In this sense, authority is relational. It is produced and reproduced through interaction. To evaluate whether such authority exists, this chapter operationalizes recognized authority through two analytical dimensions: legitimacy and conflict reduction capacity.

Legitimacy captures whether actors perceive a governance arrangement as appropriate and entitled to rule within the domain it regulates. It is reflected in breadth of participation, durability of commitment over time, rhetorical endorsement, and demonstrated willingness to align national or commercial activity with shared rules. Legitimacy is not equated with universality. Authority can stabilize within bounded communities even in the absence of global consensus, provided rules are perceived as procedurally fair and functionally necessary. In this framework, legitimacy is practice based. It is demonstrated through alignment and restraint, not simply verbal affirmation.

Conflict reduction capacity captures whether governance structures successfully manage disagreement without allowing it to escalate into fragmentation or rivalry. Authority that cannot

[169] Outer Space Treaty, art. II.
[170] Zürn, Binder, and Ecker-Ehrhardt, "International Authority and Its Politicization," 69-106.

contain conflict will erode under stress. This dimension evaluates the presence and use of dispute resolution mechanisms, clarity of jurisdictional responsibility, institutional responses to historical stress events, and the degree to which governance arrangements reduce incentives for unilateral defection. The key question is not whether conflict disappears, but whether it is channeled into predictable, rule bound procedures.

By coding each case along these dimensions, the analysis isolates how institutional architecture shapes behavioral recognition over time. Stripped of territorial sovereignty, governance in space exposes the mechanisms through which authority must be constructed rather than assumed.

A concrete illustration of this behavioral condition can be seen in the continued operation of the Liability Convention. States accept absolute liability for damage caused by space objects on Earth and fault based liability for damage in orbit, even though no standing international court compels enforcement. Claims are pursued diplomatically, negotiated through established procedures rather than coercive adjudication. The convention shapes insurance markets, national supervision of private operators, and launch authorization requirements. Authority here operates ex ante. Actors internalize risk and adjust behavior in anticipation of liability exposure. The absence of centralized enforcement does not prevent compliance. Instead, the shared expectation of responsibility structures conduct before violation occurs.[171]

6.2 Patterns Across Architectures of Authority

The comparative analysis does not yield a single optimal model of space governance. Instead, it reveals a structural pattern in how authority is generated, stabilized, and ultimately constrained.

[171] Liability Convention, 1972; Chayes and Chayes, "On Compliance," 178-181.

Each architecture produces authority through a distinct mechanism, and each secures one dimension of durability at the expense of another. The variation lies not in whether authority emerges, but in how it is constructed and where it becomes brittle.

Centralized Sovereign Governance produces authority through hierarchy and strategic coherence. Decision making is concentrated, jurisdictional responsibility is clear, and long term objectives are aligned under unified command. Within such systems, compliance is not negotiated but embedded. Authority is reinforced through organizational discipline and national mandate. This structure generates internal clarity and predictable coordination. Yet its strength is geographically and politically bounded. Recognition does not extend easily beyond the sovereign sphere. Actors outside the system may perceive authority as imposed rather than legitimate. As a result, while internal stability may be high, cross system legitimacy remains limited, and conflict reduction capacity does not scale beyond those already integrated into the hierarchy. The model generates order through control, but it struggles to produce broad recognition. A contemporary illustration can be seen in the development of China's Tiangong space station. While the station demonstrates centralized coordination and strategic coherence, participation remains largely confined to states willing to operate within Beijing's political orbit.[172] Authority over infrastructure is consolidated internally, yet recognition beyond aligned partners remains partial. The structure secures order within hierarchy but does not translate automatically into multilateral legitimacy.[173]

Legal Normative Governance produces authority through shared principles and codified commitments.[174] The foundational treaty regime of the first space age established widely endorsed norms, most notably non-appropriation and peaceful use. Its authority derives from

[172] Burke-White and Williams, "Existing Framework for Space Governance."
[173] Stroikos, "International Relations and Outer Space."
[174] Abbott and Snidal, "Hard and Soft Law," 421-456.

collective affirmation and symbolic legitimacy. For decades, this normative baseline structured expectations and constrained overt contestation. Yet law without adaptive institutional embedding becomes increasingly strained under technological and commercial transformation. As new actors enter the domain and resource utilization becomes plausible, interpretive ambiguity widens. Authority persists rhetorically, but behavioral compliance becomes uneven when incentives shift.[175] The 2021 Russian direct ascent anti satellite test provides a recent illustration. The test generated thousands of debris fragments and forced astronauts aboard the ISS to take precautionary shelter. While no treaty provision was formally repudiated, the event exposed the limits of normative restraint and triggered renewed diplomatic efforts to establish voluntary norms against debris producing tests. Authority proved insufficient to prevent the act, yet strong enough to mobilize reputational pressure and collective signaling in its aftermath. The episode demonstrates both fragility and residual strength within the Legal Normative Governance architecture.[176] The model generates recognition at the level of principle, but lacks the operational mechanisms necessary to consistently channel conflict under stress.

Networked Governance produces authority through voluntary alignment and coalition building. Like minded states coordinate around shared interpretations and operational standards without requiring universal participation. This flexibility enables rapid institutional innovation and practical coordination. Authority within such coalitions can be strong because participation is chosen rather than imposed. Yet selectivity produces segmentation. Authority consolidates within the network while alternative coalitions or rival architectures emerge elsewhere. Conflict reduction is achieved internally but displaced externally. The result is not comprehensive order

[175] Chayes and Chayes, "On Compliance," 175-205.
[176] Zahoor, "Maintaining International Peace and Security," 113-118.

but parallel spheres of governance. The model adapts quickly, but it risks reinforcing geopolitical division.

Integrated Multilateral Governance produces authority through embedded interdependence. In deeply integrated systems, actors rely on one another for mission continuity, infrastructure access, and survival critical functions. Compliance becomes materially rational because defection imposes tangible systemic costs. Authority is therefore reinforced not only by legitimacy but by structural necessity. Disputes are absorbed into institutional channels because escalation threatens shared infrastructure. This model demonstrates high conflict reduction capacity precisely because interdependence aligns incentives with stability. Yet integration at this depth requires sustained trust, resource commitment, and institutional complexity. It is difficult to replicate rapidly across expanding domains of activity. Authority is strongest where integration is deepest, but scalability remains uncertain.

Across these cases, a consistent tension emerges between clarity, legitimacy, flexibility, and embedded stability. This tension becomes visible when comparing debris management responses across architectures. The 2021 Russian anti satellite test triggered multilateral condemnation and renewed norm building efforts, yet no centralized enforcement mechanism intervened. By contrast, integrated systems such as the ISS rely on immediate procedural coordination to mitigate debris threats. The difference is not rhetorical commitment but institutional depth. Where interdependence is embedded, response is operational. Where legitimacy is diffuse, response is diplomatic.[177] Hierarchy produces coherence but narrows recognition. Law produces legitimacy but lacks adaptability. Voluntary networks produce flexibility but risk fragmentation. Interdependence produces stability but strains scalability.

[177] Zahoor, "Maintaining International Peace and Security," 113-118; ISS Intergovernmental Agreement, 1998.

The broader pattern suggests that authority in outer space fails not because actors reject governance, but because single mechanism systems cannot satisfy the simultaneous demands of recognition, adaptability, and conflict containment. In a domain characterized by rapid technological change, geopolitical rivalry, and legal constraints on sovereignty, authority must operate on multiple levels at once. Where legitimacy is present without embedded coordination, rules erode under pressure. Where coordination exists without legitimacy, recognition narrows. Where flexibility exists without structural interdependence, fragmentation follows.

The comparative findings therefore point toward synthesis rather than selection. Durable authority in outer space cannot rest on hierarchy alone, law alone, voluntary alignment alone, or integration alone. It requires a design that integrates these mechanisms into a coherent institutional architecture capable of sustaining recognition across stress, expansion, and rivalry.

6.3 Hybrid Governance as Institutional Synthesis

The comparative analysis points toward a conclusion that is more architectural than evaluative. None of the governance models examined in the previous chapter is sufficient on its own to sustain durable authority in outer space. Each succeeds along one dimension while faltering along another. The lesson is not that one model should prevail, but that authority in non-sovereign environments must be constructed through institutional synthesis. Hybrid governance emerges not as a compromise between competing systems, but as a deliberate integration of the mechanisms that make authority recognizable, stable, and adaptable under conditions of rivalry, commercialization, and technological acceleration.[178]

[178] Tepper, "Big Bang of Space Governance," 485.

A modest but revealing example can be found in the increasing use of national space traffic management frameworks. The United States has begun developing civil space traffic coordination mechanisms that translate international consultation expectations into domestic administrative practice.[179] This move does not replace treaty commitments, but embeds them within operational oversight structures capable of real time coordination. International norm, domestic regulation, and commercial compliance converge within a layered system rather than remaining formally separated.

The legal normative regime of the first space age established the foundational language through which legitimacy in outer space is still articulated. Principles such as non-appropriation and peaceful use provide the moral and juridical baseline against which all subsequent governance claims are measured. These principles continue to shape expectations and structure discourse even as new actors and technologies transform the operational landscape. Yet legitimacy rooted in principle is insufficient without institutional embedding. Norms require mechanisms of interpretation, coordination, and adaptation if they are to remain behaviorally binding. Hybrid governance therefore preserves the normative foundation of the treaty system while embedding it within structures capable of evolving alongside material change.

At the same time, centralized sovereign models reveal the importance of strategic coherence. Authority cannot exist in abstraction. It requires actors capable of decision, coordination, and implementation. Hierarchical structures provide clarity of responsibility and long term direction, preventing diffusion of authority into rhetorical ambiguity. However, hierarchy confined within national command structures cannot generate recognition beyond sovereign boundaries. Authority grounded purely in control may stabilize internal governance, but it struggles to produce cross system legitimacy. Hybrid governance absorbs the insight of

[179] Harrison and Thomas, "NASA in the Second Space Age," 8-10.

strategic coherence without replicating unilateral dominance. It situates leadership within multilateral coordination, allowing direction without enclosure.

Networked Governance illustrates a different insight: adaptability. As technological innovation accelerates and commercial participation expands, institutions that cannot evolve risk obsolescence. Voluntary coalitions demonstrate that governance can expand through alignment rather than universal consensus.[180] Such flexibility enables rapid coordination and incremental institutional development. Yet adaptability without integration can produce segmentation. When governance structures align only subsets of actors, parallel blocs form, and authority fragments along geopolitical lines. Hybrid governance incorporates flexibility within a broader normative and procedural framework, ensuring that expansion does not dissolve into rivalry.

The most stabilizing insight comes from integrated multilateral systems, where authority is embedded in operational interdependence. In deeply integrated environments, actors rely on one another for infrastructure, logistics, and mission continuity. Compliance becomes materially rational because defection imposes tangible systemic cost. Authority in such systems is not sustained by rhetoric alone, but by the architecture of shared survival. However, this depth of integration is resource intensive and institutionally complex. It cannot simply be replicated wholesale across expanding domains of activity. Hybrid governance therefore incorporates interdependence strategically, embedding it in critical infrastructures and dispute mechanisms without requiring total institutional merger.

When these mechanisms are integrated, authority shifts from being episodic and contingent to being structurally embedded. The layering of ITU spectrum allocation, national licensing regimes, and liability exposure in satellite mega constellation governance illustrates this embedding. Operators cannot launch at scale without complying with domestic regulatory

[180] Zancan et al., “Evolving Governance in the Space Sector,” 518-523.

approval, coordinating internationally for spectrum assignment, and accounting for liability risk. No single mechanism controls behavior, but together they constrain it. Authority is diffused yet cumulative.[181] Legitimacy provides recognition. Strategic coherence provides clarity. Adaptability provides resilience. Interdependence provides stability. None of these dimensions alone secures durable authority. Together, they create a layered architecture capable of withstanding stress. Authority persists not because actors are compelled by force, nor because they are persuaded by principle alone, but because institutional design aligns incentives, expectations, and long term survival.

This synthesis also reconfigures the relationship between public and private authority. The expansion of commercial actors into orbital services, lunar infrastructure, and resource extraction challenges governance models built solely around state coordination. Private entities increasingly operate systems that shape access, opportunity, and risk.[182] Authority that excludes them becomes performative rather than operative. Hybrid governance must therefore incorporate regulatory oversight, transparency obligations, and procedural accountability that bind commercial actors within shared institutional frameworks. Without such integration, corporate power risks operating parallel to, rather than within, recognized governance arrangements.

NASA's Commercial Crew program illustrates how such layering can function in practice.[183] Private firms design and operate spacecraft under fixed price contracts, yet remain licensed under national regulatory authority and subject to Article VI supervision under the Outer Space Treaty. Operational control is distributed, but responsibility is not abandoned. Authority is structured simultaneously through contract law, domestic licensing, and

[181] Ibid.
[182] Zancan et al., "Evolving Governance in the Space Sector," 518-523.
[183] Chaben, "Extending Humanity's Reach," 82–85; Outer Space Treaty, art. VI.

international obligation. The result is neither full privatization nor centralized command, but institutional interweaving.

Hybrid governance does not recreate sovereignty. It does not establish territorial control or a centralized monopoly on force. Instead, it distributes authority across institutional layers, anchoring it normatively while embedding it operationally. In doing so, it demonstrates that authority in outer space must be engineered rather than inherited. Stripped of territorial reflex, governance in space reveals that durable authority emerges from design, not possession.

In a domain where survival depends on coordinated management of fragile systems, cooperation cannot remain merely strategic. It must become structural. Hybrid governance transforms alignment from a temporary convergence of interests into a condition of shared continuity. In this sense, it represents not simply a policy preference, but an architecture of survival.

6.4 The Architecture of Survival

If hybrid governance represents the synthesis of authority producing mechanisms, the question that follows is what such an architecture must contain in order to endure under conditions of sustained expansion and rivalry. The comparative analysis makes clear that authority in outer space cannot depend on any single organizing principle. It cannot rely exclusively on law, nor on strategic leadership, nor on voluntary coalition, nor even on operational integration in isolation. Durable authority must be embedded in institutional arrangements that convert shared vulnerability into structured interdependence. In a domain where infrastructure is fragile, miscalculation carries systemic consequences, and sovereignty is legally constrained, governance must stabilize expectations before crisis emerges rather than after escalation begins.

Critical infrastructure in outer space will increasingly function as both technical and political terrain. Orbital pathways, docking interfaces, communications frequencies, and future extraction zones on the lunar surface will shape not only access but influence.[184] When such nodes of activity are governed unilaterally, incentives for suspicion and counter alignment intensify. Authority becomes conflated with control. A durable architecture therefore requires forms of shared oversight that diffuse unilateral dominance without dissolving responsibility. This does not imply the erasure of national leadership, but its institutional embedding within transparent frameworks. Inspection regimes, common operational standards, shared data reporting, and proceduralized coordination reduce the likelihood that routine activity is interpreted as strategic encroachment. In this sense, authority is sustained not through supremacy but through structured visibility. Governance that is legible becomes governance that is recognizable. The expansion of space situational awareness data sharing demonstrates this principle.[185] United States Space Command provides conjunction warnings to commercial operators and foreign governments, including actors outside formal alliance structures. These notifications are not legally binding, yet operators routinely adjust trajectories in response. Informational centrality generates behavioral alignment. Authority emerges through shared technical reliance rather than hierarchical enforcement.

Equally central is the institutionalization of dispute management before conflict escalates into rivalry. Outer space will not remain insulated from competition over resources, orbital positioning, and infrastructure priority. The absence of territorial sovereignty removes the default mechanism through which terrestrial disputes are resolved. Without credible procedural alternatives, disagreement risks migrating toward unilateral retaliation or geopolitical

[184] Deplano, "The Artemis Accords," 812–815; Hasin, "Developing a Global Order for Space Resources," 77-83.
[185] Harrison and Thomas, "NASA in the Second Space Age," 6-9; Zancan et al., "Evolving Governance in the Space Sector," 520-523.

signaling.[186] Durable authority depends on the existence of dispute resolution channels that actors are willing to treat as binding even when outcomes are uncertain or politically inconvenient. Arbitration bodies, technical adjudication panels, and jurisdictional clarification mechanisms are not peripheral to authority; they are constitutive of it. A limited illustration can be found in how harmful interference concerns have been managed under Article IX consultations. Although rarely formalized through litigation, states have invoked consultation procedures when satellite interference or proximity concerns arise. The very existence of these channels shapes behavior, even when disputes are resolved quietly. Authority operates through the expectation that consultation precedes escalation.[187] Authority persists when actors internalize procedure as preferable to confrontation, and when compliance with rulings reinforces expectations rather than undermines them. The 1978 Cosmos 954 incident offers a concrete precedent. When a Soviet satellite carrying nuclear material reentered over Canada, the resulting damage triggered liability claims under the Liability Convention. Although resolved diplomatically rather than through court adjudication, the case demonstrated that even rival powers engaged established procedures rather than rejecting them outright. The episode reinforced expectations that legal channels would be used even under Cold War strain.[188]

The absence of retaliatory escalation following these incidents is analytically significant. Neither the Cosmos 954 liability claim nor Article IX consultations produced withdrawal from the regime. Instead, actors remained within institutional channels. Authority was preserved not because outcomes were ideal, but because procedure was treated as preferable to unilateral reprisal.[189]

[186] Burke-White and Williams, "Existing Framework for Space Governance."
[187] Outer Space Treaty, art. IX; Steer, "Building the Space Citizen Model."
[188] Liability Convention, 1972.
[189] Liability Convention, 1972; Outer Space Treaty, art. IX.

Institutional adaptability forms the third structural pillar of survival. The technological trajectory of space activity ensures that governance frameworks will confront continual reinterpretation pressures. Launch costs decline, private actors proliferate, autonomous systems evolve, and resource extraction becomes operational rather than speculative.[190] Static regulatory arrangements cannot withstand such dynamism. Yet perpetual renegotiation risks instability. The challenge, therefore, is to embed mechanisms for structured evolution within the architecture itself. Amendment pathways, coalition expansion protocols, interpretive review bodies, and iterative coordination forums allow rules to adapt without dissolving their legitimacy. Stability is preserved not by freezing governance in place, but by ensuring that change occurs through recognized institutional channels rather than unilateral reinterpretation.

Taken together, these characteristics illustrate a deeper structural transformation. In outer space, authority cannot be sustained through coercive monopoly or territorial consolidation. It must be stabilized through institutional entanglement. When actors depend upon shared infrastructure, defer to procedural dispute mechanisms, and participate in adaptive institutional processes, cooperation ceases to be merely contingent. It becomes embedded. Defection carries systemic cost not because punishment is guaranteed, but because fragmentation threatens shared continuity. Authority in such an environment is not a product of force projection. It is a function of aligned incentives and mutually recognized constraints.

The expansion of commercial actors intensifies this requirement. Private firms increasingly control launch capabilities, satellite networks, resource exploration systems, and logistical infrastructures that shape the operational future of space.[191] Governance that treats these actors as peripheral to authority formation risks becoming symbolic rather than operative.

[190] Zancan et al., "Evolving Governance in the Space Sector," 518-520.
[191] Ibid.

Durable authority must incorporate regulatory oversight, transparency expectations, and accountability structures that bind corporate actors within shared institutional frameworks. Licensing coordination, reporting standards, dispute access provisions, and oversight integration are not secondary features. They are necessary components of recognized authority in a domain where operational capacity is no longer monopolized by states.

What emerges, then, is not a centralized sovereign order but a layered architecture in which normative principles anchor legitimacy, multilateral coordination provides strategic clarity, network mechanisms enable expansion, interdependence embeds stability, dispute procedures contain conflict, and adaptive processes preserve relevance. Authority in such a system is neither territorial nor absolute. It is relational, procedural, and cumulative. It persists because actors repeatedly reproduce it through participation and restraint.

Outer space exposes the fragility of governance stripped of ownership. It reveals that authority beyond sovereignty is not self generating but conditional. Where institutional design aligns incentives with collective continuity, authority can endure even in the absence of territorial enforcement. Where such alignment is absent, fragmentation and rivalry follow. The architecture of survival is therefore not aspirational rhetoric. It is the structural precondition for recognized authority in a domain where misalignment threatens not only order, but continuity itself.

6.5 Authority in Practice

The theoretical architecture outlined above must ultimately be evaluated against the perceptions of actors who operate within the system daily. To assess whether hybrid governance is analytically constructed or practically recognized, this section draws on three elite interviews conducted in early 2026.

6.5.1 Civil Advocacy and Normative Fragility

If the preceding sections construct an architectural theory of authority, the critical question is whether those structural dynamics are recognizable to actors operating within the system itself. Authority in outer space cannot be evaluated solely through institutional design or doctrinal analysis. It must also be assessed through the perceptions of those who engage the regime daily, who navigate its constraints, and who observe its vulnerabilities from within. The first interview, conducted with Jack Kiraly, Director of Government Relations at The Planetary Society, provides precisely that vantage point.[192]

Based in Washington, DC, Kiraly serves as the organization's primary representative on Capitol Hill. He works at the intersection of legislative negotiation, agency implementation, and commercial coordination, engaging members of Congress, federal agencies, and private actors on civil space policy. Trained in space policy and immersed in federal advocacy, he operates where treaty language meets budget allocation and geopolitical constraint, offering a perspective grounded in the practical realities of governance rather than abstraction.

Kiraly's assessment of the current regime reinforces the central analytical premise advanced in Section 6.1: authority in outer space rests primarily on recognition rather than coercion. As he observed, "The whole regime of international law relies on actors respecting the rules even if there is no enforcement mechanism for a violation of the Outer Space Treaty."[193] This statement captures the distinctive condition of governance beyond sovereignty. Compliance persists not because enforcement is guaranteed, but because actors continue to treat the framework as legitimate and binding. Authority, in this context, is relational and reproduced

[192] Jack Kiraly, interview with the author, February 2026.
[193] Ibid.

behaviorally. It exists insofar as actors defer to shared rules even when immediate material incentives might permit deviation.

Yet this reliance on voluntary alignment exposes structural fragility. Kiraly described contemporary governance as operating within "very narrow definitions and guardrails that were put up by the Outer Space Treaty."[194] The language is revealing. Guardrails constrain movement, but they do not constitute a fully developed adjudicatory architecture. They define boundaries of acceptable behavior without necessarily providing mechanisms for resolving interpretive dispute. While Kiraly resisted reducing the regime to mere informal understanding, his phrasing underscores an important vulnerability identified earlier in this chapter: legitimacy without embedded enforcement or procedural depth remains contingent. It depends on sustained interpretive restraint across actors whose incentives are evolving rapidly.

That strain intensifies as the material environment changes. Commercial expansion multiplies actors, technologies, and operational density. As Kiraly explained, "With more things in space, you have the problem of needing to coordinate activities more, but with smaller teams."[195] The paradox is clear. The system grows more complex precisely as institutional capacity remains limited. Coordination burdens expand while regulatory resources fragment. Moreover, material infrastructure acquires a durability that exceeds corporate lifespan, since, as Kiraly observed, "maybe the company doesn't exist anymore, but their object in space still does."[196] Governance must therefore address not only present actors but enduring technological artifacts whose jurisdictional responsibility may become ambiguous over time. Authority that fails to bind these systems risks becoming disconnected from operational reality.

[194] Ibid.
[195] Ibid.
[196] Ibid.

Kiraly further emphasized the mismatch between legal abstraction and physical dynamics. Governance discourse often relies on spatial metaphors that imply fixed zones and static boundaries. Yet, as he noted, "We think of areas of operations on a two dimensional map, where space is four dimensional… it's also through time."[197] Orbital mechanics introduce movement, overlap, and temporal sequencing that complicate territorial analogies. Proximity operations and lunar surface activities cannot be neatly partitioned through static demarcation. This reinforces the argument developed in Section 6.4: authority in outer space must be grounded in procedural coordination, transparency, and anticipatory deconfliction rather than in possession or enclosure. Legal language alone cannot substitute for dynamic institutional management.

Geopolitical fragmentation compounds these pressures. Kiraly pointed to statutory restrictions that limit routine coordination between NASA and Chinese counterparts, requiring congressional waiver for even basic communication. In a crisis scenario, such separation carries operational consequences, as one interviewee asked: "If NASA has astronauts on the surface and China does too, and an incident happens, how are they going to communicate?"[198] This question moves beyond abstract rivalry. It exposes how political segmentation can undermine survival level coordination. Authority divided along geopolitical lines risks eroding the very conflict reduction capacity necessary for sustained activity in a fragile domain.

At the same time, Kiraly identified a powerful counterexample that aligns directly with the hybrid governance thesis. The International Space Station functions, in his words, as "this beacon of collaboration and partnership in space, even when geopolitical tensions are really high." The ISS demonstrates how deeply embedded operational interdependence can stabilize cooperation despite terrestrial strain. Institutional integration converts rivalry into managed

[197] Ibid.
[198] Ibid.

coordination because mission continuity depends on mutual participation. Yet this stability is not self sustaining, since, as Kiraly warned, "When we lose the ISS… we lose this very valuable tool for diplomacy."[199] Authority embedded in shared infrastructure must be reproduced intentionally. Without institutional renewal, interdependence dissolves and with it the stabilizing effects it produces.

Kiraly's long term assessment reflects the transitional nature of the present moment. He anticipates that the existing treaty framework will likely suffice in the near term, but expects disputes over land use, proximity operations, and space situational awareness to be addressed "in an ad hoc fashion."[200] Incremental adaptation may prevent immediate breakdown, but it does not constitute structural redesign. He was explicit that the treaty regime "needs to be addressed."[201] Governance frameworks, he emphasized, are intended to endure. Without deliberate evolution, interpretive ambiguity and coordination strain will accumulate.

Taken together, Kiraly's perspective validates the central analytical claims of this chapter. Normative legitimacy remains the foundational layer of authority, but it is increasingly strained by commercial proliferation, geopolitical segmentation, and technological dynamism. Coordination burdens expand faster than enforcement capacity. Interdependence stabilizes cooperation where embedded deeply enough, yet such embedding is neither automatic nor permanent. Authority in outer space persists not because it is territorially enforced, but because actors continue to reproduce it within constrained institutional guardrails. The question confronting the next phase of expansion is whether those guardrails will be reinforced through hybrid institutional design or eroded through incremental improvisation.

---

[199] Ibid.
[200] Ibid.
[201] Ibid.

6.5.2 National Security and Strategic Credibility

The second interviewee, referred to here under the pseudonym Dr. Neil Orion, previously served within the Pentagon during the Carter and Reagan administrations, including during the period associated with the Strategic Defense Initiative. His career placed him inside early debates over whether outer space would remain a legally constrained commons or evolve into a domain defined by strategic competition and technological escalation. Now retired and residing outside the Washington, DC area, he agreed to participate on condition of anonymity and asked that his insights be incorporated analytically rather than quoted directly.[202]

From this vantage point, authority in outer space is not evaluated primarily through normative language or coalition breadth. It is evaluated through stress. Within national security institutions, governance arrangements are measured by whether they remain reliable when incentives to defect intensify. Strategic planners assume that ambiguity will be exploited, that capabilities will be interpreted in worst case terms, and that technological innovation will generate suspicion before trust. Authority that functions smoothly in cooperative environments but collapses under rivalry does not qualify as durable. Recognition, in this view, must survive adversarial reasoning.

Dr. Neil Orion reflected that during the Strategic Defense Initiative debates, the destabilizing factor was often not overt violation but uncertainty. When capabilities are opaque, adversaries plan against maximal threat. Even systems described as defensive may be interpreted as latent instruments of dominance. In such an environment, informal assurances carry little weight. Stability requires structured transparency, predictable signaling, and procedural clarity. Governance that clarifies operational expectations and reduces interpretive ambiguity can lower

[202] Neil Orion, interview with the author, February 2026.

escalation risk. Governance that rests solely on principled commitment leaves room for suspicion to fill the gap.

This perspective deepens the conflict reduction dimension developed in Section 6.1. Authority becomes strategically credible when it reduces miscalculation. Legal norms that lack operational specificity may retain rhetorical force, but if they do not translate into mechanisms that defense institutions can rely upon during a crisis, they will be discounted in contingency planning. For authority to be recognized across geopolitical rivalry, it must not only claim legitimacy but structure behavior in ways that constrain worst case escalation dynamics.

At the same time, Dr. Neil Orion did not frame governance as incompatible with deterrence. On the contrary, he suggested that structured coordination can reinforce stability. Clear notification procedures, transparency around proximity operations, and credible dispute resolution channels reduce incentives for preemptive signaling. When actors understand how others are expected to behave within institutional frameworks, they are less likely to resort to unilateral demonstrations of capability. Governance, in this sense, does not weaken strategic posture. It can stabilize it by narrowing uncertainty.

Yet he also warned that governance perceived as strategically asymmetric can accelerate fragmentation. If institutional mechanisms appear to entrench the dominance of one coalition or restrict the maneuverability of others, rival powers will construct parallel frameworks rather than integrate. Authority then becomes segmented along geopolitical lines, with recognition narrowing to block specific systems. This dynamic mirrors the pattern identified in Chapter 5, where Networked Governance strengthened internal coordination but risked reinforcing external division.

The implication is not that authority in outer space must be securitized, but that it must be legible to security institutions. Legitimacy alone is insufficient if it does not translate into predictable strategic behavior. Hybrid governance gains relevance here not as a normative compromise, but as a structural necessity. Normative principles anchor legitimacy. Operational transparency reduces uncertainty. Multilateral coordination prevents unilateral consolidation. Interdependence embeds incentives for restraint. When integrated, these layers produce authority that can withstand rivalry rather than unravel under it.

Dr. Neil Orion's perspective therefore sharpens the chapter's central claim. Durable authority cannot depend exclusively on voluntary alignment or rhetorical endorsement. It must survive worst case reasoning. Where governance reduces ambiguity and channels competition into structured procedures, recognition can extend even across adversarial divides. Where it appears politically fragile or strategically unbalanced, recognition erodes. Authority in outer space, if it is to endure, must satisfy both legitimacy and deterrence logic simultaneously.

6.5.3 Institutional Continuity and Reform from Within

The final interview was conducted with Mary Guenther, Head of Space Policy at the Progressive Policy Institute. She runs a space policy program at a Washington think tank that spans civil, commercial, national security, and international space issues, and she has worked in the space policy field for seven years. Prior to this role, she served as the head lobbyist for the Commercial Space Federation and as the lead space policy expert for the Democratic staff of the Senate Commerce Committee. Her career trajectory situates her at the intersection of congressional policymaking, industry advocacy, and institutional governance. Unlike earlier interviewees

whose perspectives were shaped by advocacy or national security planning, Guenther's vantage point reflects institutional stewardship within the policy process itself.[203]

From this perspective, one of the most significant governance challenges lies in the growing gap between legal frameworks and operational reality. As she explained, "there are domestic and international gaps."[204] Domestically, the United States lacks "a mission authorization regime that covers missions not addressed by existing regulatory structures," including activities that fall outside traditional categories such as launch, reentry, remote sensing, or spectrum regulation.[205] As commercial capabilities expand, "there are an increasing number of missions that don't have clear paths to approval."[206] In practice, these activities often proceed through ad hoc processes, but such procedures "lack clarity, timelines, transparency, and criteria companies are judged on."[207] The result is a governance environment where technological innovation is advancing faster than regulatory structures designed to oversee it.

International governance faces parallel challenges. Guenther noted that the Outer Space Treaty provides foundational principles but offers limited operational guidance for contemporary activities. In her assessment, the treaty framework "needs an update that modernizes and applies the agreed upon principles."[208] In the absence of such reform, governance initiatives have emerged to interpret and operationalize existing norms. "In the interim, we have the Artemis Accords attempting to fill the gap," she explained, though the framework remains "not globally accepted."[209] This dynamic illustrates the broader pattern identified earlier in this chapter, in

[203] Mary Guenther, interview with the author, February 23, 2026.
[204] Ibid.
[205] Ibid.
[206] Ibid.
[207] Ibid.
[208] Ibid.
[209] Ibid.

which new governance initiatives attempt to operationalize legacy legal principles without fully replacing them.

Institutional coordination also faces practical constraints when multiple actors share responsibility for missions or infrastructure. Guenther pointed to funding structures as a recurring challenge, "The U.S. generally only funds missions for one year at a time and frequently pulls out of missions even if there are international partners."[210] Other states often operate on longer funding horizons, creating asymmetry in planning cycles. Over time, this pattern can generate the perception that "the U.S. is not a reliable mission partner."[211] Governance durability therefore depends not only on legal design but also on institutional credibility and consistent participation.

Looking ahead, Guenther emphasized that existing governance frameworks remain incomplete for the next phase of human space activity. When asked whether current systems are sufficient for sustained lunar or Martian presence, she answered directly: "No."[212] Instead, she argued that "we need to see maturation in the next generation of space governance."[213] At present, the emerging governance landscape appears divided between two institutional trajectories. "Currently, we have a bipolar solution set with the Artemis Accords and the ILRS led coalition," both of which draw on the principles of the Outer Space Treaty while interpreting them differently.[214] Participation across these systems overlaps only partially, leaving open the possibility that they may either converge or conflict as activity expands.

Future governance reform could take multiple forms. Guenther suggested that possibilities range "from non-binding standards for interpretation of the OST to widespread

[210] Ibid.
[211] Ibid.
[212] Ibid.
[213] Ibid.
[214] Ibid.

adoption of either the Artemis Accords or ILRS governing principles to a new treaty," though she noted that the treaty option remains "least likely."[215] In the meantime, governance systems have yet to face the most demanding conditions of geopolitical competition. As she observed, existing frameworks "have not been tested," making it "too early to tell" whether they will prove resilient.[216] Nevertheless, she emphasized that foundational norms retain practical value, noting that "having principles to fall back on is especially helpful in times of conflict."[217]

Operational disputes are currently managed through relatively informal coordination mechanisms. Guenther explained that "issues are typically dealt with in an ad hoc manner involving a few experts from the company or government agency."[218] A common example involves predicting potential satellite collisions in orbit, where operators and officials must determine "what to do if a collision is predicted in orbit between two or more satellites."[219] While these processes have thus far prevented major incidents, their reliance on informal coordination highlights the limited procedural depth of current governance structures.

As human activity expands beyond exploration toward sustained presence, governance frameworks will require greater clarity. Guenther emphasized that future systems must establish "clear rules of the road and a determination of which set of laws apply where and when on a celestial body."[220] Such questions illustrate how governance authority must evolve alongside the material expansion of human activity in space.

Taken together, Guenther's perspective highlights the institutional dimension of authority formation. Governance durability does not depend solely on treaties or strategic competition but also on regulatory adaptation, institutional credibility, and the development of clearer operational

[215] Ibid.
[216] Ibid.
[217] Ibid.
[218] Ibid.
[219] Ibid.
[220] Ibid.

frameworks. Her assessment reinforces the chapter's broader argument that authority in outer space is sustained through layered institutional practices that translate legal principles into workable governance structures over time.

6.6 Hybrid Authority Under Conditions of Expansion

Chapters 5 and 6 have tested a single question from multiple angles: which governance architecture most reliably secures recognized authority in a legally non-sovereign domain? The answer that emerges is not rhetorical and not accidental. When evaluated against the two dimensions defined in Section 6.1, legitimacy and conflict reduction capacity, hybrid governance is the only model that sustains high performance across both variables simultaneously under conditions of expansion, rivalry, and technological acceleration.

The comparative cases in Chapter 5 demonstrate that each governance architecture secures authority through a distinct but incomplete mechanism. Centralized Sovereign Governance produces clarity and strategic coherence, yet its recognition remains largely confined within national hierarchy. Legal Normative Governance generates broad legitimacy, but without embedded coordination it struggles to channel conflict under pressure. Networked Governance enables adaptability and voluntary alignment, yet it risks fragmentation into parallel blocs. Integrated Multilateral Governance embeds stability through interdependence, though its institutional depth makes rapid scaling difficult. Only a hybrid architecture integrates these dimensions into a system capable of enduring strain.

None of these models collapses outright. Even centralized architectures such as China's space program have produced stable internal coordination, and even normative regimes such as

the Outer Space Treaty continue to command rhetorical adherence decades after adoption.[221] The limitation is not immediate failure, but cumulative strain when expansion outpaces institutional adaptation.[222] Each produces authority within its own institutional boundaries. The limitation exposed through cross case synthesis is not viability in isolation, but durability under stress. When coordination burdens multiply, when geopolitical trust narrows, and when commercial actors proliferate beyond original design assumptions, authority grounded in a single mechanism becomes brittle. Hierarchy narrows recognition. Law drifts toward interpretive ambiguity. Voluntary alignment fragments under rivalry. Deep integration strains when expansion outpaces institutional depth.

The rapid proliferation of mega constellations such as Starlink illustrates this structural stress. Tens of thousands of satellites now occupy low Earth orbit under private control, increasing congestion and collision risk beyond the assumptions embedded in early treaty frameworks. No single treaty provision anticipated such density. Yet coordination persists through layered mechanisms: International Telecommunication Union spectrum allocation, national licensing regimes, liability exposure, and shared tracking data. Authority is diffused across legal, regulatory, and operational layers. Stability emerges not from one mechanism, but from their interaction.[223]

Chapter 6 reframed the problem from model selection to architectural design. Authority in outer space is not a formal legal status but a behavioral condition. It exists when actors continue to reproduce institutional arrangements even when compliance constrains autonomy or forecloses short term strategic advantage. Under this definition, durability depends on whether

[221] Burke-White and Williams, "Existing Framework for Space Governance."
[222] Stroikos, "International Relations and Outer Space;" Chayes and Chayes, "On Compliance," 175-205.
[223] Zancan et al., "Evolving Governance in the Space Sector," 515-523.

governance can sustain recognition during moments of strain. Authority fails not when disagreement appears, but when actors abandon shared procedure in favor of unilateral action.

Hybrid governance performs differently because it integrates rather than isolates authority producing mechanisms. It preserves the normative commitments that anchor legitimacy across diverse actors. It embeds those commitments in procedural coordination that structures behavior before a crisis emerges. It maintains strategic coherence without collapsing into unilateral dominance. It allows adaptive participation without permitting fragmentation into parallel and mutually exclusive orders. It incorporates selective interdependence in critical infrastructure, aligning incentives with stability without requiring total institutional merger.

The interviews in Section 6.5 sharpen this conclusion. Civil advocacy confirms that the treaty regime continues to command behavioral recognition, yet faces mounting strain from commercial density and geopolitical segmentation. National security experience underscores that authority must withstand adversarial reasoning and reduce escalation risk, not merely articulate principle. Institutional stewardship demonstrates that legitimacy consolidates through negotiation, reputation, and incremental reform within decision making arenas. Across these vantage points, authority is consistently described as layered rather than singular. It is reinforced through transparency, coordination, shared infrastructure, dispute mechanisms, and dense relational networks.

This layered pattern confirms the core analytical claim of the chapter. Authority in outer space is not secured by law alone, nor by hierarchy alone, nor by voluntary goodwill alone. It is stabilized when normative legitimacy, procedural coordination, adaptive flexibility, and embedded interdependence reinforce one another. Hybrid governance is not a normative compromise between competing systems. It is the only architecture capable of satisfying both

dimensions of recognized authority under expansion conditions. It maximizes legitimacy while maintaining behavioral constraint. It strengthens conflict reduction capacity by institutionalizing procedure before escalation. It reduces fragmentation risk by linking flexibility to shared guardrails. It converts cooperation from a temporary convergence of interests into a structural condition of continuity.

This does not eliminate rivalry. It channels it. Competition over influence, resources, and infrastructure will persist as activity expands beyond low Earth orbit. The debate over lunar resource utilization illustrates this trajectory. National legislation recognizing commercial rights to extracted resources has prompted interpretive debate over Article II's prohibition on appropriation.[224] The Artemis Accords attempt to clarify operational safety zones without asserting sovereignty, reflecting a hybrid effort to reconcile legal principle with emerging practice. Authority here is not settled territorially, but negotiated procedurally.[225] The measure of authority will not be the absence of contestation, but whether contestation is routed through recognized procedures rather than hardened into parallel governance systems. Where authority rests on a single organizing principle, stress exposes fragility. Where authority is architected across institutional layers, resilience increases.

Chapters 5 and 6 therefore complete the analytical test established in the research design. When judged against legitimacy and conflict reduction capacity, hybrid governance demonstrates superior durability under technological change, commercial expansion, and geopolitical rivalry. Authority beyond sovereignty is possible, but only when engineered deliberately through layered institutional design. In a domain where territorial enforcement is prohibited and monopoly of force is absent, durable authority is not what treaties declare. It is what actors continue to

[224] Hasin, "Developing a Global Order for Space Resources," 75-83.
[225] Deplano, "The Artemis Accords," 805-812; Outer Space Treaty, art. II.

reproduce under stress. Hybrid governance provides the architecture through which that reproduction can endure as outer space enters its next phase of expansion.

Conclusion: Authority and the Fate of the Space Order

The question that animates this thesis is straightforward but structurally profound: how can authority be constructed and recognized in outer space in the absence of sovereignty? As lunar return accelerates, commercial actors expand, and geopolitical competition intensifies, the problem of governance beyond Earth is no longer speculative. It is operational. The foundational treaties of the first Space Age prohibit appropriation while preserving freedom of use. Yet expansion requires coordination, dispute resolution, security assurances, and legitimacy.[226] The tension between non-appropriation and practical authority forms the central dilemma of contemporary space governance.

This thesis advanced a theoretical argument that hybrid governance is not a compromise model but an architectural necessity. Authority in a non-sovereign domain cannot rely on territorial ownership. It must instead be recognized, practiced, and reinforced through layered mechanisms that combine legal norms, institutional procedures, strategic credibility, and networked cooperation. To test this claim, the study examined four governance architectures: *Centralized Sovereign Governance* through China's Tiangong and International Lunar Research Station initiatives; *Legal Normative Governance* through the Outer Space Treaty system; *Networked Governance* through the Artemis Accords; and *Integrated Multilateral Governance* through the International Space Station.

The comparative analysis demonstrates that no single architecture independently produces durable authority under conditions of expansion. Centralized Sovereign Governance maximizes command and strategic coherence but struggles to generate broad legitimacy across competing blocs. Legal Normative Governance provides a universal baseline and normative

[226] Outer Space Treaty, art. I, II.

stability, yet lacks enforcement capacity and operational specificity. Networked Governance builds coalition based legitimacy and adaptability, but depends heavily on the power and credibility of leading states. Integrated Multilateral Governance, as exemplified by the ISS, creates durable operational authority through shared jurisdictional mechanisms, but relies on political alignment that can be disrupted by geopolitical rupture.

Taken together, these findings answer the central research question. Authority in outer space emerges not from sovereignty, nor from law alone, nor from power alone, but from the interaction of these elements. Hybrid governance functions as an architecture of survival because it integrates legal commitments, strategic deterrence, institutional continuity, and cooperative practice. It reduces the probability of conflict not by eliminating competition, but by channeling it into structured forms. Under conditions of expansion, where actors multiply and activities intensify, this layered structure becomes even more necessary.

The cross case synthesis reveals that fragmentation in space governance is not necessarily institutional failure. Rather, it reflects a transitional phase in which multiple architectural models compete, overlap, and adapt. The Artemis Accords and the ILRS framework illustrate diverging strategies, yet both rely on underlying treaty commitments and shared technical practices.[227] The ISS demonstrates that even adversarial states can sustain operational cooperation when jurisdictional clarity and procedural predictability are maintained. The Outer Space Treaty system remains the normative floor upon which all subsequent structures rest. Across these cases, recognized authority depends on credible power, procedural transparency, and sustained participation. The implications of these findings are immediate and concrete. First, security stakes are rising. Dual use capabilities, anti satellite testing, cislunar positioning, and lunar infrastructure development increase the risks of miscalculation. Without hybrid authority

[227] Burke-White and Williams, “Existing Framework for Space Governance.”

structures that provide notification, coordination, and dispute management, competition may harden into confrontation. Second, economic expansion depends on predictability. Commercial actors require clarity regarding operational boundaries, resource utilization, and liability exposure. Legal ambiguity without institutional reinforcement discourages investment and multiplies conflict risk. Third, legitimacy is fragile. Governance arrangements perceived as exclusionary or hegemonic risk politicization and resistance. Authority in outer space must be recognized across diverse actors, or it will not be stable.

For policymakers, the conclusions of this thesis generate several concrete recommendations. First, coordination mechanisms between major governance frameworks should be institutionalized rather than left to informal dialogue. Transparency practices such as safety zone notifications and operational deconfliction should be standardized through multilateral registries, building upon existing treaty obligations and registration conventions. Second, preservation protocols for heritage and operational sites should be formalized in advance of expanded lunar activity. Technical guidance such as NASA's 2011 recommendations on protecting lunar artifacts demonstrates how operational norms can prevent irreversible damage while respecting non-appropriation principles.[228] Third, dispute resolution mechanisms modeled on ISS cross waiver and jurisdictional frameworks should be adapted for future lunar infrastructure to ensure continuity under political strain.[229] Fourth, soft law instruments should be intentionally designed with pathways toward gradual institutionalization, allowing practice to harden into expectation and expectation into obligation.

This thesis also contributes to the academic literature. Existing scholarship often isolates law, power, or institutional fragmentation as separate analytical domains. By focusing on

[228] NASA, *Artemis*.
[229] ISS Intergovernmental Agreement, 1998.

recognized authority in a non-sovereign environment, this study integrates these strands into a single architectural framework. It demonstrates that governance beyond sovereignty must be evaluated through structural interaction rather than categorical preference. Hybrid governance is not simply a blend of models. It is a structural condition required to sustain order where territorial ownership is prohibited but operational coordination is essential. In advancing this framework, the thesis fills a gap between international relations theory on authority and the specialized literature on space law and policy.

The research is not without limitations. The contemporary space environment is fluid, and governance arrangements continue to evolve. Interview data, while valuable, represent a limited sample within a rapidly shifting policy community. Empirical evidence regarding long term lunar settlements remains necessarily speculative. The analysis relies in part on analogical reasoning drawn from terrestrial governance domains and institutional precedents. These constraints do not undermine the findings, but they do suggest caution in extrapolation. Authority in outer space will ultimately be shaped by events as much as design.

Future research should therefore expand empirical study of emerging lunar coordination practices, particularly as commercial and governmental activities intensify. Comparative analysis of national resource licensing regimes could illuminate pathways toward harmonization or conflict. Quantitative modeling of operational interference scenarios would clarify the security implications of proximity activities. Greater examination of private corporate authority in space settlements will be necessary as commercial actors assume infrastructural roles traditionally held by states. Finally, the relationship between military space doctrines and civil governance mechanisms warrants sustained analysis, especially under crisis conditions.

Space governance is not static. The second Space Age is unfolding in real time. Artemis partnerships continue to expand. Competing lunar initiatives are developing in parallel. Commercial landers have already returned to the lunar surface. Debates over resource extraction, militarization, and orbital congestion are intensifying. The institutional choices made in this period will shape whether outer space evolves toward cooperative pluralism or hardened fragmentation. Authority beyond Earth will not arise through sovereignty. It will arise through recognition, practice, and institutional layering. The fate of the space order depends not on who claims territory, but on whether actors can construct durable architectures that reconcile freedom with coordination, competition with restraint, and expansion with legitimacy. Hybrid governance is not merely a theoretical construct. It is the structural condition for survival in a domain where sovereignty is absent but consequences are not.

The politics of the stars has begun. Governance beyond Earth will not be determined by flags planted in regolith, but by the institutional choices made before expansion becomes irreversible. This thesis has shown that authority in a non-sovereign domain is neither accidental nor automatic. It must be constructed through layered legitimacy, credible power, and sustained coordination across competing actors. The tools for stability already exist within our legal commitments, operational precedents, and cooperative frameworks. What remains uncertain is whether they will be integrated deliberately, or only after fragmentation and crisis make their necessity undeniable. If humanity is to extend its reach without importing its deepest rivalries into the heavens, then the architecture of authority must rise as intentionally as the rockets that carry us there.

Bibliography

Scholarship

Abbott, Kenneth W., and Duncan Snidal. “Hard and Soft Law in International Governance.” *International Organization* 54, no. 3 (2000): 421–56.

Allison, Graham T. “Destined for War?” *The National Interest*, no. 149 (2017): 9–21.

Barnett, Michael, and Raymond Duvall. “Power in International Politics.” *International Organization* 59, no. 1 (2005): 39–75.

Bernat, Paweł. 2019. “The Inevitability of Militarization of Outer Space”. *Safety & Defense* 5 (1), 49-54.

Burke-White, William, and Benjamin Gwyn Williams. “Diverging Strategies for Space Governance.” *Geopolitical Ambitions and Rule Contestations in Space Governance*. Centre for International Governance Innovation, 2025.

Burke-White, William, and Benjamin Gwyn Williams. “The Existing Framework for Space Governance.” *Geopolitical Ambitions and Rule Contestations in Space Governance*. Centre for International Governance Innovation, 2025.

Buzan, Barry. "America in space: The international relations of Star Trek and Battlestar Galactica." *Millennium* 39, no. 1 (2010): 175-180.

Chaben, Jack B. “Extending Humanity’s Reach: A Public-Private Framework for Space Exploration.” *Journal of Strategic Security* 13, no. 3 (2020): 75–98.

Chayes, Abram, and Antonia Handler Chayes. “On Compliance.” *International Organization* 47, no. 2 (1993): 175–205.

Deplano, Rossana. "The Artemis Accords: Evolution or revolution in international space law?." *International & Comparative Law Quarterly* 70, no. 3 (2021): 799-819.

Harrison, Todd, and Nahmyo Thomas. “NASA in the Second Space Age: Exploration, Partnering, and Security.” *Strategic Studies Quarterly* 10, no. 4 (2016): 2–13.

Hasin, Gershon. "Developing a global order for space resources: A regime evolution approach." *Geo. J. Int'l L.* 52 (2020): 77.

Lake, David A. “Rightful Rules: Authority, Order, and the Foundations of Global Governance.” *International Studies Quarterly* 54, no. 3 (2010): 587–613.

Steer, Cassandra. “Building the Space Citizen Model.” *Space Citizen: The Gap Between You, Me and the Governance of Space*. Centre for International Governance Innovation, 2025.

Stroikos, Dimitrios. "International Relations and Outer Space." *Oxford Research Encyclopedia of International Studies.* 19 Oct. 2022; Accessed 15 Sep. 2025.

Tepper, Eytan. "The big bang of space governance: Towards polycentric governance of space activities." *NYUJ Int'l L. & Pol.* 54 (2021): 485.

Weinzierl, Matthew. “Space, the Final Economic Frontier.” *The Journal of Economic Perspectives* 32, no. 2 (2018): 173–92.

Zahoor, Saadia. “Maintaining International Peace and Security by Regulating Military Use of Outer Space.” *Policy Perspectives* 14, no. 2 (2017): 113–35.

Zancan, Valentina, Alessandro Paravano, Giorgio Locatelli, and Paolo Trucco. "Evolving governance in the space sector: From legacy space to new space models." *Acta Astronautica* 225 (2024): 515-523.

Zubrin, Robert. “The Mars Decision.” *The New Atlantis*, no. 60 (2019): 46–60.

Zürn, Michael, Martin Binder, and Matthias Ecker-Ehrhardt. “International Authority and Its Politicization.” *International Theory* 4, no. 1 (2012): 69–106.

Treaties and Legal Documents

Agreement Governing the Activities of States on the Moon and Other Celestial Bodies. 1363 U.N.T.S. 3. 1979.

Antarctic Treaty. 402 U.N.T.S. 71. 1959.

International Space Station Intergovernmental Agreement. 1998.

Outer Space Treaty. *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space.* 610 U.N.T.S. 205. 1967.

U.S. Commercial Space Launch Competitiveness Act. Public Law 114–90. 2015.

Vienna Convention on the Law of Treaties. 1155 U.N.T.S. 331. 1969.

Government and Institutional Sources

NASA. *Artemis Program Overview.*

NASA. *NASA's Recommendations to Space-Faring Entities: How to Protect and Preserve the Historic and Scientific Value of U.S. Government Lunar Artifacts.* Washington, DC, 2011.

Appendix

Appendix A: Interview Protocol

To supplement the comparative institutional analysis presented in this thesis, semi-structured interviews were conducted with professionals working in space policy, governance, and international cooperation. Interviews were designed to gather expert perspectives on how authority, coordination, and conflict management function in practice within contemporary space governance frameworks.

The interview protocol focused on five core themes: institutional authority, operational governance practices, gaps between formal legal frameworks and operational reality, the role of international and commercial actors, and anticipated governance challenges associated with sustained human presence in space. Questions were open ended to allow interviewees to elaborate on their professional experiences and institutional perspectives.

Interviews were conducted either via video conference and typically lasted between thirty and sixty minutes. Not all questions were asked in every interview. Follow up questions were occasionally used to clarify or expand on responses.

Interview Questions

1. Can you describe your role and how long you have worked in the space sector?
2. In your experience, how clearly defined is authority within the programs or partnerships you work in?
3. How do governance rules or agreements shape day to day decision making in practice?
4. Where do you see gaps between formal space law or policy and operational reality?
5. How do international partnerships affect coordination and accountability?

6. Have commercial actors changed how authority or responsibility is understood in space activities?
7. What challenges arise when multiple states or institutions share responsibility for missions or infrastructure?
8. How are disputes or disagreements typically resolved in your experience?
9. Do you think existing governance frameworks are adequate for sustained lunar or Martian presence?
10. What kinds of governance reforms or innovations do you think will become necessary in the next decade?
11. Do you see current governance frameworks as resilient under conditions of intensifying geopolitical competition?
12. In cases of disagreement or conflict, how are disputes typically addressed or avoided in space related contexts?
13. How should governance adapt as human activity shifts from exploration toward sustained presence and settlement?
14. What governance challenges do you anticipate becoming most urgent in the next decade?
15. Are there particular institutional designs or hybrid models you believe are better suited to long term stability in space?

Appendix B: Interview Participants

Three expert interviews were conducted to supplement the institutional analysis presented in this thesis. Participants were selected based on professional experience in space policy, governance, and strategic planning. Interviews provided practitioner perspectives on how authority,

coordination, and conflict management operate within contemporary space governance frameworks.

Jack Kiraly: Director of Government Relations at The Planetary Society. Kiraly works in Washington, DC engaging Congress, federal agencies, and industry stakeholders on civil space policy and advocacy.

Dr. Neil Orion (pseudonym): Former national security official who previously served within the Pentagon during the Carter and Reagan administrations, including during debates associated with the Strategic Defense Initiative. Participated under condition of anonymity.

Mary Guenther: Head of the Space Policy Program at the Progressive Policy Institute. Previously served as head lobbyist for the Commercial Space Federation and as lead space policy advisor for Democratic staff on the Senate Commerce Committee.

Appendix C: Table 1. Comparative Architectures of Authority Beyond Sovereignty

This table summarizes the four governance architectures analyzed in Chapters 5 and 6 and highlights their representative cases, analytical focus, and sources of validity.

Governance Type	Representative Case	Analytical Focus	Validity Type
Centralized Sovereign Governance	China's Tiangong & International Research Lunar Station	National autonomy and capability-based legitimacy	Internal
Legal Normative Governance	Outer Space Treaty	Legal norms and collective restraint	External
Networked Governance	Artemis Accords	Soft law, norm diffusion, and coalition legitimacy	External
Integrated Multilateral Governance	International Space Station	Joint authority and institutional interdependence	Internal/External