Legislation Outpaced by Innovation: An Analysis of the United States' Commercial Space Sector

Paulina Huang

Abstract

The private space sector has emerged in the United States in recent years, with companies like SpaceX, Blue Origin, and Virgin Galactic making orbit and contributing to space innovation. The expansion of such an industry in a field that people have traditionally viewed as government domain raises questions about how these privately owned and operated companies interact with United States and International space law.

This paper will explore how these companies must adhere to, or are able to avoid, the laws that govern both national and international space activity. By examining existing United Nations (UN) space treaties and the United States' own legal framework for space ventures, this paper identifies to what extent private space companies must follow these guidelines. This paper will also examine diplomatic limits of these actors and whether or not they are required to act in alignment with their "home country." In other words, are these private corporations merely privately funded extensions of the United States' federal space sector? If not, to what extent are they independent of government interests?

In answering these questions, this paper takes into account current developments in the commercial space sector, such as new technology and current space events, that may be a source of international tension. Unveiling federal deregulation as a primary cause of the private space sector's rapid growth reveals how excessive power and freedom without proper regulation in such a vast field of study, both literally and figuratively, can potentially pave the way for international disaster.

Background: Introduction to Space Law in America

To understand the niche that the private space sector fills in the larger United States space industry, we must first understand its legal limits in space exploration. On an international and national scale, there guidelines for space exploration. For example, the UN's five space treaties and agreements are the only internationally binding space treaties today, making them essential when evaluating the consequences of commercial space on a larger, international scale. Space policy in America can be divided into several subsections, three of which are examined herein: (1) internationally binding agreements, the UN treaties; (2) international signatory (non-binding) agreements; and (3) laws specific to the commercial space sector. Looking at each of these subgroups closely and finding the boundaries they set will define the true limits of the commercial space sector in its relationship to the United States government and determine the role and future of private space enterprise. By dissecting current space policy and past precedent, we can determine how different commercial satellites are from the space crafts launched and utilized by the United States government. More urgently, if these companies can

legally behave in ways counterproductive to the United States while carrying the country's reputation, what are the consequences for the larger international community in space?

International Binding Agreements

The UN's five space treaties and agreements are the only legally enforceable international space agreements. In defining the rules and limits of space exploration, these treaties establish how countries must act and interact in shared air space. The five treaties forbid territorial claims on the moon or other celestial bodies, outlaw the stationing of weapons of mass destruction in space, establish a liability framework for potential destruction of property, require the registration of space crafts, ban "any hostile acts" in space, and more (Goguichvili, Linenberger, Gillette, & Novak, 2021). This language is ambiguous, and poses a challenge when interpreting the text for the private space sector. The latest and fifth UN space treaty, the "Moon Agreement," was implemented in 1984 when commercial space entities were rare to nonexistent in most countries (Goguichvili et al., 2021). This means language referring to "space entities" almost always reflects governments as the primary, if not only, means of space launch and thus the only entities governed by such rules. And, while a case can be made that private entities simply did not exist at the time, the 1972 "Liability Convention" does specify that the State is responsible in the event that either a "commercial actor or a State space agency" caused the damage of another State's property (Goguichvili et al., 2021). This begs the question: does the decision to specifically include the words, "commercial actor" in the Liability Convention indicate a clear connection between commercial and State actors, leaving the State responsible for the actions of the private sector? Or, does it establish a key difference between these two entities, thus demanding private sector-specific legislation?

International Signatory Agreements

The Artemis Accords are the United States' primary funnel for international space cooperation. This United States-led initiative is a set of principles–such as promoting peace, implementing interoperability in space crafts, and eliminating space debris–that other countries can choose to sign to show support for such ideals (U.S. Department of State [DOS], 2023). What sets these accords apart from UN treaties is that they are non-binding (DOS, 2023). They are instead a list of goals to work towards, where the countries that choose to sign on are expressing their alignment to these goals rather than committing themselves to a set of rules. Because of the noncommittal nature of the accords, they and other smaller international signatory agreements do not provide a legal framework for how space exploration and usage should be carried out commercially. While the principles of the Artemis Accords are meant to apply to the whole of space exploration, the inability to enforce these goals makes them unable to draw specific legal boundaries.

Laws Specific to The Commercial Space Sector in the United States

Laws specifically dealing with the commercial space sector are the easiest to parse. Much of the current space policy dates back to the Cold War era and was therefore written with merely the capacities and capabilities of the federal space sector in mind. Thus, with the emergence of the commercial space sector, newer legislation that deals with private space exploration is much less nuanced when defining boundaries. For instance, the Communications Satellite Act of 1962 actively encourages the development of an international "commercial communications satellite system" with the purpose of establishing a "global communications network" (Communications Satellite Act, 1962, sec. 102) .

These commercially-focused laws articulate government support or dissent in the development of these companies. For the purposes of outer space competition with other countries, these laws typically encourage commercial space developments. For example, The Commercial Space Launch Act of 1984, passed by the 98th congress, cites international competition as a national and economic interest and thereby encourages the private sector by requiring simplified and expedited launch licenses and increased access to government developed and approved space technology (Commercial Space Launch Act, 1984). However, this act is not without its ambiguity. The procedures set by the Commercial Space Launch Act are restricted by the seventh provision under the act's findings:

"The United States should encourage private sector launches and associated services and, only to the extent necessary, regulate such launches and services in order to ensure compliance with international obligations of the United States and to protect the public health and safety, safety of property, and national security interests and foreign policy interests of the United States" (Commercial Space Launch Act, 1984, sec. 2).

The "extent" defined is simple, in theory. Support will continue to be given to these private space companies as long as such encouragement does not spur action that may violate "national security interests and foreign policy interests of the United States" (Commercial Space Launch Act, 1984, sec. 2). These same limitations are also a primary and explicit goal of the U.S. Office of Commercial Space Transportation:

"Commercial Space Transportation was established to… Regulate the U.S. commercial space transportation industry, to ensure compliance with international obligations of the United States, and to protect the public health and safety, safety of prosperity, and national security and foreign policy interests of the United States" (Federal Aviation Administration).

From this, it seems that there are two motivations for limiting the capacity of the commercial space sector: (1) the safety of people and property and (2) noncompliance with national interests.

Health and property concerns are far from unique to the space industry, but the U.S. Commercial Space Launch Competitiveness Act of 2015 (U.S. SPACE Act) does define what ensuring safety means for these private entities. One example being that launch and reentry zones are to be monitored and services are to be facilitated in ways as to not cause bodily harm to anyone nearby (U.S. Commercial Space Launch Competitiveness Act, 2015, sec. 106 & 115).

The sector's alignment to national interests is where the boundaries start to get fuzzy. Previous national and international agreements that don't explicitly mention the commercial space sector can be used as loopholes. Even without negative intentions, events like space craft collisions could still raise negative international attention. Consequently, the competitive pressure that the United States puts on the private sector may inadvertently lead to internationally controversial boundaries being pushed that have not been remedied by policy or discussion yet.

Analysis

The problem with interpreting the motivations of the private space sector is that, because it is not a government entity, we cannot assume that its motivations are necessarily aligned with the government's. That is not to say that companies like SpaceX and Virgin Galactic are acting against government wishes, but rather that their goals have the potential to go far beyond what the United States government deems as realistic, necessary, or responsible. For instance, SpaceX launched its Starship Program in 2019, which aims to design a "a fully reusable transportation system designed to carry both crew and cargo to . . . the Moon . . . and beyond" (SpaceX). Meanwhile, BlueOrigin strives to enable all kinds of shipments and payloads to the moon in the hopes of "enabl[ing] a sustained human presence on the Moon" through their Blue Moon Lunar Transport project (Blue Origin). This innovation is where policy can start to become obsolete.

The federal government regulates governmental organizations, most notably NASA–the National Aeronautic and Space Administration (NASA, 2022), in order to ensure federal grants. A proposal system initiates almost all projects that are carried out by NASA. These proposals can be submitted to the administration outlining the how, what, where, when, and why of their project. These proposals are then either rejected, or accepted and given federal grants. Thus, these government agencies are able to be regulated by permitting or prohibiting the use of federal money. This process ensures controlled and regulated processes in the projects NASA takes on by thoroughly reviewing proposals with a strict set of parameters, including cost and efficacy, intention, viability, and safety (NASA, 2022, p. 18). Notably, NASA reviews all of its proposals under its Environmental Policy. This policy either prohibits or throughly regulates projects that would create ground disturbances (like excessive noise or construction) while also ensuring that the projects do not "contain hazardous… or radioactive materials" or involve equipment that cannot be recovered (NASA, 2022, p. 18). This system ensures government support for NASA's projects and the risks that it may encounter. These barriers, while time consuming, regulate NASA's actions before they take place and sometimes halt activity that the government believes to be inefficient, ineffectual, or downright hazardous.

These checkpoints and safety nets are few and far between in the commercial space world. As long as companies abide by the aforementioned space policy in place, they can act as private entities, and it does not help that these laws are often vague and are too broad to be applied to specific scenarios.

Commercial space innovation and its repercussions are more problematic when considering how the private sector's actions are reflective of the United States at large. Drew M. Fryhoff,

active lawyer and policy expert from Brooklyn Law School, dissects the 1967 United Nations Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, otherwise known as the Outer Space Treaty, which is the primary authority on space exploration. The jurisdiction that the federal government has over commercial space entities is made clear in Article IV, known as the Regulation Clause, which maintains that "States Parties to the Treaty shall bear international responsibility for national activities in outer space… whether such activities are carried on by governmental agencies or by non-governmental entities" (Fryhoff, 2020, p. 244-6). While this indicates that the commercial space sector is not free to run wild without government permission, this regulation is not up to date with private companies' ambitious goals for the future of outer space.

Furthermore, the treaty's Article VII, the Liability Clause, states that all objects and people launched into space are the responsibility of the country of the vehicle's registration (Fryhoff, 2020, p. 246-8). Notably, this responsibility also includes accounting for any collateral damage these vehicles may cause to other space vehicles or private property. This, along with the Convention on International Liability for Damage Caused by Space Objects, one of the five binding UN agreements, reinforces that the state of the vehicles origin and registration is "liable for any damages should there be an accident," intentional or not (Goguichvili et al., 2021).

And while the Outer Space Treaty provides the leading framework for the relationship between the government and commercial space sectors, it is still far from what Fryhoff claims to be the "leading body of law governing the commercial space sector in the United States today" (Fryhoff, 2020, p. 241). While the relationship between the U.S. government and commercial space sectors outlined in the treaty remains uncontested, policy may challenge the "dos" and "don'ts" of the treaty that pertain specifically to private companies. The main difference is that the Outer Space Treaty prioritizes safety and international peace by preventing situations that could lead to international tension.

Aforementioned laws such as the Commercial Space Launch Competitiveness Act actively encourage the growth and innovation in the private sector in order to maintain the United States' international competitive stance. But in doing so, they are encouraging innovation behind those companies personal goals, which is where comparisons between the Outer Space Treaty and these companies mission statements start to see some clash.

For example, Article II of the Outer Space Treaty states that:

"Outer space, including the Moon and other celestial bodies, is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means" (Treaty on Principles…, 1966).

However, SpaceX has made it apparent that its long-term goal is to establish sustainable human civilization on Mars, displayed in the description of its mission, "Mars & Beyond: The Road to Making Humanity Multiplanetary" (SpaceX). Though SpaceX's official website does not use the same rhetoric, many people, articles, and reports have inferred that the mission's end goal is to colonize Mars, with news articles titled similarly to CNN's, "Colonizing Mars could be

dangerous…" in 2020 (Wattles, 2020). According to Cornell University's Legal Information Institute, colonialism means to "act of power and domination of one nation, by acquiring or maintaining full or partial political control over another sovereign nation" (Cornell Law School). While Mars is closer to a neutral territory rather than a sovereign nation, subjugating Mars to "full or partial political control" is where SpaceX's Mars pursuit seems to violate the Outer Space Treaty. This is especially so when considering that the Treaty's aforementioned Regulation Clause makes any of SpaceX's expeditions, as long as the vehicles are registered under the United States, the international responsibility of the United States government. This means that the colonization of Mars by SpaceX, a private company registered under and operating in the United States, would effectively be colonizing Mars under United States power.

Federal Deregulation and the Russo-Ukrainian War

For as long as science and experimentation has existed, innovation has been in a philosophical struggle with ethics and reason. In simpler terms, the knowledge gained by trial and error, and even success, may not always outweigh the consequences of discovery. As Peter Singer discusses in his article, "Ethics and the Limits of Scientific Freedom," by using the Nuremberg Trials of Nazi doctors as an example, he ultimately questions "how strong of a principle" is the "freedom of scientific inquiry" (Singer, 1996, p. 218)?

This moral dilemma of science versus ethics, outlined by Singer, reflects the current predicament when observing the federal deregulation of the commercial space sector. Instead, the United States government's desire for commercial expansion and innovation is at odds with international relations.

Lenient policy and its broad encouragement of commercial space endeavors begs the question, why does the U.S. government see this sector's development as something that needs to be nurtured and protected? The answer to this can be found in the aforementioned Commercial Space Launch Act, as the act's fifth finding states:

"the development of commercial launch vehicles and associated services would enable the United States to retain its competitive position internationally, thereby contributing to the national interest and economic well-being of the United States." (Commercial Space Launch Act, 1984, sec. 2)

With the ongoing Russo-Ukrainian War, we can see how the free reign that United States commercial satellites have over the cosmos can have collateral effects and create international points of tension. For instance, as of late 2022, Ukraine has been relying on SpaceX's Starlink, a network of satellites that provide internet for the country, after Russia cut off the country's internet access (Kramer, 2022). In response, Konstantin Vorontsov, Senior Russian foreign ministry official, declared that commercial space vehicles could be considered legitimate targets in war, and that "quasi-civilian infrastructure may become a legitimate target for retaliation" (Davenport, 2023). Alarmingly, not only do the aforementioned Regulation and Liability Clauses in the Outer Space Treaty make the United States accountable for any possible SpaceX encounters with Russian military, but Karine Jean-Pierre, White House press secretary, asserted

that “any attack on a commercial U.S. satellite would provoke a response from the U.S.” (Kramer, 2022). With the United States encouraging its commercial space sector to grow and expand, the possibility of such a scenario only becomes more likely, especially as the Russo-Ukrainian war drags on.

The outcomes of such an exchange could potentially build to a United States versus Russia war. Considering the effort that has gone into preventing any large-scale conflicts between the two countries because of their nuclear arsenals, the current involvement that the commercial space sector has in the very delicate situation in Ukraine seems out-of-place at best, and instigating at worst. And these sorts of international conflicts are by no means limited to the Russo-Ukraine war. The means and encouragement for the commercial space sector in the United States to expand will, without specific regulation, lead to more public-private relationships like the collaboration between SpaceX and Ukraine. Thus, leading to more room for collateral damage resulting from the inevitable tests and failures of innovation.

Conclusion

The space frontier has been expanding since early exploration during the space race in the mid 20th century, and since then, countries have been working to develop new ways to utilize the literally endless reaches of the cosmos. More recently, particularly in the United States, space exploration has been taken on by private entities. And, while government organizations like NASA and the National Reconnaissance Office (responsible for launching and operating space vehicles used for gathering intelligence) are still the primary means of executing government missions, like gathering intelligence via satellites and suborbital aircrafts, the private space sector has been innovating with more abstract goals in mind. This includes SpaceX’s plans to inhabit Mars, and Blue Origin’s public space flight experiences.

The relatively recent emergence of the private space industry has led to a lack of specific regulation regarding the dos and don’ts of company actions in space. Furthermore, general space policy like UN treaties lack specific language that target commercial spacecrafts. And, while those boundaries have not been crossed yet, these companies' unique interests and goals are slowly inching beyond the limits of what has been deemed internationally acceptable in space, such as SpaceX’s mission to “colonize” Mars in violation of the UN Outer Space Treaty.

With this sector ever expanding, and space being a never-ending playing field that reaches all corners of the Earth, the effects of the United States’ powerful space sector partnered with these companies’ lack of legal limitations are starting to become more apparent. This is particularly true as the United States government has turned to deregulating the sector in favor of maintaining their competitive international positioning. For instance, Ukraine’s partnership with SpaceX’s Starlink amidst the Russo-Ukrainian war is raising red flags with Russian government officials that the United States government, in adherence to the aforementioned Outer Space Treaty, will have to be held accountable for, even though SpaceX is not a government agency.

Neither space exploration nor the private space sector is slowing down anytime soon, and with more and more launches taking place all over the world, from both government and private

entities, the number of interactions in space will only increase. Since the United States must take accountability for the launches happening within their borders, government-led or otherwise, we must consider carefully how these interactions should take place. More earnestly regulating the activities of the private sector in space, as well as their interactions with foreign nations, such as Ukraine and Russia, can help prevent another pathway to accidental international conflict.

Ultimately, while the United States government is clearly tied, by way of the aforementioned Registration and Liability clauses, for any and all of the private sector actions, their control over that sector is weak. Furthermore, a desire for international status has incentivized rapid, largely unregulated, innovation by way of expedited launch licenses and access to government-developed and approved space technology (Commercial Space Launch Act, 1984, sec. 3).

Considering the current state of space policy and the ever-expanding interests of the commercial space sector, a first step to remedying this lack of regulation could be to implement a green light system, similar to the process undergone by NASA proposals previously outlined. Record of the methods and intentions of commercial space proposals could barricade missions deemed harmful or instigating by the United States government before they reach fruition, or at least assure government support behind any actions taken by these companies. For instance, interactions between SpaceX and Ukraine could have been prevented if the government deemed the relationship overall unfavorable to national interests, or their interactions could have taken place with the knowledge that the government supported and was willing to take responsibility for the affair.

Furthermore, implementing policy specific to the commercial space sector as developments in the field arise would ensure that there are still some legal boundaries on these companies. Current legislation regarding these private companies are, as mentioned above, generally encouraging of innovation, allowing the rapid expansion of the sector without drawing any lines. SpaceX and BlueOrigin’s missions to increase human presence in outer space could be clarified with statements allowing for the existence of humans in outer space while forbidding any political claims by these companies on the moon or of Mars in accordance with the Outer Space Treaty.

References

[1] Blue Origin. (n.d.). *Blue Moon*. Blue Origin. Retrieved July 3, 2023, from https://www.blueorigin.com/blue-moon
[2] Commercial Space Launch Act, 49 U.S.C. § 2601 et seq. (1984). https://www.congress.gov/bill/98th-congress/house-bill/3942/text
[3] Communications Satellite Act, 47 U.S.C. § 609 et seq. (1964). https://www.govinfo.gov/content/pkg/STATUTE-76/pdf/STATUTE-76-Pg419.pdf#page=1
[4] Cornell Law School. (n.d.). *colonialism*. Legal Information Institute. Retrieved July 7, 2023, from https://www.law.cornell.edu/wex/colonialism
[5] Davenport, C. (2023, March 8). *Satellite technology raises new issues for American military*. The Washington Post. Retrieved July 9, 2023, from https://www.washingtonpost.com/technology/2023/03/08/ukraine-russia-satellite-space-force-policy/
[6] Federal Aviation Administration. (n.d.). *Home About FAA Offices About the Office of Commercial Space Transportation*. Federal Aviation Administration. Retrieved June 23, 2023, from https://www.faa.gov/about/office_org/headquarters_offices/ast
[7] Fryhoff, D. M. (2020). The Revolution of the Commercial Space Industry: Why Current Laws Must be Replaced Before American Business Expands to the Moon and Beyond. *Brooklyn Journal of Corporate, Financial, & Commercial Law*, *15*(1), 237-61. Retrieved June 23, 2023, from https://brooklynworks.brooklaw.edu/cgi/viewcontent.cgi?article=1347&context=bjcfcl
[8] Goguichvili, S., Linenberger, A., & Gillette, A. (2021, October 1). *The Global Legal Landscape of Space: Who Writes the Rules on the Final Frontier?* Wilson Center. Retrieved June 21, 2023, from https://www.wilsoncenter.org/article/global-legal-landscape-space-who-writes-rules-final-frontier
[9] Kramer, M. (2022, November 1). *Satellites like Elon Musl's Starlink are the next front in space war*. Axios. Retrieved July 9, 2023, from https://www.axios.com/2022/11/01/starlink-ukraine-elon-musk-war-space
[10] NASA. (2020). Guidebook for Proposers Responding to a NASA Notice of Funding Opportunity (NOFO). *National Aeronautic and Space Administration*, 1-54. Retrieved June 28, 2023, from https://www.hq.nasa.gov/office/procurement/nraguidebook/proposer2020.pdf
[11] Singer, P. (1996). Ethics and the Limits of Scientific Freedom. *The Monist*, *79*(2), 218-29. JSTOR. Retrieved July 7, 2023, from http://www.jstor.org/stable/27903475
[12] SpaceX. (n.d.). *Starship*. SpaceX. Retrieved July 5, 2023, from https://www.spacex.com/vehicles/starship/
[13] Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, December 19, 1966. https://www.faa.gov/about/office_org/headquarters_offices/ast/media/treaty_Princi_Gov_Acti_States_OST.pdf
[14] U.S. Commercial Space Launch Competitiveness Act, 51 U.S.C. § 10101 et seq. (2015). https://www.congress.gov/114/plaws/publ90/PLAW-114publ90.pdf

[15] U.S. Department of State [DOS]. (2023). *Artemis Accords*. U.S. Department of State. Retrieved June 25, 2023, from https://www.state.gov/artemis-accords/
[16] Wattles, J. (2020, September 8). *Elon Musk wants to colonize Mars. Is that profitable?* CNN. Retrieved July 7, 2023, from https://www.cnn.com/2020/09/08/tech/spacex-mars-profit-scn/index.html