

HIGH GROUND OR HIGH FANTASY: DEFENSE UTILITY OF CISLUNAR SPACE

Namrata Goswami and Bleddyn Bowen

with Introduction and Conclusion by Robert S. Wilson of The Aerospace Corporation

Debates on national security space topics often do not penetrate the public conversation. Too often, these debates are limited to specialists within the space community. This paper is part of a new series the Center for Space Policy and Strategy is publishing called “The Debate Series.” Each of these papers includes two essays written by analysts and pundits external to The Aerospace Corporation that hold different positions from one another. After having written their essay, the external authors had the opportunity to review the opposing essay and offer a rebuttal. Although these essays do not necessarily reflect views of the Center for Space Policy and Strategy, the center is publishing these essays to clarify debates on national security space issues and to try to make them accessible to a broader audience.

Introduction

Robert S. Wilson

Five decades since the last astronaut landed on the lunar surface, the Moon has reemerged as a central topic in U.S. space policy. In 2020, the U.S. State Department and NASA launched the Artemis Accords, a set of principles designed to guide civil space exploration and use of the Moon, cislunar space—the region beyond Earth’s geosynchronous orbit but within the gravitational influence

of the Earth or the Moon—and other celestial bodies.¹ As of March 2024, 36 countries have signed the agreement.* The White House released its U.S. Space Priorities Framework in 2021, which cited the need to “advance a robust lunar ecosystem,” and a national cislunar science and technology strategy in 2022.²

*As of March 2024, the list of Artemis Accords partners includes Angola, Argentina, Australia, Bahrain, Belgium, Brazil, Bulgaria, Canada, Colombia, Czech Republic, Ecuador, France, Germany, Greece, Iceland, India, Israel, Italy Japan, Luxembourg, Mexico, Netherlands, New Zealand, Nigeria, Poland, Republic of Korea, Romania, Rwanda, Saudi Arabia, Singapore, Spain, Ukraine, United Arab Emirates, United Kingdom, United States, and Uruguay.

The United States and its Artemis partners are not the only countries interested in exploring and developing the Moon. Notably, China successfully launched the first spacecraft ever to touch down on the far side of the Moon in 2019, a complex robotic mission that required the use of a communications relay satellite in lunar orbit.³ Beijing has also recruited several countries to join its Moon base initiative, with aims to establish a permanent lunar base with Russia in the 2030s.⁴ Azerbaijan, Belarus, Egypt, Pakistan, South Africa, and Venezuela are the other reported national or space agency-level signatories.⁵

This heightened interest in the Moon has triggered debates within the Pentagon about the military utility of the celestial body and the area around it, including how much the nascent U.S. Space Force (USSF) should prioritize cislunar space. Scholar James Holmes has characterized a divide between officers who “appear intent on reorienting toward cislunar space” and more traditional officers and officials who want to focus on Earthbound operations.⁶ In 2023, Frank Calvelli, the Assistant Secretary of the Air Force for Space Acquisition and Integration, said that cislunar space will be “an important topic down the road,” but what is important now is the department’s “core mission areas,” such as spacecraft within Earth’s orbit dedicated to communications, navigation and timing, and missile warning and tracking.⁷ In contrast, some Space Force officers have argued that U.S. space forces “must prepare and posture now to defend U.S. economic interests” by “developing early space security concepts and making investments for space security.”⁸ Another Space Force officer has called on the United States to not “cede access to this emerging economic zone of activity” and for the Space Force to deploy satellite communications; positioning, navigation, and timing; space domain awareness; and intelligence, surveillance, and reconnaissance systems for cislunar space.⁹ Cislunar space may not be a current Pentagon priority, but these priorities could shift, and some within DOD may want them to shift quickly.

The following two essays offer contrasting views on the military importance of the Moon and cislunar space. Dr. Namrata Goswami, a space adviser and professor at

Arizona State University and Joint Special Forces University, argues the U.S. Space Force should incorporate the Moon into its doctrinal and operational thinking and to develop cislunar defense capabilities. Goswami highlights China’s interest and activity on and around the Moon and discusses potential breakthroughs, such as the mining of rare minerals, that could come from advanced investments and motivate a military focus on protecting economic activity in cislunar space. Further, Goswami envisions a robust cislunar economy and a need for Space Force to safeguard and protect that potential economic activity.

On the other side of the debate, Dr. Bleddyn Bowen, an associate professor at Leicester University, is less optimistic about the economic potential for cislunar space. Given some of the logistical complications of operations beyond Earth’s orbit, Bowen sees little economic or military advantage from cislunar space projects, noting that lunar operations will not help the service in its core defense space missions of supporting conventional and nuclear operations. Bowen recommends that the Space Force avoid letting the Moon and cislunar space distract the service from threats and risks posed by other states to spacecraft in Earth’s orbit.

Both Bowen and Goswami are leading thinkers on defense space issues. Goswami, in addition to advising several governments on space policy topics, coauthored *Scramble for the Skies: The Great Power Competition to Control the Resources of Outer Space*, a book published in 2020 that explores the economic possibilities and ambitions of current spacefaring nations. Bowen has written two books on space power, *War in Space* (2020) and *Original Sin* (2023). *War in Space* offers a vision of space warfare based in the academic discipline of Strategic Studies; *Original Sin* analyzes 70 years of the militarized space age. Their arguments are presented here in no particular or preferential order, followed by the rebuttals. Although the Center for Space Policy and Strategy has released several papers about cislunar space, this is the first publication that focuses on the potential military dimensions of this issue.¹⁰

◀◀ Argument that Cislunar Space Is Militarily Important

Namrata Goswami

Today, nations like the United States, China, India, Japan, and Russia understand the importance of cislunar space. The Moon and its resources offer a pit stop as they further their deep space missions and end-to-end space capacity.¹¹ China has developed one of the clearest rationales for their cislunar strategy that includes a new launch system (Long March 10), missions to understand the Moon’s elemental composition, and developing a communication system from the Moon back to Earth through a composition of relay satellites like the one they have in Earth-Moon Lagrange point (L2) called Queqiao or Magpie Bridge.^{†, 12} The Moon, as senior Chinese military officers state, is China’s focus for the next 20 years for building strategic advantages and utilizing resources. It remains a critical component of their operational ethos and doctrinal thinking.

It is pertinent that the USSF, established in December 2019, makes cislunar space part of their doctrinal and operational thinking to ensure U.S. leadership in space and to guard the space domain for security, prosperity, and democratic access. U.S. grand strategy seeks to extend its space diplomacy and to that end has established the Artemis Accords to develop the Moon. Although the Accords are a civil arrangement, signatory nations expect that the USSF will be a major partner in safeguarding their investments.

In 2019, NASA and USSF released a Memorandum of Understanding (MoU) that laid out expectations that U.S. Space Force would have operations in cislunar space.¹³ To be specific, the MoU specifies that “when established in December 2019, USSF was tasked with defending and protecting U.S. interests in space. Until now, the limits of that mission have been in near Earth, out to approximately geostationary range (22, 236 miles). With new U.S. public and private operations extending into cislunar space, the reach of USSF’s sphere of influence will extend to 272,000 miles and beyond—more than a tenfold increase

in range and 1,000 fold expansion in service volume.”¹⁴ The MoU goes on to state that there is an urgent need to develop USSF capabilities as “NASA’s human presence extends beyond ISS, to the lunar surface, cislunar, and interplanetary destinations and as USSF organizes, trains and equips, to provide the resources necessary to protect and defend vital U.S. interest in and beyond Earth orbit, new collaborations will be key to operating safely and securely in those distant frontiers.”¹⁵

Strategic Considerations

The consequences of the U.S. military, particularly the USSF, considering cislunar space as part of its core mission are significant. Space is a domain in its own right. It requires both capabilities ensuring that the USSF can add to the joint fight and capabilities for developing resilience and first mover advantage and presence in cislunar space. What happens if there are space-based counterspace capabilities in the vicinity of the Moon which threaten U.S. civil or commercial interests? What happens if an adversary installs counterspace capabilities on the Moon itself? In that case, the USSF will be blindsided because it does not currently have cislunar space domain awareness. As detailed in my book with Peter Garretson, *Scramble for the Skies*, cislunar offers substantial resources to affect power in the international system.¹⁶ These resources include water ice that can be turned into rocket fuel and oxygen for life support; materials such as aluminum, iron, and silicon that can be utilized to build large structures; Helium 3, a source of energy in a nuclear fusion reactor; and rare Earth metals like titanium, uranium, platinum, potassium, and phosphorus. As nations race to create off-Earth industrial and logistics chains, the USSF cannot ignore how this will affect the ability to project power in and from the space domain. And U.S. policy, as expressed in both the *National Cislunar Strategy* and *National In-Space Servicing Assembly and Manufacturing (ISAM) Strategy*, clearly aim to create such capabilities and to extend the economic sphere to cislunar.¹⁷ China is likewise racing to generate \$10 trillion per year through an Earth-Moon economic zone with an ambition to industrialize the Moon

[†]Lagrange Points are five points of relative balance in the gravitational influence of two massive bodies (such as the Earth and Moon). Lagrange points are sometimes referred to as “prime real estate” in space because they offer orbital stability relative to other points. Practically, spacecraft do not linger exactly at Lagrange points. Instead, they orbit nearby with minimal fuel consumption. Earth-Moon Lagrange Point 2 orbits enable communications relay visibility to the lunar far side, which is otherwise not visible from Earth.

to build solar power satellites and dominate cislunar.¹⁸ The potential for economic changes in the “means of production” are showcased by United Launch Alliance (ULA) in its *Cislunar 1000* video, and most recently in the European Space Agency (ESA) Solaris ASTROM *Greater Earth Synergies* video.¹⁹

Economic capabilities and investments represent national interests. Both the United States-China Economic and Security Review Commission (USCC) and the U.S. Congress (in the 2021 National Defense Authorization Act) have called for a review of “the strategic interest in and capabilities for cislunar space.”²⁰ Within the current USSF theory of success, “creating enduring advantage” and “denying first-mover advantage” necessitate an early stabilizing presence in space and a capability to defend U.S. interests whenever called upon to do so.²¹ It requires deliberate efforts to support and protect the reach of its commercial vanguard. USSF exists, per U.S. law, not only to “conduct global space operations that enhance the way our joint and coalition forces fight,” as expressed in its self-chosen mission statement, but also to “protect the interests of the United States in space” and “provide freedom of operation for the United States in, from, and to space.”²²

Operational Considerations

There are certain operational considerations for why cislunar is important from a military perspective. Achieving strategic surprise by taking the initiative, for instance, by establishing “first presence” in cislunar space is part of current Chinese military doctrine.²³ The doctrine prioritizes offensive operational capabilities across the multiple domains, to include land, air, sea, space and cyber. China is likely to see strategic space competition through the lens of Maoist revolutionary warfare, which begins with the insurgent building parallel institutions, military strength, and using guerilla-like operations to demonstrate adversary weakness, especially in and from “hard-to-reach places.” The USSF would do well to avoid making itself an easy target for such an ambush. China has demonstrated everything it would need to execute co-orbital counter-space operations across the entirety of cislunar space: navigation, command and control, rendezvous and proximity operations (RPO), and docking in lunar orbit, complex navigation and maneuvering

between cislunar and solar regimes. For example, the Chang’e 5 mission demonstrated mastery of maneuver in cislunar (and even solar) space: it maneuvered from Earth orbit to lunar orbit, to Sun-Earth Lagrange Point 1, executed a second lunar flyby to become the first spacecraft to enter distant lunar retrograde, demonstrated a rapid transit from lunar orbit to medium Earth orbit (MEO) (5,000 km) and the delivery of a precision hypersonic device (return capsule containing lunar samples) from MEO *through intermediate orbits* to the Earth surface.

Moreover, a paper published in *Nature* in 2021, written by officials from the Xi’an Satellite Control Center, reports that China is contemplating placing a satellite in retrograde orbit in GEO via the Moon.²⁴ The advantage of a satellite in retrograde orbit in GEO is that within 12 hours, it can not only provide “early debris warning” but also inspect (or target) every other GEO satellite. Though demonstrated as scientific missions in cislunar space, China is well on its way to demonstrating offensive operational capabilities it can employ as surprise.

In conclusion, it is pertinent that cislunar space enters USSF doctrinal and operational thinking. General John Raymond, the first Chief of Space Operations (CSO), identified cislunar space as “key terrain,” stating that “as nations move out, and as the economy grows between here and the lunar surface, and as you look at key terrain for the defense of our nation, I think it’s an area that will be significant as we move forward.”²⁵ Both the USSF Capstone Doctrine and operations publications anticipate operations in cislunar space. Given the push for U.S. presence on the Moon and leading the Artemis effort as part of its long-term grand strategy for space, the USSF will find itself called upon to provide cislunar space domain awareness, operational capacity to respond in case there is any disaster, inadvertent conflict, or dispute.²⁶ Space technologies require time, investment, and effort. The time is now for the USSF to start developing cislunar capabilities so that it does not fail to do its duty when called upon. Why have an independent Space Force if it does not anticipate and train for the whole of space that includes the Moon? To ensure the USSF helps fulfill U.S. grand strategy, it must not fail to anticipate the future that is coming in space.

▶▶ **Argument That Cislunar Space Is Not Militarily Important**

Bluedyn Bowen

The Moon looks set to get busier. With the United States’ diplomatic coup of getting India onto the Artemis Accords and Pakistan signed up to the China-led International Lunar Research Station, Beijing and Washington are poised to lead waves of new science and exploration missions to the Moon over the next few decades.

With elements of the U.S. Congress, space industry, and the wider D.C. beltway policy community discussing the possible implications of economic activities on the Moon (or the so-called cislunar economy), it is only natural that military and security dimensions are raised. However, treating military and competitive economic issues on the Moon as pressing concerns are premature. At worst, it risks distracting and misdirecting the resources of the new USSF as it tries to find its feet and establish its credibility and reputation.

For this opinion piece, I label proponents of a formal USSF capability around the Moon as the “cislunar militarists.” Cislunar militarists are jumping the gun. I say this as a scholar of war studies, space warfare, and as an early supporter of creating a more independent U.S. military space service — to preempt any charges of naivete or pacifism that may be levelled against my argument or background.²⁷

As recent research again explains, the value of the Moon for economic and military purposes is overblown.²⁸ It is premature to direct the USSF to expand its operations and remit beyond the higher reaches of Earth orbit, beyond around 40,000 km altitude. First, at our early stage of selenographic knowledge, we simply do not know enough of what is really on the Moon that is actually useful and viable for the terrestrial political economy to make informed policy decisions. Second, the Moon is militarily irrelevant for wars that happen on Earth and in Earth orbit, and the U.S. can respond to any future significant economic or military developments on the Moon if they come about over the long term.

It’s the Economy, Stupid

The logic of the cislunar militarists is sound – if the Moon becomes economically valuable for the terrestrial

economy, then it becomes a prize others may wish to seize or protect. This is particularly the case if extracted resources were to be treated as tradeable property and commodities and “safety zones” in practice were to become territories and volumes with exclusive access procedures. However, much wrangling over Article II of the Outer Space Treaty is needed for the international community to accept such practices.

The cislunar militarists have an important precedent on their side: that is what has happened to Earth orbit over the last 70 years. Up to 40,000 km, Earth orbit is extremely useful for critical military services and is now also home to critical infrastructure that underpins modern economic activities. Setting up the Space Force made strategic and conceptual sense as that infrastructure needs protection, and the infrastructure of potential adversaries may need to be spied on, denied, or destroyed during wars. The current regime for orbital resources such as radio spectrum in Earth orbit, governed by the International Telecommunications Union, relies on a first come, first served basis.

Though the cislunar militarist logic makes sense, it is based on hopes rather than empirical evidence. Grand visions of a human presence on the Moon rests on speculative potential, not proven, practical value relative to opportunity costs, both in terms of other space projects and terrestrial spending priorities. Despite recent progress in making access to space cheaper, getting to the Moon is still expensive and risky. Indeed, for all the talk of a new commercial space age, or “New Space,” it is the U.S. and Chinese governments that are creating a “cislunar economy” using public funds. Proof of economically viable resource deposits or military utility is needed to commit the billions of dollars needed to expand economic and military infrastructure to the Moon — as opposed to that needed to support only science rovers and a handful of astronauts.

The lunar environment is fraught with risks, costs, and uncertainties. Simply valuing lunar resources based on estimated deposits is not enough for the billions of dollars of investment needed to realize them, particularly if any accessible deposit crashes a commodity’s value on Earth. Like seabed mining and Antarctic resource hypes of the twentieth century, the hype around lunar resources may

well fizzle out and come to nothing. The lunar environment may remain only a potential resource for the distant future.

The Long Way 'Round

Lunar development requires so many new technologies and techniques that resemble the uncertainties of rocketry and satellite experimentation in the 1950s and 1960s, which incurs high risks and the need for virtually unlimited funds to overcome them. Unlike the rockets and satellites of the early Cold War, the Moon promises no clear military utility to justify the financial, industrial, and intellectual resources that would be necessary.

As the Moon gets busier, there is a need for more Space Situational Awareness (SSA) for the cislunar environment – but that can be under civilian control, as the Artemis Program and Lunar Gateway are. Monitoring the lunar environment is needed regardless, and militarizing it will be detrimental to U.S. foreign policy goals with Artemis, and to the USSF's priorities. Responding to bad behavior will make military intervention easier to justify rather than creating a self-fulfilling prophecy by needlessly militarizing and antagonising others there first.

The Air Force Research Laboratory's (AFRL) website for the Oracle program divulges that the USSF's duties could extend out to a distance of 10 times farther than existing U.S. military space missions, covering a volume 1,000 times greater in size with a military lunar SSA program.²⁹ This is putting the cart before the horse. Performing SSA duties in Earth orbit is challenging enough, and the USSF has its hands full managing strategy, operations, and tactics in Earth orbit and providing critical services to terrestrial military forces and civilian infrastructure. This comes at a crucial time because the identity and culture of the USSF is up for grabs in its formative years. It would be detrimental for U.S. military power should the USSF's focus on orbital infrastructure for terrestrial wars and orbital warfare become distracted by small, harmless, and costly exploratory activities on the Moon.

Undoubtedly, "spacepower" is essential for the U.S. military to function as we know it, but it does not guarantee strategic victories either. Unlike Earth orbit, the Moon is simply not useful at all for modern warfare and maintaining guaranteed nuclear second-strike capabilities.

Spacepower is one part of joint warfare methods that has to work for victory to come about, and it relies on a sound political strategy and economic-logistical means.

Concerns of sneak attacks against satellites from around the Moon, beyond 400,000 km away, and toward GEO at 35,600 km are strategically absurd due to travel times and vast distances such attacks must travel. This includes directed energy weapons that lose focus and power over such vast distances. Weapons effects directed at useful satellites in Earth orbit are faster and harder to predict when coming from Earth orbit or Earth itself.

The relative ease and affordability of developing more tracking systems on Earth and in orbit can provide ample warning to respond to any possible attempt to attack from beyond 40,000 km with travel times measured in days, not minutes. In looking to the Moon for threats, it may only distract the USSF from terrestrial anti-satellite weapons and close-orbiting and "inspection" satellites fielded by potential adversaries.

If others prove the economic viability for lunar resource exploitation, or some currently unimaginable military usefulness, the U.S. with its allies in Asia and Europe will be able to respond with political and economic resources that none can easily match in the near future. Foreign policy hubris and domestic strife remain bigger risks for U.S. spacepower than Chinese robots on the far side of the Moon. Collapsing powers unable to reform, wracked by internal divisions, civil strife, isolationism, military blunders, corruption, or mere incompetence provide opportunities to others. A cursory reading of Paul Kennedy's magisterial *The Rise and Fall of the Great Powers* should be caution enough that simply being first to do something — including colonial exploration, which remains an analogical touchstone for space exploration enthusiasts — does not guarantee preponderance in power politics and economic weight, especially over the long term.³⁰

At best, the Moon may come to resemble the scientific outposts in Antarctica, but at a much smaller scale. Establishing the practical governance of exploratory activities are the "prizes" at stake on the Moon, not economic or military dominance. The U.S.- and Chinese-led lunar efforts will have symbolic, prestige value and the

potential to set important precedents for the governance of the Moon and beyond in how to use local resources for scientific outposts, and how to coordinate and deconflict such missions.

Cislunar militarism risks distracting precious military, material, and intellectual resources away from the genuine threats and risks posed by other states to U.S. military

space systems in Earth orbit. As such, committing military resources to the lunar environment (beyond crucial technical help to civil agencies operating there), according to the dreams of cislunar militarists, risks distracting and misleading the U.S. Space Force in its most formative years, and remains a premature folly for the foreseeable future.

◀ Rebuttal to the Argument that Cislunar Space is Not Important Militarily

Namrata Goswami

In response to Dr. Bowen, I would like to make three points for the readers. First, choosing to deliberately label those who view cislunar space as vital for the military as “cislunar militarists” is simplistic and fails to recognize the rich complexity of thinking about cislunar space. Similar labeling could be used to designate those arguing for USSF LEO and GEO capabilities as “LEO and GEO militarists.” These labels obscure more than they reveal.

Second, developing a plan for operations in cislunar space need not be a distraction for the USSF. Such a plan prepares the USSF to secure U.S. national interests in space, of which warfare is but one component. The USSF is a key element of U.S. international efforts to assure allies and like-minded partners that the U.S. is prepared to protect or assist critical assets on the Moon. Actual proposals by most cislunar proponents suggest adding a mere 200 people (~1 percent of USSF’s 14,000 personnel) over five years and dedicating only \$250 million (<1 percent of USSF’s \$30 billion annual budget) to cislunar.³¹ This is hardly a meaningful distraction for LEO and GEO. Bowen exaggerates the level of effort to prepare for cislunar capabilities.

Third, the USSF is legislatively tasked not only to wage war, but to protect U.S., allied, and partner nations’ space assets.³² Both a DNI National Intelligence Estimate and a U.S. State Department 2023 document identify threats from China and Russia working to undermine U.S. space security across the economic, military, and diplomatic spheres by 2045.³³ A USSF that limits itself to Earth-based military operations is setting itself up for failure, ensuring its inability to respond in the future. Consider that colonized states failed miserably to anticipate the changes in military technology, force posture, and doctrine that colonial powers developed. First presence mattered greatly to those who set the subsequent rules of engagement. It would be irresponsible of the USSF to cede control of cislunar space to countries like China and Russia. Thus, preparedness to conduct cislunar operations, far from being a distraction, is a key component to supporting U.S. diplomatic strategy and what it means for the USSF to be a culturally competent and adaptive force.

▶ Rebuttal to the Argument that Cislunar Space is Important Militarily

Bleddyn Bowen

Thanks to Dr. Namrata Goswami for penning an earnest justification for the U.S. Space Force’s cislunar geopolitical gazing and presenting a sound logic for military competition on the Moon. Whilst logically sound, the premise is based on shaky foundations, which are ahead of their time because there is no tangible military or economic benefit to the Moon for the foreseeable future.

No one is anywhere near the prospect of industrializing the Moon. Lunar resources at any significant scale remain a distant prospect subject to speculation and projection. As with the flaws in Dolman’s seminal *Astropolitik* theory on the resource bounty of the solar system, we simply do not know enough about the basics of lunar composition and the challenges of long-term mechanical and human exposure to the lunar surface and subsurface to make any confident claims about the accessibility and economics of lunar resources.³⁴

It may be in U.S. interests that China waste its limited space warfare resources by putting weapons around the Moon, safely and awkwardly distant from the theaters of space warfare that really matter – Earth orbits up to 50,000 km or so. China doing so would also be a political victory for U.S. space diplomacy as it pursues soft laws in space governance. This would be preferable to China deploying dozens of satellites in GEO with co-orbital inspection and responsive ASAT capacities, which is a far more realistic threat that the U.S. Space Force must take seriously.

The fear of “not being first” is something that can be addressed by looking at the United States’ own history in nuclear, missile, and space technologies. Britain, Germany, France, and the Soviet Union were first with many achievements in the 1920s to the 1950s. The U.S. did well in catching up to others, proving concepts and responding appropriately with a superior economy and technical base at a scale none could match. If, against expectation, the Moon becomes so valuable in the next 20 years, so long as the U.S. does not fall victim to internal collapse, political isolation, and economic stagnation, I have every confidence it and its allies can respond if others strike important “firsts” on the Moon that have systemic economic and military impacts.

Conclusion

Robert S. Wilson

In the 1970s, Gerard K. O'Neill wrote a book titled *The High Frontier: Human Colonies in Space*, which envisioned large human civilizations on and around the Moon.³⁵ How close the world gets to O'Neill's vision could determine whether significant military investments in cislunar space prove to be prescient or an inefficient use of money and time. Bowen and Goswami's pieces highlight some of the divergence in positions on the military utility of cislunar space, including the economic potential of the Moon and the defense applications stemming from orbits beyond Earth's. Given that some of the plans for the Moon and cislunar space will not be realized until several years from now, these questions will remain unsettled for some time and these divergences will likely continue animating debates in the public and within the Pentagon.

This paper presents two perspectives, but there is a spectrum of views on the military utility of cislunar space. Our goal has not been to capture all positions about this debate but to showcase opposing arguments that can help policymakers and non-specialists understand where their own views fit on this spectrum. Although some will see this issue as black and white, others will see it in shades of gray and those different shades could mean different levels of defense investment in cislunar space as well as different roles and operations for the Space Force. The debate about the military importance of the Moon and cislunar space can be difficult to follow, and Dr. Bowen's and Dr. Goswami's lucid essays clarify the issues at the heart of it.

About the Authors

Dr. Namrata Goswami teaches space policy at the Thunderbird School of Global Management, Arizona State University. She is the author of the book *Scramble for the Skies: The Great Power Competition to Control the Resources of Outer Space*.

Dr. Bleddyn Bowen is an associate professor of International Relations at the University of Leicester, United Kingdom, and is an expert on space warfare and astropolitics. He is the author of *Original Sin: Power, Technology and War in Outer Space* (Oxford University Press, 2023) and *War in Space: Strategy, Spacepower, Geopolitics* (Edinburgh University Press, 2020). Bowen is also an associate fellow of the Royal United Services Institute and founder and convenor of the Astropolitics Working Group at the British International Studies Association.

Robert Samuel Wilson is a systems director at The Aerospace Corporation's Center for Space Policy and Strategy, where he is responsible for leading work on the nexus of commercial and national security space, comparative space, and missile issues. Wilson received his bachelor's degree from the University of Virginia in political theory and his master's degree from the University of Virginia's Batten School in public policy.

About the Center for Space Policy and Strategy

The Center for Space Policy and Strategy is dedicated to shaping the future by providing nonpartisan research and strategic analysis to decisionmakers. The center is part of The Aerospace Corporation, a nonprofit organization that advises the government on complex space enterprise and systems engineering problems.

The views expressed in this publication are solely those of the author(s), and do not necessarily reflect those of The Aerospace Corporation, its management, or its customers.

For more information, go to www.aerospace.org/policy or email policy@aero.org.

© 2024 The Aerospace Corporation. All trademarks, service marks, and trade names contained herein are the property of their respective owners. Approved for public release; distribution unlimited. OTR202400503

References

- ¹ “Artemis Accords,” The U.S. Department of State, Accessed February 21, 2024.
- ² “United States Space Priorities Framework,” The White House (December 2021); “National Cislunar Science & Technology Strategy,” Executive Office of the President of the United States, National Science and Technology Council (November 2022).
- ³ Hannah Devlin and Kate Lyons, “Far side of the moon: China’s Chang’e 4 probe makes historic touchdown,” *The Guardian* (January 3, 2019).
- ⁴ Andrew Jones, “China attracts moon base partners, outlines project timelines,” *SpaceNews* (June 19, 2023).
- ⁵ Andrew Jones, “Egypt joins China’s ILRS moon base initiative,” *SpaceNews* (December 7, 2023).
- ⁶ James Holmes, “Should Space Force Look at the Moon or the Earth?” *Real Clear Defense* (January 30, 2023).
- ⁷ Sandra Erwin, “Supporting military operations on Earth to remain U.S. Space Force’s top priority,” *SpaceNews* (January 26, 2023).
- ⁸ David Buehler, Eric Felt, Charles Finley, Peter Garretson, Jaime Stearns, and Andy Williams, “Posturing Space Forces for Operations Beyond GEO,” *Space Force Journal*, Issue 1 (January 31, 2021).
- ⁹ Tyler D. Bates, “The Next US Space Force Design: Missions and Unites for the 2030s,” *Aether, Air University Journal* (November 22, 2022).
- ¹⁰ Joseph W. Gangestad, “Pack It In, Pack It Out: Updating Policy and Standards for Cislunar Sustainability,” The Aerospace Corporation (Sep. 28, 2023); Ron Birk, “Charting a Course Through Cislunar Master Planning,” The Aerospace Corporation (June 23, 2022).
- ¹¹ Indian Space Research Organisation, Department of Space, “Chandrayaan 3” https://www.isro.gov.in/Chandrayaan3_Details.html (Accessed on August 16, 2023). “Russia Announces Plans to Establish a Moon Colony by 2040,” *The Moscow Times*, November 29, 2018; “National Cislunar Science & Technology Strategy,” Executive Office of the President of the United States, National Science and Technology Council (November 2022); “The Moon Shot: Japan’s Era of New Space”, CNBC <https://www.cnbc.com/advertorial/the-moon-shot-japans-era-of-new-space/> (Accessed August 16, 2023); “The layout of the earth-moon space has reached a critical period of opportunity, and my country has the ability to build earth-moon space infrastructure,” China Aerospace Science and Technology Corporation (March 12, 2023).
- ¹² Huaxia, “China develops New Carrier Rocket, Spacecraft for Moon Landing,” *Xinhua* (July 21, 2023).
- ¹³ Memorandum of Understanding between the National Aeronautics and Space Administration and the United States Space Force (September 21, 2020).
- ¹⁴ Memorandum of Understanding between the National Aeronautics and Space Administration and the United States Space Force (September 21, 2020).
- ¹⁵ Memorandum of Understanding between the National Aeronautics and Space Administration and the United States Space Force (September 21, 2020).
- ¹⁶ Goswami, Namrata and Peter Garretson. *Scramble for the Skies The Great Power Competition to Control the Resources of Outer Space* (Lanham: Lexington Press, 2020).
- ¹⁷ “National Cislunar Science & Technology Strategy,” Executive Office of the President of the United States, National Science and Technology Council (November 2022); “In-Space Servicing, Assembly, and Manufacturing National Strategy,” The White House, (April 2022).
- ¹⁸ Andrew Jones, “From a farside first to cislunar dominance? China appears to want to establish ‘space economic zone’ worth trillions,” *SpaceNews* (February 15, 2020); United States China Economic and Security Review Commission, “China’s Ambitions in Space: Contesting the Final Frontier,” 2019 Report to the U.S. Congress, Section 3 (2019).
- ¹⁹ “Video / ULA’s vision for 1,000 people in cislunar space in 30 years,” *SpaceNews* (April 30, 2016); Greater Earth Energy Synergies, at <https://vimeo.com/816688969> (Accessed on August 18, 2023).
- ²⁰ United States China Economic and Security Review Commission, “China’s Ambitions in Space: Contesting the Final Frontier,” 2019 Report to the U.S. Congress, Section 3 (2019); “National Defense Authorization Act for Fiscal Year 2021,” Public Law 116-283 (January 1, 2021); “Saltzman Outlines ‘theory of success’ Guiding Space Force in Fulfilling its Essential Missions,” Secretary of the Air Force Public Affairs (March 7, 2023).
- ²¹ “2022 National Defense Strategy of The United States of America,” U.S. Department of Defense, (October 27, 2022); AFA Warfare Symposium, “Gen. Saltzman on ‘Guardians in the Fight’” (March 7, 2023).
- ²² “USSF Mission Statement,” CSO Notice to Guardians (May 15, 2023); 10 U.S. Code 9081: The Space Force.
- ²³ State Council, The People’s Republic of China, “China’s Military Strategy” (May 27, 2015); “Full Text: China’s Space Program: A 2021 Perspective The State Council Information Office of the People’s Republic of China” (January 2022); “Exploiting earth-moon space: China’s ambition after space station,” *Chinadaily.com.cn* (March 8, 2016).
- ²⁴ Huaxia, “Chang’e 5 Orbiter Enters 1st Lagrange Point of Sun-Earth System,” *Xinhua*, (March 19, 2021).
- ²⁵ Greg Hadley, “Raymond Foresees Cislunar Space as ‘Key Terrain’ Guardians Going to Space,” *Air & Space Forces Magazine* (March 3, 2022).

²⁶ “Space Force Doctrine Publication 3.0 Operations Doctrine for the Space Forces,” United States Space Force (July 19, 2023).

²⁷ Bleddyn Bowen, “Space Warfare in the Pentagon: In Support of an Independent Space Corps,” *Defence In-Depth* (June 24, 2017).

²⁸ Mariel Borowitz, Althea Noonan, and Reem El Ghazal, “U.S. Strategic Interest in the Moon: An Assessment of Economic, National Security, and Geopolitical Drivers,” *Space Policy* (June 14, 2023).

²⁹ “Oracle,” Air Force Research Lab, <https://afresearchlab.com/technology/oracle/> (Accessed February 21, 2024).

³⁰ Kennedy, Paul. *The Rise and Fall of the Great Powers*, (Vintage: January 15, 1989).

³¹ Charles S. Galbreath, “Securing Cislunar Space and the First Island Off the Coast of Earth,” Mitchell Institute Vol. 45 (January 2024); “About the Space Force,” U.S. Space Force <https://www.spaceforce.mil/About-Us/About-Space-Force/> (Accessed March 13, 2024).

³² 10 USC 9081: The United States Space Force.

³³ “Chinese Space Activities Will Increasingly Challenge U.S. Interests through 2030, National Intelligence Estimate NIE 2021-01634 (Washington, D.C.: Office of the Director of National Intelligence, April 2021; declassified by DNI Haines on September 17, 2022); “A Strategic Framework for Space Diplomacy,” U.S. State Department (May 2023).

³⁴ Dolman, Everett C. *Astropolitik: Classic Geopolitics in the Space Age* (Routledge: London, 2001).

³⁵ O’Neil, Gerard. *The High Frontier: Human Colonies in Space* (Corgi: 1978).