Photo by: National Aeronautics and Space Administration

Eyes on the Prize

The Strategic Implications of Cislunar Space and the Moon

BY Spencer Kaplan

STRATEGIC INTEREST IN CISLUNAR SPACE AND THE MOON is growing as launch capabilities and commercial ventures proliferate. Between the Moon's vast reserves of civilization-changing resources and potential as a staging ground for missions to Mars and beyond, the lunar and cislunar domains may become prime targets for national security investment in the 21st century.

The Moon has three fundamental types of value: prestige, scientific, and strategic. Its prestige value derives from the difficulty of achieving success on lunar missions. Successful missions sent to the Moon are often viewed as markers of technological and societal advancements, and few nations have managed to successfully reach the Moon. This symbolic value can be leveraged to send a message to competing nations, as the United States did with the Apollo program.

The Moon's scientific value stems from both its ability to serve as a testbed for the technology deemed critical to settle Mars and the opportunity it presents to gain important insights into the Earth's geology, the history of the solar system, and the existence of life on Earth.[1] As the Moon is a celestial body reachable from Earth with minimal gravity and low shielding from radiation, it is uniquely positioned to host laboratories dedicated to deep space exploration research.

Most importantly for this analysis is the Moon's strategic and economic value. Primarily, the Moon's resources can be utilized to enable new, powerful types of

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terrestrial energy production and to facilitate deep space exploration through on-site rocket fuel production. To preserve a share of the Moon's future economic potential, countries may seek to develop a presence at locations on the Moon with significant resource concentrations. As many of the Moon's resources are not yet accessible, guaranteeing future access to the relatively limited resource-rich sites on the Moon increasingly appears to be a high priority for countries around the world.

Recognition of the Moon as a strategic target is not new; during the Cold War, planners in both the United States and the Soviet Union conceived of missions to build lunar bases and detonate nuclear weapons on the lunar surface.[2] In addition to the surface of the Moon, some military analysts aimed to strategically utilize the space in between the Earth and the Moon—often thought of as vacant space—to their strategic advantage. By safeguarding some of the Soviet Union's nuclear weapons hundreds of thousands of kilometers away, they could leverage the distance and time between the Earth and the Moon to guarantee second-strike capabilities because any attack on lunar weapons would take several days to deliver to the Moon.[3] This has since been banned by the *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies*, commonly known as the Outer Space Treaty, which prohibits states from orbiting or placing nuclear weapons on celestial bodies.[4]

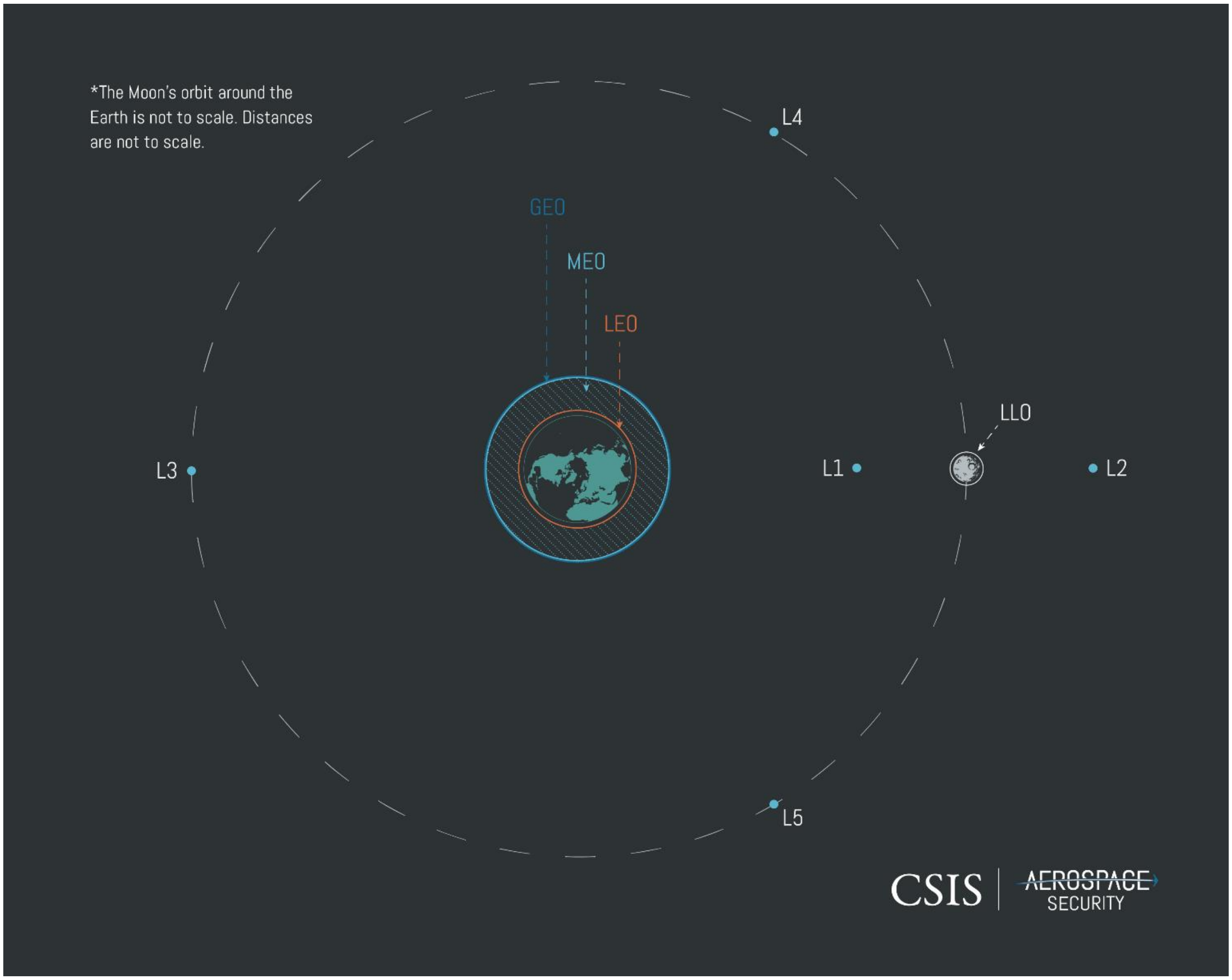
Today, the strategic importance of cislunar space is growing. As countries and companies look to establish a permanent presence on the Moon, cislunar space may become increasingly important for transportation to and from the moon, as well as to develop technologies for lunar and deep space missions. Furthermore, national security concerns about cislunar space are emerging. Though countries like the United States and China are pursuing peaceful cislunar projects like massive space-based solar arrays, habitation facilities, and industrial factories for energy-intensive goods like microchips, the domain could also be used to hide potentially harmful satellites or to deny others access to the Moon.[5]

The increasing number of cislunar opportunities, paired with the contested nature of the domain, suggest that decision makers require a better-developed framework for strategic thinking. This paper will analyze the strategic value of cislunar space and the Moon as well as how countries plan to leverage the cislunar and lunar domains to their advantage.

What is Cislunar Space?

Cislunar space is often referred to as the volume inside the Moon's orbit of the Earth and the region around the Moon. Many objects currently occupy cislunar space, including satellites and meteorites. The Earth-orbiting satellites in cislunar space are often categorized into orbital regimes by their altitude above Earth: low Earth orbit (LEO), medium Earth orbit (MEO), and geosynchronous Earth orbit (GEO). While cislunar space technically starts at 160 km above Earth (LEO), This analysis will focus on the parts of cislunar space beyond GEO.

Beyond these most common orbits, some cislunar objects reside in low lunar orbit (LLO), which describes the region within 100 km of the Moon's surface. Since there is very little atmosphere on the Moon, objects can orbit at very low altitudes. However, the Moon has irregularly distributed mass concentrations, called mascons, within its mantle, rendering its gravitational field uneven.[6] Consequently, satellites in LLO may have to make frequent station keeping adjustments to stay in orbit. The gravitational perturbation effects of mascons are so severe that there are only four orbital inclinations that can support a stable orbit: 27°, 50°, 76°, and 86°.[7] Moreover, satellites located in orbits above 100km off the Moon's surface would be subject to increasingly significant gravitational disturbances from the Earth



and the Sun as their altitude above the Moon climbs.[8] In sum, the gravitational environment surrounding the Moon substantially limits operational capabilities for satellites and future space stations.

There are also specific locations in cislunar space that are of strategic and economic interest. The Lagrange points are locations in space where the gravitational forces from two large bodies, like the Earth and the Moon, balance each other. Lagrange points are important because spacecraft or satellites can stay in a stable orbit without having to expend much fuel.[9] All systems of two large bodies contain five Lagrange points, two of which (L4 and L5) are stable, and three of which (L1, L2, and L3) are unstable, meaning spacecraft at those points require periodic corrections to maintain their position. In the Earth-Moon system, the L1 point resides between the Earth and the Moon, the L2 point lies behind the Moon relative to the Earth, the L3 point is located directly opposite to the Moon in its orbit around the Earth, the L4 point leads the Moon in its orbit, and the L5 trails the Moon in its orbit.

It is essential to understand the scale of cislunar space. The average distance between the Earth and the Moon is 384,000 km.[10] The L2 Lagrange point, considered part of cislunar space, is another 61,347 km past the Moon.[11] For comparison, LEO, where fifty five percent of all operational satellites are located, ranges between 160 km and 2,000 km off the Earth's surface.[12] The immense size of cislunar space, as well as its newfound accessibility, present critical strategic challenges and opportunities.

The Moon as a Strategic Target

Establishing a permanent settlement on another celestial body has often been seen as an important milestone for humanity. Yet, spacefaring countries like the United States and China are not just motivated to develop the Moon for symbolic reasons, but also strategic purposes. The Moon's physical conditions and undeniable resource potential make it an attractive future destination for significant scientific, commercial, and security investment.

The Moon appears to be an encouraging location for in-situ resource utilization (ISRU), or the production of refined materials using resources found on-site.[13] Notably, scientific findings from previous lunar missions suggest that the Moon's poles house significant lunar ice deposits, which can be used to create oxygen and chemical fuels.[14] The ability to manufacture rocket fuel on the lunar surface could facilitate novel missions further into the solar system and beyond. ISRU could also enable commercial companies to easily transport lunar resources from the Moon's surface back to Earth.

The Moon's low gravity would provide immense scientific value for future lunar settlements and allow them to serve as a promising staging ground for future missions deeper into the solar system. The Moon's weak surface gravity and lack of atmosphere mean that launching from the Moon's surface to other locations in deep space requires less energy than launching from the Earth's surface. Consequently, a space agency with a presence on the Moon or in lunar orbit could utilize efficient mission architectures for deep space missions, enhancing their scientific capabilities or reducing their costs.[15] Thus, a country that builds a lunar base as a refueling and assembly outpost for space operations may enjoy greater freedom to navigate the solar system with ease.

The Moon's resources also have the potential to reshape life on Earth. Its abundant deposits of Helium-3—a Helium isotope that could enable efficient nuclear fusion without harmful waste products—could provide Earth with an extraordinary amount of energy, unlocking new technologies and ending humanity's reliance on fossil fuels.[16] In addition to Helium-3, the National Aeronautics and Space Administration (NASA) has detected the presence of rare-Earth elements (REE) on the Moon. Since rare-Earth elements are contentious, difficult to refine, and vital for national security applications, a country with the means to extract and refine them from the Moon would have a strategic advantage over other countries.[17]

Although the Moon has clear commercial value in the form of resources, they are currently inaccessible. However, nations are beginning to position themselves to preserve their ability to harness the Moon's commercial value in the future. Notably, those nations that develop sustained operations on the Moon first will begin to establish de facto norms of behavior, enabling them to "set the tone" for future lunar operators. For example, countries motivated by open exploration and commercial development (i.e., the United States) may seek to normalize cooperation and free access to all parts of the Moon. By setting acceptable standards of behavior early, actors who subsequently join the lunar surface may be more likely to follow these norms or would at least be viewed as breaking the norms. In addition to setting standards, developing a presence on the Moon early can guarantee access to certain locations of increased scientific or commercial value, like the Shackleton Crater, which lies on the South Pole and likely contains ice.[18] Doing so may be vital to prevent other countries from engaging in exclusionary behavior and denying access to such locations in the future.

Cislunar Space as a Strategic Target

While most of the Moon's strategic value almost exclusively derives from its future economic value, the cislunar domain has wide-ranging implications for contemporary and future national security. Security-focused cislunar policy should consider how to both secure future access to the Moon as well as defend against attacks on terrestrial or orbital targets launched from cislunar space.

Cislunar space and the Moon are strategically linked. A presence on the Moon is futile without the ability to freely travel between the Moon and the Earth through cislunar space. Until a country develops the ability to have a self-sustaining settlement on the Moon, it will rely on the ability to transport crew and cargo to the lunar surface and back, making it vulnerable to anti-access tactics in cislunar space. In a future conflict, countries may seek to deny their adversaries access to the Moon because, among other potentialities, it could be an important source of REE for military technology or Helium-3 for nuclear fusion energy. Having military cislunar intelligence (LUNINT) and potentially defensive and offensive weapons platforms stationed at cislunar Lagrange points could give a country a strategic advantage by allowing it to interfere with its adversary's ability to access the Moon and its resources.

Cislunar space is a challenging domain for national security practitioners because traditional intelligence gathering and situational awareness platforms are not well-equipped to surveil satellites hundreds of thousands of kilometers away from Earth at high resolutions.[19] One particular concern is that hostile actors could use cislunar space to attack satellites from "above" rather than "below," as is typically imagined of anti-satellite (ASAT) weapons.

The first example of a satellite entering orbit from "above" was the 1993 *AsiaSat-3* satellite. After the satellite failed to reach its intended orbit, engineers expended a percentage of the satellite's fuel to do a fly-by of the Moon, where they then utilized the Moon's gravity to assist the satellite to eventually re-enter GEO.[20] This mission showed a new way cislunar space could invigorate missions to common orbital regimes. Some experts are concerned this same strategy, which saved *AsiaSat-3*, could also be used in an act of aggression. In a "surprise attack," an adversary could deceptively launch a satellite on a translunar injection trajectory but then alter its course near the Moon to set it on a collision course with an essential national security satellite. Since space situational awareness (SSA) sensors are not typically focused on cislunar space, satellite operators may not detect the incoming satellite, even though the attack would take around a week to execute. Moreover, hostile satellites anchored at Lagrange points would be very difficult to identify and track without using SSA assets at or near these points, allowing them to stay "parked" for long periods.[21] Losing track of a potentially hostile satellite could be catastrophic if it is later employed against a critical space system. Until LUNINT gathering improves, cislunar space will continue to be a significant vulnerability for civil, military, and commercial satellites.[22]

Lunar and Cislunar Locations of Special Strategic Significance

Specific locations within cislunar space and on the Moon's surface are especially important as they hold more strategic value. These points are important for future commercial development or resource extraction.

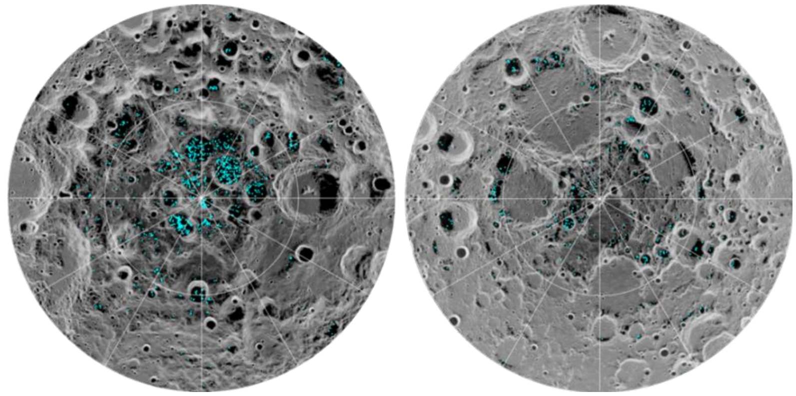
The Moon's Equator

One of the most valuable resources on the Moon is Helium-3. Ouyang Ziyuan, the Chief Scientist of the Chinese Lunar Exploration Program, has emphasized the potential of lunar Helium-3 by saying it could "solve humanity's energy demand for around 10,000 years at least."[23] The Earth has very little of the isotope because its magnetosphere deflects solar wind, which is one of the most common natural sources of Helium-3. However, the Moon, lacking a magnetosphere, is exposed to a significant amount of solar wind. Thus, the parts of the Moon that are exposed most often and most directly to the sun likely have large deposits of Helium-3. Just as lower latitudes on Earth are warmer because they receive more direct sunlight, the equatorial regions of the Moon are exposed more to Helium-3-carrying solar wind.[24] Therefore, efforts to secure lunar sites of strategic significance should include the equator.

The Moon's Polar Regions

The Moon's poles are two often-cited locations of value because of their geophysical characteristics. In 2018, NASA confirmed the presence of water ice at the Moon's poles using data collected by its Moon Mineralogy Mapper (M3) instrument on India's *Chandrayaan-1* spacecraft. Specifically, the findings suggest ice is widely but sparsely distributed at the north pole but concentrated within craters at the south pole.[25] While the ice is itself valuable as a source of water and fuel, its location amplifies its utility. Due to the Moon's small axial tilt, there are locations on the Moon's poles which are both almost constantly in the sun (rims of craters) and constantly dark (bottom of craters). Having near-constant sunlight would allow a mining operation to always have solar power available. At the same time, the constant darkness of the crater depths leads to low temperatures and accumulation of ice.[26]

The poles have additional value because a lunar base at either pole could theoretically have far more access to a space station orbiting the Moon in LLO than any other position on the Moon. Since there are few stable orbits in LLO, a country or company may choose to place a space station in an inclined orbit such that it would not require much propellant to remain in position. A lunar orbit with an inclination of 86° would be both stable and nearly polar, meaning it would pass over each pole



Suspected polar ice deposits on the South and North Poles of the Moon. Source: National Aeronautics and Space Administration

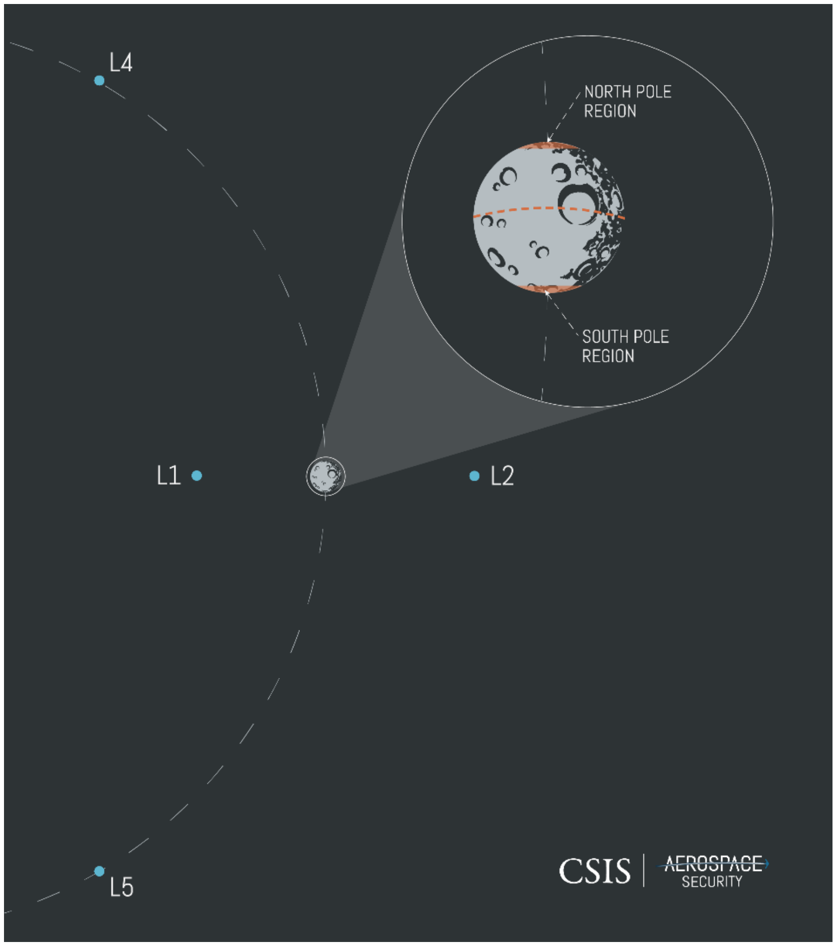
during each orbital period. Thus, a lunar base would have more launch opportunities to access an orbiting station if it were located by one of the poles. The availability of lunar ice, combined with easy accessibility to on-orbit platforms, makes the Moon's poles an attractive strategic target for future lunar efforts.

Lunar Surface Beneath the L1 and L2

A great deal of the lunar poles' strategic value comes from their ability to transfer people and cargo to orbit easily. Similarly, the points on the lunar surface underneath the L1 and L2 Lagrange points could also provide orbital accessibility benefits. Specifically, engineers and scientists have proposed building lunar space elevators that connect the Lagrange points to the Moon's surface.[27] By extending a strong cable from the L1 Lagrange point to the Moon's surface, vehicles could easily traverse cislunar space by "crawling" along the cord.[28] On the other side of the Moon, a space elevator to the L2 Lagrange point could enable deep space missions by easily transporting cargo, crew, and vehicles to the edge of cislunar space from the surface of the Moon as well as enhance communications capabilities with the lunar far side. Though lunar elevators sound farfetched, engineers believe they could be constructed using materials available today (unlike terrestrial space elevators, which face additional gravitational, atmospheric, and space debris challenges).[29]

A lunar space elevator would dramatically reduce the cost of traveling through space since little fuel would be necessary to go between the lunar surface and L1 or L2 as well as make the journey significantly safer because vehicles would be moving in one dimension (as opposed to the three-dimensional travel of traditional spacecraft).[30] Improving the cost and safety of traversing cislunar space is critical to ensure the long-term viability of commercial enterprises like lunar resource mining or space tourism. Accordingly, securing access to future tether sites of the space elevators—points on the Moon's equator directly underneath the L1 and L2 Lagrange points—could be vital to future commercial success on the Moon.

Earth-Moon Lagrange Points



The Lagrange points in the Earth-Moon system are strategically important because they are favorable locations to anchor commercial or military satellites and space stations. Because the gravitational forces of the Earth and the Moon are equal at the Lagrange points, satellites or stations remain stationary relative to the Moon and Earth and would need little energy for station keeping.[31] Consequently, the Lagrange points could serve as an appealing place to build trade and logistics terminals where crew or cargo arriving on spacecraft from Earth could be transferred to lunar landing vehicles.[32] Alternatively, crew and cargo could launch from the lunar surface, dock with the station, and take a new vessel back to Earth. Future commercial mining operations will likely make use of a station at a Lagrange point to organize transportation of their materials. Moreover, the L4 and L5 points in the Sun-Jupiter system are known to contain "Trojan" asteroids, which are asteroids that gather over time at the Lagrange points leading and trailing Jupiter. Scientists believe that the Earth-Moon L4 and L5 points may also house Trojan asteroids that may contain precious metals and minerals which could be extracted for commercial or scientific purposes.[33]

The relative stability of the Lagrange points also allows for countries to place military satellites in cislunar space and keep them "parked" with few station keeping requirements, very similar to how nations utilize geostationary orbit today. While satellites in LEO, MEO, and GEO have "lifespans" dictated by the amount of propellant they carry to make course corrections, stationary satellites at Lagrange points would require very little fuel to remain in position, making the Lagrange points an appealing destination for long-term civilian and military platforms. Moreover, the L2, L4, and L5 points are attractive locations for future positioning, navigation, and timing (PNT), SSA, and communications platforms because satellites at those points would be able to "see" behind the Moon, a part of cislunar space that is not visible from Earth. As countries and companies increasingly develop the Moon, the strategic importance of the Lagrange points as veritable gateways to the Moon will steadily rise.

International Efforts in Cislunar Space and on the Moon

China

China's main lunar program is the Chinese Lunar Exploration Program (CLEP), which launches its flagship *Chang'e* missions. On its first mission in 2007, CLEP launched *Chang'e 1*, a satellite that traveled to LLO and imaged the Moon's surface. In addition to taking high-resolution images of the Moon's surface, *Chang'e 1* surveyed the Moon for Helium-3 deposits. In 2009, China launched *Chang'e 2* to the Moon on a mapping mission.[34] After identifying locations for future landers, *Chang'e 2* flew to the L2 Earth-Sun Lagrange Point and later rendezvoused with a near-Earth asteroid. *Chang'e 2*'s missions beyond the Moon were a significant development because they demonstrated China's ability to access locations throughout and beyond cislunar space.[35] Launched in 2013, *Chang'e 3* became the first space lander to soft-land on the Moon in almost 40 years. The lander contained the original *Yutu* rover which stopped working after technical problems prevented it from properly preparing for the lunar night. *Chang'e 4*, launched in 2018, made history as the first lander to land on the far side of the Moon. Significantly, the mission featured a communications relay to enable direct communications with the lander on the far side of the Moon and *Yutu-2*, a rover that is currently in operation.[36] In 2020, China plans to launch *Chang'e 5*, which will return samples to Earth from the lunar surface. China is planning other sample return missions throughout the 2020s and intends to develop a base on the Moon's South Pole by 2030.[37]

China also has ambitious plans for crewed space exploration. Notably, China built and launched two crewed space laboratories in 2011 and 2016, though both have since been retired. China's permanent space station, the Chinese Space Station (CSS), will be constructed throughout the early 2020s, with *Tianhe*, its core section, launching as early as 2021.[38]

China's dual pursuit of human spaceflight and lunar exploration align with its plan to become the preeminent space power in the world by 2045.[39] According to international relations expert Namrata Goswami, China's space strategy calls for its national space agency to make incremental steps toward long-term economic dominance of cislunar space. The steps include building launch capacity, developing a permanent space station, creating systems to enable supremacy in cislunar space, building a sustainable presence on the Moon, and maturing its systems for deep-space exploration.[40] Eventually, China plans to develop large space-based solar power arrays to beam energy to Earth and industrial facilities on the Moon.[41]

While some countries see the Moon as a distant target, China is targeting lunar exploration and the economic development of cislunar space as an integral part of its grand strategy. Speaking to taikonauts in 2013, Chinese President Xi Jinping said, "The space dream is part of the dream to make China stronger. With the development of space programs, the Chinese people will take bigger strides to explore further into space."[42] Moreover, high-ranking officials in China's space program have described dominance of cislunar space (and the economic power that comes with it) as important for the "great rejuvenation of the Chinese people."[43] The Moon itself is highly regarded by the Chinese government; commenting on the Moon's strategic value, Ouyang, the designer of China's lunar program, said, "Whoever first conquers the Moon will benefit first."[44]

The United States

Like China, the United States is pursuing scientific and military missions that are strategically preparing it to be an international leader in developing cislunar space and the Moon. The roughly analogous American counterpart to the Chinese *Chang'e* program is NASA's Artemis Program. Under the Artemis program, NASA will conduct a series of crewed and uncrewed missions to the Moon to establish a permanent, sustainable civil presence in the late 2020s. Artemis 1, a three-week mission to lunar orbit and back set to launch in 2021, will be the inaugural flight of NASA's Orion capsule (uncrewed) and Space Launch System (SLS) rocket.[45]

In 2023, NASA intends to launch the first two modules of the Lunar Gateway space station—NASA's flagship cislunar program—to a halo orbit around the L2 Lagrange point.[46] The station, which is accessible by the SLS and commercial platforms, will act as a staging point for future missions to the Moon and Mars as well as enable sample return and other scientific missions.[47] NASA will follow up on the Gateway missions with crewed missions to the lunar surface in accordance with President Trump's directions to land humans on the Moon by 2024.[48]

In addition to its crewed lunar program, NASA also intends to send a variety of landers and rovers to the Moon over the next decade through its Commercial Lunar Payload Services (CLPS) program. One of the first missions in this program is a lunar rover called Viper, which will prospect the south pole to create a map of lunar ice resources. The Viper mission is of particular importance for the commercial space industry because for a company to invest in building mining capabilities on the Moon, it would need to have relative confidence that the resources exist in a profitable quantity. Other CLPS payloads include scientific and technology development experiments.[49]

The United States is also investing in intelligence and military capabilities for cislunar space. The new Space Development Agency (SDA) is planning to develop a seven-layer satellite architecture that will increase the military's capabilities in space. One of the layers, the deterrence layer, focuses directly on identifying and potentially mitigating threats in cislunar space.[50] A significant portion of the deterrence layer's function is to provide cislunar space domain awareness capabilities for the military. To develop those capabilities, SDA has proposed placing three Advanced Maneuvering Vehicles in cislunar space which could quickly rendezvous with any suspicious target for inspection and analysis.[51] The U.S. military, which includes the new Space Force, is also working with private vendors to develop a three-dimensional interface for LUNINT collection and a PNT constellation for cislunar space.[52]

The military's and NASA's investments in cislunar capabilities may indicate that the United States considers cislunar space as both a vulnerability and an opportunity. Unlike China, space does not appear to be one of the critical centerpieces of America's grand strategy, as it is not referenced in the National Defense Strategy, Defense Space Strategy or other key strategy documents.[53] However, the United States is making quiet progress on a variety of commercial and military technologies necessary to lead the development of cislunar space.

Others

Since the inception of its *Chandrayaan* program in 2003, India has launched several missions to the Moon. *Chandrayaan-1*, launched in 2008, involved putting a satellite in LLO and deploying a lunar impact probe. The mission was successful, and the probe provided critical data that led to NASA confirming the existence of water on the Moon.[54] After the *Chandrayaan-2* mission partially failed in 2018, India announced *Chandrayaan-3*, which will consist of a lunar lander and rover. *Chandrayaan-3* will attempt to land at the Moon's south pole.[55] In the late 2020s, India intends to launch the Lunar Polar Exploration Mission jointly with Japan. The mission will survey the region for water and test the technology needed to develop a sustained robotic presence at the south pole.[56]

Japan also has significant lunar ambitions. In 2007, Japan launched the Selenological and Engineering

Explorer (SELENE) mission to lunar orbit, which consisted of one spacecraft and two sub-satellites. SELENE focused on identifying the distribution of minerals on the Moon as well as conducting geologic experiments. The Japanese Aerospace Exploration Agency (JAXA) plans to follow-up SELENE with the Smart Lander for Investigating Moon (SLIM), which will demonstrate precise lunar landing capabilities. In addition to its domestic initiatives, Japan is a key partner on the NASA-led Gateway project and will provide habitation technology and logistics resupply. JAXA intends to utilize the Gateway for the Human Enhanced Robotic Architecture for Lunar Exploration and Science (HERACLES) project in 2026. HERACLES will return samples to Earth from the lunar surface.[57]

Russian scientists, like their Soviet predecessors, are attempting to build a base on the Moon in the 2030s. To do so, Roscosmos, Russia's civil space agency, is planning a series of missions under its *Luna-Glob* program that will gradually develop the necessary capabilities to establish a presence on the Moon. *Luna-25*, Russia's first lunar mission since 1976, will test soft-landing techniques and other technological advancements. Following that mission, *Luna-26* will orbit the Moon and determine possible landing sites for *Luna-27*, an uncrewed lander that will look for water in the Moon's regolith. Russia is targeting 2021, 2024, and 2025 launch dates for *Luna-25*, *Luna-36, and Luna-27*, respectively. After those three missions, Roscosmos plans to launch an additional three missions to detect and possibly return samples of lunar resources.[58] Roscosmos is developing the *Oryol* (formerly known as Federation) spacecraft to bring future cosmonauts to the Moon's surface and eventually to Russia's lunar base.[59] Russia has also expressed interest in potentially partnering with NASA on the Gateway station.[60]

Strategic Outlook

Given its enormity and apparent lack of accessibility, cislunar space beyond GEO is often conceived as an empty void that is only relevant when it is traversed by astronauts or spacecraft. Yet, between complex gravitational phenomena and resources that could revolutionize life on Earth and encourage deep space exploration beyond the Moon, cislunar space represents an immense challenge for analysts developing future commercial, military, and scientific policy. The cislunar environment today can be analogized to LEO in the early-1960s; some satellites had been launched, but access was generally limited. Similarly, though countries have launched spacecraft to the Moon in the past decade, the launches have been infrequent and the ability to exploit the resources of the Moon remain limited. If countries like the United States, China, India, Japan, and Russia pursue objectives in cislunar space and the Moon in earnest, strategists will need to realign their focus to include the entire Earth-Moon system.

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