INSTITUTE FOR DEFENSE ANALYSES

People's Republic of China in Cislunar Space: Activities, Motivations, and Implications

Kelsey L. Schoeman
Irina Liu

April 2024

Approved for public release;
distribution is unlimited.

IDA Product 3002255

INSTITUTE FOR DEFENSE ANALYSES
730 East Glebe Road
Alexandria, Virginia 22305-3086

About This Publication

This work was conducted under the IDA Systems and Analyses Center Central Research Program, Project C1330, “Space Issues Working Group - Research.” The views, opinions, and findings should not be construed as representing the official position of either the Department of Defense or the sponsoring organization.

Acknowledgments

The authors would like to thank the technical reviewers for their insight and recommendations: Asha Balakrishnan of the IDA Science and Technology Policy Institute, Matthew Hallex and Travis Cottom of the IDA Systems and Analyses Center.

For More Information

Kelsey L. Schoeman, Joint Advanced Warfighting Division
kschoema@ida.org | 703-845-6744

Asha Balakrishnan, Science and Technology Policy Institute
abalakri@ida.org | 202-419-5480

Kristen M. Kulinowski, Director, Science and Technology Policy Institute
kkulinow@ida.org | 202-419-5491

Copyright Notice

INSTITUTE FOR DEFENSE ANALYSES

IDA Product 3002255

People's Republic of China in Cislunar Space: Activities, Motivations, and Implications

Kelsey L. Schoeman
Irina Liu

Executive Summary

The People's Republic of China (PRC) has invested significantly in research and development in cislunar space technologies and missions, from landing on the far side of the Moon to the International Lunar Research Station. In its space narrative, China advocates for the peaceful use of outer space and upholding international space law of not weaponizing outer space and denying any territorial sovereignty in outer space, which aligns with the Outer Space Treaty of 1967; however, there has been concern from entities in the United States on China's presence in cislunar space. Focusing on the regions beyond geostationary orbit to include the upper altitude limit of lunar orbit, this report summarizes China's past, present, and future cislunar space activities. It then discusses PRC's motivations for pursuing these cislunar space activities—international and domestic prestige, scientific discovery, economic benefits, and military advantages—by analyzing official documents and press releases, and statements by officials. The report concludes with the implications for the U.S.-China space competition, including cislunar space norms and governance, space domain awareness, and knowledge sharing and coordination.

This report demonstrates that PRC's cislunar space activities are situated more broadly within its plan and approach to lunar and deep space exploration. The Chinese Lunar Exploration Program and the International Lunar Research Station, and their corresponding technological developments, aim to establish and advance China's long-term presence in space. Motivated by international and domestic prestige, scientific discovery, economic benefits, and the potential military advantages, PRC's cislunar activities can pose a challenge to U.S. cislunar space activities and objectives, particularly in regard to cislunar space norms and governance. While China upholds international space law and promotes the peaceful use of outer space, China's ambitions for prestige and economic benefits will shape its proposals for cislunar norms and governance that favor its national interests. The United States needs to consider this near-peer spacefaring nation when developing its strategic messaging on and its strategy for cislunar space in the age of great power competition.

Contents

1. Introduction

The People's Republic of China (PRC) has invested significantly in research and development in cislunar space technologies and missions, from landing on the far side of the Moon to the International Lunar Research Station (ILRS). In its space narrative, China[1] advocates for the "peaceful use of outer space" and upholding international space law of not weaponizing outer space and denying any territorial sovereignty in outer space, which aligns with the Outer Space Treaty of 1967 (UNOOSA 1967). Cislunar space offers strategic value, including key orbits, lines of communication, international prestige, natural resources, and military advantages, thus developing the domain is in a great power's interest (Berkowitz and Williams 2023). The Chinese government stressed that China is leaping from exploring cislunar space to interplanetary exploration in early 2022 in the fifth White Paper on *China's Activities in Space.* The White Paper identifies cislunar space as an area for further research and development, that China will "continue studies and research on the plan for a human lunar landing, develop new-generation manned spacecraft, and research key technologies to lay a foundation for exploring and developing cislunar space" (The State Council Information Office of PRC 2022).

This report defines cislunar space as "the sphere comprising all the volume between Earth and the Moon," focusing on the regions beyond geostationary orbit (GEO) to include the upper altitude limit of lunar orbit (U.S.-China Economic and Security Review Commission 2019; Duffy and Lake 2021; Willis 2023). There has been substantial concern from the United States about China's presence in cislunar space (Wall 2024). Unlike the United States, PRC does not have a singular document defining its cislunar space strategy. Space exploration and advancement, including cislunar space exploration, are a part of PRC's broader space strategy. This report analyzes China's official cislunar activities and motivations to better understand the implications of China's cislunar presence for the United States. An awareness of China's motivations for its cislunar activities will help U.S. policymakers and stakeholders make more informed decisions on their own strategy, approach, and responses regarding cislunar space.

This report summarizes China's past, present, and future cislunar space activities, which are a part of China's broader plan to establish a long-term presence in space. It then discusses PRC's motivations for pursuing these cislunar space activities—international and domestic prestige, scientific discovery, economic benefits, and potential military

[1] PRC and China are used interchangeably throughout this paper.

advantages—by analyzing official documents and press releases, and statements by officials. Lastly, the report concludes with the implications for the U.S.-China space competition, including cislunar space norms and governance, space domain awareness, and knowledge sharing and coordination.

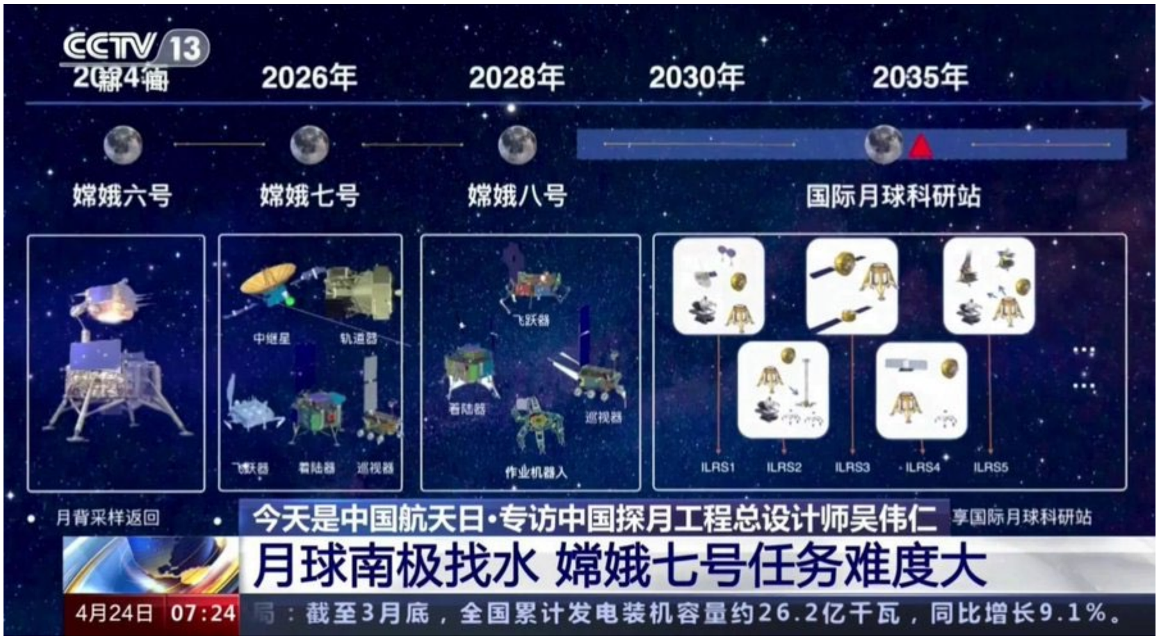
2. PRC's Cislunar Space Activities

The Chinese Lunar Exploration Program (CLEP) was officially approved in January 2004 and encompasses all of China's cislunar activities. CLEP, also known as the Chang'e Program and named after the Moon goddess in Chinese folklore, is managed by the China National Space Administration (CNSA). This chapter highlights China's major cislunar accomplishments, future cislunar plans, and enabling activities for cislunar exploration to provide general context on China's overall cislunar presence in the twenty-first century.

A. Overview of the Chinese Lunar Exploration Program

CLEP was originally divided into three main operational phases with a fourth phase announced after the success of the first three phases (*Xinhua News* 2023; Xiaoci 2023). Table 1 provides a summary of the major past and planned missions of these four phases. The first phase, "circling around the Moon," consisted of two lunar orbiters, the Chang'e-1 (October 2007) and Chang'e-2 (October 2010) missions. The probes of these two missions mapped the lunar topography to provide a reference for future soft landings, which are non-impact landings that prevent any damage to the probe (Haldar 2020). They also mapped the surface chemical composition and other lunar surface features. The second phase, "landing on the Moon," consisted of Chang'e-3 (December 2013), and Chang'e-4 (January 2019) missions, which carried out soft landing and lunar vehicle techniques. Chang'e-4 was a significant advancement for lunar exploration because it was humanity's first landing on the far-side of the Moon, which had not been explored by landers. Chang'e-5-T1 (October 2014) and Chang'e-5 (November 2020) comprised the third phase, "returning from the Moon." The Chang'e-5 mission launched on 23 November 2020 and returned on 16 December 2020 with lunar samples weighing 1,731 g (61.1 oz; Lin and Ziyang 2014; China's National Space Administration 2020).

Following the completion of these first three phases, PRC continued the program with a fourth phase, reportedly approved in 2021, consisting of Chang'e-6, -7 and -8 missions with the objective to "establish an experimental [autonomous] lunar research station at the lunar south pole by 2030" (Hua 2024; Lin et al. 2020). Figure 1 demonstrates how the fourth phase missions lay the foundation for China's future lunar research station.



From left to right: 2024: Chang'e-6 lunar far side sample return; 2026: Chang’e-7 south pole lander, orbiter, rover, hopper; 2028: Chang’e-8 south polar lander, rover, hopper, 3D printing robot; 2030-35: ILRS missions 1-5.

Source: Jones (2024)

Figure 1. CCTV Reported the Chinese Lunar Exploration Program Timeline on 23 April 2023

Table 1. Summary of Chinese Lunar Exploration Program Missions

Phase	Mission	Launch Date	Status	Description
Phase 1	Chang'e-1	10/24/2007	Success	First Chinese lunar mission; lunar orbiter to generate detailed map for reference for future soft landings; mapped the abundance and distribution of various chemical elements on the lunar surface; validated technologies needed to fly a lunar mission.[a]
	Chang'e-2	10/01/2010	Success	Lunar orbiter originally designed as a backup satellite for Chang'e-1; modified to expand on Chang'e-1 mission and return high-resolution images of the lunar surface for selection of future landing site for Chang'e 3 lander and rover mission; completed flyby of asteroid 4179 Toutatis.[b]
Phase 2	Chang'e-3	12/01/2013	Success	Lunar lander equipped with *Yutu** robotic rover; equipped with various scientific instruments to inspect composition of soil and lunar crust; *Yutu* operated for 31 months (originally expected lifespan of 3 months).[c]
	Queqiao-1	05/20/2018	Success (Ongoing)	Communications relay satellite to enable communications between the Chang'e-4 lander on the far side of the Moon and Earth.[d]
	Chang'e-4	12/07/2018	Success (Ongoing)	Lunar lander equipped with *Yutu-2* robotic rover on the far side of the Moon in the South Pole-Aitken Basin; originally constructed as a backup to the Chang'e-3 mission with the same basic structure; modified with a different science payload.[e]

Phase	Mission	Launch Date	Status	Description
Phase 3	Chang'e-5-T1	10/23/2014	Success	Test vehicle for planned 2017 Chang'e-5 lunar sample return mission; tested return capsule.
	Chang'e-5	11/23/2020	Success (Ongoing)	Lunar orbiter, lander, and sample return; landed near Mons Rumker and returned 1,731g of lunar soil to Earth; first lunar sample return since the Soviet Union's Lunar 24 mission in 1976.[f]
Phase 4	Queqiao-2	03/20/2024	Success (Ongoing)	Communications relay satellite to support the future Chang'e-6, 7, and 8 missions as well as the ongoing Chang'e-4 lunar far side rover;[g] more capable follow-up of aging Queqiao-1; entered lunar orbit on March 25.[h]
	Chang'e-6	05/2024		Lunar orbiter, lander, and sample return mission targeting the far side of the Moon in the South Pole-Aitken Basin; objective to collect ~2 kg of lunar soil;[i] originally constructed as a backup to Chang'e-5.[j]
	Chang'e-7	2026		Lunar orbiter, lander, rover, and mini-flying probe; objective to perform an in-depth surface survey of lunar south pole to look for the presence of water-ice.[k]
	Chang'e-8	2028		Objective to test technologies and serve as support basis for ILRS.
	Crewed lunar mission	~2030		Preliminary plan to place two astronauts on the Moon to conduct scientific tasks and collect samples.[l]

*Yutu (literal translation Jade Rabbit) is named after the mythical companion in Chang'e folklore (Wall 2016).

[a] NASA n.d.
[b] NASA n.d.a
[c] NASA n.d.b; Wall 2016
[d] NASA n.d.f
[e] NASA n.d.c
[f] NASA n.d.d
[g] Jones 2023
[h] Jones 2024
[i] NASA n.d.e
[j] Jones 2022a
[k] Ibid.
[l] Jones 2023

Achieving success on five consecutive missions, CLEP has greatly buoyed interest in China’s overall space program and its confidence as a spacefaring nation (Li et al. 2023). China has been able to not only replicate the lunar exploration missions that the United States and the Soviet Union accomplished in the twentieth century, but also achieve global firsts in space. The program built upon each mission’s success and incrementally developed China’s lunar exploration capabilities. The program experienced minimal delays and expanded its mission objectives as Chang’e-2, Chang’e-4, and Chang’e-6 were originally constructed as backup missions in case a previous mission failed (Jones 2020a; Jones 2021; Jones 2022). The fourth phase marks a new chapter in China’s Lunar Exploration Program as it shifts into more applied research focusing on lunar resource utilization and creating the ILRS (Li et al. 2023). This shift demonstrates China’s efforts in establishing a long-term presence in space, with the Moon and its resources serving as a stepping stone for deep space exploration.

B. Major Scientific Discoveries

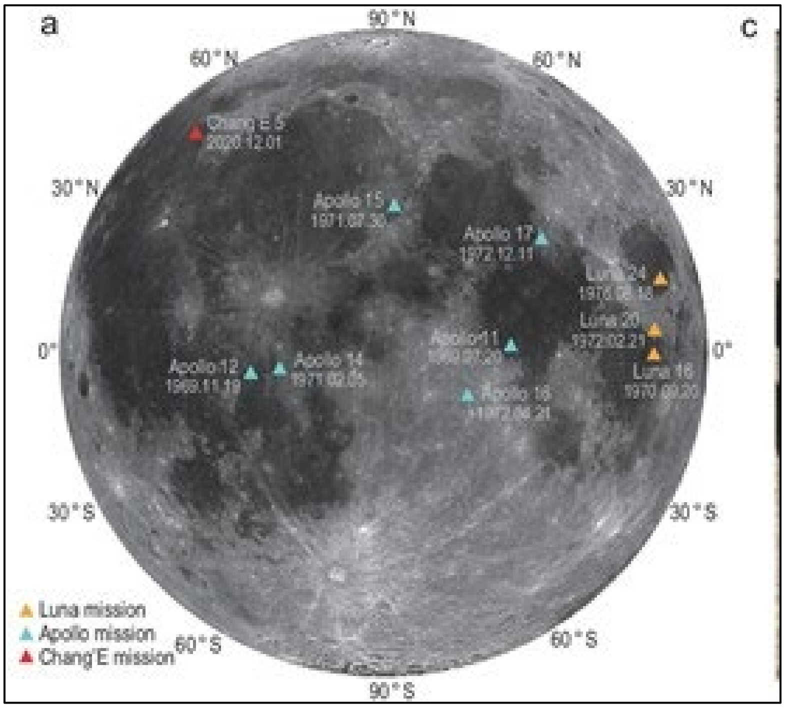
CLEP has achieved major technical feats for uncrewed lunar exploration in orbiting, landing, and returning, demonstrating PRC’s technical capabilities in cislunar exploration. However, CLEP has also contributed to a better lunar understanding and has made major scientific discoveries. These new discoveries have large implications in many scientific fields and have inspired a growing technical workforce. Over 800 scientific papers either using Chang’e data or related to Chang’e data have been published as of April 2022 (Li et al. 2023). This section provides a brief overview of the major scientific achievements by the Chang’e missions, especially highlighting the Chang’e-5 sample return mission.

Chang’e-1 and Chang’e-2 provided detailed imaging of lunar topography and the composition of lunar materials via remote sensing measurements. Subsequent missions gathered remote sensing and in-situ measurements on the chemical and mineral composition of lunar surface materials; the thickness and distribution patterns of the surface layer’s rocks, dust, and other materials; and the microwave properties of lunar soil (Li et al. 2023).

Additionally, Chang’e-5 returned lunar soil from a latitude that was not reached by previous Apollo and Luna sampling missions (Figure 2), thus expanding humanity’s lunar sample sites and providing a new understanding of the Moon (Li et al. 2022). The Chang’e-5 sample contains the youngest dated lunar igneous rock with the least contamination by ejecta, filling a critical gap in the Moon’s geological history (Hu et al. 2021; *Phys.org*. 2021). The sample is being studied by 100 groups at 13 domestic research organizations working on 31 scientific projects (China's National Space Administration 2022).

A research team from the China Institute of Atomic Energy (CIAE) identified the abundance of over 40 elements using neutron activation analysis in early 2022. However, most recent studies have focused on the abundance of water and Helium-3 (Fan Anqui

2022). Researchers from the Chinese Academy of Sciences (CAS) have found glass beads in the lunar sample and suggest that these glass beads may act as a hidden reservoir of water (He et al. 2023). Their study estimates that potentially 600 trillion pounds of water may be trapped in the top 40 feet of the lunar surface, which would potentially be a convenient resource for water extraction for future human crews and deep space exploration missions (He et al. 2023).



Note: Chang'e-5 sampled from a new area at mid-latitude

Source: Li et al. (2022)

Figure 2. The Geographic Location of the Lunar Sampling Sites and Dates

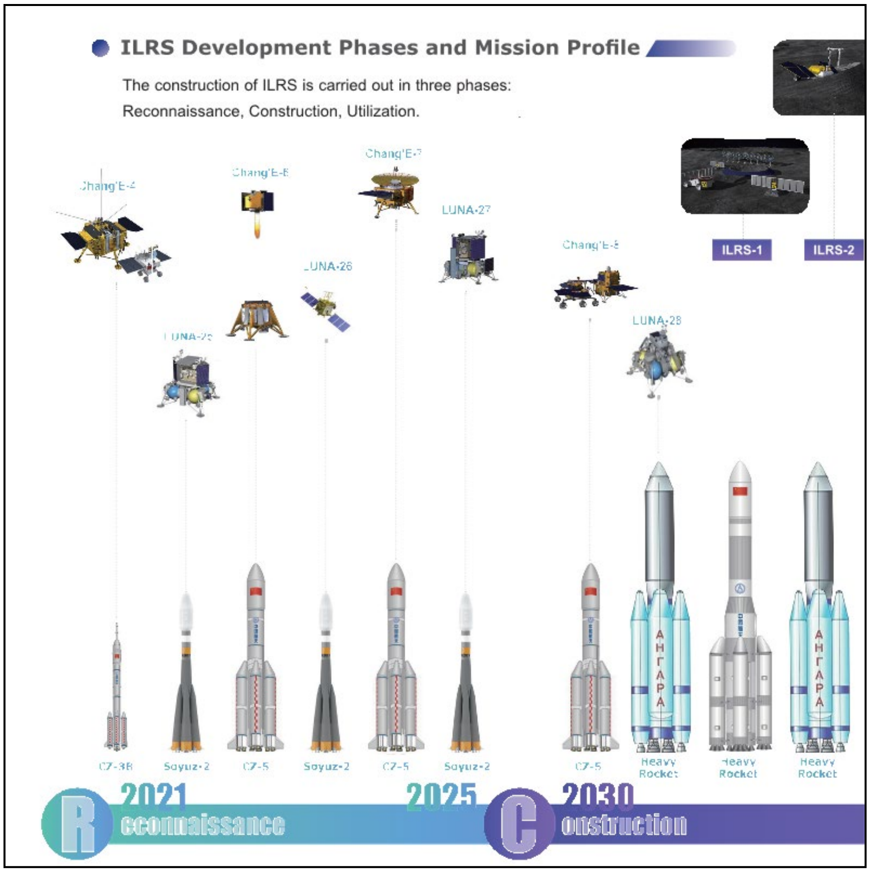
Furthermore, CNSA and the China Atomic Energy Authority (CAEA) confirmed the discovery of a new mineral, named Changesite-(Y) (嫦娥石), characterized by colorless, transparent columnar crystals (*Xinhua News* 2022). Changesite-(Y) contains Helium-3, a light stable helium isotope that is rare on Earth, but believed to be abundant on the Moon (*Xinhua News* 2022; Sherriff 2022). Given its non-radioactive nature, Helium-3 is an attractive option for nuclear fusion reactors and provides a sustainable source of clean energy, as well as nuclear weapons with minimal to no radiation or fallout (Mortier 2015). However, there is still significant debate regarding how useful Helium-3 might be at meeting lunar energy needs (Vidal 2022). Ouyang Ziyuan, the chief scientist of CLEP, said that the Moon's Helium-3 deposits could solve humanity's energy demand (Gibson 2021). These discoveries might have large implications regarding lunar resources and the future cislunar economy. A better understanding of lunar soil composition will support a long-term presence on the Moon and in deep space.

C. International Lunar Research Station

While all Chang'e missions exhibited international cooperation with other space agencies providing support or participating in the various Chang'e missions, phase four marks a shift in China's approach to cislunar international cooperation. International cooperation is at the forefront of CLEP with the announcement of the ILRS in 2019 by CNSA (Wu 2023; 佘惠敏 She Huimin 2023). Led by China, ILRS is a multilateral cooperative framework to establish a research platform with a lunar base either on the lunar surface or in lunar orbit to carry out scientific experiments and explore long-term autonomous operation. CNSA and Russia's space agency, Roscosmos, signed a memorandum of understanding on the ILRS in March 2021 and revealed the roadmap and partnership guidelines in June 2021.

As outlined in PRC's "International Lunar Research Station (ILRS) Guide for Partnership" released in June 2021, the construction of the ILRS consists of three phases: reconnaissance, construction, and utilization (CNSA 2021). For the reconnaissance phase, the objectives include selecting the ILRS site and verifying the technology for secure high precision soft landing. Chang'e-4 helped support the ILRS reconnaissance even though it was not made for ILRS, specifically.

The future missions planned for the reconnaissance phase include PRC's Chang'e-6, and -7 missions, and the Russian Luna-26 and -27 missions. Following the planned missions, the construction phase—scheduled for 2030–2035—aims to conduct a massive-cargo delivery and high precision landing for the establishment of the in-orbit and surface facilities of the ILRS, including energy, communication, and transport infrastructure (CNSA 2021). Plans for the ILRS are reported to include "cislunar transportation facilities, long-term support facilities on lunar surface, lunar transportation and operation facilities, scientific facilities, as well as ground support and application facilities" (*Dongfang Hour* 2021). Finally, the last phase of utilization is scheduled to begin in 2035 with the objective of scientific research and exploration, expanding ILRS modules as needed (CNSA 2021).



Source: CNSA (2021) p.4

Figure 3. ILRS Development Phases

As of April 2024, eight countries (in addition to China), Russia, Pakistan, Thailand, Venezuela, South Africa, Azerbaijan, Belarus, and Egypt have signed agreements for ILRS participation (Jones 2024e; Jones 2024f). China has faced difficulties attracting government partners because many nations with a space program have already signed the Artemis Accords with the United States. The ILRS is perceived as a parallel project and potential competitor to the U.S.-led Artemis program. The ILRS Partnership agreement is a technical program, whereas the Artemis Accords are considered a diplomatic, geopolitical approach. There is nothing that explicitly precludes a country from signing both the ILRS and the Artemis Accords, but there are obvious geopolitical reasons that make it unlikely. A caveat to this is that the United Arab Emirates (UAE) has signed the Accords, but a university in the UAE signed on to ILRS (Jones 2023e). As of April 2024, outside of national-level participation, nine non-governmental entities—including the intergovernmental organization, Asia-Pacific Space Cooperation Organization (APSCO) and Hawaii's International Lunar Observatory Association (ILOA)—have also signed agreements for ILRS participation (Jones 2024e).

D. Enabling Technologies for Cislunar Missions

Future Chang'e and ILRS mission objectives require additional technologies and capabilities. This section summarizes the China's developments in enabling technologies, including lunar communications and navigation, launch vehicles, and space domain awareness capabilities. These technologies are critical building blocks to China's long-term presence in space.

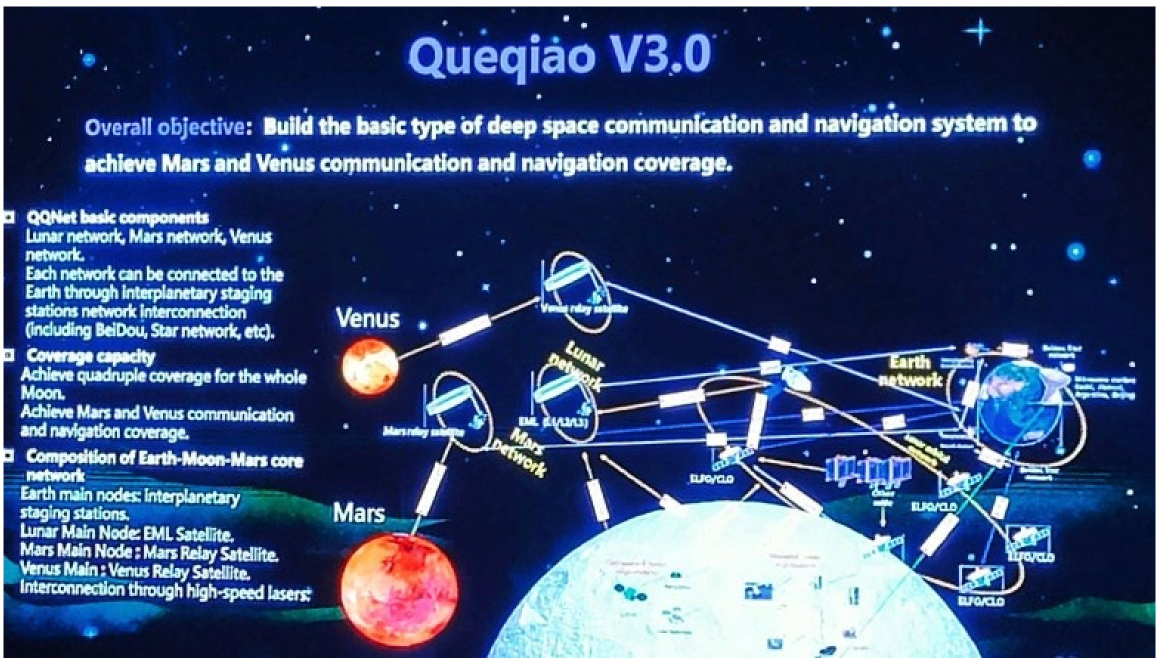
1. Lunar Communications and Navigation

One of the critical mission requirements to explore the far side of the Moon is lunar communications. To address this requirement, PRC developed the Queqiao ("Magpie Bridge") satellites, inspired by the Chinese folktale *The Cowherd and the Weaver Girl*, where a flock of magpies formed a bridge to reunite two star-crossed lovers (the cowherd and the weaver girl). Since direct communication with Earth is not possible on the far side of the Moon, China launched the Queqiao-1 communications relay satellite to support the Chang'e-4 mission landing on the far side of the Moon. Launched in May 2018 several months before the Chang'e-4 mission, Queqiao-1 is in halo orbit around the Earth-Moon L2 point.

Queqiao-2 replaced the aging Queqiao-1 when it launched on 19 March 2024 and entered orbit on 24 March 2024 (Jones 2024d). Its first task is communications support for Chang'e-6. Queqiao-2 will also continue assisting the ongoing Chang'e-4 lunar far side lander. Queqiao-2 is in an elliptical frozen orbit, instead of the L2 halo orbit, with the expectation that the frozen orbit will be highly stable and require minimal maintenance. Subsequently, Queqiao-2 will switch to a 12-hour period orbit to support the 2026 Chang'e-7 and 2028 Chang'e-8 missions to the lunar south pole (Jones 2023d). It is expected to operate for at least 8 years to support these missions (Jones 2024c; Zhang 2021).

To build communications infrastructure for the ILRS and future space missions, China has proposed a *Queqiao constellation*, creating a network of satellites for lunar relay communications and navigation, and eventually remote sensing (Zhang 2021). Such a constellation could support long-duration robotic and human lunar missions operating on the far side of the Moon. Wu Weiren, a chief engineer of CLEP, described such a constellation as the "lunar version of the Beidou Navigation system" in an interview in April 2023 (*Baidu News* 2023). A parallel project for the United States would be the National Aeronautics and Space Administration's (NASA) LunaNet, which has similar objectives to support the Artemis program with communications, navigation, and networking capabilities (Schauer and Baird 2021).

At the 2023 International Astronautical Congress (IAC), Xi Xiangyu, an engineer at the System Research Institute under China's Deep Space Exploration Laboratory, presented a three-phase plan to achieve a lunar communication, navigation, and remote sensing network (Jones 2023c). The first phase consists of Queqiao-2 and two companion satellites (Tiandu-1 and Tiandu-2) launched on 19 March 2024. The Tiandu experimental satellites are expected to fly in formation in lunar orbit and validate navigation and communications technology to lay the groundwork for a future constellation (Jones 2024d). The second phase consists of a series of satellites that provide coverage of the entire Moon. According to Andrew Jones, a recent proposal included “three satellites each in [Earth-Moon Lagrange point (EML)] EML1 and EML2, plus another at EML3, six circular orbit satellites, a pair in elliptical frozen orbits and a geostationary ‘orbital interplanetary station’” (Jones 2023c). The third phase proposes a system for deep space communication and navigation beyond cislunar space (Jones 2023c; Figure 4).



Source: Jones (2023c)

Figure 4. Phase Three of the Chinese Queqiao Constellation Concept

Chinese space authorities have also mentioned that the Queqiao spacecraft could support other countries’ future lunar missions by providing communication and navigation services for the far side of the Moon (Jones 2024d). China had previously granted NASA and other space agencies access to Queqiao-1 for future lunar missions (Bilibili 2023; Needham 2019).

Additionally, China has developed the Chinese Deep Space Network (CDSN). It is composed of at least seven different locations in China with radio telescopes, and two overseas stations in Argentina and Namibia (Burke 2022). CDSN works in conjunction with CAS’s very-long-baseline interferometry (VLBI) network, which also has locations outside of PRC, to determine the precise orbit of its spacecraft using several radio telescopes (Burke 2023). CDSN can communicate and track China's Lunar and Martian probes. According to Kristin Burke, "China has tested extending its VLBI capability to its overseas stations in Argentina and Namibia, but found that there was not enough bandwidth for those stations to transmit real time tracking data and VLBI data back to Beijing, so the former [VLBI] will continue as the priority" (Burke 2022, p. 4).

2. Launch Vehicles

All CLEP missions were launched using the Long March series of rockets produced by the China Aerospace Science and Technology Corporation (CASC), a state-owned entity for the aerospace industry. Chang'e missions 1–4 were launched on various medium-lift Long March 3 rockets. Chang'e-5 was launched on a heavy-lift Long March 5, which had previously suffered a failure in 2017, leading to a 3-year delay for the Chang'e-5 mission (Jones 2024c). Chang'e missions 6–8 will also be launched with the Long March 5 vehicle. To achieve future crewed lunar missions, CASC is developing super heavy-lift launch vehicles, which could be ready as early as 2027 (Jones 2023a).

Planning for future deep space exploration missions, CASC released the "2017–2045 Development Roadmap for Space Transportation System" in November 2017 (*People's Daily* 2017). The roadmap outlines the stages for the Long March series of launch vehicles with the goal to achieve nuclear-powered space shuttles around 2040. The stages to reach this point progress in 5-year increments with the following objectives:

- reusable suborbital carriers (2025),
- heavy carrier rockets for manned lunar landings and sample returns from the Moon and Mars (2030),
- reusable carrier rockets (2035), and
- "subversive changes in the ways of entering and leaving space and space transportation, and the construction of ladders, earth stations, and space stations" (2045; The State Council of PRC 2017).

CASC has already made extensive progress on the first two objectives. CASC also plans to launch two reusable rockets in 2025 and 2026 in preparation for the future crewed missions to the Moon (Nalewicki 2024). Since China envisions cislunar space to be a foundation for its long-term presence in space, there is a plan to develop a transport hub orbiting Earth with permanently docked nuclear-powered shuttles that are accessible from Earth with reusable rockets (Messier 2019).

3. Cislunar Space Domain Awareness

Space domain awareness (SDA), traditionally applied to near-Earth space between low Earth orbit (LEO) and GEO, is also critical for cislunar space security. A Chinese military thinktank emphasized the importance for a country to build up its SDA infrastructure and capabilities in order to not fall behind in the future era of space development (陈经纬 Chen Jingwei 2023). With the expansion of cislunar space activities, detecting objects moving to and from the Moon is critical. Generally, China is behind the United States, the European Union, and Russia in terms of SDA (Wang et al. 2022). Despite its numerous lunar missions, PRC—much like many other spacefaring nations, including the United States—lacks the ability to detect and monitor objects in cislunar space as China does not have a specialized system for SDA beyond GEO.

The majority of China's ground-based optical telescopes are focused on LEO and GEO (Willis 2023; Burke 2022). While CAS and some Chinese universities have optical telescopes that could detect and track objects in cislunar space, they are primarily scheduled for academic efforts in astronomical studies. While China is developing many different SDA systems and technologies that have capacity beyond GEO, it is not clear that it has prioritized cislunar SDA as opposed to near-Earth SDA.

3. Motivations

PRC has developed and implemented comprehensive plans for its lunar exploration program and its international lunar research station. There are many different drivers for why nations choose to go to the Moon and invest in space activities broadly; some of these drivers include the promise of national prestige and geopolitical advantages along with economic growth and development (Lal et al. 2015). Synthesizing official policies, plans, statements, as well as academic and media articles, this chapter outlines four motivations for China's cislunar space activities: international and domestic prestige, scientific discovery, economic benefits, and military advantages. While these motivations are not unique to China, they are rooted in the China's history and PRC ideology. These motivations demonstrate that PRC's space activities, more broadly than just in cislunar space, contribute to its national objective to expand its long-term presence in space, expand its comprehensive national power, and achieve and maintain recognition as an international leader in the space domain.

A. International and Domestic Prestige

Prestige is a significant driver for space activities for many spacefaring nations. Accomplishments in lunar exploration have a strong impact on self-confidence and national pride. This is especially true given China's experiences with foreign imperialism in the nineteenth and twentieth century. Under Xi Jinping's leadership, PRC endeavors to achieve the "China Dream" or "Strong Country Dream" (强国梦), in other words, to achieve the great rejuvenation and build a powerful, modern socialist country (*Yunnan Net* 2022). Within this strategic aim is the "space dream" (航天梦), which promotes the advancement of China's space industry and interlocks space exploration and space advancements with achieving economic strength, improving international prestige, enhancing national pride and self-confidence, and building comprehensive national power.

The China Dream and the space dream are founded in Chinese history as the great rejuvenation of China is to essentially stand up to the world and demonstrate that China cannot and will not again be bullied, subjugated, or challenged by foreign powers. A 2016 article published by official state news agency *Xinhua* explained that, "The series of unequal treaties signed by the Qing Dynasty and foreign powers is a shame, but it should become a kind of monument, not forgetting our humiliating history, and supporting and cherishing the hard-won peaceful life now" (*Xinhua News* 2016). Furthermore, in traditional history, Chinese folklore emphasizes a mythical fascination of the Moon and demonstrates the cultural importance of the Moon. Such folklore and mythology have a direct impact on current cislunar activities, as exhibited with the names of the missions and equipment of the activities (Zheng et al. 2008).

To be seen as a strong country by both Chinese citizens and other countries, PRC deems it necessary to have a strong aerospace industry. A *China Daily* article stated, "if [China] lags behind others in the aerospace industry and lacks anything to say, it will not be a first-class country, it will not be worthy of the expectations of the people of the world, and it will not be able to win the respect of other nations" (*China Daily* 2016). PRC recognizes the international prestige that has resulted from successful space missions, particularly sending humans to the Moon and accomplishing missions that other nations have not achieved previously.

A popular quote reoccurs across Chinese articles, social media posts, and even film: "Today we complain that our ancestors 500 years ago gave up the sea, and we cannot let our children and grandchildren 500 years later complain that we gave up the stars."[2] This unattributed quote reveals two possible motivations behind China's space exploration: (1) not being left behind while the rest of the world explores space, and (2) redemption for past failures and enabling future generations for success in the world.

In an interview, Wu Weiren, the chief engineer of China's Lunar Exploration Program, stated, "Compared with American astronauts who can only stay for dozens of hours after landing on the Moon, Chinese astronauts will stay on the Moon for a longer time, and astronauts are expected to carry out some scientific research work on the Moon" (*Zhongguo Xinwen Wang* [*China News*] 2021). Wu's statement clearly outlines that China aims to go further than what the United States has already accomplished by having astronauts stay longer and also land on the Moon's south pole. Wu recognized during the same interview that China's space ambitions were a long-term endeavor, and that China does not yet have the capabilities to put a person on the Moon now but will in the future. As it relates to building prestige domestically and internationally, cislunar space offers a visible objective for China to achieve and to compare its accomplishments to the other great powers: the United States and Russia. However, U.S. policies and programs are not the sole or leading driver for China's space program and cislunar activities; rather, PRC space aspirations are rooted in PRC's history and ideology (Berkowitz and Williams 2023). China has successfully accumulated prestige already with its landing on the far side of the

---

2 Some trace the origins of China's failure to keep pace with the West at sea to the time China burned its naval fleet due to its fear of free trade. The full Chinese quote is, "今天我们抱怨500年前的祖先放弃了大海，不能让500年后的子孙抱怨我们放弃了星辰。" (迷彩虎 Mi Caihu, "中国人为何非要去火星？绝不能让后人再抱怨我们放弃了星辰大海！ [Why Do Chinese People Go to Mars? Never Let Future Generations Complain That We Have Given up the Sea of Stars!]," *Sina*, July 27, 2020, http://k.sina.com.cn/article_6004273387_m165e1f0eb00100tei7.html?cre=tianyi&mod=pcpager_tech&loc=7&r=9&rfunc=45&tj=none&tr=9&from=mil; 张冰 Zhang Yong, "嫦娥三号发射与我们有何直接关系？ [What Is the Relationship Between the Chang'e 3 Launch and Us?" Zhihu, https://www.zhihu.com/question/22165121]

Moon, receiving congratulations and recognition from the NASA Administrator in 2019 (Kaplan et al. 2019).

Alongside the China Dream and the space dream is the recurring narrative that China is committed to the "peaceful use of outer space," demonstrating how China positions itself as a shaper of cislunar norms and governance on the international stage. China portrays its space activities as solely peaceful and committed to upholding the Outer Space Treaty (*China News Network* 2012; Delegation of PRC to UN and Other International Organizations in Vienna 2010; *The People's Daily* 2020). A *People's Daily* article refers to China's space activities "as a staunch force for maintaining world peace, [and] China's outer space activities not only abide by international law and abide by international commitments, but also appeal and advocate for the peaceful use of outer space in the international community" (*Baidu News and the People's Daily* 2022).

In January 2022, China released its fifth *China's Activities in Space* White Paper; previous Space White Papers were released in 2000, 2006, 2011, and 2016. These official White Papers are published by the State Council Information Office of China and summarize China's past and future space activities, the mission or purpose of space activities, and the space policies. All of the Space White Papers stress the peaceful use of outer space and scientific discovery. Significantly, the latest White Paper highlights China's striving for leadership in outer space with the first sentence of the preamble being a quote from Xi Jinping: "To explore the vast cosmos, develop the space industry and build China into a space power is our eternal dream" (The State Council Information Office of PRC 2022). The strong language is followed by a declaration that "China upholds the principle of exploration and utilization of outer space for peaceful purposes" (The State Council Information Office of PRC 2022).

B. Scientific Discovery

Scientific discovery and technological capabilities are deeply intertwined with prestige. China considers achievements in deep space exploration as extremely impressive and only reserved for the strongest nations in science and technology. As a journal article published in 2008 by scholars from CAS states, "lunar exploration is a hotspot for spaceflight nowadays in the world, and also an important reflection of a country's comprehensive national strength and science and technology level" (Zheng et al. 2008). The success of its Chang'e missions in terms of validation of the country's technical capabilities have buoyed China's self-confidence and national prestige as a science and technology leader.

CLEP is portrayed as a key opportunity for scientific research and has yielded extensive scientific discoveries. Most official statements and media articles about China's reasons and motivations for its space activities emphasize scientific research as a driving factor, including human development and utilization of lunar resources, astronomical observation, and deep space exploration (Taiwan Affairs Office of the PRC State Council 2010; *Baidu* 2022; Chinese Academy of Sciences 2003). In response to a reporter inquiring why China should invest in costly deep space exploration, Ouyang Ziyuan stated, "In my opinion, China's deep space exploration should implement limited goals and focus on breakthroughs, which can ensure that our deep space exploration not only conforms to my country's current national conditions and international development trends, but also saves money to the greatest extent" (Taiwan Affairs Office of the PRC State Council 2010).

C. Economic Benefits

In addition to the promise of scientific discovery and exploration, the cislunar economy is projected to be worth trillions as it offers plentiful resources, such as water, Helium-3, and rare Earth metals. Guo Bing, head of the Institute of Nuclear Physics at CIAE, highlights the importance of lunar resources after the Chang'e-5 sample return mission, stating "we can extract more than 30 kilograms of titanium from one ton of lunar samples, the content of which is more than six times the average of titanium on Earth." Although there is promise for resources, there is much debate on how much the lunar resources will be worth: for example, whether it is more economical to launch water to the Moon or to create a colony and develop the technology to mine lunar water.

There is also the broader opportunity for economic growth and development with cislunar activities. Chinese policy documents, such as the *Five-Year National Science and Technology Innovation Plan* or the *National Medium- and Long-Term Science and Technology Development Planning Outline*, offer a different glimpse into the planning and ambitions of China's space program. The *Five-Year Plans for Economic and Social Development* do not mention the "peaceful use of outer space" and only refer to space for national defense and economic benefit.[3] For example, one of the few mentions of China's space program in the *14th Five-Year Plan for Economic and Social Development,* which was passed in March 2021 by the National People's Congress for the years 2021–2025, is about developing space infrastructure in the section titled, "Promote the simultaneous increase of national defense strength and economic strength" (Center for Security and Emerging Technology 2022; *Xinhua News* 2021; The State Council of PRC 2021).

China's *Science and Technology Daily* newspaper published a report in 2020 about a presentation given by Bao Weimin—the director of the Science and Technology Committee of the First Academy of CASC—at a forum hosted by China Academy of Launch Vehicle Technology. In this presentation, Bao stated China's interest in establishing a "space economic zone" that could produce US$10 trillion a year by 2050

3 *The Five-Year Plan for Economic and Social Development of the People's Republic of China* is the highest-level Plan the State Council releases with implications for civil space. China's *Five-Year Plans* are social and economic development initiatives published by PRC detailing objectives for China's economy, science and technology, policy, environment, and culture.

(Lan Shunzheng 2022; Jones 2020). While the official might represent his individual perspective, or even his organization—CASC, a state-owned enterprise—the "space economic zone" has not been stated as an initiative by PRC.

Nonetheless, an article published by the PRC State Council stated that the Moon's development would bring incalculable economic benefits, and "the secondary development and application of other technologies will inevitably promote the development and improvement of the industry." It uses the example that the Apollo missions generated 3,000 patents, which led to the development of high-tech industries such that "every dollar invested brought five dollars of benefits" (Taiwan Affairs Office of the PRC State Council, 2010).

D. Building Military Advantages

In addition to prestige and profit, cislunar space offers military advantages to PRC. Despite the recurring phrase of "peaceful use of outer space" in PRC's space narrative, there are reports and articles from prior to 2007 that explicitly, though briefly, comment on the military angle of China's space program. As one netizen eloquently wrote on a *Zhihu* post about reasons for China's lunar exploration, "If we are to lie, then [the lunar missions] are to engage in scientific research; if we are to tell the truth, then [the lunar missions] have a military objective" (*Baidu* 2007). Ouyang Ziyuan, Chief Scientist of the Chinese Lunar Exploration Program, noted that the Moon offers a "special space environment to build astronomical observatories and research bases with high precision, low construction cost, and low operation and maintenance costs; it is also a commanding point for environmental monitoring and military strategic significance" (*大众日报 Dazhong Ribao* 2007).

Official PRC statements and policies rarely articulate a military angle for pursuing space activities, and if they do, it is strictly in relation to national defense, such as in the *14th Five Year Plan*. Regardless, there are military advantages of cislunar space, to include conducting unmonitored operations, increasing surveillance capabilities, and restricting other spacefaring nations' activities in the region. PRC's military build-up to achieve the great rejuvenation and increase its comprehensive national power extends to the space domain.

4. Implications for the United States: Cislunar Norms and Governance

PRC's activities in cislunar space serve as building blocks for its deep space exploration and as an opportunity to leap-frog the U.S. space program. As China advances its cislunar space capabilities, there are implications for U.S. national interests and the space program that U.S. policymakers and government stakeholders need to consider.

PRC contributes to international space norms and governance by working through international organizations, such as the United Nations Committee on the Peaceful Uses of Outer Space (COPUOS). For example, in March 2024, the Chinese delegation to the Working Group on Legal Aspects of Space Resource Activities of the Legal Subcommittee of the COPUOS submitted a document expressing its position on the use of space resources. The document argues that the use of space resources is legal, but stresses the need to uphold existing space law frameworks with the Outer Space Treaty as a cornerstone. It also acknowledges topics that need greater consideration, such as the sustainable use of space resources and the supervision of national activities, including commercial space actors (United Nations Legal Subcommittee of the Committee 2024). Christopher Johnson, director of legal affairs and space law at the Secure World Foundation, stated that this submission by the Chinese delegation demonstrates that China takes international organizations seriously, and "seems to be engaging in good faith with the fora and with the process" (Jones 2024a).

The present-day legal infrastructure for cislunar space is limited and immature, and is prime for development and shaping. Since space is a core component of China's "comprehensive national power," China is motivated to shape cislunar space norms and to be a leader in science and technology innovation and exploration in the space domain. It is in both the United States' and PRC's interest to shape the space norms and legal infrastructure as it will dictate future long-term industrial production and economic activity, and even future defense advantages. Although China offers an alternate framework for cislunar space norms to the United States, as demonstrated by the ILRS framework and the Artemis Accords respectively, PRC does not seek to dramatically alter space norms based on publicly available information.

That said, it is important to acknowledge PRC's coercive campaigns to promote its interests and claims, such as its efforts in the South China Sea that violate international law and international maritime norms (Marek 2021). Ouyang Ziyuan, in a 2007 article that highlighted why China wants to explore the Moon, acknowledged the Moon does not belong to anyone but noted the first to conquer and make use of its plentiful minerals, metals, and energy resources will have claim to it (*大众日报 Dazhong Ribao* 2007; Goswami 2019). If spacefaring nations and commercial entities seek to mine lunar water or Helium-3, the strategic locations will be on a first-come, first-served basis (Duffy and Lake 2021; *大众日报 Dazhong Ribao* 2007; Goswami 2019). As often quoted in Western academic articles, a statement by Ye Peijian, Chief Commander and Chief Designer of CLEP, in an interview with a CCTV reporter in 2019, reinforces these concerns:

> The universe is an ocean, the Moon is the Diaoyu Islands, and Mars is the Huangyan Island. If we can go now but if we do not, then future generations will blame us. Others have gone and occupied it, and you cannot go there no matter how much you want to. This reason is enough [to go to the Moon].[4]

Much like in the South China Sea, China might seek to establish its own territorial claims on the Moon and act to enforce its claims. If China moves to establish an exclusive economic zone or space defense identification zone in cislunar space, and has the capabilities to enforce these zones, it could severely limit U.S. freedom of access to the strategic chokepoints, such as LaGrange points and resource rich regions, and enable PRC to monopolize the lunar resources (Berkowitz and Williams 2023).

At the same time, PRC is keeping a close watch on U.S. cislunar policies and activities. Lan Shunzheng, a research fellow at Charhar Institute and a member of the Chinese Institute of Command and Control, argued that PRC needs to pay close attention to the strategic issues of cislunar space as the United States endeavors to establish cislunar space norms and to cultivate cislunar space to support military operations. Lan emphasized that the U.S. Space Force's "Introduction to Cislunar Space," released in June 2021, proposed a concept for conducting combat operations in cislunar space that "kicked off the U.S. attempt to control cislunar space, marking a new stage in its pursuit of space hegemony" (Lan Shunzheng 2020, 2022). The United States needs to be mindful of its own cislunar space narrative and activities and its potential influence on China. The Outer Space Treaty forbids military activity on the Moon, but not necessarily in the space around it. This naturally informs what the U.S. and Chinese militaries choose to do (UNOOSA 1967). While U.S. activities in cislunar space might not be the primary driver or motivator for PRC's program, it is likely a consideration in PRC's decision-making process.

Given the caveat that China might cultivate cislunar space for military operations, there is a need for cislunar SDA. At present, U.S. Earth-based SDA is not sufficient to

---

4 Original Chinese text:
"宇宙就是个海洋，月亮就是钓鱼岛，火星就是黄岩岛，我们现在能去我们不去，后人要怪我们。别人去了，别人占下来了，你再想去都去不了。这一条理由就够了" (赛欣言, "热血院士叶培建：面向未来 探索星辰大海[Enthusiastic Academician Ye Peijian: Exploring the Stars and the Sea in the Future]," *CCTV News*, September 18, 2019, https://news.cctv.com/2019/09/18/ARTI40ad9pLx5jBrz8rnohTS190918.shtml.

monitor Chinese activities on the far side of the Moon. Since both PRC and the United States do not have cislunar SDA capabilities, both states are near a similar starting point. The volume of space around the Moon is still large and in the near-term, cislunar space will not face the same space traffic management (STM) requirements as spacecraft in LEO. Cislunar SDA requires additional consideration about its technology, purpose, and implications.

The United States has an opportunity to set standards early, such as creating a two-line element, the standardized format for documenting a satellite's orbit, equivalent for the Moon, and cultivating a STM system around the Moon. Standards in cislunar STM are important because they can (1) foster legitimacy needed for managing space traffic and protecting the space environment, (2) achieve consensus for stakeholders and stimulate a predictable and supportive environment, and (3) limit the number of dangerous actions in space (Gleason 2019). Creating these cislunar standards can position the U.S. Department of Commerce as a leader in STM in cislunar space. Using the Department of Commerce rather than the U.S. Department of Defense to develop these standards is important in the United States' strategic messaging to the international community, especially PRC, about upholding the peaceful use of space. In light of these opportunities, the United States should identify and evaluate specific efforts and standards regarding cislunar SDA and their possible advantages.

While it can be counterintuitive, U.S. policymakers might also consider knowledge sharing with PRC in regard to cislunar space to shape cislunar norms and governance. Although the United States and China generally do not collaborate on space activities given the heavy restrictions from U.S. policy, specifically the Wolf Amendment, there are many opportunities for knowledge sharing.[5] A recent example is the announcement from CNSA allowing international groups to submit research proposals for portions of the Chang'e-5 lunar sample. NASA granted its researchers permission to apply to the CNSA for access to the Chang'e-5 lunar sample, having provided the necessary certification to Congress beforehand (Jones 2023f; Normile 2023). The United States stands to gain a better understanding of the Moon by participating in such research.

Given the success and rapid development of the Chang'e missions, the United States could also benefit from valuable insights and lessons learned from these missions, especially in areas for which China paved the way (i.e., landing on the far side of the Moon). Wu Weiren, the chief engineer of CLEP, commented that NASA scientists had

---

5 Passed in 2011, the Wolf Amendment prohibited NASA, the White House's Office of Science and Technology Policy, and the National Space Council from using Federal funding to engage in bilateral cooperation with PRC and Chinese state-affiliated organizations. Cooperation between organizations is allowed only with certification from the Federal Bureau of Investigation to ensure there is no risk of information sharing and that no Chinese officials involved who have a record of human rights violations. (Makena Young, "Bad Idea: The Wolf Amendment (Limiting Collaboration with China in Space)," *Defense360*, December 4, 2019, accessed April 16, 2024, https://defense360.csis.org/bad-idea-the-wolf-amendment-limiting-collaboration-with-china-in-space/)

asked to leverage China's Queqiao-1 relay satellite to plan a NASA mission to the far side of the Moon (Chen 2019; Xin 2024). There were also discussions between NASA and CNSA to exchange data between NASA's lunar orbiter and the Chang'e-4 lander and coordinate findings on lunar landing research (S. Chen 2024).

Another area for potential cooperation is NASA's Deep Space Network (DSN) and China's Deep Space Network. DSN is an array of giant radio antennas in Australia, Spain and California that supports interplanetary spacecraft missions, including the Artemis I mission, and provides radar and radio astronomy observations (Monaghan 2023; NASA Jet Propulsion Laboratory 2022). However, it is increasingly costly to maintain and in high demand (Foust 2023). DSN gives priority to crewed spacecrafts, therefore when Artemis comes online, other space programs will become secondary (Foust 2023). PRC is developing the CDSN and VLBI network, but it is unclear whether PRC uses or is reliant on NASA's DSN. Both the DSN and the CDSN have disadvantages: the former is stretched thin across demands and the latter does not have the same international capabilities. If PRC does not have the capability to track and communicate with its crewed missions in deep space, then NASA could offer assistance through DSN to enable, augment, or serve as a backup to PRC's those missions, and vice versa. This exchange would be considered sharing an enabling technology rather than information sharing.

China also emphasizes that it is open to U.S.-China space collaboration and international space cooperation. In December 2023, a spokesperson for CNSA, Xu Hongliang, responded to U.S. Ambassador to China Nicholas Burns, to demonstrate that the lack of U.S.-China space collaboration is due to U.S. policy, especially with the Wolf Amendment (CNSA 2023). China believes it is up to the United States to decide on the level of cislunar collaboration between the two countries.

Both the United States and PRC seek to establish cislunar norms and governance, and the open-source documents suggest that both parties largely agree on the legal frameworks. By working through the international organizations as responsible space actors, the United States and PRC can build a mutually agreeable legal framework for cislunar governance, but the United States needs to be wary of possible divergences between PRC's stated objectives and its activities, as well as its own space narrative and strategic messaging to manage escalation in the cislunar domain.

5. Conclusion

PRC's cislunar space activities are situated more broadly within its plan and approach to lunar and deep space exploration. The Chinese Lunar Exploration Program and the International Lunar Research Station, and their corresponding technological developments, aim to establish and advance China's long-term presence in space. Motivated by international and domestic prestige, scientific discovery, economic benefits, and the potential military advantages, PRC cislunar activities can pose a challenge to U.S. cislunar space activities and objectives, particularly in regard to cislunar space norms and governance. While China upholds international space law and promotes the peaceful use of outer space, China's ambitions for prestige and economic benefits will shape its proposals for cislunar norms and governance that favor its national interests.

The United States needs to consider this near-peer spacefaring nation when developing its strategic messaging on and its strategy for cislunar space in the age of great power competition.

References

Berkowitz, Marc, and Chris Williams. 2023. "Strategic Implications of China's Cislunar Space Activities." Occasional Paper, National Space Security Association, August 21, 2023. https://nssaspace.org/wp-content/uploads/2023/08/Strategic-Implications-of-Chinas-Cislunar-Space-Activities-8.21-final.pdf.

Burke, Kristin. 2022. "China's Space Situational Awareness Capacity for Beyond GEO." China Aerospace Studies Institute. September 12, 2022. https://www.airuniversity.af.edu/CASI/Display/Article/3154886/chinas-space-situational-awareness-capabilities-for-beyond-geo/.

———. 2023. "China Kicks Off Construction of New Telescopes for Future Lunar Missions." November 9, 2023. https://english.cas.cn/newsroom/cas_media/202311/t20231109_642655.shtml

Center for Security and Emerging Technology. 2022. "CSET Original Translation: Outline of the People's Republic of China 14th Five-Year Plan for National Economic and Social Development and Long-Range Objectives for 2035." August 15, 2022. https://cset.georgetown.edu/publication/china-14th-five-year-plan/.

Chen, Laurie. 2019. "NASA Wanted to Use China's Spacecraft to Plan a New American Moon Mission, Top Chinese Scientist Says." *South China Morning Post*, January 16, 2019. Accessed April 2, 2024. https://www.scmp.com/news/china/science/article/2182253/nasa-wanted-use-chinas-spacecraft-plan-new-american-Moon-mission?campaign=2182253&module=perpetual_scroll_0&pgtype=article.

Chen, Stephen. 2024. "Skynet 2.0: China Plans to Bring Largest Surveillance Camera Network on Earth to the Moon to Protect Lunar Assets." *South China Morning Post*, March 4, 2024. Accessed April 2, 2024. https://www.scmp.com/news/china/science/article/3254054/skynet-20-china-plans-bring-largest-surveillance-camera-network-earth-Moon-protect-lunar-assets?campaign=3254054_112d337a-f0dd-11ee-b2bc-02cf01f3e550&module=perpetual_scroll_1_AI&pgtype=article.

China's National Space Administration. 2020. "China's Chang'e-5 Retrieves 1,731 Grams of Moon Samples." December 19, 2020. https://www.cnsa.gov.cn/english/n6465652/n6465653/c6810963/content.html.

———. 2021. "International Lunar Research Station (ILRS) Guide for Partnership." June 16, 2021. https://www.cnsa.gov.cn/english/n6465652/n6465653/c6812150/content.html.

———. 2022. "New Mineral Found by Chinese Scientists." September 9, 2022. https://www.cnsa.gov.cn/english/n6465652/n6465653/c6840851/content.html.

———. 2023. "Update: China Open to Space Exchanges with U.S.: CNSA." Beijing, December 22, 2023. https://www.cnsa.gov.cn/english/n6465652/n6465653/c10449500/content.html.

Chinese Academy of Sciences. "China Kicks Off Construction of New Telescopes for Future Lunar Missions." November 9, 2023. https://english.cas.cn/newsroom/cas_media/202311/t20231109_642655.shtml.

Dongfang Hour. 2021. "China and Russia's Lunar Ambitions: A Year of Big News." September 2, 2021. Accessed April 19, 2022. https://dongfanghour.com/china-russia-ilrs/.

Duffy, Laura, and James Lake. 2021. "Cislunar Spacepower the New Frontier." *Space Force Journal*, no. 2 (December 31, 2021). Accessed April 2, 2024. https://spaceforcejournal.org/3859-2/.

Fan Anqi. 2022. "China Determines over 40 Elements in Chang'e-5 Lunar Samples, 'Significant for Moon Formation Studies.'" *Global Times*, March 27, 2022. Accessed April 2, 2024. https://www.globaltimes.cn/page/202203/1256907.shtml.

Feng Hua. 2024. "New Journey Begins for Fourth Phase of China's Lunar Exploration Program." *People's Daily*, March 28, 2024. Accessed April 2, 2024. http://en.people.cn/n3/2024/0328/c90000-20150651.html.

Foust, Jeff. 2023. "NASA Deep Space Network Reaches "Critical Point" as Demand Grows." *SpaceNews*, August 29, 2023. Accessed April 16, 2024. https://spacenews.com/nasa-deep-space-network-reaches-critical-point-as-demand-grows/.

Gibson, Liam. 2021. "China Plans Moon Mining to 'Power Earth for 10,000 Years'." *Taiwan News*, November 9, 2021. Accessed April 19, 2022. https://www.taiwannews.com.tw/en/news/4339520.

Gleason, Michael. 2019. "Establishing Space Traffic Management Standards, Guidelines, and Best Practices." Aerospace Center for Space Policy and Strategy, The Aerospace Corporation, September 2, 2019. https://csps.aerospace.org/papers/establishing-space-traffic-management-standards-guidelines-and-best-practices.

Haldar, S. K. 2020. "Extraterrestrial Systems." In *Introduction to Mineralogy and Petrology*, 53–107. *Elsevier*.

He, Huicun, Jianglong Ji, Yue Zhang, Sen Hu, Yangting Lin, Hejiu Hui, and Jialong Hao et al. 2023. "A Solar Wind-Derived Water Reservoir on the Moon Hosted by Impact Glass Beads." *Nature Geoscience* 16, no. 4 (2023): 294–300. https://doi.org/10.1038/s41561-023-01159-6.

Hu, Sen, Huicun He, Jianglong Ji, Yangting Lin, Hejiu Hui, Mahesh Anand, and Romain Tartèse et al. 2021. "A Dry Lunar Mantle Reservoir for Young Mare Basalts of Chang'e-5." *Nature* 600, no. 7887 (2021): 49–53. https://doi.org/10.1038/s41586-021-04107-9.

Jones, Andrew. 2020. “From a Farside First to Cislunar Dominance? China Appears to Want to Establish ‘Space Economic Zone’ Worth Trillions.” *SpaceNews*, February 15, 2020. Accessed April 2, 2024. https://spacenews.com/from-a-farside-first-to-cislunar-dominance-china-appears-to-want-to-establish-space-economic-zone-worth-trillions/.

———. 2020a. “China Rolls Out Long March 5 Rocket to Launch Chang’e-5 Lunar Sample Return Mission.” *SpaceNews*, November 17, 2020. Accessed April 2, 2024. https://spacenews.com/china-rolls-out-long-march-5-rocket-to-launch-change-5-lunar-sample-return-mission/.

———. 2021. “1,000 Days on the Moon! China’s Chang’e 4 Lunar Far Side Mission Hits Big Milestone.” *Space*, October 5, 2021. Accessed April 2, 2024. https://www.space.com/china-chang-e-4-Moon-far-side-1000-days.

———. 2022. “China’s Next Moon Missions Get the Green Light.” *Space*, September 13, 2022. Accessed April 2, 2024. https://www.space.com/china-Moon-exploration-chang-e-missions-approved.

———. 2022a. “China Outlines Pathway for Lunar and Deep Space Exploration.” *SpaceNews*, November 28, 2022. Accessed April 2, 2024. https://spacenews.com/china-outlines-pathway-for-lunar-and-deep-space-exploration/.

———. 2023. “China Sets Out Preliminary Crewed Lunar Landing Plan.” *SpaceNews*, July 17, 2023. Accessed April 2, 2024. https://spacenews.com/china-sets-out-preliminary-crewed-lunar-landing-plan/.

———. 2023a. “China’s New Moon Rocket Could Launch as Soon as 2027.” *Space*, July 26, 2023. Accessed April 2, 2024. https://www.space.com/china-new-rocket-progress-astronaut-Moon-mission.

———. 2023b. “China Makes Chang’e 5 Moon Samples Open to International Researchers.” *Space*, August 14, 2023. Accessed April 2, 2024. https://www.space.com/china-change-5-Moon-samples-open-international-researchers.

———. 2023c. “China Wants a Lunar Satellite Constellation to Support Deep Space Missions.” *SpaceNews*, October 5, 2023. Accessed April 2, 2024. https://spacenews.com/china-wants-a-lunar-satellite-constellation-to-support-deep-space-missions/.

———. 2023d. “China to Launch Queqiao-2 Moon Relay Satellite in Early 2024.” *SpaceNews*, October 17, 2023. Accessed April 2, 2024. https://spacenews.com/china-to-launch-queqiao-2-Moon-relay-satellite-in-early-2024/.

———. 2023e. “Emirati University Signs up to China’s Moon Base Project.” *SpaceNews*, November 20, 2023. Accessed April 16, 2024. https://spacenews.com/emirati-university-signs-up-to-chinas-Moon-base-project/.

———. 2023f. “NASA Researchers Get Permission to Apply for China’s Moon Samples.” *SpaceNews*, December 1, 2023. Accessed April 2, 2024.

https://spacenews.com/nasa-researchers-get-permission-to-apply-for-chinas-Moon-samples/.

———. 2024. "'Chinese Lunar Exploration Timeline, via CCTV/DSEL: …'." Accessed April 2, 2024. https://twitter.com/AJ_FI/status/1650379939592515585.

———. 2024a. "China Outlines Position on Use of Space Resources." *SpaceNews*, March 6, 2024. Accessed April 2, 2024. https://spacenews.com/china-outlines-position-on-use-of-space-resources/.

———. 2024c. "China Rolls Out Rocket for Queqiao-2 Lunar Satellite Launch." *SpaceNews*, March 18, 2024. Accessed April 2, 2024. https://spacenews.com/china-rolls-out-rocket-for-queqiao-2-lunar-satellite-launch/.

———. 2024d. "China's Queqiao-2 Relay Satellite Enters Lunar Orbit." *SpaceNews*, March 25, 2024. Accessed April 2, 2024. https://spacenews.com/chinas-queqiao-2-relay-satellite-enters-lunar-orbit/.

———. 2024e. "China Adds New Moon Base Project Partners, but Struggles to Attract National-Level Participation." *SpaceNews*, March 28, 2024. Accessed April 2, 2024. https://spacenews.com/china-adds-new-Moon-base-project-partners-but-struggles-to-attract-national-level-participation/.

———. 2024f. "Thailand Joins China-Led ILRS Moon Base Initiative." *SpaceNews*, April 5, 2024. Accessed April 16, 2024. https://spacenews.com/thailand-joins-china-led-ilrs-Moon-base-initiative/.

Kaplan, Sarah, Gerry Shih, and Rick Noack. 2019. "China Lands Spacecraft on the Far Side of the Moon, a Historic First." *The Washington Post*, January 3, 2019. Accessed April 16, 2024. https://www.washingtonpost.com/science/2019/01/03/china-lands-spacecraft-far-side-Moon-historic-first/.

Lal, Bhavya, Emily J. Sylak-Glassman, Michael C. Mineiro, Nayanee Gupta, Lucas M. Pratt, and Abigail R. Azari. 2015. *Global Trends in Space Volume 1: Background and Overall Findings*. P-5242, Institute for Defense Analyses, Science and Technology Policy Institute, June 2015. https://www.ida.org/-/media/feature/publications/g/gl/global-trends-in-space-volume-1-background-and-overall-findings/p5242v1.pdf.

Li, Chunlai, Hao Hu, Meng-Fei Yang, Zhao-Yu Pei, Qin Zhou, Xin Ren, and Bin Liu et al. 2022. "Characteristics of the Lunar Samples Returned by the Chang'e-5 Mission." *National science review* 9, no. 2 (2022): nwab188. https://doi.org/10.1093/nsr/nwab188.

Li, Chunlai, Wei Yan, Jianjun Liu, and Ziyuan Ouyang. 2023. "Innovative Developments in Lunar and Planetary Science Promoted by China's Lunar Exploration." *Science China Earth Sciences* 66, no. 11 (2023): 2399–2418. https://doi.org/10.1007/s11430-022-1030-8.

Marek, Jon. 2021. "US-China International Law Disputes in the South China Sea." *Wild Blue Yonder*, July 9, 2021. Accessed April 2, 2024. https://www.airuniversity.af.edu/Wild-Blue-Yonder/Article-

Display/Article/2685294/us-china-international-law-disputes-in-the-south-china-sea/.

Messier, Doug. 2019. "China's Ambitious Plans to Dominate Cislunar Space." *Parabolic Arc*, December 26, 2019. Accessed April 19, 2022. http://www.parabolicarc.com/2019/12/26/chinas-ambitious-plans-to-dominate-cislunar-space/.

Monaghan, Heather. 2023. "What Is the Deep Space Network?" *The National Aeronautics and Space Administration*, September 29, 2023. Accessed April 16, 2024. https://www.nasa.gov/directorates/somd/space-communications-navigation-program/what-is-the-deep-space-network/.

Mortier, Jan. 2015. "China Leads Race to the Moon." *The Diplomat*, January 7, 2015. Accessed April 16, 2024. https://thediplomat.com/2015/01/china-leads-race-to-the-Moon/.

Nalewicki, Jennifer. 2024. "China Will Launch Giant, Reusable Rockets Next Year to Prep for Human Missions to the Moon." *Space*, March 11, 2024. Accessed April 2, 2024. https://www.space.com/china-reusable-rockets-human-Moon-missions.

Namrata Goswami. 2019. "China's Future Space Ambitions: What's Ahead?" *The Diplomat*, November 4, 2019. Accessed July 6, 2022. https://thediplomat.com/2019/11/chinas-future-space-ambitions-whats-ahead/.

NASA Jet Propulsion Laboratory. 2022. "How NASA's Deep Space Network Supports the Agency's Missions." November 15, 2022. Accessed April 16, 2024. https://www.jpl.nasa.gov/news/how-nasas-deep-space-network-supports-the-agencys-missions.

National Aeronautics and Space Administration. n.d. "Chang'e 1." https://nssdc.gsfc.nasa.gov/nmc/spacecraft/display.action?id=2007-051A.

———. n.d.a. "Chang'e 2." https://nssdc.gsfc.nasa.gov/nmc/spacecraft/display.action?id=2010-050A.

National Aeronautics and Space Administration. n.d.b. "Chang'e 3." https://nssdc.gsfc.nasa.gov/nmc/spacecraft/display.action?id=2013-070A.

———. n.d.c. "Chang'e 4." https://nssdc.gsfc.nasa.gov/nmc/spacecraft/display.action?id=2018-103A.

———. n.d.d. "Chang'e 5." https://nssdc.gsfc.nasa.gov/nmc/spacecraft/display.action?id=2020-087A.

———. n.d.e. "Chang'e 6." https://nssdc.gsfc.nasa.gov/nmc/spacecraft/display.action?id=CHANG-E-6.

———. n.d.f. "Queqiao." https://nssdc.gsfc.nasa.gov/nmc/spacecraft/display.action?id=QUEQIAO.

Needham, Kirsty. 2019. "Red Moon Rising: China's Mission to the Far Side." *The Sydney Morning Herald*, January 19, 2019. Accessed April 2, 2024.

https://www.smh.com.au/world/asia/red-Moon-rising-china-s-mission-to-the-far-side-20190117-p50s0y.html.

Normile, Dennis. 2023. "NASA Opens Door to Cooperation with China on Moon Rock Research." *Science*, December 7, 2023. Accessed April 16, 2024. https://www.science.org/content/article/nasa-opens-door-cooperation-china-Moon-rock-research.

People's Daily. 2017. "China to Achieve "Major Breakthrough" in Nuclear-Powered Space Shuttle Around 2040: Report." November 17, 2017. http://en.people.cn/n3/2017/1117/c90000-9293719.html.

Phys.org. 2021. "Samples Returned by Chang'e-5 Reveal Key Age of Moon Rocks." October 7, 2021. Accessed April 2, 2024. https://phys.org/news/2021-10-change-samples-reveal-key-age.html.

Pultarova, Tereza. 2023. "Hidden Water Source on the Moon Found Locked in Glass Beads, Chinese Probe Reveals." *Space*, March 28, 2023. Accessed April 2, 2024. https://www.space.com/Moon-water-glass-beads-change-5-reveals.

Schauer, Katherine, and Danny Baird. 2021. "LunaNet: Empowering Artemis with Communications and Navigation Interoperability." The National Aeronautics and Space Administration, October 7, 2021. Accessed April 16, 2024. https://www.nasa.gov/humans-in-space/lunanet-empowering-artemis-with-communications-and-navigation-interoperability/.

Sherriff, Lucy. 2022. "Scientists in China Discover Rare Moon Crystal That Could Power Earth." *Discovery*, October 13, 2022. Accessed April 2, 2024. https://www.discovery.com/science/scientists-in-china-discover-rare-Moon-crystal-that-could-power-.

The State Council Information Office of the People's Republic of China. 2022. "Full Text: China's Space Program: A 2021 Perspective." Beijing, January 2022. http://english.www.gov.cn/archive/whitepaper/202201/28/content_WS61f35b3dc6d09c94e48a467a.html.

U.S.-China Economic and Security Review Commission. 2019. "Chapter 4 Section 3 - China's Ambitions in Space - Contesting the Final Frontier." Annual Report to Congress. November 2019. https://www.uscc.gov/annual-report/2019-annual-report-congress.

United Nations Legal Subcommittee of the Committee. 2024. "Submission by the Delegation of China to the Working Group on Legal Aspects of Space Resource Activitiesof the Legal Subcommittee of the Committee on the Peaceful Uses of Outer Space." March 2024. https://www.unoosa.org/documents/pdf/copuos/lsc/space-resources/LSC2024/English_Chinas_submission_to_the_working_group_on_space_resources.pdf.

UNOOSA. 1967. "Treaty on the Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and other Celestial Bodies." United Nations. https://www.unoosa.org/pdf/gares/ARES_21_2222E.pdf.

Vidal, Florian. 2022. “Helium-3 from the Lunar Surface for Nuclear Fusion?” *Association Polytechnique Insights*, May 17, 2022. Accessed April 16, 2024. https://www.polytechnique-insights.com/en/braincamps/space/extraterrestrial-mining/helium-3-from-the-lunar-surface-for-nuclear-fusion/.

Wall, Mike. 2016. “China’s Yutu Moon Rover Bites the Lunar Dust.” *Space*, August 8, 2016. Accessed April 2, 2024. https://www.space.com/33681-china-Moon-rover-yutu-dead.html.

———. 2024. “US Must Beat China Back to the Moon, Congress Tells NASA.” *Space*, January 17, 2024. Accessed April 16, 2024. https://www.space.com/us-win-Moon-race-china-congress-artemis-hearing.

Wang, Beichao, Shuang Li, Jinzhen Mu, Xiaolong Hao, Wenshan Zhu, and Jiaqian Hu. 2022. “Research Advancements in Key Technologies for Space-Based Situational Awareness.” *Space: Science & Technology* (2022). https://doi.org/10.34133/2022/9802793.

Willis, Shawn. 2023. “To the Moon: Strategic Competition in the Cislunar Region.” *Æther: A Journal of Strategic Airpower & Spacepower* 2 (2023): 17–30. Accessed April 2, 2024. https://www.airuniversity.af.edu/Portals/10/AEtherJournal/Journals/Special-Edition_Winter2023/Willis.pdf.

Wu, Xiaodan. 2023. “The International Lunar Research Station: China’s New Era of Space Cooperation and Its New Role in the Space Legal Order.” *Space Policy* 65 (2023): 101537. https://doi.org/10.1016/j.spacepol.2022.101537.

Xiaoci, Deng. 2023. “Chief Designer Discloses China’s Phase-4 Lunar Probe Plans.” *Global Times*, February 6, 2023. Accessed April 2, 2024. https://www.globaltimes.cn/page/202302/1284935.shtml.

Xin, Ling. 2024. “China to Hear Pitches from Nasa Scientist, Other Researchers, to Study Chang’e 5 Lunar Samples.” *South China Morning Post*, April 10, 2024. Accessed April 16, 2024. https://www.scmp.com/news/china/science/article/3258530/china-hear-pitches-nasa-scientist-other-researchers-study-change-5-lunar-samples.

Xinhua News Network. 2021. “中华人民共和国国民经济和社会发展第十四个五年规划和2035年远景目标纲要 [The 14th Five-Year Plan for National Economic and Social Development of the People’s Republic of China and Outline of the Vision for 2035].” The State Council of the People’s Republic of China, Beijing, March 13, 2021. http://www.gov.cn/xinwen/2021-03/13/content_5592681.htm.

———. 2023. “China to Advance Lunar Exploration Program-Xinhua.” February 6, 2023. Accessed April 2, 2024. https://english.news.cn/20230206/10408e89573d4ca5bd8db3d84054fab1/c.html.

———. 2022. “Chinese Scientists Discover New Lunar Mineral.” September 9, 2022. Accessed April 2, 2024. https://english.news.cn/20220909/28b26d3c26e44a9a92365a9e40e5611d/c.html.

Xu Lin, and Ouyang Ziyang. 2014. “Scientific Progress in China’s Lunar Exploration Program.” *Space Science Activities in China*, 2014. http://english.cssar.cas.cn/ic/CNCOSPAR/201410/W020141016603613596668.pdf.

Xu Lin, Pei Zhaoyu, Zou Yongliao, and Wang Chi. 2020. “China’s Lunar and Deep Space Exploration Program for the Next Decade (2020-2030).” *Journal of Space Science (空间科学学报)* 40, no. 5 (2020): 615–17. https://www.cjss.ac.cn/cn/article/doi/10.11728/cjss2020.05.615.

Young, Makena. 2019. “Bad Idea: The Wolf Amendment (Limiting Collaboration with China in Space).” *Defense360*, December 4, 2019. Accessed April 16, 2024. https://defense360.csis.org/bad-idea-the-wolf-amendment-limiting-collaboration-with-china-in-space/.

Zhang, Lihua. 2021. “Development and Prospect of Chinese Lunar Relay Communication Satellite.” *Space: Science & Technology* (2021). https://doi.org/10.34133/2021/3471608.

Zheng, Yongchun, Ziyuan Ouyang, Chunlai Li, Jianzhong Liu, and Yongliao Zou. 2008. “China’s Lunar Exploration Program: Present and Future.” *Planetary and Space Science* 56, no. 7 (2008): 881–86. https://doi.org/10.1016/j.pss.2008.01.002.

“中国探月计划出台始末以及必须登月的七大理由 [The Beginning and End of China’s Lunar Exploration Plan and Seven Reasons Why It Must Land on the Moon].” Taiwan Affairs Office of the PRC State Council, September 30, 2010. http://www.taiwan.cn/zt/szzt/change2/change221/change222/201009/t20100930_1547585.htm.

Baidu. “中国进行探月的原因 [Reasons for China Conducting Lunar Explorations].” November 7, 2007. https://zhidao.baidu.com/question/39124655.html.

Baidu News and the People’s Daily. “为和平利用太空贡献中国智慧和力量（望海楼）[Contribute Chinese Wisdom and Strength to the Peaceful Use of Space (Wanghai Tower)].” July 6, 2022. https://baijiahao.baidu.com/s?id=1737549489042303910&wfr=spider&for=pc.

人民政协网 [People’s Political Consultative Conference Network]. “委员故事丨中国人为什么要探月？ [Committee Member: Why Do Chinese People Explore the Moon?].” *Baidu*, April 21, 2022. https://baijiahao.baidu.com/s?id=1730647910561138311&wfr=spider&for=pc.

佘惠敏She Huimin. “国际月球科研站彰显中国襟怀 [International Lunar Scientific Research Station Demonstrates China’s Ambition].” *The Paper*, October 8, 2023. Accessed April 2, 2024. http://paper.ce.cn/pad/content/202310/08/content_282027.html.

兰顺正. “兰顺正：美军要构建“地月空间安全”[Lan Shunzheng: The US Military Wants to Build “Earth-Moon Space Security”].” *世界知识*, August 17, 2022. https://baijiahao.baidu.com/s?id=1741375133634297854&wfr=spider&for=pc.

兰顺正Lan Shunzheng. “Why China Should and Will Continue to Participate in Peacekeeping.” *CGTN*, September 27, 2020. Accessed April 2, 2024. https://news.cgtn.com/news/2020-09-27/Why-China-should-and-will-continue-to-participate-in-peacekeeping-U7DbedQBnG/index.html.

CCTV News. “在月球上看电视不是梦！中国航天未来如何构建深空通信网？[Watching TV on the Moon Is No Longer a Dream! How Will China's Space Industry Build a Deep Space Communication Network in the Future?].” https://content-static.cctvnews.cctv.com/snow-book/index.html?item_id=12299542021816630005&toc_style_id=feeds_default&track_id=F0BF222E-75DE-4A5B-B70E-1D692B20CE62_732666550668&share_to=wechat.

China News Network. “外交部官员：防止外空和平利用出现军事化倾向 [Ministry of Foreign Affairs Official: Prevent the Tendency of Militarization of Peaceful Use of Outer Space].” January 13, 2012. https://www.chinanews.com.cn/gn/2012/01-13/3604324.shtml.

张冰Zhang Yong. “嫦娥三号发射与我们有何直接关系？ [What Is the Relationship Between the Chang'e 3 Launch and Us?.” https://www.zhihu.com/question/22165121.

Yunnan Net. “彩云网评：航天梦为中国梦增添异彩[Caiyun.Com Review: Aerospace Dream Adds Color to the Chinese Dream.” April 24, 2022. https://m.yunnan.cn/system/2022/04/24/032045466.shtml.

Chinese Academy of Sciences. “我们为什么要发展航天事业Women Wei Shenme Yao Fazhan Hangtian Shiye [Why Do We Want to Develop the Aerospace Sector].” July 3, 2003. https://www.cas.cn/zt/kjzt/kpf/xcl/200307/t20030703_1711348.shtml.

“我国发布未来航天运输系统路线图 [My Country Releases Roadmap for Future Space Transportation System].” The State Council of the People's Republic of China, November 17, 2017. http://www.gov.cn/xinwen/2017-11/17/content_5240308.htm.

Baidu News. “我国正在构建月球通信导航卫星星座，对比星链哪个更厉害？[My Country Is Building a Lunar Communications and Navigation Satellite Constellation. Which One Is More Powerful Compared to Starlink?].” April 24, 2023. https://baijiahao.baidu.com/s?id=1764049066681559966&wfr=spider&for=pc.

“联合国和平利用外层空间委员会简介 [Introduction to the United Nations Committee on the Peaceful Uses of Outer Space].” Delegation of the People's Republic of China to the United Nations and Other International Organizations in Vienna, Vienna, April 11, 2010. https://www.mfa.gov.cn/ce/cgvienna//chn/dbtyw/hplywk/COPUOS_CH/t209025.htm.

“航天专家：月球探测工程具有重要意义 [Aerospace Expert: Moon Exploration Engineering Is of Great Significance].” Taiwan Affairs Office of the PRC State

Council, September 30, 2010. http://www.taiwan.cn/zt/szzt/change2/change221/change222/201009/t20100930_1547585.htm.

China Daily. "“航天梦”与“中国梦” [Space Dream and the China Dream]." September 16, 2016. https://china.chinadaily.com.cn/theory/2016-09/16/content_26805874.htm.

许翀Xu Chong. "中国梦， 强国梦， 人民的梦 [China Dream, Strong Country Dream, and the People's Dream." *Xinhua News Network*, February 10, 2016. http://www.xinhuanet.com/politics/2016-02/10/c_128712071.htm.

赛欣言. "热血院士叶培建：面向未来 探索星辰大海[Enthusiastic Academician Ye Peijian: Exploring the Stars and the Sea in the Future]." *CCTV News*, September 18, 2019. https://news.cctv.com/2019/09/18/ARTI40ad9pLx5jBrz8rnohTS190918.shtml.

赵竹青Zhao Zhuqing. "浩瀚宇宙 不懈追梦 习近平殷殷嘱托指引航天强国路 [The Vast Universe, Unremitting Pursuit of Dreams, Xi Jinping Earnestly Entrusted to Guide the Road to Aerospace Power]." *The People's Daily*, April 24, 2020. http://scitech.people.com.cn/n1/2020/0424/c1007-31685775.html.

迷彩虎Mi Caihu. "中国人为何非要去火星？绝不能让后人再抱怨我们放弃了星辰大海！ [Why Do Chinese People Go to Mars? Never Let Future Generations Complain That We Have Given up the Sea of Stars!]." *Sina*, July 27, 2020. http://k.sina.com.cn/article_6004273387_m165e1f0eb00100tei7.html?cre=tianyi&mod=pcpager_tech&loc=7&r=9&rfunc=45&tj=none&tr=9&from=mil.

郭超凯 [Guo Chaokai]. "中国探月工程总师详解月球科研站如何建？载人登月如何开展？[The Chief Engineer of China's Lunar Exploration Project Explained in Detail How to Build a Lunar Scientific Research Station? How Does the Manned Moon Landing Work?]." *中国新闻网Zhongguo Xinwen Wang [China News]*, March 11, 2021. https://www.chinanews.com.cn/gn/2021/03-11/9430020.shtml.

陈经纬Chen Jingwei. "全知全能—太空态势感知系统 [Omniscient and Omnipotent—Space Situational Awareness System]." *军鹰动态Joint Armament Think Tank*, June 5, 2023. https://www.sohu.com/a/682247310_358040.

青年科技派. *青年科技派丨中外青年科研人员热议中国探月进程 [Youth Science and Technology Group 丨Young Scientific Researchers at Home and Abroad Discuss China's Lunar Exploration Process]*. Bilibili, 2023. https://www.bilibili.com/video/BV1ZM4y1J7o4/.

大众日报Dazhong Ribao. "首席科学家详解:中国为什么要探月？ [Detailed Explanation of the Chief Scientist: Why Should China Explore the Moon?]." October 24, 2007. http://www.dzwww.com/xinwen/xinwenzhuanti/07cety/zs/200710/t20071024_2553796.htm.

Xinhua News. "“鹊桥”通天择日架 “嫦娥”奔月待时飞 [The “Magpie Bridge” Connects the Sky and Chooses a Day to Build the “Chang’e” to Fly to the Moon].” May 2, 2018. http://www.xinhuanet.com/politics/2018-05/02/c_1122771103.htm.

Abbreviations

APSCO	Asia-Pacific Space Cooperation Organization
CAEA	China Atomic Energy Authority
CAS	Chinese Academy of Sciences
CASC	China Aerospace Science and Technology Corporation
CDSN	Chinese Deep Space Network
CIAE	China Institute of Atomic Energy
CLEP	Chinese Lunar Exploration Program
CNSA	China National Space Administration
COPUOS	Committee on the Peaceful Uses of Outer Space
DSN	Deep Space Network
GEO	geostationary orbit
IAC	International Astronautical Congress
ILOA	International Lunar Observatory Association
ILRS	International Lunar Research Station
LEO	low Earth orbit
NASA	National Aeronautics and Space Administration
PRC	People's Republic of China
SDA	Space domain awareness
STM	space traffic management
UAE	United Arab Emirates
VLBI	very-long-baseline interferometry

REPORT DOCUMENTATION PAGE			*Form Approved* *OMB No. 0704-0188*

1. REPORT DATE *(DD-MM-YYYY)*	**2. REPORT TYPE**	**3. DATES COVERED** *(From - To)*
XX-04-2024	FINAL	

4. TITLE AND SUBTITLE People's Republic of China in Cislunar Space: Activities, Motivations, and Implications	**5a. CONTRACT NUMBER** HQ0034-19-D-0001
	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S) Shoeman, Kelsey L. Liu, Irina	**5d. PROJECT NUMBER** C1330
	5e. TASK NUMBER
	5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) IDA Systems and Analyses Center 730 East Glebe Road Alexandria, VA 22305-3086	**8. PERFORMING ORGANIZATION REPORT NUMBER** IDA Product 3002255
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) IDA Systems and Analyses Center 730 East Glebe Road Alexandria, VA 22305-3086	**10. SPONSOR/MONITOR'S ACRONYM(S)** IDA
	11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT

Approved for public release; distribution is unlimited (3 May 2024).

13. SUPPLEMENTARY NOTES

14. ABSTRACT

This report summarizes China's past, present and future cislunar space activities, which are a part of China's broader plan to establish a long-term presence in space. It then discusses the PRC's motivations for pursuing these cislunar space activities—international and domestic prestige, scientific discovery, economic benefits, and potential military advantages—by analyzing official documents and press releases, and statements by officials. Lastly, the report concludes with the implications for the U.S.-China space competition, including cislunar space norms and governance, space domain awareness, and knowledge sharing and coordination.

15. SUBJECT TERMS

China; cislunar space; cislunar governance; cooperation; great power competition

16. SECURITY CLASSIFICATION OF:			**17. LIMITATION OF ABSTRACT**	**18. NUMBER OF PAGES**	**19a. NAME OF RESPONSIBLE PERSON**
a. REPORT	**b. ABSTRACT**	**c. THIS PAGE**			Kulinowski, Kristen M.
Unclassified	Unclassified	Unclassified	SAR	42	**19b. TELEPHONE NUMBER** *(Include area code)* 202-419-5491

Reset

Standard Form 298 (Rev. 8/98)
Prescribed by ANSI Std. Z39.18