COMMITTEE ON
SCIENCE, SPACE
AND TECHNOLOGY
CHAIRMAN BRIAN BABIN

SUBCOMMITTEE ON SPACE & AERONAUTICS

HEARING CHARTER

"Strategic Trajectories: Assessing China's Space Rise and the Risks to U.S. Leadership"

Thursday, December 4, 2025
9:00 AM
2318 Rayburn House Office Building

Purpose

The purpose of the hearing is to examine the progress of the People's Republic of China in achieving its goal of becoming a dominant space power. It will outline China's objectives for its national space programs, both in terms of completing space missions and in advancing its geopolitical influence. The hearing will evaluate China's space strategy, including the benefits of a consistent political direction, sustained funding, and its military-civil fusion approach. Finally, it will highlight the risks of ceding leadership in space exploration to China, with a particular focus on the Moon, as well as the broader economic, geopolitical, and national security consequences of China attaining preeminence in space.

Witnesses

- **Mr. Dean Cheng,** Senior Fellow**,** The Potomac Institute for Policy Studies
- **Mr. Clayton Swope,** Deputy Director, Aerospace Security Project**,** Center for Strategic and International Studies
- **Dr. Patrick Besha,** Founder, Global Space Group
- **Dr. Michael D. Griffin,** Co-President, LogiQ, Inc.

Overarching Questions

- What are the key objectives for China's national space programs?
- What is the state of China's space program, and to what extent does it represent a threat to U.S. global space leadership?
- What are the broader economic, geopolitical, and national security consequences of ceding space leadership to China?

Background

The People's Republic of China (PRC or China) presents the most credible challenge to the United States' interests in space. The PRC considers its space capabilities critical for achieving its economic and security goals. Moreover, China views the space domain as an essential component of its central planning and a key measure of its status as a global power, using its achievements in space to demonstrate technological capability and enhance its national reputation.

PRC National Strategy

When Xi Jinping was elected President of the PRC in 2013, he brought with him the "Chinese Dream" as a foundation of his ideological platform.[1] The Chinese Dream calls for the great rejuvenation of the Chinese nation, with a focus on modernization. It outlined President Xi's vision for China to evolve into a fully developed, world-leading, great power by 2049.[2] Along with the Chinese Dream, President Xi also established a corresponding "Space Dream," prioritizing the space program as central to national modernization and achieving China's great rejuvenation.[3] Connecting China's space activities to the PRC's central planning efforts brought the space program to the forefront of the PRC's interests.

In 2014, the PRC initiated the Space Information Corridor (SIC), also known as the Space Silk Road. The SIC serves as the space element of the PRC's Belt and Road Initiative (BRI) and contributes to the PRC's "strategy to export surplus capacity, proliferate technical standards, and deepen foreign reliance on Chinese infrastructure."[4] It offers Chinese space capabilities in exchange for partnerships and access to foreign markets while serving as the "digital glue" connecting BRI projects.[5] By creating international partnerships, the SIC also provides opportunities for the PRC to deploy ground stations and other space infrastructure on foreign soil.

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[1] Kirk A. Denton, *China Dreams and the "Road to Revival",* Origins Current Events in Historical Perspective, https://origins.osu.edu/article/china-dreams-and-road-revival

[2] Johnathan P. Roll, Oliver J. Du Bois, *Redshift: The Acceleration of China's Commercial and Civil Space Enterprise & The Challenge to America A Strategic Report from the Commercial Space Federation,(Sept. 2025) https://commercialspace.org/wp-content/uploads/2025/09/CSF-Redshift-v6.pdf*

[3] Kevin Pollpeter, Eric Anderson, Jordan Wilson, Fan Yang, *China Dream, Space Dream, China's Progress in Space Technologies (, and Implications for the United States,* IGCC, https://www.uscc.gov/sites/default/files/Research/China%20Dream%20Space%20Dream_Report.pdf

[4] *Id. at 2*

[5] Hema Nadarajah, *China: A Global Power's Celestial Ambitions,* Asia Pacific Foundation, (May 9, 2024) https://www.asiapacific.ca/publication/china-global-powers-celestial-ambitions

Figure 1: Map of International Space Cooperation with China. [Source: USCC]

The same year, the State Council of China released "Document 60," which loosened restrictions on private capital investment into sectors of China's space industry. This policy change was driven, in part, by the PRC's focus on self-reliance for its space program, a principle emphasized throughout PRC planning documents and linked to the goal of modernization in the Chinese Dream.[6] External forces also contributed, namely the U.S. policy of noncooperation with China. The Wolf Amendment, for example, has been included in Appropriations legislation every year since 2011, and prohibits the National Aeronautics and Space Administration (NASA), the Office of Science and Technology Policy (OSTP), and the National Space Council (NSpC) from using funds to work with the PRC or any associated entities.[7] The prohibition on U.S.-China space collaboration resulted from growing national security concerns over the rapid advancement of the PRC's space program, as well as concerns regarding Chinese technological espionage.[8]

President Xi also prioritized the PRC's national security space efforts. In 2015, China recognized space as a warfighting domain.[9] In doing so, the PRC undertook a reorganization of the People's Liberation Army (PLA), which included the creation of a Strategic Support Force (SSF) to oversee space, cyber, and electronic warfare capabilities.[10] Unlike an operational force, the SSF

[6] *Id. at 3*
[7] Alison Fong, *Working with China in Space,* American Security Project, (Jul.15, 2024)https://www.americansecurityproject.org/working-with-china-in-space/
[8] Christopher J. Griffin, Joseph Lin, *China's Space Ambitions,* AEI, (Apr. 7, 2008) https://www.aei.org/articles/chinas-space-ambitions/
[9] Stave Lambakis, *Space as a Warfighting Domain: Reshaping Policy to Execute 21st Century Spacepower,* National Institute for Public Policy (May 2021), https://nipp.org/wp-content/uploads/2021/06/Space-as-a-Warfighting-Domain-pub-5.21.pdf
[10] Keving L. Pollpeter, Michael S. Chase, Eric Heginbotham, *The Creation of the PLA Strategic Support Force and Its Implications for Chinese Military Space Operations,* RAND, (Nov. 10, 2017), https://www.rand.org/pubs/research_reports/RR2058.html

is "a unique organization tasked with the inherently joint mission of supporting all services with its space, cyber, and electronic warfare capabilities."[11] The structure of the SSF demonstrates the PRC's goal to centralize space operations and integrate space capabilities into all aspects of the PLA.

The multilateral focus on developing a domestic space program, commercial industry, and strengthening the PRC's military space capabilities continues to guide Chinese space activities. PRC planning documents showcase the expansion of Chinese space activities and reflect the progress that the PRC has made on the pathway to becoming a global space power. A recent PRC white paper on space states that, "China will accelerate work on its space industry" and describes the PRC's interest in developing "new business models for upscaling the space economy, such as travel, biomedicine, debris removal, and experiment services."[12] Additionally, the white paper highlights the PRC's interest in global space governance, including their plans to "actively participate in formulating international rules regarding outer space." [13] This includes efforts related to space environment governance, monitoring and response to near-Earth objects, planet protection, space traffic management, and the development and utilization of space resources. The white paper also outlines China's interest in accelerating the development of a domestic legal regime for space to promote law-based governance of the space industry.[14]

The PRC's future ambitions for space science are discussed in the National Mid-Term & Long-Term Plan for Space Science in China (2024–2050). The plan is the first long-term, national-level plan for space science, guiding both research activities and investments to realize a leading position in global space science by 2050.[15] It outlines a deliberate, three-phase strategy to achieve leadership in space exploration and scientific research.[16] Across the phases, the plan focuses on five scientific themes: the Extreme Universe, Space-Time Ripples, Panoramic View of Sun-Earth, Habitable Planets, and Biological and Physical Science in Space.[17] Additionally, the plan aims to attract international participation in its space science projects and promote global collaboration with the PRC.[18]

While the national interest and associated funding have enabled the advancements of China's space program, the PRC's comprehensive planning efforts drive its progress. The PRC manages its space program through a combination of short-, medium-, and long-term national plans that establish goals and objectives for the Chinese space program and mandate funding to achieve

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[11] *Id. at 10*
[12] China Aerospace Studies Institute, *China's Space Program: A 2021 Perspective The State Council Information Office of the People's Republic of China, China Aerospace Studies Institute, (Jan 2022),* *https://www.airuniversity.af.edu/Portals/10/CASI/documents/Translations/2022-02-16%20ITOW%20China's%20Space%20Program-%20A%202021%20Perspective.pdf*
[13] *Id. at 12*
[14] *Id. at 12*
[15] *Id. at 2*
[16] Jie Gao, China Brief Notes, *PRC Unveils New Space Plan,* The Jamestown Foundation, (Nov. 5, 2024 4:42PM) https://jamestown.org/program/prc-unveils-new-space-plan/
[17] Andrew Jones, *China set to unveil long-term vision for space science,* SpaceNews, (Sep. 20, 2024) https://spacenews.com/china-set-to-unveil-long-term-vision-for-space-science/
[18] Dennis Normile, *China's ambitious new space plan includes call to bring home a bit of Venus's atmosphere,* Science, (Oct. 17, 2024 5:05PM) https://www.science.org/content/article/china-s-ambitious-new-space-plan-includes-call-bring-home-bit-venus-s-atmosphere

them. [19] Notably, the PRC has repeatedly demonstrated an ability to achieve its goals on the schedule established by these plans.[20] This consistency showcases the credibility of the PRC space program and highlights how quickly China has moved from aspirational planning to concrete achievements. The rise of the Chinese space program is a result of systematic and sustained planning, combined with a strict and unwavering commitment to successfully execute the goals and objectives set by these plans.

PRC Organizational Structure and Military-Civil Fusion

China's space program benefits from the PRC's Military-Civil Fusion Development Strategy, a state-directed system that aligns civil, military, and commercial entities under a unified national strategy. This structure supports China's long-term strategic objectives by removing barriers between sectors and ensuring that all space activities align with national goals. However, the lack of transparency makes external assessments of the program difficult, as it becomes challenging to distinguish between civilian activities and those intended for military use.[21]

Given the dual-use nature of most space technologies, the PRC views space power as inseparable from military power and has focused on space as a key enabler of achieving its military modernization goals.[22] The PRC has been keenly focused on space capabilities since its first widespread use by the U.S. during the first Gulf War.[23] Not only did the PRC realize the value of space, but it also acknowledged the asymmetry between U.S. and Chinese space capabilities at the time.[24] Bridging this gap and eliminating the U.S. military advantage in space is a key objective of the Chinese space program efforts.

Since 2015, the PLA SSF has managed the PRC's military space program. In 2024, the PLA reorganized the SSF into three components, including the Aerospace Force (ASF).[25] The ASF "is responsible for nearly all PLA space operations, including space launch and support; space surveillance; space information support; space telemetry, tracking, and control; and space warfare."[26] Additionally, the China Manned Space Agency (CMSA), which manages human

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[19] Kevin Pollpeter, *PRC Space and Missile Capabilities,* CNA, (Apr. 13, 2023) https://www.cna.org/reports/2023/05/Kevin-Pollpeter-Testimony-April13-2023-on-PRC-Space-and-Missile-Capabilities.pdf

[20] United States- China Economic and Security Review Commission (Nov. 2019), *China's Ambitions in Space: Contesting the Final Frontier [Report] ,* https://www.uscc.gov/sites/default/files/2019-11/Chapter%204%20Section%203%20-%20China%E2%80%99s%20Ambitions%20in%20Space%20-%20Contesting%20the%20Final%20Frontier.pdf

[21] U.S. Department of State (May 2020) , *Military-Civil Fusion and the People's Republic of China [Report],* https://www.state.gov/wp-content/uploads/2020/05/What-is-MCF-One-Pager.pdf

[22] *Id. at 2*

[23] Khyle Eastin, *A Domain of Great Powers: The Strategic Role of Space in Achieving China's Dream of National Rejuvenation,* Mapping China's Strategic Space, (May 10, 2024) https://strategicspace.nbr.org/a-domain-of-great-powers-the-strategic-role-of-space-in-achieving-chinas-dream-of-national-rejuvenation/

[24] Kevin Pollpeter, Elizabeth Barrett, April Herlevi, *Deterring China's Use of Force in the Space Domain,* (May 2025) https://www.airuniversity.af.edu/Portals/10/CASI/documents/Research/Space/2025-05-19%20Deterring%20China's%20Use%20of%20Force%20in%20Space.pdf?ver=wAcgo4Ea0biL5scDuYHMeA%3D%3D

[25] Ying Yu Lin, Tzu-Hao Liao, *RIP, SSF: Unpacking the PLA's Latest Restructuring,* The Diplomat, (Apr. 23, 2024) https://thediplomat.com/2024/04/rip-ssf-unpacking-the-plas-latest-restructuring/

[26] U.S. Department of Defense (2024), *Military and Security Developments Involving the People's Republic of China* , https://apastyle.apa.org/style-grammar-guidelines/references/examples/report-government-agency-references

spaceflight, operates under China's highest military authority, the Central Military Commission (CMC).[27] Notably, through the SSF restructuring, the ASF was placed directly under the CMC.

China's civil space program is led by the China National Space Administration (CNSA), which falls under the management of the Ministry of Industry and Information Technology, and is responsible for overall space program planning and engagement with international partners.[28] Unlike NASA, the CNSA does not function as an operational space agency; instead, it fulfills a diplomatic and administrative role, coordinating with foreign partners and guiding high-level programmatic decisions. The CNSA engages two national state-owned enterprises, China Aerospace Science and Technology Corporation (CASC) and China Aerospace Science and Industry Corporation (CASIC), to develop spacecraft and related technologies.[29]

The third element of the Chinese space program is its commercial space sector. The PRC's private space industry is composed of a government-directed network of quasi-private companies that are either created or supported through state policy to drive innovation and expand the nation's industrial capacity.[30] China's interest in a domestic commercial space sector was influenced by the PRC's belief that private industry could help the PRC overcome the limitations that its state-owned enterprises faced in terms of innovation or capacity.[31] While they are typically described as private enterprises, these companies operate within the strategic framework set by the Chinese government and frequently carry out national objectives.[32] For example, Chinese space companies are required to provide the PRC with their technologies and expertise upon request.[33] This allows the PRC's military space program to benefit directly from advancements made by China's private space industry. In addition to promoting the development of a private space sector, China has prioritized the export of products and services from its domestic industry, including through a dedicated space export promotion agency.[34] Notably, there are currently over 500 commercial space companies in China.[35]

PRC Investment in Space

China's Military-Civil Fusion model complicates efforts to accurately assess the full scale of its national investment in space. The PRC can coordinate resources across sectors while also limiting transparency around its total expenditures. Open-source reporting indicates that China's

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[27] Taylor Lee, Peter Singer, *China's Space Program Is More Military Than You Might Think,* (July 16, 2021), https://www.defenseone.com/ideas/2021/07/chinas-space-program-more-military-you-might-think/183790/

[28] *China,* Space Security Portal, (Aug. 2023) https://spacesecurityportal.org/states/china

[29] *The China National Space Administration (CNSA),* The Planetary Society, https://www.planetary.org/the-china-national-space-administration-cnsa

[30] Ryan Nelson, Taylor Rhoten, Brian Maccarthy, *Eastern Stars Rising: The Rise of China's Commercial Space Industry,* War on the Rocks, (Jul. 29, 2025) https://warontherocks.com/2025/07/eastern-stars-rising-the-rise-of-chinas-commercial-space-industry/

[31] Henry Boyd, Erik Green, Meia Nouwens, *China's commercial space sector,* IISS, (Aug. 21, 2025) https://www.iiss.org/online-analysis/charting-china/2025/08/chinas-commercial-space-sector/

[32] *Id. at 2*

[33] *Id. at 2*

[34] Nathaniel Rome, *China's Space Export Strategy*, Space Policy, 2023, https://doi.org/10.1016/j.spacepol.2023.101574.(https://www.sciencedirect.com/science/article/pii/S0265964623000413)

[35] *Id. at 31*

total space budget was approximately $20 billion in 2024.[36] For comparison, in 2024, the U.S. space budget was reported to be around $79 billion.[37] While the two countries' budgets indicate an imbalance in national space spending, this may not capture the complete level of state investment, as there is limited official PRC information on its space budget, and reported budget figures often underestimate China's annual space investment. For example, the Department of Defense estimates that the PRC spends 40% to 90% more than it announces in its public defense budget.[38] Although the publicly available accounting of China's space budget appears modest compared to U.S. spending, the scope and scale of Chinese space activities indicate the PRC is allocating funding that isn't captured by its budget.[39] Additionally, China benefits from significantly lower labor costs and other added services, which also contribute to the funding imbalance.[40]

The lack of a clear division between civilian and military spending in the space domain has provided China with an advantage when scaling its space programs and mobilizing funding for strategic initiatives, while obscuring the amounts the government is allocating. The structure of China's system allows for rapid expansion, long-term strategic planning, and sustained operations across the full range of space activities.

Chinese Space Programs & Capabilities

China is executing a diverse portfolio of activities related to its space program, from human space exploration and space science to infrastructure modernization and commercialization. Through China's short-, medium-, and long-term plans, the PRC provides insight into both past efforts and future. The following describes China's space activities across major space segments.

Launch

The Long March family of rockets has been developed and manufactured by CASC since the late 1960s. First launched in April 1970, the Long March series has been used for most Chinese space launches.[41] In recent years, launch cadence has increased significantly, with China attempting 68 orbital launches in 2024.[42] Developing a domestic space launch capability represents one of the PRC's longest-standing ambitions for space. Independent launch capabilities provide access to orbit and enable all operations within the space domain, aligning directly with China's pursuit of space independence and creating opportunities to provide launch services to other nations.

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[36] Michal Pietrzak, *Economic and Social Aspects of the Space Sector Development Based on the Modified Structure–Conduct–Performance Framework,* World, https://www.mdpi.com/2673-4060/6/2/79

[37] *Id. at 36*

[38] *Id. at 26*

[39] Jack Kuhr, *China to Invest Heavily in its Race to the Moon,* Payload, (May 18, 2023) https://payloadspace.com/china-to-invest-heavily-in-its-race-to-the-moon/

[40] Namrata Goswami, *China in Space: Ambitions and Possible Conflict,* Strategic Studies Quarterly, https://www.airuniversity.af.edu/portals/10/ssq/documents/volume-12_issue-1/goswami.pdf

[41] John Dotson, *China's Long March Rocket Program Sees Both Dramatic Successes and Failures in Spring 2020,* The Jamestown Foundation (May 15, 2020 4:07PM) https://jamestown.org/program/chinas-long-march-rocket-program-sees-both-dramatic-successes-and-failures-in-spring-2020/#:~:text=The%20early%20months%20of%202020,mid%2DMarch%20and%20early%20April.

[42] Johnathan McDowell, *Space Activities in 2024,* Jonathans Space Report, (Jan. 24, 2025) https://planet4589.org/space/papers/space24.pdf

Currently, CASC is developing a new class of heavy and super-heavy-lift launch vehicles designed to compete with U.S. capabilities and carry out China's long-term space ambitions.[43] These launch vehicles include the Long March 10, a human-rated, three-stage rocket intended to support China's goal of landing astronauts on the Moon by 2030. As well as the Long March 9, a reusable super-heavy lift vehicle is being developed for deep space missions and large-scale infrastructure deployment.

The PRC also continues to support the development of a domestic commercial launch industry, which currently consists of over 20 well-established launch companies.[44] While these companies are private, they still operate within a national strategic framework and benefit from China's Military-Civil Fusion strategy. They're also supported by a funding structure with multiple investor streams, which includes a significant increase in investment from Chinese city and provincial government sources.[45] This approach has increased China's overall launch capacity and has introduced a broader range of launch providers focusing on innovation, development cycles, and industrial scalability.

China aims to reduce costs, increase launch cadence, and directly compete with U.S. commercial providers such as SpaceX, ULA, and Blue Origin.[46] CASC's updated architecture for the Long March 9, for example, shifted from a traditional expendable model with four boosters to a fully reusable, methane-fueled design, which is visually similar to SpaceX's Starship system, indicating that China recognizes the value of reusable launch vehicles.[47]

PRC companies such as LandSpace and Galactic Energy are also pursuing reusability as a core capability of their launch vehicles. LandSpace's Zhuque-2 became the first methane-fueled rocket to reach orbit in 2023, and future variants are planned with a reusable first stage. [48] Galactic Energy is developing the Pallas-1 rocket, which features similar design elements, including grid fins and landing legs. The launch vehicle is intended to rival Falcon 9 in both capability and cost efficiency.[49] While still in its early stages, these developments indicate a shift in China's approach to launch vehicle architecture. China recognizes the economic value of reusable systems, as well as their strategic value in supporting high-frequency launch operations and long-duration deep space missions.[50]

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[43] *Id. at 12*
[44] *Id. at 31*
[45] *Id. at 2*
[46] United States- China Economic and Security Review Commission (Apr. 2025), *Hearing on the Rockets Red Glare: China's Ambitions to Dominate Space [Hearing Transcript],* https://www.uscc.gov/sites/default/files/2025-04/April_3_2025_Hearing_Transcript_0.pdf
[47] Andrew Jones, *China unveils fully reusable Starship-like rocket concept,* SpaceNews, (Nov. 14th, 2024) https://spacenews.com/china-unveils-fully-reusable-starship-like-rocket-concept/
[48] Reuters, *China beats rivals to successfully launch first methane-liquid rocket,* Reuters, (Jul. 11, 2023) https://www.reuters.com/technology/space/china-beats-rivals-successfully-launch-first-methane-liquid-rocket-2023-07-12/
[49] Andrew Jones, *Chinese launch startup Galactic Energy raises $154 million for Pallas-1 reusable rocket, SpaceNews, (Dec. 20, 2023) https://spacenews.com/chinese-launch-startup-galactic-energy-raises-154-million-for-pallas-1-reusable-rocket/*
[50] *Id. at 46*

Launch Infrastructure

The PRC heavily invests in its space infrastructure to expand its capacity and enable new capabilities. China operates five ground-based launch sites,[51] including three inland launch sites that have been operational for decades: the Jiuquan Satellite Launch Center, which serves as the launch site for crewed missions; the Taiyuan launch site, which specializes in polar orbit launches; and the Xichang Satellite Launch Center, which supports missions to geostationary orbit. China also maintains the Wenchang Space Launch Site, located on Hainan Island off the southern coast of China. Wenchang began operating in 2016 and is used to launch a range of missions, with a focus on Long March-5 and -7 launch operations.[52] Finally, China also conducts sea-based launches using a ship-based platform.[53]

The Hainan International Commercial Aerospace Launch Center, which is collocated with government launch facilities at the site, supports several commercial space endeavors. Hainan, which conducted its first mission in 2024, is China's first launch site dedicated to commercial operations.[54] A phase two upgrade for Hainan is also ongoing. It will include two new launch pads, a commercial aerospace command and control center, a rocket assembly and testing facility, and a tracking, telemetry, and command station.[55]

Human Space Exploration

PRC human exploration efforts consist of two lanes: human operations in low-Earth orbit (LEO) and crewed missions to the Moon and other deep space destinations. Since launching the first taikonaut into orbit in 2003 and becoming the third country to independently send humans into space, the PRC has continued to launch more taikonauts and conduct increasingly complex missions.[56]

Low-Earth Orbit

One of the main elements of China's human spaceflight program is the *Tiangong* space station. The development of *Tiangong* is occurring in several phases, beginning with the launch of the *Tiangong-1* and *Tiangong-2* laboratories in 2011 and 2016, respectively.[57] These space stations were used to demonstrate and mature a range of technologies, such as capabilities for rendezvous and refueling. The current *Tiangong* station was assembled between 2021 and 2022 and consists of three modules: the Tianhe core module, which houses command systems and crew quarters, as well as the two laboratory modules, Wentian and Mengtian, equipped with experimental racks

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[51] *Id. at 2*

[52] *Wenchang Space Launch Centre,* China Space Report, https://chinaspacereport.wordpress.com/facilities/wenchang/

[53] chinadaily.com.cn, *China's Smart Dragon 3 rocket launches satellites from sea,* China Services INF, (Jan. 14th 2025) https://govt.chinadaily.com.cn/s/202501/14/WS678e199e498eec7e1f72db90/chinas-smart-dragon-3-rocket-launches-satellites-from-sea.html

[54] Zhao Lei, *China launches 18 satellites from Hainan commercial spacecraft launch site,* China Daily, (Mar. 11, 2025) https://www.chinadailyhk.com/hk/article/606741

[55] Xinhua, *2nd phase of Hainan commercial spacecraft launch site under construction in S China*, English, (Sep. 6th, 2025, 9:37 PM) https://english.www.gov.cn/news/202509/06/content_WS68bc38fdc6d0868f4e8f560f.html

[56] Space.com Staff, *Making History: China's First Human Spaceflight,* Space.com (Sep. 28, 2005) https://www.space.com/1616-making-history-china-human-spaceflight.html

[57] Daisy Dobrijevic, Andrew Jones, *China's space station, Tiangong: A complete guide, Space.com, (Aug. 15, 2023) https://www.space.com/tiangong-space-station*

used for conducting scientific research. In its current form, the *Tiangong* station is around 20% of the mass of the International Space Station (ISS).[58]

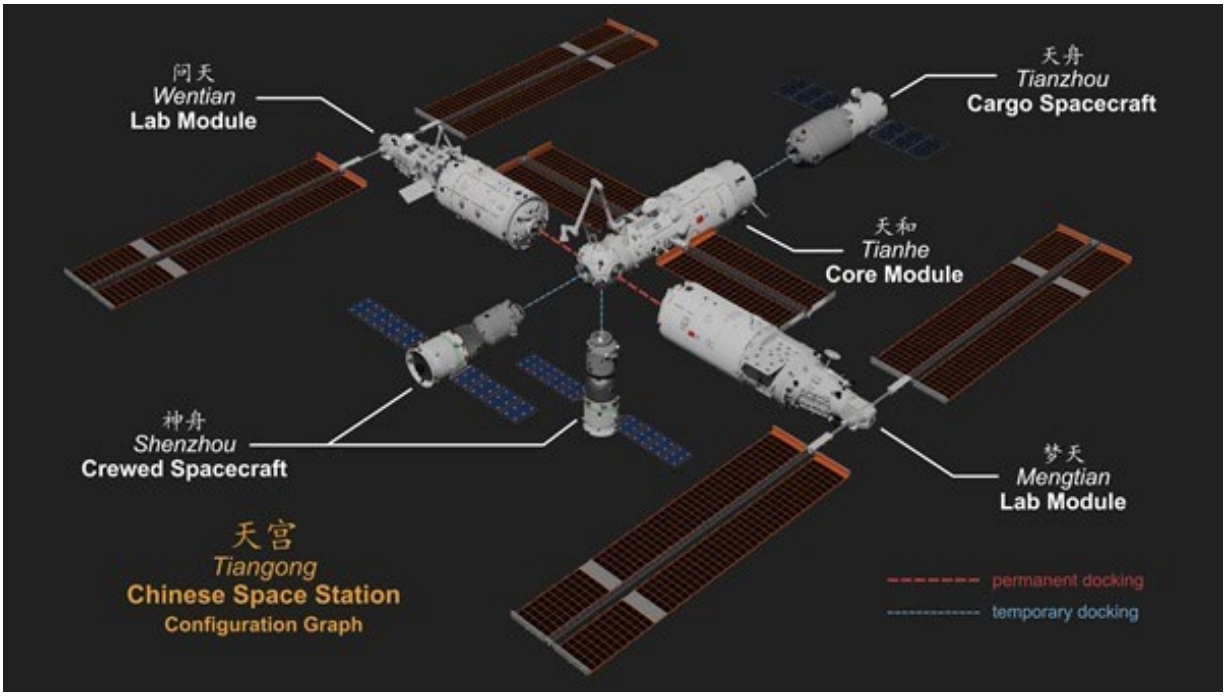

Figure 2: Tiangong Space Station [Source: Astronomy.com]

The PRC is also planning upgrades to *Tiangong*, including the addition of three new modules to enhance overall research and support large extravehicular experiments.[59] Additionally, the PRC plans include the development of a large-scale space-survey telescope, similar to NASA's Hubble Space Telescope, designed to operate in tandem with *Tiangong*.[60]

Since becoming operational, the PRC has conducted regular six-month crew rotations, comprised of three taikonauts per rotation. In October 2025, the PRC's seventh crew arrived at *Tiangong* to take over operations.[61] These crews conduct a range of research projects while on station, with a primary focus on areas related to deep space exploration, including the study of human physiology in microgravity, closed-loop life support systems, and materials science experiments.[62] In addition to carrying out Chinese research projects, the PRC utilizes *Tiangong* as a tool for international engagement. For example, in 2018, 27 countries, including several U.S.

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[58] Mike Wall, *China's Shenzhou 20 astronauts arrive at Tiangong space station (video),* Space.com, (Apr. 23, 2025) https://www.space.com/space-exploration/missions/chinas-shenzhou-20-astronauts-arrive-at-tiangong-space-station

[59] Andrew Jones, *China wants to make its Tiangong space station bigger and better,* Space.com, (Oct. 28, 2024) https://www.space.com/china-expand-upgrade-tiangong-space-station

[60] Xinhua, Huaxia, *Flagship Chinese space telescope to orbit with space station,* English News, (Aug. 18th, 2023, 11:20 PM) https://english.news.cn/20230818/4f3205e5a4ea40ec9e80d2a3c170f0c6/c.html

[61] Andrew Jones, *China reveals crew for Shenzhou 21 mission to Tiangong Space Station, including nation's youngest astronaut (video),* Space.com, (Oct. 30, 2025) https://www.space.com/space-exploration/human-spaceflight/china-reveals-crew-for-shenzhou-21-mission-to-tiangong-space-station-including-nations-youngest-astronaut-video

[62] *Id. at 57*

allies, submitted proposals for projects onboard *Tiangong*.[63] Additionally, under an agreement signed between China and Pakistan in February 2025, China will host and train Pakistani astronauts prior to a series of joint, short-duration missions to *Tiangong*.[64]

Tiangong and, more broadly, China's presence in low-Earth orbit have strategic implications. As the International Space Station nears its expected retirement in 2030, a gap in U.S. crewed operations in low-Earth orbit could potentially emerge if U.S. commercial platforms are not yet fully deployed at the time of transition. In such a scenario, *Tiangong* may become the world's only human outpost in orbit, expanding Beijing's influence over access to low-Earth orbit and potentially forcing nations to engage with China as the primary, or only, avenue for scientific collaboration in space.[65]

The Moon & Other Deep Space Destinations

The PRC is also interested in sending taikonauts to other planetary bodies. The Moon currently serves as the focus for the Chinese space program, with the goal of landing its taikonauts on the lunar surface by 2030.[66]

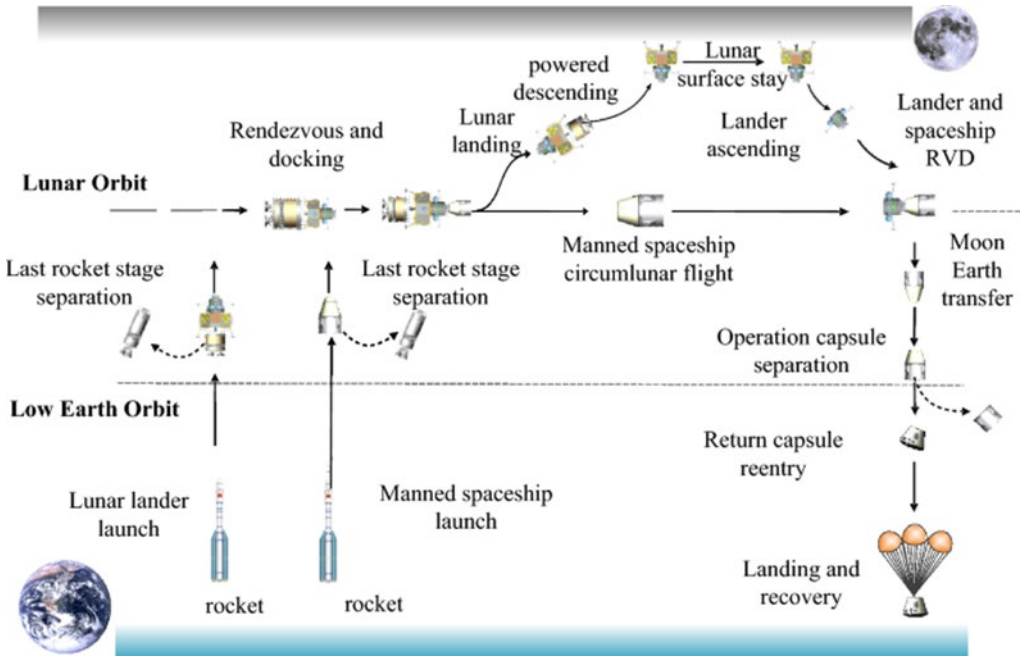

Figure 3: Concept of Operations for China's Crewed Lunar Landing Mission [Source: Springer]

In 2004, the PRC introduced its lunar exploration program, named Chang'e. The program was designed to be a multi-phase lunar exploration, beginning with the deployment of lunar rovers

[63] Andrew Jones, *International experiments selected to fly on Chinese space Station,* SpaceNews, (Jun. 13, 2019) https://spacenews.com/international-experiments-selected-to-fly-on-chinese-space-station/

[64] Julian Dossett, *China and Pakistan agree to fly 1st foreign astronaut to Chinese space station, Space.com, (Apr. 9 2025)* *https://www.space.com/space-exploration/human-spaceflight/china-and-pakistan-agree-to-fly-1st-foreign-astronaut-to-chinese-space-station*

[65] China Power Team. *"What's Driving China's Race to Build a Space Station?", China* Power. December 7, 2016. Updated April 21, 2021. Accessed November 5, 2025. https://chinapower.csis.org/chinese-space-station/

[66] Yidong Gu, Jin Ba, *Space exploration in China,* Journal of Physics: Conference Series, https://iopscience.iop.org/article/10.1088/1742-6596/2877/1/012049/pdf

and concluding with the return of samples from the lunar surface.[67] Between 2007 and 2024, China launched six Chang'e missions to the Moon, including two orbiters to map and image the surface (Chang'e 1 and 2); two landers to demonstrate soft landings and deploy rovers (Chang'e 3 and 4); and two spacecraft that conducted lunar sample return missions (Chang'e 5 and 6).[68] Notably, the Chang'e 4 mission, in 2019, represented the first soft-landing on the far side of the Moon, and Chang'e 6, in 2024, was the first mission to collect and return samples from the far side of the Moon.[69]

Two additional Chang'e missions are scheduled: Chang'e 7, which will perform lunar surface exploration and surveying activities in 2026, and Chang'e 8, which will test and demonstrate technologies for building infrastructure on the surface of the Moon in 2028.[70] These precursor missions will build out Chinese capabilities and demonstrate key technologies, all structured to support planned human exploration efforts through the PRC's International Lunar Research Station (ILRS). The ILRS was established through a 2021 Memorandum of Understanding between China and Russia to build a research facility on the Moon's surface.[71]

The ILRS is designed to be a comprehensive and scalable facility that can perform multidisciplinary, multi-target, large-scale scientific and technological activities.[72] Research objectives for IRLS include conducting a geological survey of the Moon, lunar-based astronomy observations, space environment observations of the Sun-Earth-Moon system, lunar-based fundamental science experiments, and lunar in-situ resource utilization.[73]

Following the Chang'e 8 mission, the PRC has planned a series of missions that, by 2035, will construct a scientific facility with basic functions and essential supporting elements around the lunar south pole, a site considered strategically important due to the potential presence of water ice.[74] Once built, China plans to operate the ILRS facility while also expanding its lunar presence through a second phase, in which the PRC will add additional facilities (both at the Moon's equator and on the far side), deploy power and communications infrastructure, and introduce new capabilities to support mobility.[75]

As part of the preparation for future human lunar missions, in 2025, the PRC completed the first integrated landing and ascent test of its *Lanyue* crewed lunar lander, validation tests of the Long

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[67] *Id. at 66*
[68] Katie Holland, *Chinese Lunar Exploration Program,* National Space Centre, (Apr.29, 2024) https://www.spacecentre.co.uk/news/space-now-blog/chinese-lunar-exploration-program/
[69] *Id. at 68*
[70] *Chang'e Missions,* Orbital Data Explorer Help, https://ode.rsl.wustl.edu/MArs/pagehelp/Content/Missions_Instruments/Change/Intro.htm
[71] Lukasz Kobierski, *China and Russia Agree to Build Lunar Research Station,* Warsaw Institute, (Mar. 15, 2021) https://warsawinstitute.org/china-russia-agree-build-lunar-research-station/
[72] *International Lunar Research Station (ILRS),* Deep Space Exploration Laboratory of CNSA, (May, 2023) https://www.unoosa.org/documents/pdf/copuos/2023/TPs/ILRS_presentation20230529_.pdf
[73] Lin XU, Hui LI, Zhaoyu PEI, et al. *A Brief Introduction to the International Lunar Research Station Program and the Interstellar Express Mission (J/OL)*. Chinese Journal of Space Science, 2022, 42 (4): 511-513. 2024-07-17. 2025-11-07. https://www.sciengine.com/doi/10.11728/cjss2022.04.yg28
[74] *Id. at 6*
[75] Andrew Jones, *China plans to build moon base at the lunar south pole by 2035,* Space.com, (Sep. 10, 2024) https://www.space.com/china-moon-base-south-pole-2035

March 10 rocket, and pad abort testing for the *Mengzhou* crewed spacecraft. [76] The PRC is also preparing for additional testing and validation efforts prior to conducting a crewed lunar mission. This includes trials of a robotic prototype of *Lanyue* in 2027 and 2028 as well as an uncrewed joint *Mengzhou-Lanyue* mission in either 2028 or 2029.[77] China also plans to conduct an in-flight maximum dynamic pressure escape test of *Mengzhou* next year.[78] Additionally, China is preparing for flight testing of Long March 10, but hasn't stated a timeline for its completion.[79]

While officially framed as a scientific endeavor, the ILRS also functions as a diplomatic and strategic tool for the PRC. China's goal is to have 50 countries participate in the ILRS, and the PRC has made extensive efforts to attract international partners.[80] China has used ILRS in recent years to build partnerships with non-Western-aligned countries, with a particular emphasis on developing nations seeking new pathways for space cooperation.[81] The ILRS is also closely linked to China's broader foreign policy approach, including the Digital Silk Road, which plans to integrate its space-based infrastructure into international development plans. ILRS is also a foil to NASA's Artemis Accords, which 59 countries have signed.[82] This strategy supports long-term access to lunar resources, advances in in-situ resource utilization (ISRU), and extends China's geopolitical reach in space.

Spacecraft and Satellites

As part of its endeavor to become a great space power, the PRC is developing a range of satellite capabilities while also enabling private sector opportunities. The PRC is working to expand its global influence and increase foreign technical dependencies on China through systems like the Beidou satellite navigation network, as well as observation platforms and state-backed broadband constellations.

China is developing a layered space information network that can provide both the PLA with secure, independent, and comprehensive battlespace awareness, as well as competitive commercial services. A primary component of this infrastructure is the Beidou Satellite Navigation System, which is China's alternative to the U.S. Global Positioning System (GPS).[83]

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[76] Andrew Jones, *China completes landing and takeoff test for crewed moon lander,* SpaceNews, (Aug. 7, 2025) https://spacenews.com/china-completes-landing-and-takeoff-test-for-crewed-moon-lander/

[77] Marissa Martin, *China Is Going to the Moon by 2030. Here's What's Known About the Mission—and Why It Matters,* RAND.org, (Nov. 13, 2025) https://www.rand.org/pubs/commentary/2025/11/china-is-going-to-the-moon-by-2030-heres-whats-known.html

[78] Mark Thompson, *China Tests the Crew Escape for its New Lunar Capsule,* universetoday.com, (June 20, 2025) https://www.universetoday.com/articles/china-tests-the-crew-escape-for-its-new-lunar-capsule

[79] Andrew Jones, *China targets 2026 for first Long March 10 launch, new lunar crew spacecraft flight, SpaceNews.com, (Oct. 30, 2025) https://spacenews.com/china-targets-2026-for-first-long-march-10-launch-new-lunar-crew-spacecraft-flight/#:~:text=Discounted%20Access,challenges%20and%20workload%20were%20significant.*

[80] *China's International Lunar Research Station,* spacesecurity.wse.jhu.edu, (Jul. 28, 2024) https://spacesecurity.wse.jhu.edu/2024/07/28/chinas-international-lunar-research-station/

[81] United States- China Economic and Security Review Commission (Nov. 2022), *Report to Congress,* https://www.uscc.gov/sites/default/files/2022-11/2022_Annual_Report_to_Congress.pdf

[82] Jeff Foust, *Lativia to sign Artemis Accords,* SpaceNews, (Nov. 1, 2025) https://spacenews.com/latvia-signs-artemis-accords/

[83] China Aerospace Studies Institute, *To Be More Precise: BEIDOU, GPS, and the Emerging Competition in Satellite-Based PNT,* Air University, (May 20 2024),

Beidou provides the PLA with access to precision navigation, timing (PNT), and communications capabilities, without reliance on foreign systems. China is also promoting international adoption of Beidou through its broader Digital Silk Road initiative.[84]

Outside of Beidou, China is also developing the Guowang satellite constellation, a state-directed program that will deploy approximately 13,000 communications satellites to low-Earth orbit, competing with Western systems such as Starlink. [85] While officially described as a communications network, Guowang is widely assessed to be a dual-use system and can integrate broadband data services with surveillance and signals intelligence capabilities.[86] This system aims to improve the PLA's ability to operate and monitor in multiple regions worldwide. Additionally, companies such as the Shanghai Spacecom Satellite Technology (SSST) are also developing satellite constellations. SSST is building Qianfan, or Thousand Sails, which is a planned constellation of 14,000 satellites in LEO that will provide communications and broadband data services country-wide.[87]

An increasing focus of China's space program is the development of In-Space Servicing, Assembly, and Manufacturing (ISAM) technologies. These capabilities are strategically important, as they allow for satellites to have extended lifespans, enhanced maneuverability, and greater operational flexibility. China began pursuing this objective with a successful in-space propellant transfer demonstration in 2017, and the technology is now used to support the routine resupply and maintenance of the *Tiangong* space station.[88] ISAM technologies are also being tested in higher orbits. In January 2022, the Shijian-21 satellite conducted a mission in geosynchronous orbit, where it rendezvoused with a defunct Beidou satellite, captured it using a robotic arm, and moved it to a higher "graveyard" orbit.[89] More recently, in June 2025, the newer Shijian-21 and Shijian-25 satellites appeared to experiment with docking and propellant transfer between the two spacecraft.[90]

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https://www.airuniversity.af.edu/Portals/10/CASI/documents/Research/Space/2024-05-20%20To%20Be%20More%20Precise%20-%20Beidou.pdf

[84] Reconnectiong Asia, *Mapping China's Digital Silk Road,* Reconnecting Asia, (Oct. 19, 2021) https://reconasia.csis.org/mapping-chinas-digital-silk-road/

[85] Greg Gillinger, *Developing and testing China's Guowang constellation,* The Space Review, (Jun. 16, 2025) https://www.thespacereview.com/article/5004/1

[86] Andrew Jones, *China's Guowang launch raises questions about satellite purpose and transparency,* SpaceNews, (Jan. 7, 2025) https://spacenews.com/chinas-guowang-launch-raises-questions-about-satellite-purpose-and-transparency/

[87] Sydney Nystrom, David Zou, Peter Garretson, *Thousand Sails: Why Low Earth Orbit is the Next Frontier for Great Power Competition between the U.S. and China,* Space Policy Review, https://www.afpc.org/uploads/documents/Thousand_Sails-_Why_Low_Earth_Orbit_is_the_Next_Frontier_for_Great_Power_Competition_between_the_US_and_China_-_Final.pdf

[88] Stephen Clark, *Tianzhou 1 freighter achieves China's first in-space refueling demo,* Spaceflight Now, (Apr. 27, 2017), https://spaceflightnow.com/2017/04/27/tianzhou-1-freighter-achieves-chinas-first-in-space-refueling-demo/

[89] *Shijian-21 Satellite,* eoPortal, (Jan. 31, 2022) https://www.eoportal.org/satellite-missions/shijian-21

[90] U.S. Senate Committee on Commerce, Science, & Transportation (Sep. 3, 2025), *There's a Bad Moon on the Rise: Why Congress and NASA Must Thwart China in the Space Race [Hearing],* https://www.commerce.senate.gov/2025/9/there-s-a-bad-moon-on-the-rise-why-congress-and-nasa-must-thwart-china-in-the-space-race_2

These advancements demonstrate China's progress in developing ISAM capabilities while also presenting dual-use implications. Under the Military-Civil Fusion strategy, a satellite designed for servicing missions could also be repurposed to interfere with, inspect, or collect intelligence on assets belonging to the United States. In this context, China's ability to refuel satellites would also enable them to conduct frequent orbital maneuvers without depleting their propellant reserves, in turn improving the survivability of the satellites and complicating monitoring and tracking capabilities.[91]

The PRC's interest in developing and deploying satellite capabilities also extends to lunar orbit. As part of past Chang'e lunar missions, China has deployed several satellites to the cislunar domain, including the Queqiao-1 and 2 communications satellites, which enabled both of China's landings on the far side of the Moon.[92] Moreover, the PRC is planning to develop comprehensive communications and positioning, navigation, and timing (PNT) capabilities for the cislunar domain. The PRC's proposal spans three phases and centers around deploying additional satellites, introducing new capabilities, and expanding the cislunar orbits it operates in.[93] The current, first phase will focus on providing communications relay services for missions to the south pole and far side of the Moon as well as validating a range of communications, PNT, and remote sensing capabilities. This will be followed by a second phase where China will deploy additional satellites to extend its capabilities, providing comprehensive coverage of the Moon. Following the establishment of robust lunar communications and PNT capabilities, the PRC plans to extend these capabilities and establish a deep space communications and PNT system.[94]

Sample Return

For China's space science program, a major focus is currently the development of sample return capabilities. The PRC has demonstrated its competence in this domain through a series of Chang'e lunar sample return missions. While continuing to execute lunar exploration objectives, China is also extending its sample return efforts to interplanetary targets. The Tianwen-2 mission, which launched in May 2025, marks China's first attempt to retrieve samples from another planet and will test technologies for navigating, collecting, and returning material from low-gravity environments.[95] The subsequent mission in the Tianwen program, Tianwen-3, is scheduled for launch in 2028 and is intended to collect and return samples from the surface of Mars.[96] If successful, this mission could precede the NASA-European Space Agency joint

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[91] Kristin Burke, *China's SJ-21 Framed as Demonstrating Growing On-Orbit Servicing, Assembly, and Manufacturing (OSAM) Capabilities,* China Aerospace Studies Institute, (Dec. 2021) https://www.airuniversity.af.edu/Portals/10/CASI/documents/Research/Space/2021-12-09%20SJ-21%20and%20China%27s%20OSAM%20Capabilities.pdf

[92] Planetary Society, *Queqiao-2: China's bridge for lunar exploration, https://www.planetary.org/space-missions/queqiao-2-chinas-bridge-for-lunar-exploration*

[93] Andrew Jones, *China wants a lunar satellite constellation to support deep space missions, SpaceNews.com, (Oct. 5, 2023) https://spacenews.com/china-wants-a-lunar-satellite-constellation-to-support-deep-space-missions/*

[94] *Id. at 93*

[95] Son Jianlan, *Tianwen-2 Sets Out for Asteroid Sampling and Comet Exploration,* Bulletin of the Chinese Academy of Sciences (Jun. 26, 2025*)* https://bcas.cas.cn/head/202506/t20250626_1046258.html

[96] Hou, Z., Liu, J., Pang, F. et al. *In search of signs of life on Mars with China's sample return mission Tianwen-3*. Nat Astron 9, 783–792 (2025). https://doi.org/10.1038/s41550-025-02572-0

mission in returning the first Martian surface samples to Earth through NASA's Mars Sample Return program, and would represent a major milestone in China's scientific capabilities.