Statement before the

House Committee on Science, Space, and Technology
Space and Aeronautics Subcommittee

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

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December 4, 2025

Swope: Written Testimony, Committee on Science, Space, and Technology, December 4, 2025

Chairman Haridopolos, Ranking Member Foushee, and distinguished Members of the Committee, I am honored to share my views with you on this important topic. CSIS does not take policy positions, so the views represented in this testimony are my own and not those of my employer.

The People's Republic of China (PRC) is methodically executing an ambitious, multi-faceted space agenda that—at the highest level—aims to prove that China is a world power in space without equal. Beijing is using space in ways that provide direct, tangible benefits to its military and economy, while also fostering national pride and unity. China is fielding satellites that provide the ability to identify, characterize, and track objects of all sizes in the Indo-Pacific region and move data and information around the world—both to and from space and in orbit. China is building out infrastructure on Earth and developing technologies in space that will support the future growth of a PRC-aligned space ecosystem. China is extending the footprint of its human spaceflight activities from low Earth orbit to the Moon and aiming to be the first country to bring back samples of another planet to Earth.

Every new space technology, skill, and industrial capability acquired by the PRC will be used to provide the People's Liberation Army (PLA) a battlefield advantage, as well as power civilian and commercial innovation and economic growth in China. Beijing will derive national and economic advantages from today's space race, as one of the PRC's core strategies is military-civil fusion.[1] China will seek to use all its national power to obtain an edge in space. The United States—the world's most important spacepower—uses space in the same way, as a foundational pillar of our national strength. Though the United States, by most metrics, remains the most consequential nation in space, China is motivated to close the gap and has demonstrated through its actions, measured over decades, that it wants to win. To date, China has mostly copied the U.S. playbook, but China is starting to increasingly set its own course.

Charting the PRC's Rise in Space

What China is doing today in space cannot be properly understood without assessing what it has done over the last 70 years. Throughout the first five decades of its space program, beginning in the 1950s, China focused on military, technological, and industrial development. China's earliest space efforts—the Two Bombs, One Satellite initiative—focused entirely on military objectives.[2] In quick succession, China tested an atomic bomb (1964) and hydrogen bomb (1967) and launched its first satellite (1970). In the 1980s and 1990s, China sought to market its space launch capabilities to international customers and restarted its human spaceflight program, which had been paused in the 1970s. The last years of the 20th century witnessed the beginning of China's rise as a global economic juggernaut, growth of its middle class, military modernization, and an increased focus on space.

Over the last 25 years, the PRC's civil space programs have methodically checked off technical achievements in human spaceflight and uncrewed exploration that will likely culminate in a crewed landing on the Moon within five years. China has already built three space stations, conducted six robotic lunar missions, launched two lunar relays, and executed a mission to Mars. This progress has happened rapidly. China did not launch

[1] "The Chinese Communist Party's Military-Civil Fusion Policy," U.S. Department of State, https://2017-2021.state.gov/military-civil-fusion/.
[2] "The "Two Bombs and One Satellite"," The State Council Information Office of the People's Republic of China, July 13, 2022, http://english.scio.gov.cn/m/featured/chinakeywords/2022-07/13/content_78321940.htm.

its first space science mission until 2003, which is the same year China placed an astronaut into orbit for the first time.[3] Meanwhile, China has developed and deployed space capabilities with direct applicability to military operations that allow the PLA to monitor what is happening on Earth and in space, communicate with its forces throughout the Indo-Pacific region, and navigate with a high level of precision using its BeiDou system.[4]

China is heavily focused on ramping up its production capabilities to support its growing space program. China has built satellite and rocket manufacturing facilities and associated supply chains, launch facilities, ground stations, and space object tracking systems, which includes ships designed for space tracking and telemetering. Much of this infrastructure is located inside China—nearly a vertically integrated space ecosystem—but some elements are in other countries, such as ground stations and space object tracking facilities. Simultaneously, Beijing has used the establishment of terrestrial space infrastructure and membership in the coalition supporting the PRC-led equivalent to the Artemis program—called the International Lunar Research Station—to build and strengthen diplomatic relations, particularly with the Global South, similar to how it's used the Belt and Road Initiative.[5] Russia is the co-lead of the ILRS initiative. The PRC is also developing on-orbit infrastructure and technologies, such as in-space refueling, highly maneuverable satellites, space-based nuclear and solar power, space-based data centers, and satellite docking and capture technologies. Terrestrial and on-orbit space infrastructure is the foundation of future spacepower—equivalent to power grids; undersea cables; roads, railroads, and airports; data centers, and gas refineries, pipelines, and stations on Earth.

China has also built—while continuing to test and deploy new technologies and increase the scale and sophistication of its systems—networks of satellites designed to keep tabs on what is happening on Earth and in space. Such technologies have civilian applications, such as for agriculture, disaster response, and insurance purposes, but also military uses. China has several satellites which have—based on public information—no peers. China launched a remote-sensing satellite, called Yaogan-41, into geostationary orbit in December 2023.[6] The satellite can conduct continuous surveillance of the Pacific and Indian Oceans, as well as Taiwan and Mainland China. Paired with data from other Chinese surveillance satellites, Yaogan-41 could provide China an unprecedented ability to identify and track car-sized objects throughout the entire Indo-Pacific region and put at risk numerous U.S. and allied naval and air assets operating in the region.[7] China has other surveillance satellites in low Earth orbit and geosynchronous orbit, as well as a new one in medium Earth orbit.[8] In addition to building capabilities to support military operations on Earth, the PLA is

[3] "Double Star factsheet," European Space Agency, https://www.esa.int/Science_Exploration/Space_Science/Double_Star_factsheet and "Yang Liwei, China's first man in space," CGTN, April 25, 2025, https://news.cgtn.com/news/2025-04-25/Yang-Liwei-China-s-first-man-in-space-1CRp6L9OiR2/p.html.
[4] Argyris Kriezis, "GPS Faces Growing Competition from China's BeiDou," Payload, September 4, 2024, https://payloadspace.com/gps-faces-growing-competition-from-chinas-beidou/.
[5] Andrew Jones, "China wants 50 countries involved in its ILRS moon base," Space News, July 23, 2024, https://spacenews.com/china-wants-50-countries-involved-in-its-ilrs-moon-base/.
[6] Andrew Jones, "China launches large classified optical satellite towards geostationary orbit," Space News, December 15, 2023, https://spacenews.com/china-launches-large-classified-optical-satellite-towards-geostationary-orbit/.
[7] Clayton Swope, "No Place to Hide: A Look into China's Geosynchronous Surveillance Capabilities," CSIS, January 19, 2024, https://www.csis.org/analysis/no-place-hide-look-chinas-geosynchronous-surveillance-capabilities.
[8] "Space Threat Fact Sheet," U.S. Space Force, September 2025, https://www.spaceforce.mil/About-Us/Fact-Sheets/Fact-Sheet-Display/Article/4297159/space-threat-fact-sheet/ and Andrew Jones, "China launches mystery Yaogan-45 spysat,

also developing and fielding an increasingly sophisticated toolkit of counterspace weapons that can threaten U.S. and allied satellites.[9]

Looking back over the past several decades, China has mostly copied the U.S. space playbook. It is scaling its ability to build, launch, and operate satellites and spacecraft; developing reusable space launchers; deploying satellites to conduct surveillance and reconnaissance of Earth; planning a crewed mission to the Moon; and operating a modular space station. But China is not only mirroring the United States anymore—it is doing things no one else has done. China was the first nation to land on and conduct a sample return from the far side of the Moon.[10] In 2025, China conducted what many suspect was the world's first satellite refueling operation in geosynchronous orbit—though the United States has conducted life-extension missions, similar to refueling, and is planning for a refueling mission in geosynchronous orbit in 2026 and conducted a fueling and servicing mission in low Earth orbit in 2007.[11] Since 2018, China has operated the world's first and only communications satellite in an orbit around the Earth-Moon L_2 Lagrange point.[12] China is ramping up operations in very low Earth orbit, aiming to place a 300-satellite surveillance constellation there.[13] China is already operating what might be the only synthetic aperture radar satellite in very low Earth orbit.[14] China is also demonstrating a high level of space operational acumen. The PRC is maneuvering its satellites in a way that suggests not only an understanding of what U.S. satellites are doing but also that Chinese satellites have a way to counter U.S. actions—Chinese satellites have reportedly maneuvered to counter U.S. efforts to inspect them.[15] In the coming years, what China does in space will probably continue to surprise us.

Elements of National Space Power—Comparing the PRC to the United States

A comparison between China's presence in space today and ten years ago, in 2015, illustrates the breadth and scope of China's rapid rise in space—and may also foreshadow what to expect in the next ten or twenty years. In 2015, China launched 19 rockets and put around 40 satellites into orbit.[16] As of late November 2025, China has had nearly 80 launches and placed around 250 payloads into orbit in 2025.[17] By comparison, the United States has had over 160 successful space launches and placed over 2,000 payloads into orbit this year

expands Geesatcom constellation," Space News, September 9, 2025, https://spacenews.com/china-launches-mystery-yaogan-45-spysat-expands-geesatcom-constellation/.

[9] Clayton Swope, Kari A. Bingen, Makena Young, and Kendra LaFave, "Space Threat Assessment 2025, CSIS, April 25, 2025, https://www.csis.org/analysis/space-threat-assessment-2025.

[10] Simone McCarthy, "China's Chang'e-6 moon mission returns to Earth with historic far side samples," CNN, June 25, 2024, https://www.cnn.com/2024/06/25/china/china-change-6-moon-mission-return-scn-intl-hnk.

[11] Stephen Clark, "China jumps ahead in the race to achieve a new kind of reuse in space," Ars Technica, July 8, 2025, https://arstechnica.com/space/2025/07/china-jumps-ahead-in-the-race-to-achieve-a-new-kind-of-reuse-in-space/.

[12] Luyuan Xu, "How China's lunar relay satellite arrived in its final orbit," The Planetary Society, June 15, 2018, https://www.planetary.org/articles/20180615-queqiao-orbit-explainer.

[13] Ling Xin, " China's bullet-shape satellite test paves the way for very low orbit surveillance network," South China Morning Post, May 14, 2025, https://www.scmp.com/news/china/science/article/3310148/chinas-bullet-shape-satellite-test-paves-way-very-low-orbit-surveillance-network.

[14] Li Yali, "China launches first low-inclination orbit SAR satellite 'Haishao-1'," Phys Org, July 3, 2025, https://phys.org/news/2025-07-china-inclination-orbit-sar-satellite.html.

[15] "The Integrity Flash, Issue 104," Integrity ISR, September 1, 2024, https://isruniversity.com/wp-content/uploads/2025/02/integrity-flash-104.pdf.

[16] Zhu Xi, "19 Rockets and 43 Satellites! Year-Round Review of China's Space Developments in 2015," People's Daily Online, December 31, 2015, https://en.people.cn/n3/2015/1231/c90000-8997611.html.

[17] Space Data Navigator, AEI, https://spacedata.aei.org/.

as of late November 2025—with around 1,700 of those being Starlink satellites and over 100 being Amazon Leo satellites.[18]

To date, the only entity—worldwide—to have mastered vertical landing and reusability of orbital-class boosters at scale is SpaceX, though Blue Origin too demonstrated it can vertically land a booster rocket. A company in China may, however, attempt a vertical landing of an orbital-class rocket within the next few months.[19] Meanwhile, several other entities in China are working on reusable launch vehicles, as Beijing has made mastering reusable rockets a key national priority.[20] As of November 2025, eight companies in China have successfully conducted orbital launches.[21] All but two of the operational rockets developed by these companies are small-lift space launch vehicles, as most of China's larger launchers are built and operated by state-owned enterprises. But there are a variety of medium- and heavy-lift rockets under development, by companies and state-owned enterprises, that could become operational in the next few years, potentially alleviating China's launch bottleneck.[22] China already operates a reusable space plane, which commentators have compared to the U.S. X-37B, and is developing other similar vehicles.[23]

China launched the first satellite in what was intended to be its first low Earth orbit broadband constellation, called Hongyun, in 2018. Yet by November 2025, not one of China's proposed mega constellations was close to full operation, with Guowang "national network"—a planned 13,000 satellite constellation—having less than 150 satellites in orbit. Meanwhile, Starlink has over 8,000 active satellites and Amazon, which started launching production satellites in the last year, has over 100 satellites in orbit. However, Guowang may be picking up speed, as it has conducted around 10 launches since December 2024.[24] In addition to providing broadband, Guowang may serve as the backbone for a plug-and-play system that incorporates satellites having synthetic aperture radar, electro-optical sensors, or other payloads.[25] Other than Guowang, China is

[18] Ibid.
[19] Andrew Jones, "China is about to start trying to land and reuse its rockets," Space News, August 25, 2025, https://spacenews.com/china-is-about-to-start-trying-to-land-and-reuse-its-rockets/.
[20] Peter W. Singer and Alex Nova, "China is working on reusable rockets—and a strategic leap in space power," Defense One, August 14, 2025, https://www.defenseone.com/ideas/2025/08/china-working-reusable-rocketsand-strategic-leap-space-power/407453/.
[21] "Sizing Up China's Commercial Launchers," China Space Monitor, November 23, 2025, https://chinaspacemonitor.substack.com/p/sizing-up-chinas-commercial-launchers.
[22] Andrew Jones, "New rocket plans continue to emerge to support China's growing space ambitions," Space News, August 22, 2025, https://spacenews.com/new-rocket-plans-continue-to-emerge-to-support-chinas-growing-space-ambitions/ and "The Launch Bottleneck Holding up China's Starlink," China Space Monitor, March 16, 2025, https://chinaspacemonitor.substack.com/p/the-launch-bottleneck-holding-up.
[23] "Reusable Chinese spacecraft lands successfully - state media," Reuters, September 6, 2020, https://www.reuters.com/world/china/reusable-chinese-spacecraft-lands-successfully-state-media-2020-09-06/ and Daniel Shats and Peter Wood, "Chinese Spaceplane Programs," China Aerospace Studies Institute, Prepared by BluePath Labs, November 2021, https://bluepathlabs.com/wp-content/uploads/2024/05/chinese-spaceplane-programs.pdf.
[24] Andrew Jones, "China sends 10th group of Guowang broadband satellites into orbit with Long March 8A launch," Space News, August 25, 2025, https://spacenews.com/china-sends-10th-group-of-guowang-broadband-satellites-into-orbit-with-long-march-8a-launch/.
[25] Stephen Clark, "China's Guowang megaconstellation is more than another version of Starlink," Ars Technica, August 20, 2025, https://arstechnica.com/space/2025/08/china-may-have-taken-an-early-lead-in-the-race-for-a-military-megaconstellation/.

actively launching several other low Earth orbit communications constellations: Qiafan "Thousand Sails", GEESATCOM, and Tianqi.[26] More Chinese constellations are in the works.[27]

To date, China has not shown that it can manufacture and conduct space launch at the same cadence as companies, mainly SpaceX and Rocket Lab, in the United States—but China is diligently working to close that manufacturing gap and working to master reusable space launch technologies. According to a Chinese source, as of April 2025, "37 satellite manufacturing plants have already been commissioned, 13 are under construction, and another 8 are at the planning stage."[28] Many of these facilities are projected to be able to produce at least 100 satellites each year, with one factory in Hainan province expected to eventually produce over 1,000 satellites per year.[29] If these manufacturing facilities meet their target production rates, China would be capable of manufacturing over 4,000 satellites per year. If China commits more of its manufacturing might to building satellites, it could even eclipse these numbers. For reference, SpaceX alone can make 70 satellites per week—at a rate that translates to over 3,500 satellites per year.[30] Amazon says it can build five satellites per day—meaning possibly around 1,800 per year.[31]

China is also making strides in other important areas. Amazon successfully tested a 100 Gbps optical intersatellite link between its prototype satellites in 2023.[32] As of 2025, Starlink optical intersatellite links operate at speeds up to 200 Gbps between satellites in low Earth orbit.[33] Meanwhile, a Chinese company claims to have tested a 400 Gbps optical intersatellite link between two low Earth orbit satellites in March 2025.[34] China is also aiming to leapfrog the United States on space-based positioning, navigation, and timing, which has unambiguous military and non-military purposes. China is planning to launch its next generation BeiDou system from 2029 to 2035.[35] At the same time, the United States seems to be considering the value of China's multi-orbit approach—BeiDou satellites are in three different orbits—for its next-generation GPS

[26] Andrew Jones, "China launches first satellites for Thousand Sails megaconstellation," Space News, August 6, 2024, https://spacenews.com/china-launches-first-satellites-for-thousand-sails-megaconstellation/; "Geely Lauches 11 Satellites for 4th Orbital Plane, Advancing Integrated Space-Earth Mobility Ecosystem," Geely, August 11, 2025, https://www.geely.com/en/news/2025/geely-launch-11-satellites-4th-orbital-plane; and "China Expands Satellite Constellations to Enhance Smart Connectivity," Beijing Post, https://beijingpost.com/china-expands-satellite-constellations-to-enhance-smart-connectivity.

[27] "Honghu-3," Baidu.com, https://baike.baidu.com/item/Honghu-3/64762413.

[28] 你好太空2022. "中国有多少卫星工厂," [How Many Satellite Factories Does China Have?] April 22, 2025. https://www.bilibili.com/opus/1058634152000094227.

[29] "China to build factory in Hainan that makes 1,000 satellites a year," CGTN, April 6, 2024, https://news.cgtn.com/news/2024-04-06/China-to-build-factory-in-Hainan-that-makes-1-000-satellites-a-year-1sAsJw3Sy2Y/p.html.

[30] Michael Kan, "SpaceX Offers Rare Peek Inside a Starlink Satellite Factor, Tips 'Mini Lasers'," PC Mag, August 26, 2025, https://www.pcmag.com/news/spacex-offers-rare-peek-inside-a-starlink-satellite-factory-tips-mini-lasers.

[31] Thomas Kohnstamm, "Everything you need to know about Project Kuiper, Amazon's satellite broadband network," About Amazon, June 3, 2025, https://www.aboutamazon.com/news/innovation-at-amazon/what-is-amazon-project-kuiper.

[32] Amazon Staff, "Amazon's Project Kuiper completes successful tests of optical mesh network in low Earth orbit," About Amazon, December 13, 2023, https://www.aboutamazon.com/news/innovation-at-amazon/amazon-project-kuiper-oisl-space-laser-december-2023-update.

[33] "Satellite Technology," Starlink, https://www.starlink.com/technology.

[34] Andrew Jones, "China Makes High-Speed Laser Links in Orbit 400-gigabit-per-second intersatellite comms reduce the need for ground stations," IEEE Spectrum, May 12, 2025, https://spectrum.ieee.org/satellite-internet-china-crosslink.

[35] Xinhua, "China sets build next-generation BeiDou system," China Daily, November 28, 2024, https://www.chinadaily.com.cn/a/202411/28/WS6747f9b7a310f1265a1d0134.html.

system. A geostationary test satellite for the next generation GPS network was launched in August 2025.[36] A company in China has also tested technologies for uncrewed commercial reusable spacecraft.[37] Varda Space Industries, a U.S. company, has already conducted several reentries and received U.S. regulatory approval for unlimited future reentries.[38]

Space for Science and Exploration—and National Prestige

China's political leaders have worked to equate the nation's successes in space to the success and leadership of the party. By all accounts, those endeavors have paid off, as the people of China take tremendous pride in the country's civil space accomplishments. Between 1992, when China stood up the China Manned Space Program, and 2022, China achieved all its original human spaceflight goals, including the operation of a crewed spacecraft, mastering rendezvous and docking, and building a modular space station. China has maintained a continuous human presence in low Earth orbit for three years on its Tiangong-3 space station and demonstrated it can safely and reliably ferry humans and cargo to and from low Earth orbit.[39] China is pursuing the development of commercial cargo resupply capabilities for its space station.[40] When the International Space Station is deorbited in 2030, China will doubtless continue to operate its space station. It remains to be seen if the United States has allocated sufficient resources to ensure the availability of a commercially operated space station for U.S. and allied use by 2030. China also has plans for a robust docket of uncrewed deep space science missions, including an asteroid sample-return mission launched in 2025 and upcoming missions to Mars and Jupiter.

Currently, however, the focus of China's civil space program is undeniably the Moon, with a crewed lunar landing planned by 2030. In April 2024, a senior Chinese space official reaffirmed that timeline, noting that the "program development" for major mission components, including the Long March 10 rocket, Mengzhou crewed spacecraft, Lanyue lunar lander, and lunar landing space suits, was already complete.[41] Meanwhile, timelines for critical components of NASA's Artemis III mission, most notably the Human Landing System, are in flux and risk delaying NASA's schedule for returning astronauts to the Moon.[42] China also has two uncrewed missions in the works: Chang'e 7 planned for 2026 and Chang'e 8 planned for 2028. Chang'e 8 will test technologies required to build a permanent base. Both uncrewed missions play a role in China's plans for the International Lunar Research Station, a "scientific experimental facility consisting of sections

[36] Sandra Erwin, "U.S. eyes geostationary orbit for next-gen GPS," Space News, September 23, 2024, https://spacenews.com/u-s-eyes-geostationary-orbit-for-next-gen-gps/.
[37] Andrew Jones, "Commercial Chinese rocket launches small returnable spacecraft to orbit (video)," Space.com, December 20, 2023, https://www.space.com/commercial-chinese-rocket-ispace-launches-returnable-spacecraft.
[38] Garret Reim, "Space Ops: FAA OKs Unlimited Reentries For Varda Capsules," Aviation Week, June 25, 2025, https://aviationweek.com/space/space-exploration/space-ops-faa-oks-unlimited-reentries-varda-capsules.
[39] Global Desk, "Shenzhou 20 Mission astronauts dock with Tiangong space station. Here's what happened," The Economic Times, April 24, 2025, https://economictimes.indiatimes.com/news/international/us/shenzhou-20-mission-astronauts-dock-with-tiangong-space-station-heres-what-happened/articleshow/120596549.cms.
[40] Andrew Jones, "China to launch 2 new space station cargo spacecraft on commercial rockets in 2025," Space News, February 4, 2025, https://spacenews.com/china-to-launch-2-new-space-station-cargo-spacecraft-on-commercial-rockets-in-2025/.
[41] Andrew Jones, "China on track for crewed moon landing by 2030, space official says," Space News, April 24, 2024, https://spacenews.com/china-on-track-for-crewed-moon-landing-by-2030-space-official-says/.
[42] Josh Dinner, "SpaceX Starship timeline delays astronaut moon landing for NASA's Artemis 3 mission to 2028: Report," Space.com, November 17, 2025, https://www.space.com/space-exploration/spacex-starship-timeline-delays-astronaut-moon-landing-for-nasas-artemis-3-mission-to-2028-report.

on the lunar surface, in lunar orbit and on Earth."[43] The first phase of the base will be built by 2035 in the lunar south pole. China and Russia are also planning to build a lunar nuclear power station to support the base.

Looking beyond the Moon, Beijing will continue to pursue new space exploration achievements—exploring the cosmos is a core part of Xi Jinping's "space dream."[44] Mars features prominently in the PRC's 2050 space science strategy, unveiled in October 2024, and a roadmap released in March 2025 by the Deep Space Exploration Laboratory (e.g., China's equivalent to the Jet Propulsion Laboratory).[45] Two goals related to Mars—sending an uncrewed probe around 2020 and landing humans on the Martian surface around 2050—were outlined in a 2010 space science and technology roadmap published by the Chinese Academy of Science.[46] China accomplished the first of these goals in 2021 with the Tianwen-1 mission. With the Tianwen-3 mission, scheduled for launch in 2028, China will likely achieve something no nation has done before: returning Martian samples to Earth. In 2021, a senior Chinese official spoke about crewed missions to Mars in 2033, but that date seems unlikely.[47] A more realistic estimate is probably no sooner than 2040, which aligns with a presentation by the Deep Space Exploration Laboratory in 2023.[48]

Space for Technological and Industrial Development

The aerospace industry fits squarely into the long-term technological and economic development strategies and "new industrialization" policies of the PRC.[49] President Xi has unambiguously affirmed the importance to China in developing its space industry.[50] The 15-year National Medium- to Long-Term Program (MLP) for Science and Technology Development, launched in 2006, outlined plans for 16 major special projects, often called megaprojects, intended to advance national goals and China's indigenous engineering and technological capabilities—one of these megaprojects was space-related: building a second-generation BeiDou satellite navigation network.[51] In 2015, Beijing unveiled its Made in China 2025 initiative, which

[43] "China outlines blueprint for international lunar research station," Xinhua, The State Council Information Office of the People's Republic of China, September 6, 2024, http://english.scio.gov.cn/internationalexchanges/2024-09/06/content_117411749.html.
[44] "Backgrounder: Xi Jinping's Vision for China's Space Development," Xinhuanet, April 24, 2017, http://www.xinhuanet.com/english/2017-04/24/c_136232642.htm.
[45] "National Mid- and Long-term Plan for Space Science in China, National Space Science Center, Chinese Academy of Sciences, October 28, 2024, http://english.nssc.cas.cn/pub/202410/t20241028_692867.html and Andrew Jones, "China has a planetary exploration roadmap focused on extraterrestrial life," Post on X.com, March 26, 2025, https://x.com/AJ_FI/status/1904778023896760724.
[46] Yongxiang Lu, "Science & Technology in China: A Roadmap to 2050," Chinese Academy of Sciences, 2010, https://archive.org/details/isbn_9783642048227/.
[47] "China plans its first crewed mission to Mars in 2033," Reuters, June 24, 2021, https://www.reuters.com/business/aerospace-defense/china-plans-its-first-crewed-mission-mars-2033-2021-06-24/.
[48] International Lunar Research Station (ILRS), Deep Space Exploration Laboratory of CNSA, Presentation to UNOOSA, May 2023, https://www.unoosa.org/documents/pdf/copuos/2023/TPs/ILRS_presentation20230529_.pdf.
[49] "China front-loads future with new industrialization," China Daily, The State Council of the People's Republic of China, December 4, 2023, https://english.www.gov.cn/news/202312/04/content_WS656d32c7c6d0868f4e8e1df3.html.
[50] "Xi Jinping calls for accelerating progress in China's space endeavors," CGTN, September 23, 2024, https://news.cgtn.com/news/2024-09-23/Xi-calls-for-accelerating-progress-in-China-s-space-endeavors-1x8mrMw5GBa/p.html.
[51] "The National Medium- to Long-Term Program for Science and Technology Development," The State Council of the People's Republic of China, https://www.itu.int/en/ITU-D/Cybersecurity/Documents/National_Strategies_Repository/China_2006.pdf and "The Rise of China's Industrial Policy,"

aimed to extend the goals of the MLP to 2025 and focused on advancing indigenous capabilities across ten industrial sectors, which included the aerospace sector and, within that sector, space launch technologies.[52]

Beijing has also emphasized the need to harness indigenous industry partners. In 2014, Beijing implemented a new policy that created opportunities for private sector space development.[53] A 2022 white paper on space released by the central government recognized industry as a "critical element of the national strategy."[54] Development plans on the national, provincial, and district levels incorporate aerospace-related industrial goals. Emerging space technologies and space resources are also playing into China's industrialization initiatives. In an October 2024 lecture, a member of the Chinese Academy of Engineering discussed building a gigantic space-based solar power array in geosynchronous orbit.[55] In 2025, scientists in China shared a plan for using space resources and defending Earth from asteroids.[56] The upcoming Chang'e 8 lunar mission involves testing technologies for in-situ resource utilization on the Moon.[57] Chinese scholars have also discussed using in-situ resources for the construction of infrastructure on Mars.[58] China is also developing a satellite constellation for artificial intelligence-enabled computing in space.[59]

Recommendations

If the United States is in a race with China, it is a race that has no end, other than an end associated with the rise and fall of nations in a timeframe measured over centuries. This race is a test of endurance and will take place over an indeterminate period of time. China is certainly running such a race. With its focus on military-civil fusion, Beijing is marshalling its technical and manufacturing resources to enhance its overall national power—with space playing a key role. The importance of space to national power is also recognized by the United States, with President Trump noting in July 2025 that space systems "power exploration, defense, and communication" and that the nation will ensure "the American flag remains the ultimate symbol of leadership across the final frontier."[60]

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Though the PRC's space power is growing, the United States can retain its lead in space and ensure it remains the world's most consequential space power. To do so, we must take full advantage of our strongest advantages—a mature, yet still growing, space innovation ecosystem; a space economy built on free-market principles; and a coalition of willing international partners who want and choose to work with the United States, because these nations believe in a future of humankind in space that matches our own vision. These characteristics of U.S. national space power are force-multipliers for every dollar spent by the U.S. government on space activities and should be harnessed, in the same way that Beijing uses military-civil fusion, to advance the defense, economic security, scientific and space exploration objectives, and prestige of our nation.

To capitalize on the U.S. space innovation ecosystem, policymakers should recognize the role of stable government spending and program direction in doing several things that help advance U.S. national space power: 1) funding basic and early stage (i.e., technology readiness level one or two) research and development applicable to space which a company might view as too risky to undertake with its own money; 2) funding activities in space, such as science and exploration, which do not have strong non-government business cases but can generate new ideas and innovation that feed back into the space economy; and 3) funding activities to pursue government objectives in a way that they create opportunities and lower costs for other entities to try out their ideas and technologies. The Commercial Lunar Payload Services program is an example of the latter activity, as it was structured in a way that created lower cost ride-sharing opportunities for non-NASA entities into space and to the Moon. The Commercial Orbital Transportation Services program, which began in the mid-2000s, is another program that aimed to provide a broader benefit to the space economy, while also providing cargo transportation services to the International Space Station.

A strong and growing U.S. space economy strengthens U.S. economic and national security. The U.S. space economy, which operates on free-market principles, can facilitate the process of creative destruction, generating new ideas and businesses. Over the last 15 years, U.S. companies have succeeded in increasing their share of and growing existing space markets (i.e., commercial launch and satellite communications) and creating new or maturing developing markets (i.e., commercial remote sensing, human spaceflight, and reentry services). The most effective way that policymakers can accelerate the flywheel powering the success of U.S. companies in space is to identify how existing regulations or procedures (i.e., on spectrum, launch and reentry, and export control and International Traffic in Arms Regulations) might be holding back free-market forces and artificially slowing the growth of U.S. space companies. Regulations that incentivize the status quo over innovation should be reevaluated. Once identified, policymakers should consider how to change and modernize rules with the goal of optimizing them towards facilitating more commercial growth in space for U.S. companies. The Trump administration, as well as past ones, have sought to update and modernize such rules along these lines—continuing this work is important. Proposals for new regulations or authorizations for commercial space activities should be scrutinized, as they would add more bureaucracy to an already bureaucratized business.

Finally, unlike the PRC, the United States has a long list of international friends who want to partner with it in space—the growing list of signatories to the Artemis Accords and roster of countries contributing to the

Artemis program stands as unambiguous proof that nations want to partner with the United States.[61] The recently launched NISAR (NASA-ISRO Synthetic Aperture Radar) satellite is another example of the value of partnerships.[62] NASA supplied a radar, while India provided a satellite bus, a second radar, and the rocket that launched the satellite into orbit. Selfishly, the United States should cultivate and strengthen such relationships, particularly with nations who bring money to the table. Pooling resources, including money and talent, with international partners will allow the United States to do more in space and, diplomatically, increase the odds that U.S. values and free-market principles are reflected in humankind's future activities on the Moon and across the Solar System. International space partnerships are also an effective soft power tool, whose impact on shaping global geopolitics and strengthening a world order in America's image should not be underestimated.

In 1963, Edward Teller, a Hungarian emigrant to the United States who played a critical role in the development of the atomic bomb, testified before the Senate Foreign Relations Committee on nuclear strategy and weapons development saying that, "I believe that in a race for knowledge we [the United States] will win. But I believe that in a race in which we are not running or running half-heartedly we have been losing and we will continue to lose."[63] Today, we as a nation face a similar situation in space. We have many advantages over the PRC that we can use to maintain our edge—but to do so, we need to start running.

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[62] "NISAR," NASA, https://science.nasa.gov/mission/nisar/.
[63] "Nuclear Test Ban Treaty: Hearings Before the Committee on Foreign Relations," U.S. Congress, U.S. Government Printing Office, 1963, https://books.google.com/books?id=qkovAAAAMAAJ&pg=PR1#v=onepage&q&f=false.