Testimony

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The Expansion of China's Military Space and Counterspace Capabilities and Implications for Space as a Contested Domain

CT-A3951-1

Testimony presented before the U.S.-China Economic and Security Review Commission on April 3, 2025

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Published by the RAND Corporation, Santa Monica, Calif.

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The Expansion of China's Military Space and Counterspace Capabilities and Implications for Space as a Contested Domain

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China's leaders see preeminence in space as an important component of a strong country,[3] a source of national pride, and key to a prosperous nation.[4] People's Liberation Army (PLA) writings from 2013 describe space capabilities as strategically important for winning what the PLA calls *informatized wars*.[5] Since that time, China has designated space as a warfighting domain and has been "growing its military space and counterspace capabilities at breathtaking pace."[6] My testimony today will describe recent developments and the trajectory of Chinese space and counterspace capabilities, changes to how China organizes for military space, factors that may affect the risk of warfare escalating to the space domain, and recommendations

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[3] Howard Wang, Gregory Graff, and Alexis Dale-Huang, *China's Growing Risk Tolerance in Space: People's Liberation Army Perspectives and Escalation Dynamics*, RAND Corporation, RR-A2313-2, 2024, p. 2, https://www.rand.org/pubs/research_reports/RRA2313-2.html.

[4] Headquarters Space Force Intelligence, "Space Threat Fact Sheet," U.S. Space Force, February 21, 2025, p. 1.

[5] See "Research on Joint Operations" ["联合作战研究"], National Defense University Press, 2013. *Informatized warfare* refers to warfare conducted with enhanced battlespace awareness and capability to communicate and share information with military units, which can be enabled by space capabilities.

[6] Headquarters Space Force Intelligence, 2025; Stephen N. Whiting, "Fiscal Year 2025 Priorities and Posture of United States Space Command," presentation to the Senate Armed Services Committee February 29, 2024, p. 6.

for shaping the trends in directions favorable for U.S. national security. I begin with a discussion of recent trends in the development of China's military space capabilities.

Recent Trends in China's Military Space Capabilities

There is evidence that, similar to the U.S. military, the PLA has increasing dependence on space for joint warfighting,[7] and this dependence is reflected in the rapid growth of its space capabilities. In the past eight years, China has increased the number of satellites for intelligence, surveillance, and reconnaissance (ISR) by about a factor of six, which includes a 17-fold increase in the number of commercial ISR satellites, increasing ISR capacity and improving revisit rates.[8] These ISR satellites provide the PLA with the capability to assess U.S. force posture in the Indo-Pacific region, track and target U.S. naval assets, and target and assess the outcomes of missile attacks on overseas bases where U.S. forces may be operating, among other military uses. China also operates the only synthetic aperture radar satellite based in geostationary orbit (GEO) which likely provides China with day-or-night, all-weather, persistent imaging capability for surveilling U.S. Navy assets operating in the region.[9]

China increased its number of communication satellites by a factor of twelve over this time frame. A national priority for China is to develop a megaconstellation of communication satellites to function as "China's Starlink," and this effort is called Project SatNet.[10] China launched 72 Project SatNet satellites into low earth orbit (LEO) as part of a constellation of 648 planned by the end of 2025, with thousands planned by 2030.[11] Project SatNet is distinct from other Chinese initiatives to build a megaconstellation, such as another effort called G60,[12] and is almost certainly intended for some military use.[13]

China's BeiDou satellite system achieved full operational capability in 2020 and provides position, navigation, and timing (PNT) services for civilian and military applications, as well as a communications and command and control capability, from satellites in a variety of orbits. It is owned and operated by the civilian China National Space Administration.

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[7] Corey Crowell and Sam Bresnick, *Defending the Ultimate High Ground: China's Progress Toward Space Resilience and Responsive Launch*, Center for Security and Emerging Technology, July 2023, p. 9, https://cset.georgetown.edu/publication/defending-the-ultimate-high-ground/.

[8] The trends in space capabilities provided in this section are primarily based on the counts of military and commercial satellites from Todd Harrison, "Space Data Navigator," American Enterprise Institute, undated, https://spacedata.aei.org/. Estimates can vary by source. For an alternative characterization of the trends, see Headquarters Space Force Intelligence, 2025.

[9] Clayton Swope, "No Place to Hide: A Look into China's Geosynchronous Surveillance Capabilities," Center for Strategic and International Studies, January 19, 2024.

[10] Howard Wang, Jackson Smith, and Cristina L. Garafola, *Chinese Military Views of Low Earth Orbit: Proliferation, Starlink, and Desired Countermeasures*, RAND Corporation, RR-A3139-1, 2025, p. vi, https://www.rand.org/pubs/research_reports/RRA3139-1.html.

[11] Headquarters Space Force Intelligence, 2025.

[12] Wang, Smith, and Garafola, 2025, p. 30.

[13] Wang, Smith, and Garafola, 2025, p. 29.

From 2017 to 2021, China launched a new constellation of early warning satellites into GEO. China has also made impressive strides in enhancing its capabilities for space domain awareness (SDA), which includes satellites but also ground infrastructure, such as radar and telescope systems, many of which are located in foreign countries.[14] SDA allows military forces to plan, integrate, execute, and assess space operations, including counterspace operations.[15]

China also has a reusable space plane.[16] The mission of this space plane is probably similar to the mission of the U.S. X-37B,[17] though its mission capabilities may be more limited, since its payload capacity is likely far below that of the X-37B and its flight tests have demonstrated lower levels of endurance than the X-37B.[18]

China has expanded its launch industry and accelerated its launch pace. In 2022, China began construction on a new launch complex on Hainan Island and built sea platforms that support launch.[19] China had around 70 launches in 2024, compared with 150 launches for the United States.[20] Regarding reliability, a report from 2023 notes that China's Long March–series rockets had six failures to achieve orbit in 284 attempts from 2013 to 2022, in contrast with two failures in 279 attempts by the United States over the same period using a combination of Delta IV, Atlas V, and SpaceX Falcon 9 rockets.[21] In August 2024, China attempted to launch 18 communication satellites into LEO on a liquid-fueled rocket; however, the upper stage broke apart during the launch and created more than 50 pieces of debris, posing a risk to satellites in LEO below 800-km altitude.[22] China is prioritizing a tactically responsive space launch capability that leverages several of its new mobile, solid-fuel launch vehicles for this capability, provided by a combination of China's established space companies and newer companies.[23] However, the newer companies had few launches and high failure rates (five failures out of 11 launches as of 2023).[24]

The PLA typically acquires whole systems that are manufactured or integrated by state-owned enterprises (SOEs) that fall under the State Administration for Science, Technology, and

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[14] China maintained ground sites for space capabilities in six countries in 2019, a number that increased to "more than a dozen countries" by 2023 (Cate Cadell and Marcelo Perez del Carpio, "A Growing Global Footprint for China's Space Program Worries Pentagon," Washington Post, November 21, 2023).

[15] Joint Publication 3-14, *Space Operations*, Joint Chiefs of Staff, August 23, 2023, p. xiii.

[16] Andrew Jones, "China's Secretive Reusable Spaceplane Lands After 267 Days in Orbit," *SpaceNews*, September 6, 2024.

[17] For recent information about the X-37B, see U.S. Space Force, "United States Space Force Launches Seventh X-37B Mission," press release, December 30, 2023.

[18] Wang, Smith, and Garafola, 2025, p. 40.

[19] Crowell and Bresnick, 2023, p. 18.

[20] The primary source for this section is Crowell and Bresnick, 2023.

[21] Crowell and Bresnick, 2023, p. 21.

[22] Andrew Jones, "Chinese Megaconstellation Launch Creates Field of Space Debris," *SpaceNews*, August 8, 2024, https://spacenews.com/chinese-megaconstellation-launch-creates-field-of-space-debris/.

[23] Crowell and Bresnick, 2023, p. 2.

[24] Crowell and Bresnick, 2023, p. 23.

Industry for National Defense, and the PLA rarely acquires a complete system manufactured by a privately owned company.[25] SOEs China Aerospace Science and Technology Corporation and China Aerospace Science and Industry Corporation or their subsidiaries dominate China's space industry. However, as mentioned, newer companies are also entering the market, and they are primarily focused on launching smaller payloads to LEO. Interestingly, GeeSpace, a subsidiary of China's largest automaker Geely, is fielding a LEO constellation to provide navigation services with centimeter-level accuracy for Geely-manufactured autonomous vehicles,[26] and this company represents a new entrant that may be able to provide PNT services to the PLA as an alternative to BeiDou.

China has made significant progress with orbital inspection, repair, and refueling capabilities. In 2022, China's Shijian-21 space debris mitigation satellite docked with a defunct BeiDou satellite and towed it into a graveyard orbit.[27] In February 2025, China's Shijian-25 satellite refueled a BeiDou satellite in GEO.[28] As I discuss later in my testimony, these capabilities could also be used for counterspace weapons.

Similar to the United States, China is leveraging methods to enhance the resilience of its space architectures to hostile actions (such as counterspace attacks) or adverse conditions. For instance, the proliferation method used by the U.S. Starlink and Chinese Project SatNet enhances resilience by deploying large numbers of the same payloads or systems of the same types to perform the same mission.[29] Another example is the diversification method, which uses different orbits, systems, or commercial, civil, or international partners to support the same mission in multiple ways. BeiDou employs satellites in different orbits (in contrast, the U.S. GPS employs satellites in medium earth orbit). Progress on resilience is nascent for both actors, but I would expect to see this trend continue because of its potential benefits.

The focus of my testimony is on China's military space and counterspace capabilities. However, it is worth mentioning a few key advancements in civilian space. China is excluded from the International Space Station as a likely result of a congressional amendment from 2011, known as the Wolf Amendment, that prohibits the National Aeronautics and Space Administration (NASA) from cooperating substantially with its Chinese counterpart without express prior authorization; China operates its Tiangong space station instead.[30] China has ambitions to land humans on the moon by 2030; in summer 2024, China's unmanned spacecraft

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[25] Eli Tirk, "Sichuan Tengden Technology: Privately Owned, State Sponsored," China Aerospace Studies Institute, November 2022.

[26] Resilient Navigation and Timing Foundation, "Commercial Chinese LEO PNT Launching in 2020—Spacewatch Global," March 5, 2020.

[27] Andrew Jones, "China's Shijian-21 Towed Dead Satellite to a High Graveyard Orbit," *SpaceNews*, January 27, 2022, https://spacenews.com/chinas-shijian-21-spacecraft-docked-with-and-towed-a-dead-satellite/.

[28] "China Achieves Space Refueling Technology: A New Era of 'Space Equality' Dawns," *The Nation*, February 24, 2025, https://thenationonlineng.net/china-achieves-space-refueling-technology-a-new-era-of-space-equality-dawns/.

[29] For a formal treatment of resilience methods, see Joint Publication 3-14, 2023, p. III–4.

[30] Daisy Dobrijevic and Andrew Jones, "China's Space Station, Tiangong: A Complete Guide," Space.com, updated August 15, 2023, https://www.space.com/tiangong-space-station.

returned samples from the far side of the moon.[31] China positioned a relay satellite at a Lagrange point to enable communications with its lunar landers for this mission.[32] In March 2021, China and Russia agreed to a memorandum of understanding to build an International Lunar Research Station as a scientific experiment base on the lunar surface or orbit that would be open to all interested countries and international partners.[33] By July 2024, China indicated it had reached agreements with ten countries to join it and Russia in the effort, with the aim of having a basic station by 2035 and an extended station by 2045.[34] A report published in 2024 concluded that there was limited expectation at that time for military activity on the moon surface or the cislunar region between the earth and moon.[35]

Recent Trends in China's Counterspace Capabilities

In 2007, China demonstrated a direct ascent anti-satellite (DA-ASAT) missile capability for kinetic attacks on satellites in LEO, and China now has an operational ground-based system that the PLA trains to operate.[36] In 2013, China launched a ballistic object to an altitude approaching GEO,[37] and this may be an indication that China will eventually field a DA-ASAT capability for satellites in higher orbits.[38]

China's orbital inspection and repair satellites in GEO, such as the Shijian-21 and Shijian-25, are potentially dual-use as military weapons with flexible capabilities.[39] For instance, a grappler on a repair satellite could be used to irreversibly attack a satellite by permanently damaging satellite components or to reversibly attack a satellite by reorienting the satellite to temporarily take it out of mission. Conceivably, the same type of satellite could also be used to defend a satellite from attack by another repair satellite equipped with a grappler. Similarly, China demonstrated complex maneuvers with experimental satellites in LEO in 2024 that a top U.S. Space Force general characterized as rehearsing "dogfighting" maneuvers; the maneuvers

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[31] Leonard David and Lee Billings, "China Makes History with First-Ever Samples from the Moon's Far Side," *Scientific American*, June 25, 2024, https://www.scientificamerican.com/article/china-returns-first-ever-samples-from-the-moons-far-side/.

[32] Science Informed, "A New Era of Space Exploration: The Battle for Lagrange Points," December 24, 2023, https://scienceinformed.com/a-new-era-of-space-exploration-the-battle-for-lagrange-points/.

[33] Rafi Letzter, "China and Russia Say They Will Join Forces to Build Moon Base," Live Science, March 10, 2021, https://www.livescience.com/china-russia-moon-mission.html.

[34] Andrew Jones, "China Wants 50 Countries Involved in Its ILRS Moon Base," *SpaceNews*, July 23, 2024, https://spacenews.com/china-wants-50-countries-involved-in-its-ilrs-moon-base/.

[35] Dean Cheng, *China and the New Moon Race: A Collection of Papers by Dean Cheng*, George Washington University, November 2024, p. 96, https://elliott.gwu.edu/china-and-new-moon-race.

[36] Headquarters Space Force Intelligence, 2025.

[37] Headquarters Space Force Intelligence, 2025.

[38] Defense Intelligence Agency, *Challenges to Security in Space: Space Reliance in an Era of Competition and Expansion*, 2022.

[39] Kristin Burke, *PLA Counterspace Command and Control*, China Aerospace Studies Institute, December 2023, p. 60, https://www.airuniversity.af.edu/CASI/Display/Article/3612979/pla-counterspace-command-and-control/.

involved three Shiyan-24C experimental satellites and two other Chinese experimental spacecraft, the Shijian-6 series satellites.[40]

According to the Defense Intelligence Agency (DIA), China has multiple ground-based laser weapons to disrupt, degrade, or damage satellites. Also, DIA indicates that the PLA routinely incorporates electronic warfare into its exercises that are intended to deny communications, radar systems, and PNT support to force movements and degrade precision-guided munitions.[41]

The wide range of counterspace capabilities and capabilities with potential dual-use provide PLA commanders with systems that can be used for offensive and defensive purposes, with reversible and irreversible modes of attack. These systems provide the PLA with flexible tools that are relevant for crisis and escalation management.

Recent Changes in China's Organization for and Operational Approach to Military Space

Following its designation of space as a warfighting domain, China organized its military space capabilities and military network operation capabilities under the Strategic Support Force (SSF)[42] as a service branch of the PLA in 2015.[43] There is uncertainty about which space and counterspace capabilities were operated by or under the control of the SSF, but it appears that many counterspace capabilities were not centralized under the SSF. For instance, it appears that the PLA Rocket Force and the SSF both operated the DA-ASAT capability, which was under the control of the Central Military Commission (CMC).[44] Also, terrestrial satellite communications jamming capabilities were operated by PLA services other than the SSF under theater commander control.[45]

In April 2024, China disestablished the SSF as a service branch.[46] The PLA is now organized into four services (Army, Navy, Air Force, and Rocket Force) and four *arms*, which are the Aerospace Force, Cyberspace Force, Information Support Force, and Joint Logistic Support

[40] Courtney Albon, "China Demonstrated 'Satellite Dogfighting,' Space Force General Says," *Defense News*, March 18, 2025, https://www.defensenews.com/space/2025/03/18/china-demonstrated-satellite-dogfighting-space-force-general-says/.

[41] Defense Intelligence Agency, 2022.

[42] The SSF was further subdivided into the Space Systems Department and Network Systems Department (see Burke, 2023, p. 5).

[43] Joe McReynolds and John Costello, "Planned Obsolescence: The Strategic Support Force in Memoriam (2015–2024)," *China Brief*, Vol. 24, No. 9, April 26, 2024, https://jamestown.org/program/planned-obsolescence-the-strategic-support-force-in-memoriam-2015-2024/.

[44] PLA Academy literature from 2000 to 2020 states that the decisions to use a kinetic space weapon, such as DA-ASAT, would be made at the CMC's Joint Operations Command Center and commanded from the Space Systems Department directly under the CMC. See Burke, 2023, p. 22.

[45] Burke, 2023, p. 12.

[46] McReynolds and Costello, 2024.

Force. The remnants of the space-related elements of the SSF are now aligned under the Aerospace Force, and the four arms are directly subordinate to the CMC.[47]

The PLA's operational concept for multi-domain warfare prioritizes striking key vulnerabilities in an adversary network information system of systems, with the belief that striking key nodes will severely hinder an adversary.[48] This operational concept would certainly apply to space warfare, and it suggests that the PLA would seek to identify key U.S. space dependencies for joint warfighting and hold the associated space systems at risk.

China does not recognize a distinction between commercial and military satellites; international law notwithstanding, China would likely treat civilian and commercial satellites supporting military operations as military targets.[49]

Factors That Could Affect the Risk of Escalating Warfare to the Space Domain

A report published in 2024 by my colleagues at RAND suggests that the PLA has grown increasingly risk tolerant in its approach to escalation in the space domain under Chinese Communist Party General Secretary Xi Jinping.[50] That report finds that the PLA's approach to deterrence and escalation in space prioritizes securing political objectives over avoiding conflict, and "Beijing could initiate conflict activities if it judged that the political risk of inaction exceeded the military risk."[51] Additionally, the PLA's threat perceptions tend to exaggerate U.S. capabilities, leading to assessments and responses that prepare for the worst possibilities.[52] These factors may increase the risk of escalating warfare to the space domain.

On the other hand, the tremendous growth in China's military space capabilities may reflect the PLA's growing dependence on space for joint warfighting. China may have less incentive to escalate warfare to space if the PLA needs to preserve the space capabilities it depends on for joint warfighting and if the PLA believes that the United States can hold those capabilities at risk. For instance, in a 2023 wargame of a defense of Taiwan scenario set in 2026, it was observed that

> [n]o players used direct-ascent weapons against adversary satellite constellations because of concerns about losing their own capabilities. It was a classic case of

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[47] Gordon Arthur, "Why China Axed the Strategic Support Force and Reshuffled the Military," *Defense News*, April 26, 2024, https://www.defensenews.com/global/asia-pacific/2024/04/26/why-china-axed-the-strategic-support-force-and-reshuffled-the-military/.

[48] Wang, Graff, and Dale-Huang, 2024, p. 18.

[49] Yool Kim George Nacouzi, Dwight Phillips, Krista Romita Grocholski, Igor M. Brin, Brian Dolan, Jonathan Fujiwara, John Hoehn, Kotryna Jukneviciute, Gwen Mazzotta, Jordan Willcox, Jonathan P. Wong, and Barbara Bicksler, *Operational and Policy Implications of Integrating Commercial Space Services into U.S. Department of Defense Operations*, RAND Corporation, RR-A2562-2, 2025, p. 66, https://www.rand.org/pubs/research_reports/RRA2562-2.html.

[50] Wang, Graff, and Dale-Huang, 2024, pp. 24–25.

[51] Wang, Graff, and Dale-Huang, 2024, p. 24.

[52] Wang, Smith, and Garafola, 2025, p. vi.

> mutual deterrence. In counterspace operations, both sides contented themselves with electronic warfare and dazzling. They also launched co-orbital attacks that would only unfold beyond the time scale of a Taiwan operation. While space is a critical warfighting domain, it was relatively static in these scenarios.[53]

It should be noted that an observation from one wargame is scant evidence of a trend.

Recommendations

This panel is about China's ambition to dominate space. Striving for space dominance narrowly focuses attention on threats to space capabilities. I recommend a more balanced approach for the United States that not only takes threats into account but also considers the specific U.S. and Chinese dependencies on space for joint warfighting. The U.S. military should seek to preserve the space capabilities that it relies on for the joint warfight and to hold at risk the space capabilities that China relies on to achieve its military objectives. This approach, I believe, will yield better insights into the priorities for spending on U.S. military space and counterspace capabilities.

Systems that increase U.S. resilience challenge the PLA's preferred approach to warfighting.[54] The United States should continue to acquire space architectures, or services from commercial space architectures, that leverage methods of enhancing resilience, including proliferation and diversity methods. For instance, the United States should enhance the resilience of architectures that provide PNT services.

The PLA appears to be pursuing a portfolio of counterspace capabilities that can flexibly be used for offense or defense and can deliver effects that are reversible or irreversible. These capabilities provide PLA commanders with powerful tools for crisis and escalation management. I recommend equipping the U.S. military with a similar set of capabilities. In particular, the U.S. military should be equipped with capabilities that can hold at risk the space capabilities that China is highly dependent on for joint warfighting; the U.S. military should also be equipped with capabilities to defend its own satellites that lack resilience features and that the United States depends on for joint warfighting. Robust capabilities for space domain awareness, and robust capabilities for command and control of space operations, are foundational.

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[53] Mark F. Cancian, Matthew Cancian, and Eric Heginbotham, *The First Battle of the Next War: Wargaming a Chinese Invasion of Taiwan*, Center for Strategic and International Studies, January 2023, p. 115.

[54] Wang, Smith, and Garafola, 2025, p. vi.