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Rethinking Strategic Competition in Space and Space in Strategic Competition

Annotated Bibliography

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Rethinking Strategic Competition in Space and Space in Strategic Competition

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Key Questions:

- How has the nature of competition in space shifted in recent years?
- How should the place of space in strategic competition evolve?
- What implications follow for the formulation and implementation of U.S. space strategy?

Panel Topics:

1. The New Policy Context
2. China, Strategic Competition, and Space
3. Space Offense: How Far and How Quickly?
4. Space Defense: How Far and How Quickly?
5. Space Competition and Strategic Stability
6. Civil Space and Privatization: Where Does it Go from Here?
7. The Space Force: Where Does it Go from Here?
8. The Roles of U.S. Allies: Both Losers and Winners?
9. Cooperation with Competitors: Any Prospect?

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Panel 1: The New Policy Context

- What are the new administration's policy priorities?
- What are the main elements of continuity and change with prior approaches?
- What congressional equities will be consequential to policy implementation?

Nina M. Armagno, Jane Harman, and Esther D. Brimmer, "Securing Space: A Plan for U.S. Action," Council on Foreign Relations (February 2025). https://www.cfr.org/task-force-report/securing-space.

> The Council on Foreign Relations Task Force Report: Securing Space warns that the United States is at risk of losing its leadership in space due to rising congestion, mounting space debris (especially in Lower Earth Orbit (LEO)), and increasing threats from adversaries such as China and Russia. The report frames space as a "strategic vulnerability" for the U.S. modern life and U.S. national security, which relies on satellites. Yet, these assets are highly vulnerable to attack and disruption, while the absence of strong international governance makes space traffic management dangerously inadequate. This is particularly the case given China and Russia's means to target U.S. space assets with a variety of capabilities. The Task Force stresses that space must become a top U.S. national priority. Recommendations include revitalizing American leadership, strengthening deterrence, establishing clear "rules of the road" for space traffic, engaging both allies and rivals in practical cooperation, and integrating private sector expertise. Ultimately, it argues that space should be treated as a global common and that decisions taken now will determine whether space remains usable and beneficial for all humanity in the decades ahead.

Geoffrey S. Reber, "Strengthening A Solid Foundation: U.S. Advantages from Commercial Space," Center for Space Policy and Strategy (October 2024). https://csps.aerospace.org/papers/strengthening-solid-foundation-us-advantages-commercial-space.

> This piece argues that America's commercial space sector remains the backbone of U.S. leadership in space but faces intensifying competition. The U.S. currently leads in spacecraft manufacturing, launch services, and commercial innovation. Yet, China is rapidly expanding capacity and capabilities through their policy of military–civil fusion. Russia is turning to asymmetric strategies amid industrial decline. Meanwhile, European allies are working to better coordinate investment to improve demand for systems and support space firms. The report finds that the most advantageous U.S. strategies are those that maximize strengths and opportunities—such as accelerating the use of commercial solutions, expanding modular open systems, and improving acquisition processes—while carefully calibrating policies on export controls. Ultimately, sustaining U.S. leadership will require leveraging domestic innovation pipelines, integrating commercial capabilities into national security space, and proactively shaping global market conditions rather than relying on defensive measures.

James B. Meigs, “U.S. Space Policy: The Next Frontier,” Manhattan Institute (April 2025). https://manhattan.institute/article/us-space-policy-the-next-frontier.

> Meigs argues that a second Space Age is unfolding—driven by private-sector innovation that promises to make spaceflight routine and widely accessible, reigniting hopes for a sustained lunar return and eventual Mars missions. Even so, the United States is facing two major barriers to leadership: (1) outdated and burdensome regulations, which hinder rapid commercial launch innovation, and (2) NASA’s inefficiencies—most notably the Space Launch System (SLS), which is years behind schedule, over-budget, and projected to be extremely costly per launch. To maintain and expand U.S. leadership in space, the report urges four key reforms: overhaul launch regulations; retire the SLS after its first successful lunar mission; expand and deepen public–private partnerships; and restructure NASA to focus on its strengths in research, mission planning, and science while freeing resources through fixed-price commercial models. There will likely be challenges to these changes, but with growing competition from China, quick and meaningful changes to the U.S. approach to space are required.

Robert S. Wilson, *FY 2025 Defense Space Budget: Continued Emphasis on Proliferation Under a More Constrained Top-Line,* Center for Space Policy and Strategy (June 2024). https://csps.aerospace.org/sites/default/files/2024-06/FY25BudgetBrief_20240605.pdf.

> The Center for Space Policy and Strategy assessment of the FY 2025 Space Force budget reflects the first year in which budget requests have declined from prior years. This decline in budgetary requests is assessed to be due to a shifting focus on “proliferation and simpler, commercially derived spacecraft.” Acquisition priorities are on the development of low-Earth orbit satellite networks to support data transfer, missile warning, and satellite tracking. The largest new budget line item is the Protected Tactical Satcom – Global (PTS-G), which is intended to improve communications security. These FY 2025 initiatives appear to be aligned with past budget efforts to diversify and simplify space-based operations for improved security in the space domain.

Clayton Swope, “The Golden Dome as a Service,” Center for Strategic and International Studies (June 2025). https://www.csis.org/analysis/golden-dome-service.

> Swope analyzes President Trump’s $175 billion Golden Dome missile defense initiative and its potential reliance on commercial “as-a-service” models for space-based detection and intercept systems. This model would mean that a group of private companies may contribute capabilities to the project and sell the service of defense as a subscription model. It argues that while legal and regulatory barriers to outsourcing such military functions are limited, cultural and institutional resistance remains strong, stemming from doubts about commercial reliability, concerns over contractors in quasi-combat roles, and the absence of established markets for pure military services. Drawing on existing precedents in satellite communications, ISR, launch services, and cloud computing, the paper highlights the speed and innovation advantages of subscription-based commercial solutions compared to government-run acquisition processes. It concludes that if properly structured—with government personnel retaining ultimate launch authority—using commercial providers for space-based missile defense could accelerate capability development, lower costs, and unlock private innovation, potentially reshaping how the

Pentagon approaches future space power and national security. Some of the barriers to using commercial services to create this system include material deficiencies (such as quality and cybersecurity), contractors becoming combatants and becoming military targets, a lack of a mature commercial market, and differences in the government vs. private sector consumers—which may ultimately impact how companies provide the capability and service.

Panel 2: China, Strategic Competition, and Space

- As the pacing threat, what is China's strategy for space competition?
- Is the strategy sound?
- How does it assess its prospects for competitive success?

Conlan Ellis, Theodora Ogden, and James Black, "China and space: How space technologies boost China's intelligence capabilities as part of hybrid threats," The European Centre of Excellence for Countering Hybrid Threats (October 2024). https://www.hybridcoe.fi/publications/hybrid-coe-paper-21-china-and-space-how-space-technologies-boost-chinas-intelligence-capabilities-as-part-of-hybrid-threats/.

This paper examines how Beijing's rapid advances in space technologies—especially satellites for Earth observation, ISR, SATCOM, and PNT—are boosting its intelligence capabilities and shaping hybrid threats. Anchored in China's doctrine of military-civil fusion, these dual-use assets strengthen the People's Liberation Army (PLA) command and control, underpin "systems warfare," and enable coercive tactics from close-proximity satellite maneuvers to control of information pipelines. China's military-civil fusion approach has allowed for coordination and fast innovation in space capabilities. The paper also highlights how China exports satellite services via the Belt and Road Initiative's Digital Silk Road and pursues alternatives to systems like Starlink, creating levers of influence over partner states. For the EU and NATO, the implications include increased exposure to Chinese hybrid threats. These threats require proactive measures to bolster resilience and deterrence—through offering alternatives, hardening cyber and space defenses, resisting Chinese dominance of technical standards, and ensuring credible deterrence by denial and punishment in the space domain. NATO and EU states should leverage their existing strengths as well, given their leading commercial space firms and capabilities. Continued investment in and encouragement of competition between these firms would be prudent for deterring hybrid threats from China going forward.

R. Lincoln Hines, "China's branding problem: Image management and the U.S.-China space relationship," *Space Policy, Volume* 69. (August 2024). https://www.sciencedirect.com/science/article/pii/S0265964623000656.

Hines argues in this article that China seeks to project a peaceful, cooperative image of its space program to reassure the United States and prevent counterbalancing, but China's domestic political realities undermine this effort. Beijing highlights its cultural symbols (through the Chang'e lunar program and Tiangong space station), public goods provision

(BeiDou services and space station access), and leadership in institutions (UN peacekeeping and the PPWT treaty proposal). But at the same time its lack of transparency, military-dominated space sector, and nationalist domestic messaging generate suspicion. These contradictions, such as the PLA conducting an anti-satellite test without informing the foreign ministry, create mixed signals that reinforce U.S. perceptions of China as a revisionist competitor rather than a responsible stakeholder. As a result, U.S. policy has tilted toward containment and balancing, from the creation of the Space Force and Artemis Accords to expanded export controls and military investment. This has resulted in worsening security dilemma dynamics. The article concludes that unless China increases transparency and clearly separates civilian and military space activities, its reassurance strategy will remain ineffective, heightening risks of misperception, arms racing, and conflict in the space domain.

Jessica Martin, “China’s Methodology in Collecting Partnerships for Outer Space and the Evolving U.S. Response,” Institute for China-America Studies (March 2024). https://chinaus-icas.org/research/building-blocs-in-space-diplomacy-chinas-methodology-in-collecting-partnerships-for-outer-space-and-the-evolving-u-s-response/.

Martin argues that China is proactively constructing a network of bilateral space partnerships, reflecting a “hub-and-spoke” model rooted in customized, state-to-state agreements that are more robust and flexible than traditional multilateral treaties. The partners in these agreements are regionally diverse—with countries on nearly every continent and at a variety of levels of economic development. As of mid-2022, the China National Space Administration (CNSA) had signed 149 space cooperation agreements or MOUs with 46 national space agencies and 4 international organizations, forged 17 cooperation mechanisms, and participated in 18 international bodies. These agreements have an emphasis on satellite engineering, lunar/deep-space exploration, and space applications. The United States, which has historically relied on multinational treaties for space governance, is now appearing to lag in diplomatic engagements and should adopt a more visible, tailored approach to space diplomacy if it wants to retain leadership and relevance in the global space arena.

Howard Wang, Jackson Smith, and Christina L. Garafola, “Chinese Military Views of Low Earth Orbit: Proliferation, Starlink, and Desired Countermeasures,” RAND Corporation (March 2025). https://www.rand.org/pubs/research_reports/RRA3139-1.html.

The authors examine how the PLA perceives proliferated low Earth orbit constellations, with Starlink as the central focus for the analysis. The report highlights the importance of understanding the PLA’s perspective on this capability for escalation management. Drawing from PLA publications, the report finds that Chinese analysts see Starlink not as a commercial project but as an integrated U.S. military capability that fundamentally threatens PLA operational doctrine, which depends on paralyzing adversaries by targeting key nodes. PLA writings attribute exaggerated capabilities to Starlink, including missile interception, co-orbital attacks, and global command-and-control resilience. The PLA sees this as proof of U.S. hostile intent and a destabilizer of strategic stability. This analysis also found that the use of Starlink in Ukraine in 2022 reinforced PLA perceptions of the U.S. seeking military supremacy in space. In response, Beijing is pursuing both soft-kill measures (cyber, electronic warfare, lasers) and a parallel mega-constellation, Project

SatNet, designed as “China’s Starlink” to support PLA warfighting. The report concludes that PLA threat perceptions are shaped by worst-case thinking and fears of falling behind technologically, creating a volatile escalation environment until China fields its own resilient LEO constellation.

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 (June 2024). https://www.rand.org/pubs/research_reports/RRA2313-2.html.

This RAND report assesses how the PLA views space competition with the U.S. and U.S.-China crisis stability and escalation management. Drawing on PLA publications and professional military education texts, the study finds that Chinese leaders see the U.S. as a declining but still dominant hegemon, assume U.S. intent is hostile, and inflate U.S. space capabilities. PLA doctrine views space deterrence not as conflict avoidance but as coercion—using shows of force, military exercises, force posturing, and even limited space strikes to compel adversaries into political submission. China’s political goals are more important than conflict avoidance. Since 2013, PLA writings have grown more risk-tolerant, with Xi directing a proactive strategy to shape the international environment. This combination of suspicion, proactive doctrine, and limited interest in crisis communications means that U.S.-China crises in space will likely unfold with little dialogue, compressed decision cycles, and a higher risk of unintended escalation, even though PLA actions remain ultimately constrained by political imperatives.

Panel 3: Space Offense: How Far and How Quickly?

- How far and how fast should the U.S. proceed?
- What new capabilities are, will, or might be needed?
- What responses can the U.S. expect to a more ambitious strategy?

Clayton Swope, Kari A. Bingen, Makena Young, and Kendra LaFave, *Space Threat Assessment 2025,* Center for Strategic and International Studies (April 2025). https://www.csis.org/analysis/space-threat-assessment-2025.

The CSIS Space Threat Assessment 2025 finds that while no major new counterspace systems were unveiled in the past year, the global threat environment in orbit has become more dangerous and complex. China demonstrated increasingly sophisticated satellite maneuvers in both GEO and LEO, including refueling experiments and dual-use proximity operations, while reorganizing its military to consolidate space operations under the Aerospace Force, which will manage PLA space-based capabilities. Russia continued provocative activities, from maintaining close-orbiting inspector satellites to developing (and possibly testing) a space-based nuclear anti-satellite capability, while also expanding GPS jamming across Europe and threatening commercial assets. Iran and North Korea advanced space launch and cyber capabilities, with both countries pursuing cyber operations tied to aerospace targets. The report highlights broader systemic risks: widespread GPS jamming/spoofing now endemic across multiple regions, cyber intrusions against space-linked infrastructure, rising uncertainty over rendezvous and proximity operations, and the destabilizing effects of unintentional debris-generating incidents. Finally, it warns that the blurring of commercial and military space—exemplified by private sector servicing, debris-removal, and defense technologies—will make commercial actors more entangled in conflict, while U.S. initiatives like the "Golden Dome" missile defense plan and bodyguard satellite concepts show Washington itself is preparing to expand its counterspace toolkit.

Jennifer DiMascio, "U.S. Counterspace Capabilities," Congressional Research Service (September 2024). https://www.congress.gov/crs-product/IN12420?q=%7B%22search%22%3A%22space%22%7D&s=10&r=10.

This brief explains that U.S. counterspace operations encompass both offensive actions, such as disrupting, denying, or impairing adversary space systems, and defensive actions to protect U.S. satellites from attack or interference. It outlines four categories of counterspace weapons: kinetic (e.g., direct-ascent or co-orbital ASATs), non-kinetic (e.g., nuclear detonations, lasers, and microwaves), electronic (jamming and spoofing), and cyber operations targeting satellite networks. For Congress, the report highlights debates over balancing investments in offensive and defensive counterspace systems, protecting the growing U.S. commercial satellite sector, and responding to threats posed by Chinese and Russian advances, including Russia's possible pursuit of a space-based nuclear weapon.

John M. Olson, Steven Butow, Andy Williams, Andrew Metcalf, "State of the Space Industrial Base 2023," Defense Innovation Unit (December 2023). https://assets.ctfassets.net/3nanhbfkr0pc/5qTI9wqmgHP1GBKFEeReMN/2c007046f6c5cbc1ed0ffaf06e91d780/State_of_the_Space_Industrial_Base_2023_Report_-_FINAL___1_.pdf.

This DIU report emphasizes that the U.S. is at a pivotal moment in space competition, with commercial innovation driving unprecedented growth but being threatened by bureaucratic inefficiency, fragile supply chains, and accelerating Chinese advances. There is emphasis on the need for a "North Star Vision" that unites U.S. strategy with allies, enabling a sustainable and rules-based space economy that supports both prosperity and security. Key recommendations include streamlining regulations to speed launches and licensing, improving access to capital through debt and commoditization of space products, building resilient supply chains, and integrating allied capabilities "by design" into space architectures. The report highlights critical opportunities in reusable heavy-lift launch, in-space servicing and manufacturing, hybrid space communications, and advanced power and propulsion, while stressing that bureaucratic delays and continuing resolutions are eroding U.S. competitiveness. It concludes that only a whole-of-nation approach, aligning government, industry, finance, and global partners, will secure enduring American leadership in the future space economy.

Mike Carey and Charlie McGillis, "Navigating the Gray Zone: Reframing Space Strategy for Contemporary Operational Environments," Journal of Indo-Pacific Affairs 7, no. 4 (2024), pp. 97-113. https://www.airuniversity.af.edu/JIPA/Display/Article/3821280/navigating-the-gray-zone-reframing-space-strategy-for-contemporary-operational/.

The authors explore ways in which space strategy must adapt if countries wish to continue operating in the gray zone—pursuing deterrence and persuasive action against adversaries without provoking or resorting to armed conflict. According to the authors, increasing traffic in LEO, unregulated by no-fly zones and quarantines, will continue to make space strategy more complex. Considering dependencies on space infrastructure for military and commercial purposes, preservation of gray zone operations will continue to play a critical role moving forward. As such, the authors contend that counterspace measures, satellite design, and space domain awareness are crucial to increasing resiliency in U.S. space infrastructure and deterring adversaries.

Panel 4: Space Defense: How Far and How Quickly?

- How far and how fast should the U.S. proceed with missile defense in space? With protection of space-based assets?
- What new capabilities are, will, or might be needed?
- What responses can the U.S. expect to a more ambitious strategy?

MITRE Center for Data-Driven Policy, "Improving U.S. Space Capabilities in Integrated Deterrence," MITRE (July 2024). https://www.mitre.org/sites/default/files/2024-07/PR-24-01820-02-Improving-US-Space-Capabilities-Integrated-Deterrence.pdf.

This policy memo emphasizes strategic recommendations for strengthening U.S. space capabilities to support integrated deterrence in the face of growing threats from adversaries such as Russia and China. With risks posed by anti-satellite (ASAT) weaponry, space is no longer a sanctuary, thus there is a need for space-systems to play a critical role in national security, intelligence, communications, and economic stability. MITRE recommends that incoming U.S. leadership establish clear deterrence messaging, expand the use of commercial and proliferated low Earth orbit (pLEO) systems, and invest in resilience and inoperability. The authors discuss policy and budgetary actions for the new administration to create within the first 100 days in office.

Stephen J. Flanagan, Nicholas Martin, Alexis A. Blanc, and Nathan Beauchamp-Mustafaga, *A Framework of Deterrence in Space Operations,* RAND Corporation (August 2023). https://www.rand.org/pubs/research_reports/RRA820-1.html.

This study by RAND scholars develops a comprehensive framework for deterrence in space, drawing on lessons learned from nuclear and cyber domains while accounting for the unique dynamics of counterspace competition. The authors examine deterrence by denial, punishment, and hybrid strategies, as well as supporting mechanisms such as declaratory policy, dissuasion, and assurances. By comparing national approaches from actors such as

Russia, China, France, Japan, and India, an outline can be made for three different archetypes for space deterrence: denial dominant, mixed, and offense dominant. While deterrence of all counterspace attacks is unlikely, the study explains that well-tailored strategies that integrate resilience, selective revelation, strategic messaging, and the cultivation of international norms can improve stability.

Andrew Berglund, "Strengthening the Industrial Base to Deliver Proliferated Defense Space Systems," Center for Space Policy and Strategy (October 2024). https://csps.aerospace.org/papers/strengthening-industrial-base-deliver-future-defense-space-architecture.

In this chapter of Space Agenda 2025, the author examines the Department of Defense's (DOD) transition toward proliferated satellite constellations and the resulting implications for the defense industrial base. The report emphasizes motivators behind this shift, including resiliency and rapid technology refresh, while also focusing on vulnerabilities in supply chains exposed by recent geopolitical and pandemic disruptions. There are challenges such as subcontractor delays, competition for scarce resources, and diverging contractor business models, noting both benefits and risks for industry. Berglund proposes multiple strategies to reinforce supply chains, including better planning and visibility through Space Futures Command, strategic stockpiling of critical components, leveraging commercial off-the-shelf technologies, and targeted financial support. Ultimately, there is a need for sustaining strong industrial and supply chain capacity, which is essential for the DOD to realize the full operational benefits of proliferated defense space systems.

U.S. Department of Defense, *Space Policy Review and Strategy on Protection of Satellites* (September 2023). https://media.defense.gov/2023/Sep/14/2003301146/-1/-1/0/COMPREHENSIVE-REPORT-FOR-RELEASE.PDF.

This congressionally mandated report fulfills requirements from the FY2022 and FY2023 National Defense Authorization Acts by providing a comprehensive review of U.S. defense space policy and a strategy for protecting DOD and intelligence community satellites. It assesses current and emerging threats from adversaries, notably Russia and China, which are advancing counterspace capabilities such as direct-ascent anti-satellite weapons, cyber operations, and electronic warfare. U.S. national security objectives reemerge as articulated in the 2022 National Security and Defense Strategies, emphasizing resilience, deterrence, and integrated deterrence across domains. Key measures include accelerating the transition to resilient space architecture, strengthening space domain awareness, developing defensive and counterspace capabilities, and expanding cooperation with allies, partners, and commercial actors. The document also addresses policy and funding priorities and doctrinal frameworks that are essential to maintaining current and future space operations.

Steve Fetter and David Wright, "Can the Iron Dome Be Transmuted into a Golden Dome?," *The Washington Quarterly* (Summer 2025). https://dgi.umd.edu/sites/default/files/2025-07/FetterWright_TWQ_48_2.pdf.

This article assesses Israel's missile defense performance during the April 2024 and October 2024 Iranian attacks and examines its implications for broader U.S. missile defense ambitions. While Israel and allied systems intercepted an estimated 80% to 85% of Iranian medium-range missiles, the authors argue that success was due to largely favorable conditions: limited geographic scope, conventional warheads, poor missile accuracy, and the absence of countermeasures. These results do not translate to defending against long-range, nuclear-armed missiles, where even minimal leakage would cause catastrophic consequences. Another important note discussed by the authors is that Israeli and U.S. interceptors cost several times more than the missiles they engage, raising doubts about sustainability in protracted conflicts and highlighting a steep cost-exchange ratio. The authors conclude that the vision of a U.S. "Golden Dome," promoted in 2025 as a national missile shield, is technologically unrealistic and strategically dangerous, advocating instead for arms control and diplomacy to reduce nuclear risks.

T. H. Karas, M. Callaham, R. Dalbello, and G. Epstein, "Anti-Satellite Weapons, Countermeasures, and Arms Control," Office of Technology Assessment (September 1, 1995). https://apps.dtic.mil/sti/html/tr/ADA338027/index.html.

The 1995 report examines the development, strategic implications, and policy debates surrounding Ballistic Missile Defense (BMD) Technologies and Anti-Satellite Weapons (ASAT). It outlines how both the United States and the Soviet Union pursued ASAT systems to gain military advantage in space, while recognizing satellites' growing role in communications, intelligence, and navigation. The report highlights the vulnerabilities of space assets to attack, explores potential countermeasures such as hardening, redundancy, and rapid replacement, and evaluates the technical feasibility of different BMD and ASAT systems. Importantly, it also assesses the arms control dimension, discussing proposals to limit or ban ASAT testing and deployment in order to reduce risks of escalation and preserve the peaceful use of space. The study concludes that ASAT weapons pose significant challenges to strategic stability, making arms control and cooperative agreements crucial to preventing a destabilizing space arms race.

Panel 5: Space Competition and Strategic Stability

- How might intensified space strategic competition affect strategic stability?
- How might nuclear stability be affected?

Zhanna L. Malekos Smith, "Competition and Stewardship: The Strategic Wisdom of Responsible Behavior in Space," Modern War Institute (March 1, 2023). https://mwi.westpoint.edu/competition-and-stewardship-the-strategic-wisdom-of-responsible-behavior-in-space/.

In this commentary, the author examines the intensifying U.S.-China competition in outer space, emphasizing the strategic value of promoting responsible behavior as a means of preserving stability and legitimacy in the domain. Recent developments, including the growth of China's Tiangong space station, its expanding lunar ambitions, and NASA's Artemis program, have occurred within a broader geopolitical contest where both nations seek to be the primary shaper of international norms. Drawing on principles from the Outer Space Treaty and the Secretary of Defense Lloyd Austin's memorandum on responsible space conduct, the author argues that stewardship, transparency, and restraint can enhance U.S. leadership and build trust among allies, contrasting with authoritarian models of space governance.

Alexandra T. Evans, Andrew Radin, Katie Feistel, Krista Langeland, Bruce McClintock, and Howard Wang, *Space Strategic Stability: Assessing U.S. Concepts and Approaches,* RAND Corporation (May 2024). https://www.rand.org/pubs/research_reports/RRA2313-1.html.

This RAND study analyzes how improvements in Russian and Chinese counterspace capabilities heighten risks of instability and unintended escalation in the space domain. The authors test six propositions related to stability—ranging from first-strike incentives to the role of reversible capabilities—and provide recommendations for how the U.S. Space Force can manage escalation risks. Findings emphasize the need to separately address U.S. and adversary incentives, enhance resilience across allied and commercial systems, anticipate crises without reliable communication channels, and advocate norms to counter adversary influence. The authors also discuss the strategic value of selective revelation of U.S. space capabilities, provided such disclosures are coupled with clear messaging to shape adversary perceptions.

Cheyenne Tretter, "Exploring Factors for U.S.-Russia Crisis Stability in Space," RAND Corporation (January 2025). https://www.rand.org/pubs/research_reports/RRA2313-3.html.

The author analyzes Russian perspectives on space and crisis stability, tracing how doctrine and strategic thinking evolved over three periods: the Cold War and post-Soviet era (1960-2014), post-Crimea annexation (2014-2022), and after Russia's 2022 invasion of Ukraine. With information drawn primarily from Russian defense writings, the report finds that Moscow views U.S. actions in space as hostile and fears that Washington could target space-based elements of its nuclear deterrent. While Russia's wartime behavior in Ukraine has been relatively restrained in space, its strategists increasingly emphasize explicit warfighting preparations, suggesting risk tolerance could rise in a NATO conflict. The author recommends that U.S. officials should not rely on traditional crisis management tools, but instead prepare for limited cooperation, inflated Russian threat perceptions, and the likelihood that Moscow will employ advanced counterspace capabilities in future confrontations.

Anya Fink, "Golden Dome: Potential Strategic Stability Considerations for Congress," Congressional Research Service (June 2025).
https://www.congress.gov/crs_external_products/IN/PDF/IN12568/IN12568.1.pdf.

The author analyzes strategic stability concerns surrounding the Trump Administration's proposed "Golden Dome," a homeland missile defense shield against nuclear and conventional attacks. The report explains the historical context of U.S. missile defense debates, from the 1972 ABM Treaty through the Strategic Defense Initiative and subsequent post-Cold War missile defense acts. An expansive U.S. missile defense system would exacerbate longstanding fears of the Russians and Chinese, which would have the consequence of undermining nuclear regulatory capabilities. The author notes joint statements in opposition of the Golden Dome, instead suggesting that Congress should consider U.S. deterrence strategy in a two-peer nuclear environment, with the Russians and Chinese being the primary responders.

Panel 6: Civil Space and Privatization: Where Does it Go from Here?

- Is the role for civil space stable, advancing, or receding?
- How will the private sector's role in the decade ahead differ from its role in the past decade? Why?
- What more needs to be done to fully mobilize the private sector to support U.S. space policy objectives?

NATO, "NATO Commercial Space Strategy," NATO (June 2025). https://www.nato.int/cps/en/natohq/official_texts_236520.htm.

The NATO Commercial Space Strategy builds upon NATO's 2019 Overarching Space Policy, which recognized space as an operational domain and emphasized leveraging commercial services alongside national capabilities. The Strategy aims to more closely integrate the commercial space sector into NATO operations, training, and planning across peace, crisis, and conflict scenarios—thus enhancing collective capacity, capability, and resilience. It sets three strategic objectives: flexibly incorporating commercial space solutions, ensuring continuous access to commercial services, and fostering coherent engagement with the commercial sector through simplified governance. To meet these goals, NATO will determine space-related operational needs, explore multinational cooperation, adopt agile contracting models, embed commercial partners in exercises, and drive standardization and interoperability in military-relevant space applications. The strategy lays out concrete objectives and steps for the alliance to take to achieve them.

Rachel Lindbergh, "Space Resource Extraction: Overview and Issues for Congress," Congressional Research Service (July 2024). https://www.congress.gov/crs-product/R48144 .

This report outlines congressional interest in, and considerations for, extracting resources, such as water, oxygen, and precious metals, from celestial bodies like the Moon, Mars, and asteroids for both terrestrial use and in-space operations. So far, only national space agencies have successfully retrieved small extraterrestrial samples for research. NASA is advancing resource R&D under its Artemis program, aiming to produce rocket fuel and water on the Moon, alongside scientific asteroid missions. Additional U.S. efforts include natural resource mapping by the U.S. Geological Survey and resource related studies by DARPA. NASA has also contracted with four commercial entities to demonstrate future space resource collection capability, setting a precedent for private-sector involvement. The report highlights legal uncertainties about the permissibility of space resource extraction under international law. Although previous legislation grants rights to U.S. citizens to possess extracted resources, interpretations differ on whether such activities violate the Outer Space Treaty's prohibition on national appropriation. Congress also faces questions about lack of clear regulatory authority, specifically which federal agency should oversee or authorize commercial extraction operations, and if existing R&D funding is sufficient.

Yool Kim, George Nacouzi, Dwight Phillips, Krista Romita Grocholski, Igor M. Brin, Brian Dolan, Jonathan Fujiwara, John Hoehn, Kotryna Jukneviciute, Gwen Mazzotta, et al., “Operational and Policy Implications of Integrating Commercial Space Services into U.S. Department of Defense Operations,” RAND Corporation (February 2025). https://www.rand.org/pubs/research_reports/RRA2562-2.html.

The report finds that the DOD is increasingly reliant on commercial space services across six mission areas: satellite communications, space domain awareness, remote sensing, environmental monitoring, positioning/navigation/timing, and space logistics. Satellite communications and space domain awareness are already critical enablers for daily operations. While commercial systems can enhance resiliency through diversification, distribution, and proliferation, they also introduce vulnerabilities. Adversaries are likely to target commercial systems, and under international law such satellites supporting military operations are generally considered legitimate military targets. The authors note that a loss of access would degrade or even abort some missions (including Army logistics, Air Force ISR, and Marine Corps expeditionary operations) unless robust contingency measures are adopted. The report emphasizes that integration requires more than contracts. It depends on modernizing ground systems, hybrid terminals, enterprise satellite communications management, clear information-sharing frameworks, and synchronized acquisition and policy strategies. Findings include that commercial partnerships are indispensable for future DOD space architectures but warns that the Department must address gaps in governance, threat awareness, and insurance protections.

United States Patent and Trademark Office of the Chief Economist, “Privatizing the space economy: A perspective on U.S. government and private sector participation based on patents,” United States Patent and Trademark Office (January 2025). https://www.uspto.gov/ip-policy/economic-research/publications/reports/privatizing-space-economy-perspective-us.

Utilizing patent data, the U.S. PTO finds that U.S. space-related inventions have surged, with patent applications disclosing space technologies growing 144% between 2003 and 2023, which is four times the overall patent growth rate. While federal agencies like NASA, DOD, and the Department of Energy (DOE) remain key contributors, the private sector accounts for the majority of U.S. space patents, rising from 65% (1976–1993) to nearly 84% (1993–2023). In 2023, nearly 16% of U.S. space patents still had government involvement, seven times higher than for patents overall, with government activity concentrated in space transportation and human habitation. Meanwhile, private actors lead in satellite communications, navigation, and Earth observation. A major trend in the data is the rise of small companies, universities, and nonprofits, which reached 40% of all U.S. space patents by 2023, reflecting venture-backed innovation and the growing commercialization of space. Overall, the piece highlights an expanding, privatized U.S. space economy built on a strong government foundation.

Panel 7: The Space Force: Where Does it Go from Here?

- How should the Space Force continue to mature and adapt?
- What lessons can be learned from past successes and failures?

U.S. Space Force, "Space Force Doctrine Document 1 – The Space Force (SFDD-1)," Department of Defense (April 2025). https://csps.aerospace.org/sites/default/files/2025-04/Space%20Force%20Doctrine%20Document%201%20%28SFDD-1%29_4Apr25_0.pdf.

> Space Force Doctrine Document 1 (SFDD-1) codifies the mission, identity, and employment of the U.S. Space Force as an independent military service and emphasizes that space power is vital to national security. There are six "undeniable truths" about the role of Guardians, framing space as a contested warfighting domain in which the Space Force must secure superiority through space control, global mission operations, and space access. The Space Force philosophy is one of "competitive endurance," which is the need to deny adversary first-mover advantage and conduct the responsible counterspace operations. Additionally, the document details the core values and organizational structure of the Force, integration of allies, commercial partners, the joint force, and the readiness model known as SPAFORGEN. Overall, SFDD-1 establishes the conceptual foundation for how Guardians organize, train, and fight to secure U.S. interests in the space domain.

Hannah D. Dennis, "Defense Primer: U.S. Space Force," Congressional Research Service (December 2024). https://www.congress.gov/crs-product/IF12610?q=%7B%22search%22%3A%22space%22%7D&s=10&r=4.

> This Defense Primer gives an overview of the U.S. Space Force (USSF), its origins, organization, missions, and current policy debates. Established by the FY2020 National Defense Authorization Act, the USSF is tasked with ensuring freedom of operation in, from, and to space, conducting space operations, and protecting U.S. interests in the domain. There are three major fields of command (with a potential forth in the making): Space Operations Command, Space Training and Readiness Command, Space Systems Command, and Space Futures Command (which has been proposed and is currently in creation). Key responsibilities are held by the USSF, which include satellite operations, missile warning, cyber defense, and space surveillance, as well as its integration into joint combatant commands. The Defense Primer also discusses policy and budgetary reforms to space acquisition processes and balancing investments across major programs such as missile warning, SATCOM, GPS, and proliferated low-Earth orbit constellations.

Robert S. Wilson, "FY 2025 Defense Space Budget: Continued Emphasis on Proliferation Under a More Constrained Top-Line," Center for Space Policy and Strategy (June 2024). https://csps.aerospace.org/papers/fy-2025-defense-space-budget-continued-emphasis-proliferation-under-more-constrained-top.

> The Biden Administration's FY2025 requested a total of $29.6 billion for USSF, which makes about 3.5% of the total DOD budget. This budget brief details how the request reflects trade-offs under tighter fiscal constraints while maintaining a strong emphasis on

proliferated, commercially derived satellites in low-Earth orbit. The Space Development Agency remains a major budgetary winner, securing increases for its transport and tracking layer constellations, central to missile warning, missile tracking, and "Joint All-Domain Command and Control." Also, the brief introduces the Protected Tactical Satcom-Global (PTS-G) as the most significant new program, further illustrating the shift away from large bespoke satellites toward more resilient architectures. Broader trends show the DOD's long-term transition toward proliferated space architectures, including increased integration of commercial satellite communications, congressional support for rapid acquisition, and future experiments with "GPS-light" prototypes.

Todd Harrison, "Embracing Space Force Exceptionalism," American Enterprise Institute (February 2025). https://www.aei.org/articles/embracing-space-force-exceptionalism/.

In this policy commentary article, the author argues that the USSF should fully embrace its unique character and shed the legacy constraints of traditional military services, advocating for a more forward-leaning posture in missions, reform, and organizational structure. Ultimately, this philosophy would allow for the Space Force to act more nimbly and innovatively in both offensive and defensive counterspace operations. There are seven crucial recommendations offered by the author: merging acquisition and operations (e.g., combining Space Systems Command and the proposed Space Futures Command), halting the formation of a separate Space Futures Command, restructuring budgets around mission areas, collocating operators with engineers and analysts, updating DOD directives to reflect the Space Force's distinct missions, creating a senior civilian space leadership position, and launching a commission to reform the Space Force personnel system. With respect to the key points, "Space Force Exceptionalism" should become the service's cultural core and identity.

Panel 8: The Roles of U.S. Allies: Both Losers and Winners?

- What does an America-First strategy imply for U.S. allies?
- How can they best secure their interests in space cooperation?

Clementine Starling, Christopher P. Mulder, Marco Tantardini, and Julia Siegel, "How the U.S. and its Allies Should Respond to Evolving Space Threats," Atlantic Council (January 12, 2023). https://www.atlanticcouncil.org/blogs/new-atlanticist/how-the-us-and-its-allies-should-respond-to-evolving-space-threats/.

The authors argue that the United States and its allies need to focus their attention on four critical areas to ensure the future of safe space operations in a contested environment. Firstly, the United States must display international leadership in the creation of standards for the management of space debris and counterspace capabilities to ensure the safety of critical defense and offensive capabilities. Secondly, the United States and its allies must "radically" improve its cooperation to create a safer network in the face of a growing Chinese threat. Thirdly, the lowering of the barrier for entry into space operations has created new opportunities for space to be exploited by non-state actors, requiring allied cooperation to combat possible terrorist threats. Finally, the lack of space governance makes it difficult for the United States and its allies to punish those who threaten space viability.

Jennifer D. P. Moroney, Stephanie Pezard, et al., *Overcoming Barriers to Working with Highly Capable Allies and Partners in the Air, Space, and Cyber Domains,* RAND Corporation (July 5, 2023). https://www.rand.org/pubs/research_reports/RRA968-1.html.

The report finds that growth in allied cooperation would support a more effective space deterrence framework. The current lack of agreed upon norms, disconnected allied space capabilities, and historical preference for national space programs creates barriers for cooperation in improving overall space security. The creation and promotion of international regulation with ability to punish actors who violate them may have great success in allowing all parties access to space. Similarly, space strategies must be tailored to fit the challenges posed across all phases of conflict.

Nicholas Eftimiades, *Integrating US and Allied Capabilities to Ensure Security in Space,* Atlantic Council (April 27, 2023). https://www.atlanticcouncil.org/in-depth-research-reports/issue-brief/integrating-us-and-allied-capabilities-to-ensure-security-in-space/.

Eftimiades considers the benefits of allied integration for space security operations and the existing obstacles to such integration, ultimately recommending U.S. action to improve collaboration and potential interoperability with spacefaring allies. Against the backdrop of a rapidly changing space security environment, he argues that increased allied coordination would importantly shift adversaries' deterrence calculus, unlock geostrategic locations for ground-based space domain awareness (SDA), enable burden-sharing, enhance global norms and crisis management, and improve the resiliency of space architectures and the allied industrial base. The United States and its allies should build upon existing efforts, but bureaucratic, classification, strategic, and logistical impediments will continue to prevent the benefits of fully realized integration. Among other recommendations to overcome these obstacles, the author argues the U.S. Space Force should clarify to allies where American capabilities needs gap-fillers and holistically examine internal obstacles to space security collaboration.

Bec Shrimpton and Ulas Yildrim, *More Inclusive Partnerships Will Help Prevent Conflict in Space,* The Strategist Australian Strategic Policy Institute (August 5, 2022). https://www.aspistrategist.org.au/more-inclusive-partnerships-will-help-prevent-conflict-in-space/.

The United States is beginning to pursue greater cooperation with allies on space issues as a means to prevent space-based conflict. The authors see the release of the Combined Space Operations (CSpO) Vision 2031 as a productive first step to deepen integration between the United States and its key allies. The authors commend the codification of cooperation between the Five Eyes nations and France and Germany as these constitute a "significant proportion of global military space power." The growing reliance on space by all nations provides a strong foundation for allied networks and work within the domain. The CSpO initiative also deepens commercial partnerships between the Five Eyes nations and France and Germany in pursuit of strategic and military objectives.

U.S. Space Force, "U.S. Space Force International Partnership Strategy: Strength Through Partnership," U.S. Space Force (June 2025). https://www.spaceforce.mil/Portals/2/Documents/SAF_2025/USSF%20International%20Partnership%20Strategy.pdf.

> The U.S. Space Force's International Partnership Strategy frames global partnerships as America's greatest asymmetric advantage in space, stressing that no nation can secure the domain alone. It sets three enduring goals: securing collective interests by empowering allies as combat multipliers, enabling interoperable data and capabilities through broad information sharing, and fully integrating partners across force design, development, and operations. To achieve this, the strategy organizes efforts into three lines of effort—create, integrate, and operate. This approach advocates for bringing partners into early force design and wargaming, embedding them in force development processes, and expanding joint operations and exchanges. The document also details "means" for execution, including coordination across DOD, Space Command, and the Intelligence Community. It also assigns roles for standards adoption, acquisition integration, and combined planning. Overall, the strategy emphasizes that "Strength Through Partnership" is essential for resilience, deterrence, and sustaining U.S. leadership in the space domain.

Kota Umeda. *Japan's Space Domain Defense Guidelines: Background, Key Features, and Policy Implications*, Institute of Geoeconomics (August 2025). https://instituteofgeoeconomics.org/en/research/2025081401/.

> This commentary piece summarizes the context and contents of the Japanese Ministry of Defense's July 2025 "Space Domain Defense Guidelines." The goal of the guidelines is primarily to clarify the roles and strategies of the Ministry and Self-Defense Forces (SDF) in space security, while also enhancing public-private cooperation through providing greater predictability to private industry. Historically, Japan's space policy was strictly civilian-focused until the Basic Space Law of 2008 permitted military-related use of space, though initial efforts were hampered by limited resources and expertise. Evolving national security priorities have led Japan to steadily expand its space defense posture. The new guidelines systematically organize existing policy initiatives into four main thrusts: rapid and accurate situational awareness; resilient satellite communications; mission assurance (including cybersecurity and satellite protection); and disrupting an adversary's command, control, and communications. Important features of the guidelines include their alignment with Japan's broader National Security Strategy and their strong emphasis on leveraging commercial space services. However, the document also presents challenges such as the absence of operational concepts, resource constraints (including only three national security satellites currently in orbit), and the need to clearly define risk management and roles for private-sector involvement.

Panel 9: Cooperation with Competitors: Any Prospect?

- Is cooperation in science or exploration possible? How?
- Is cooperation on planetary defense possible?
- Are formal or tacit agreements on some rules of the road possible?

Carla P. Freeman, Bruce W. MacDonald, Alison McFarland, et al., *China and Strategic Instability in Space: Pathways to Peace in an Era of US-China Strategic Competition,* U.S. Institute of Peace (February 2023). https://www.usip.org/sites/default/files/2023-02/20230209-sr-515-china-strategic-instability-space.pdf.

> The authors identify three "drivers of instability" in space: nuclear-conventional entanglement, direct-ascent anti-satellite (DA-ASAT) weapons testing, and orbital congestion from large satellite constellations. The authors emphasize the need for U.S.-China dialogue in these three areas to prevent military escalation and to preserve the usability of space. In a conventional conflict, satellites that support both nuclear launch detection and conventional forces are inherently escalatory, as the destruction of these satellites could be interpreted as nuclear escalation. Thus, each side should aim to disentangle such assets and establish bilateral communication lines. When it comes to DA-ASAT weapons testing, the authors argue that China should reduce its current arsenal to establish credibility as a responsible player, following the example of the United States and other nations that have implemented self-imposed bans. Finally, the authors encourage the United States to pursue multi-stakeholder dialogue with China to regulate launch and traffic of satellite constellations.

Scott Pace, "U.S. Space Policy and Theories of International Relations: The Case for Analytical Eclecticism," *Space Policy* 65 (January 2023), pp. 1-13. https://doi.org/10.1016/j.spacepol.2022.101538.

> Pace argues that the United States primarily views China and Russia as competitors in space, with little room for cooperation due to these countries' aggressive actions in other domains. However, the 2007 Chinese test of an anti-satellite (ASAT) weapon illustrates how U.S. perceptions of adversary intent can influence the potential for competition versus cooperation. This incident and the subsequent ASAT testing may be seen as a direct challenge to U.S. nuclear deterrence, contributing to an offense-defense arms race. However, the seeming unintentionality behind creating space debris, which was mitigated in subsequent ASAT tests by China, suggests a desire for responsible space operations and could be an area of aligned interests. It is thus crucial for the United States to discern the intentions of strategic competitors to avoid unwanted escalation. The paper also highlights the significance of "transnational epistemic communities," such as scientific communities and private actors, in establishing peaceful norms and thus promoting strategic stability in space.

Dan Hart, “The case for the United States and China working together in space,” Atlantic Council (August 2024). https://www.atlanticcouncil.org/blogs/new-atlanticist/the-case-for-the-united-states-and-china-working-together-in-space/.

> The article argues that, despite current strategic tensions, the U.S. and China should revive meaningful cooperation in space for mutual benefit and to reduce risks of miscalculation in a domain increasingly vital to security and science. It proposes concrete, low-barrier confidence-building steps, starting with a bilateral NASA–CNSA working group to enable joint astronaut rescue operations, and extending to coordinated use of lunar communication and navigation services, consumables, and habitat support. To lay the groundwork for such cooperation, it advises the United States to repeal the restrictive Wolf Amendment and calls on China to enhance transparency, particularly regarding space debris incidents, and to initiate discussions on moratoria for destructive direct-ascent anti-satellite testing.

Michaela Janovská, “Rivals Beyond Earth: China, the US, and the EU in the New Space Era,” China Observers in Eastern Europe (March 2025). https://chinaobservers.eu/rivals-beyond-earth-china-the-us-and-the-eu-in-the-new-space-era/.

> Janovská outlines how the modern space domain has evolved into a three-way competition, shifting from the twentieth-century U.S.–USSR standoff to a rivalry among the United States, China, and the EU. China’s rapid investment into “New Space,” spanning satellite internet, space tourism, asteroid mining, and lunar resource development, poses a serious challenge to U.S. dominance while exposing the EU’s structural vulnerabilities. The article spotlights BeiDou as a symbol of China’s ambition to offer alternatives to GPS and Galileo, reinforcing its influence in global navigation infrastructure. China’s strategy of forging partnerships with developing nations through affordable launches and technology transfers, thus advancing its strategic interests and reshaping space diplomacy via its Belt and Road-related “Space Information Corridor” is highlighted. As China pursues ambitious projects like its International Lunar Research Station (ILRS) joint venture with Russia, the author argues that the United States and EU must strengthen R&D, deepen private-sector collaboration, and reignite international cooperation to preserve leadership in space.

Juliana Suess and Jack Crawford, “Russia and China Reaffirm Their Space Partnership,” Royal United Services Institute (April 2024). https://www.rusi.org/explore-our-research/publications/commentary/russia-and-china-reaffirm-their-space-partnership.

> This commentary piece highlights a significant deepening of Sino-Russian cooperation in space, demonstrated by Russia’s announcement of plans to build an automated nuclear power plant on the Moon. This plant is designed to supply energy to their joint International Lunar Research Station (ILRS), slated for operation between 2033 and 2035. Though China has not publicly confirmed the initiative, its implicit support signals a more overt alignment with Russia in lunar exploration. This development underscores Russia’s strategic pivot eastward, aligning itself with an emerging Chinese-led space order, especially as the International Space Station (ISS) nears retirement. Russia appears to be betting on closer collaboration with China to maintain relevance and influence in space, while China seems to be embracing its role as a rising power in space.