



Research Report

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Space Strategic Stability

Assessing U.S. Concepts and Approaches



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About This Report

Improvements in Russian and Chinese counterspace capabilities could endanger the space-based capabilities the United States relies on for a broad array of military and economic functions. The multiplication of U.S. and adversary capabilities could lead to unstable competition in space, raising the risk of rapid, and perhaps unintended, military escalation. This report documents and examines the conventional wisdom regarding escalation in the domain to offer recommendations for how the U.S. Space Force (USSF) and other stakeholders can better prepare to deter and manage escalation. We investigate the implications of six propositions related to stability: (1) the incentives to employ offensive capabilities early in a conflict; (2) the benefits of leveraging foreign and commercial systems; (3) the utility of communications channels for crisis prevention and de-escalation; (4) the feasibility of promoting shared norms of responsible behavior; (5) the strategic benefits of selective revelation; and (6) the use of reversible capabilities to manage escalation. We conclude with a discussion of preliminary insights and recommendations for U.S. space policy, planning, and further research. The other publicly available forthcoming volumes in the series are as follows:

- 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, forthcoming.
- Cheyenne Tretter, *Exploring Factors for U.S.-Russia Crisis Stability in Space*, RAND Corporation, RR-A2313-3, forthcoming.

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Summary

Issue

Improvements in Russian and Chinese counterspace capabilities raise the risk of rapid, and perhaps unintended, military escalation that could endanger the space-based capabilities the United States relies on for a broad array of military and economic functions.

Approach

This report identifies and explores six propositions that undergird U.S. thinking about escalation in space. These propositions encompass the following:

1. the incentives to employ offensive capabilities early in a conflict
2. the benefits of leveraging foreign and commercial systems
3. the utility of communications channels for crisis prevention and de-escalation
4. the feasibility of promoting shared norms of responsible behavior
5. the selective revelation of capabilities to deter adversaries
6. the use of reversible capabilities to manage escalation.

We investigate the implications of each proposition and offer recommendations for how to avoid unintended escalation in space while preserving U.S. advantage.

Key Findings and Implications

Our analysis yielded the following findings:

- It is plausible that there exists an offensive advantage in space that generates an incentive to attack first. However, this proposition cannot be fully validated given the fact that conflict in space has not occurred. Adversary perceptions of the balance are more likely to determine their reactions to changes in the strategic environment than any objective analysis of the offense-dominant character of the domain.
- Expanding collaboration with allies, partner countries, and commercial organizations is a central plank in the U.S. Department of Defense (DoD) space strategy. Doing so raises the risk of adversary escalation, especially against commercial systems, because China and Russia have indicated their intention to target commercial actors providing space support to DoD. A desire to avoid horizontal escalation might reduce the relative likelihood of attacks on allied and partner countries.

- Effective communications channels might be more difficult to establish in space because of China's reticence to use existing vehicles for information-sharing or to engage in meaningful space security dialogue.
- The United States is unlikely to soon achieve the norm diffusion necessary to restrict Chinese and Russian space activities given these countries' deeply rooted skepticism about U.S. intent in and dependence on space. These beliefs will be difficult to change without compromising capabilities the United States has indicated it wishes to preserve.
- The selective revelation of information about concealed U.S. space capabilities might reduce uncertainty about U.S. advantages, but challenges in assessing the military balance in space might complicate adversary assessments of the revealed information. The resulting misinterpretations could reduce a disclosure's deterrent effect or even provoke undesired escalation.
- Employing even reversible counterspace capabilities might risk escalation if those capabilities cause accidental damage or their intent is misinterpreted by adversaries.

These findings suggest several implications for the U.S. government, the joint force, and the U.S. Space Force (USSF) in particular:

- The DoD space enterprise should separately evaluate U.S. and adversary incentives to undertake attacks at different stages of crisis and conflict. Similarly, there is value in identifying adversary responses to more- or less-resilient architectures.
- Enhancing the resilience of commercial, allied, and partner country constellations can help deter attacks but might be insufficient. Given that commercial satellites are likely to be targeted alongside U.S. government assets, articulating potential U.S. responses to attacks on commercial satellites can bolster deterrence.
- USSF should prepare for a strategic environment in which communications channels with China are not available in a crisis or conflict. Nevertheless, it might be worth keeping open the offer to develop communications channels if, and when, Chinese perspectives change.
- Despite the obstacles to U.S. norms advocacy, persistent attempts to open dialogue are still valuable to preserve the possibility of future improvements. U.S. norms advocacy might also foster greater cohesion among U.S. allies and partners and help to counter Russian and Chinese alternatives that are contrary to U.S. interests.
- A greater ability to release information on current space capabilities and emerging risks will enhance the U.S. ability to persuade other actors of the dangers inherent to the current environment and the benefits of desired responses.
- Decisionmakers should weigh the prospective signaling benefit of selective revelation against the opportunity costs associated with enabling an adversary to develop countermeasures that might reduce the disclosed capability's military utility.
- Demonstrations or revelations of U.S. space capabilities should be accompanied by additional strategic messaging to improve the likelihood that an adversary interprets the information as intended.

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Space Strategic Stability: Assessing U.S. Concepts and Approaches

Over the past two decades, space capabilities have become more sophisticated, less expensive, and more essential to the international economy and global security.¹ Critical space services enable telecommunication and broadcasting services; position, navigation, and timing; weather monitoring and prediction; remote sensing; internet services; scientific exploration; and a variety of related defense and national security missions, among other functions. Recent years have witnessed spectacular growth in the number of governmental, military, and commercial entities engaged in space.

The expansion in space activity creates both opportunities and dilemmas for the United States, its allies, and its partners. Foreign adversaries such as Russia and China are improving their counterspace capabilities and developing military doctrines that frame disrupting U.S. space operations as a “means both to reduce U.S. military effectiveness and to win future wars.”² Advances in U.S. and adversary capabilities and capacities could raise the risk of rapid, and perhaps unintended, military escalation. Such an outcome could have major consequences for U.S. military operations, prosperity, and security.

The U.S. Space Force (USSF) and other stakeholders must balance efforts to alleviate the risk of escalation in space with the imperative to preserve the United States’ ability to safeguard vital national interests, including the ability to deter and, if necessary, prevail in conflict. As the 2022 National Defense Strategy explains, deterrence by resilience is a key part of the U.S. Department of Defense’s (DoD’s) approach to integrated deterrence, because “fielding diverse, resilient, and redundant satellite constellations” can “reduce adversary incentives for an early attack.”³ But resilience alone might not deter adversaries, especially given the potential advantage of offense in the space domain and other risk factors that could contribute to accidental or inadvertent escalation. The challenge of maximizing strategic advantage while avoiding escalation is not unique to the space domain, and there are lessons to be learned from U.S. experience in managing other strategic arms competitions, such as the benefits of communications channels with adversaries during crises. Yet specific attributes of the current space environment do present distinct challenges.

This report documents and examines generally accepted theories and concepts (what we categorize as *propositions*) related to escalation in space to offer recommendations for how USSF and other stakeholders can better prepare to manage the risk of unwanted escalation. In the following section, we define key terms and explain how we identified and evaluated six propositions about

¹ White House, *United States Space Priorities Framework*, December 2021, p. 3. See also Space Capstone Publication, *Spacepower: Doctrine for Space Forces*, Headquarters United States Space Force, June 2020.

² White House, 2021, p. 6; Office of the Director of National Intelligence, *Annual Threat Assessment of the U.S. Intelligence Community*, March 2022.

³ DoD, *National Defense Strategy*, October 2022, p. 8.

escalation in space. The remaining sections investigate each proposition in turn. The report concludes with a discussion of preliminary insights and recommendations for U.S. space policy, planning, and further research.

Stability in Space: Common Terms and Propositions

Practitioners and scholars have explored the risks of a conflict in space since the 1950s, but attention has increased since the reestablishment of U.S. Space Command (USSPACECOM) and the establishment of USSF in 2019.⁴ Although many details regarding capabilities, activities, and plans related to the domain are tightly held, policymakers and analysts have articulated general *propositions*—by which we mean statements that make claims about how capabilities, strategies, or other factors shape policy and activities. Such propositions reflect how policymakers think about the domain and help to explain their assessment of the costs, benefits, and trade-offs associated with specific policy options. With the expansion of the responsible organization and continued growth in spending, public evaluation of core strategic concepts is especially valuable.

We focused on propositions related to promoting stability and managing escalation in space. *Escalation* refers to an increase in the intensity or scope of military interaction that crosses a significant threshold.⁵ We define *instability* as the propensity for a confrontation to escalate to a conflict that might otherwise not have occurred.⁶ In addition, we considered how attributes of the space domain might contribute to the likelihood of *inadvertent* escalation, or circumstances in which a state's actions lead to escalation that it did not intend or anticipate. Our primary focus was the potential for conflict within the domain, although events in space might contribute to cross-domain escalation and influence terrestrial and cyber operations. Following the language proposed in DoD documents, we considered escalation and stability in space across the full spectrum of interactions between strategic adversaries (Figure 1), from peacetime competition, through crisis, and across different intensities of conflict.⁷

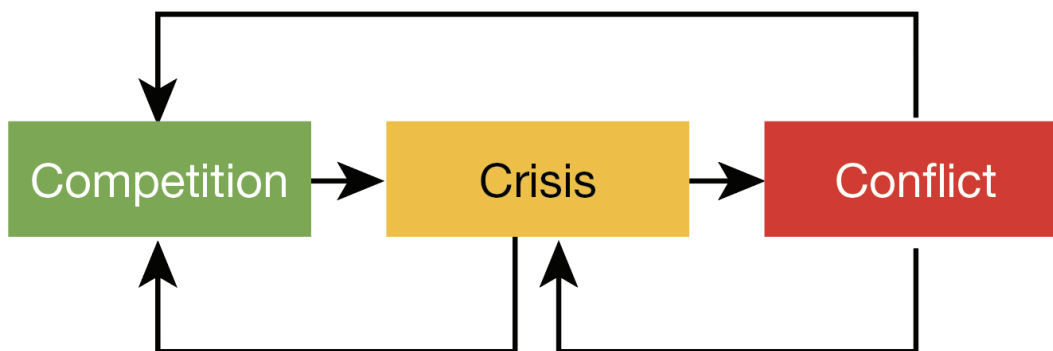
⁴ Kelly M. Saylor, *Defense Primer: The United States Space Force*, Congressional Research Service, updated November 16, 2022; Christian Davenport and Paul Sonne, "Trump Officially Launches U.S. Space Command in Counter to Russia, China Threats," *Washington Post*, August 29, 2019.

⁵ Forrest E. Morgan, Karl P. Mueller, Evan S. Medeiros, Kevin L. Pollpeter, and Roger Cliff, *Dangerous Thresholds: Managing Escalation in the 21st Century*, RAND Corporation, MG-614-AF, 2008. See also Alex Braithwaite and Douglas Lemke, "Unpacking Escalation," *Conflict Management and Peace Science*, Vol. 28, No. 2, 2011.

⁶ In the literature, the term *stability* by contrast often refers to the absence of incentives to attack first. We selected a definition that aligns with common usage within the space community given that decades of debate have not yet produced a consensus definition. For a survey of alternative definitions, see Elbridge A. Colby and Michael S. Gerson, eds., *Strategic Stability: Contending Interpretations*, U.S. Army War College Press, 2013. For space applications, see Bruce W. MacDonald, ed., *Crisis Stability in Space: China and Other Challenges*, Johns Hopkins School of Advanced International Studies and Foreign Policy Institute, 2022.

⁷ See, for example, Joint Doctrine Note 1-19, *Competition Continuum*, Joint Chiefs of Staff, June 3, 2019.

Figure 1. Escalation Pathways Across the Competition-Conflict Spectrum



SOURCE: Adapted from Joint Doctrine Note 1-19, 2019.

To identify these propositions, we reviewed public statements by U.S. military space leaders, U.S. policy documents,⁸ and supporting policy research published in the public domain.⁹ Although we often reference statements by senior U.S. officials to frame the propositions, we drew from a wider literature in recognition that analysis originating outside government can also shape policymaking. From this literature review, we identified six significant propositions that appear to undergird U.S. thinking about required capabilities and strategy and the utility of different policy tools for averting and managing escalation in space. They are as follows:

1. Current space architectures create an incentive for countries to attack first in space.
2. Leveraging commercial and allied systems is beneficial for stability.
3. Active communications channels with adversaries can reduce the likelihood of a crisis and alleviate pressure to escalate.
4. Developing shared norms for responsible behavior in space can promote stability in the near term.

⁸ These include Space Capstone Publication, 2020; White House, 2021; DoD, “Commander Lists 5 Tasks to Ensuring Continued Space Superiority,” *DoD News*, January 26, 2021a; DoD, *Defense Space Strategy: Summary*, June 2020; Department of Defense Directive (DoDD) 3100.10, *Space Policy*, Office of the Under Secretary of Defense for Policy, U.S. Department of Defense, August 30, 2022; and DoD, “Tenets of Responsible Behavior in Space,” Office of the Secretary of Defense, July 7, 2021b.

⁹ For RAND work, see Bruce McClintock, Krista Langeland, and Michael Spirtas, *First Mover Typology for the Space Domain: Building a Foundation for Future Analysis*, RAND Corporation, RR-A2208-1, 2023; Bonnie Triezenberg, Krista Langeland, and Bryce Downing, *Space Competition and the Dynamics of Conflict: Using Game Theory and Artificial Intelligence to Gain Strategic Insight*, RAND Corporation, RR-A751-1, 2022; Alexis A. Blanc, Nathan Beauchamp-Mustafaga, Khrystyna Holynska, M. Scott Bond, and Stephen J. Flanagan, *Chinese and Russian Perceptions of and Responses to U.S. Military Activities in the Space Domain*, RAND Corporation, RR-A1835-1, 2022; Bruce McClintock, Katie Feistel, Douglas C. Ligor, and Kathryn O’Connor, *Responsible Space Behavior for the New Space Era: Preserving the Province of Humanity*, RAND Corporation, PE-A887-2, 2021; and Forrest E. Morgan, *Deterrence and First-Strike Stability in Space: A Preliminary Assessment*, RAND Corporation, MG-916-AF, 2010. See also MacDonald, 2022; Michael Krepon and Julia Thompson, eds., *Anti-Satellite Weapons, Deterrence, and Sino-American Space Relations*, Stimson, 2013; Robin Dickey, *Commercial Normentum: Space Security Challenges, Commercial Actors, and Norms of Behavior*, Aerospace Corporation, August 2022; and Victoria Samson and Brian Weeden, “Enhancing Space Security: Time for Legally Binding Measures,” *Arms Control Today*, December 2020.

5. Selectively revealing new capabilities can enhance the credibility of U.S. threats and deter adversary escalation.
6. Developing and employing reversible options can be useful for managing escalation in crisis and conflict.

These propositions can, in principle, inform approaches to escalation and de-escalation across the competition-conflict spectrum, although their actual applicability and utility might vary. For example, the proposition that there is an advantage to attacking first in space increases the likelihood that a competitor would provoke a crisis, initiate a conflict, or intensify a conflict. Fielding or employing additional commercial capabilities could be escalatory if an adversary believes there is an opportunity to attack them without consequence, while improved integration with allied capabilities could deter an adversary from escalation. Conversely, the current U.S. government discussion of promoting norms for responsible behavior and communications channels could reduce tensions during competition and lower the likelihood of a crisis escalating to conflict. Selective revelation of capabilities might deter an adversary from escalating from crisis to conflict, while the use of reversible capabilities as a signal or pressure value could reduce the likelihood of escalation.

By examining the available evidence to support these propositions, we evaluated their validity, identified areas of uncertainty or inaccuracy, and shed light on actions USSF or other stakeholders can take to better manage escalation risks. These six propositions are not meant to be exhaustive; our research identified additional areas for further study, which are noted in the conclusion.

The following sections provide an overview of each proposition and their consequences for deterrence and escalation dynamics. In each, we describe the issue at stake and explain why the proposition is important for USSF policy and planning. To evaluate their validity, we applied relevant insights from the scholarly and policy literature on competition and conflict in other strategic domains, such as cyber security and nuclear weapons. For illustrations and context, we also offer select examples of Chinese and Russian strategic and operational concepts, as well as Chinese and Russian responses to U.S. activities. We conclude our discussion of each proposition with recommendations for how USSF can address the issues raised.

Current Space Architectures Create an Incentive for Countries to Attack First in Space

Senior space officials have expressed concern that the current space environment is unstable. Summarizing a prevailing view, USSF Chief of Space Operations Gen Chance Saltzman stated in March 2023 that the “visibility, predictability, and reconstitution timelines associated with current military space architectures favor the actor that goes on the offensive first.”¹⁰ Acknowledging that technological changes can tilt the balance between offensive and defensive capabilities over time,

¹⁰ As quoted in Theresa Hitchens, “Space Force Chief Outlines 3-Part ‘Competitive Endurance’ Theory Aimed at ‘Space Superiority,’” *Breaking Defense*, March 7, 2023b.

Saltzman argued that the balance “unequivocally” favors the attacker for two reasons:¹¹ existing satellite constellations were designed for a benign environment, and satellites naturally move in predictable and observable orbits (see Figure 2).¹²

Saltzman’s characterization of the offensive advantage as “an unstable condition that works against deterring attacks on space assets” highlights the latent risk of undesired escalation, and even conflict, in space.¹³ By this logic, leaders might be predisposed to escalate a standoff—or to initiate a conflict—more quickly than they would in other circumstances because they fear that the opportunity to preserve their advantage is winnowing. Just as some historians have argued that mobilization timelines drove European leaders to take more-provocative actions in the lead-up to World War I,¹⁴ Saltzman’s logic suggests that, in a crisis, even leaders who initially did not seek to start a war could be motivated to use offensive space capabilities to attack first to preempt the loss of space capabilities essential to warfighting.¹⁵

To reduce the pressure to act first, Saltzman’s suggested solution is to “mak[e] an attack on satellites impractical, even self-defeating” by “investing in resilient space order of battle.”¹⁶ Resilience could include such improved protections as ensuring that space architectures are resistant to cyberattacks or nuclear effects and efforts to incorporate disaggregation, distribution, diversification, and proliferation into U.S. and allied space architectures.¹⁷ For example, DoD is prioritizing investments in *proliferated space architectures*, layered networks of low Earth orbit (LEO) constellations

¹¹ As a summary of a 2018 workshop states, “[a] major theme in conversations surrounding U.S. space strategy is the concept of space as an ‘offense-dominant’ domain. Current U.S. policy is guided by this principle, as space systems are few and vulnerable, and view this condition of affairs as being permanent” (J. Pearl, “Workshop Summary for Space in 21st Century Conflict: Calibrating Risks, Tailoring Strategies,” Lawrence Livermore National Laboratory, 2018, p. 12). See also Morgan, 2010, p. 2; James P. Finch, “Bringing Space Crisis Stability Down to Earth,” *Joint Force Quarterly*, Vol. 76, 2015, p. 18; and Michael P. Gleason and Peter L. Hays, “A Roadmap for Assessing Space Weapons,” Aerospace Corporation, 2021, p. 4. For a contrary view, see Brad Townsend, “Strategic Choice and the Orbital Security Dilemma,” *Strategic Studies Quarterly*, Spring 2020, pp. 82–83.

¹² Peter Garreston, “Gen. Chance Saltzman: Competitive Endurance, Proposing a ‘Theory of Success’ for the Space Domain,” *Space Strategy* podcast, August 23, 2023.

¹³ Hitchens, 2023b. Notably, the academic literature does not predict that offense-dominant capabilities always create a first strike incentive. For a study that hypothesizes that this is the case, see Stephen Van Evera, “Offense, Defense, and the Causes of War,” *International Security*, Vol. 22, No. 4, Spring 1998.

¹⁴ James Joll, *The Origins of the First World War*, 2nd ed., Pearson Educational, 1992. Joll’s analysis also emphasizes the importance of additional social and political factors in precipitating the July 1914 crisis and contributing to the outbreak of World War I.

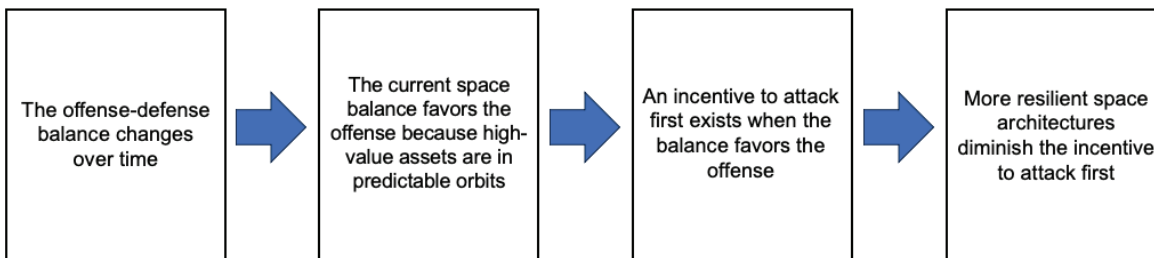
¹⁵ Saltzman’s comments build on remarks by his predecessor, Gen John Raymond, about the existence of a “first mover advantage” in space. For Raymond’s comments, see Shaun Waterman, “US Must ‘Slash Costs’ to Afford Space Superiority, Raymond Says,” *Air and Space Forces Magazine*, April 5, 2022. A RAND report highlights the difference between a first-to-employ advantage often implied by space leaders and other advantages conferred by being the first to innovate and invest, reveal, and maneuver. See McClintock, Langeland, and Spirtas, 2023.

¹⁶ Saltzman also highlighted the advantages of “disaggregation, distribution, diversification and protection, [and] maneuverability” (Hitchens, 2023b).

¹⁷ See DoD, “Space Domain Mission Assurance: A Resilience Taxonomy,” Office of the Assistance Secretary of Defense for Homeland Defense and Global Security, September 2015; C. Todd Lopez, “Agency Director Discusses Multi-Pronged Approach to Resiliency in Space,” *DoD News*, April 14, 2023.

comprising hundreds (if not thousands) of satellites that reduce the effect of an attack that disables or destroys a single asset.¹⁸

Figure 2. USSF Articulated Relationship Between Offense-Defense Balance and Resilience



SOURCES: Adapted from Hitchens, 2023b; Garreston, 2023.

If resilient architectures diminish the first attacker’s advantage, this investment decision might yield considerable strategic benefits for avoiding escalation in space and unwanted conflict. Yet two issues highlighted in the academic literature on escalation—the difficulty assessing the balance between offensive and defensive capabilities and the role of perceptions in shaping states’ strategic choices—raise questions about the proposition.

First, assessing the balance between offensive and defensive capabilities is challenging in any domain, including space. Military observers frequently have misjudged the significance of emerging technologies and operational concepts for the overall balance.¹⁹ For example, European strategists mistakenly agreed in the run-up to World War I that offensive doctrines prevailed over defensive ones, despite considerable evidence that new technologies favored the defender.²⁰ The possibility of miscalculating the balance between offensive and defensive capabilities in space is all the more acute for the simple reason that space warfare has not occurred. Although wargames and other structured analytic methods can help to elucidate how friendly and adversary activities might interact in particular scenarios, the ongoing evolution in operating concepts, pace of technological change, and the secrecy surrounding space capabilities all complicate forecasts.²¹ Although tactical effects might be predicted relatively easily, the strategic consequences of emerging technologies are more difficult to anticipate because they depend on militaries’ ability to develop optimal concepts, organizations, and

¹⁸ Vivienne Machi, “US Military Places a Bet on LEO for Space Security,” *Via Satellite*, June 2021. This article is also duplicated on the Space Development Agency’s website. The Space Development Agency renamed the resilient LEO constellation the Proliferated Warfighter Space Architecture in early 2023 (USSF, “SDA Layered Network of Military Satellites Now Known As ‘Proliferated Warfighter Space Architecture,’” press release, January 23, 2023).

¹⁹ Indeed, Posen argues that the tendency of militaries to promote offensive doctrines as a means of limiting uncertainty might also create a bias toward offensive doctrines even when technology would enable defense (Barry Posen, *Sources of Military Doctrine: France, Britain and Germany Between the World Wars*, Cornell University Press, 1984, p. 47).

²⁰ For a discussion of military planners’ mistaken assumptions in the years prior to World War I, see Jack Snyder, *The Ideology of the Offensive: Military Decision Making and the Disasters of 1914*, Cornell University Press, 1989.

²¹ On overclassification in the space domain, see Robert Fahs, “Gen. Hyten Finds Over-Classification of Space Information Undermines National Security, Promises Reform,” U.S. National Archives, December 1, 2020.

supporting capabilities to exploit their full potential.²² Studies examining the implications of novel military technologies for escalation found that decisionmakers generally are hesitant to use them during a crisis or conflict because they lack confidence in their strategic or battlefield utility.²³

Relatedly, observers have noted that space capabilities cannot be divided as strictly offensive or defensive. In general, one can imagine offensive or defensive uses for practically any weapon, and weapons in space are no exception.²⁴ Armored vehicles, for example, can be used to defend a position or to support an offensive maneuver. Similarly, satellites that could be used to defend against a kinetic anti-satellite (ASAT) attack could also be used to hinder an adversary's satellite. Capabilities designed for such defensive functions as debris mitigation could also be turned against other satellites for offensive purposes.²⁵ But although difficulties in distinguishing offensive and defensive systems can hinder efforts to calculate whether a system contributes more to an offensive or defensive advantage, the resulting uncertainty does not negate the potential that such an advantage exists. Academic theorists and Saltzman's own assessment imply that it is possible to understand the offense-defense balance by evaluating the overall potential to conduct offensive or defensive operations rather than assessing the capabilities of specific systems.²⁶

A second issue is that national policies regarding the use of space capabilities might not be based on objective technological considerations. Rather, leaders' behavior reflects their perceptions of offensive or defensive capabilities based on their interpretations of the available, often imperfect, information. For example, a series of wars in the decades before World War I provided ample evidence that technological changes favored the defender. However, military observers misperceived the outcome of these conflicts as confirmation of the theory of the offensive advantage and devised military and political strategies using this premise. Leaders' behavior in a future space crisis or conflict is likely to be similarly driven by their subjective assessment of the offense-defense balance, more than the real characteristics of the underlying capabilities.

If adversaries believe that defense was dominant or discount the idea of an offense-defense balance, that might question the applicability of this proposition. However, People's Liberation Army (PLA)

²² Todd S. Sechser, Neil Narang, and Caitlin Talmadge, "Emerging Technologies and Strategic Stability in Peacetime, Crisis, and War," *Journal of Strategic Studies*, Vol. 42, No. 6, 2019, p. 729.

²³ For research examining this phenomenon in other domains, see Erik Gartzke, "The Myth of Cyberwar: Bringing War in Cyberspace Back Down to Earth," *International Security*, Vol. 38, No. 2, 2013, pp. 42–43; Jon R. Lindsay, "Stuxnet and the Limits of Cyber Warfare," *Security Studies*, Vol. 22, No. 3, 2013.

²⁴ See, for example, Colin S. Gray, "New Weapons and the Resort to Force," *International Journal*, Vol. 30, No. 2, 1970; John J. Mearsheimer, *Conventional Deterrence*, Cornell University Press, 1986; Jonathan Shimshoni, "Technology, Military Advantage, and World War I: A Case for Military Entrepreneurship," *International Security*, Vol. 15, No. 3, 1990–1991; Colin Gray, *Weapons Don't Make War: Policy, Strategy, and Military Technology*, University Press of Kansas, 1993. For the argument that states can accurately perceive and classify weapons as offensive or defensive, see Sean M. Lynn-Jones, "Offense-Defense Theory and Its Critics," *Security Studies*, Vol. 4, No. 4, 1995, pp. 674–677, 679–682.

²⁵ For this example and a corresponding discussion of the legal implications, see Linda Slapakova, Theodora Vassiliki Ogden, and James Black, "Strategic and Legal Implications of Emerging Dual-Use ASAT Systems," *NATO Legal Gazette*, Vol. 42, 2021, p. 179.

²⁶ Stephen Biddle, "Rebuilding the Foundations of Offense-Defense Theory," *Journal of Politics*, Vol. 63, No. 3, August 2001, pp. 741–774. Saltzman explains, "We don't think in terms of offense or defense. Those are operations, not systems. And so when I say I'm bringing on a capability, I'm bringing on a capability to support a range of operations. We don't think about an F-35 as being offensive or defensive" (Greg Hadley, "Space Force Will Get New Capability for 'Full Spectrum Operations' by 2026, Saltzman Says," *Air and Space Force Magazine*, April 19, 2023b).

writings on space conflict indicate that the Chinese military shares the belief that space is an offense-dominant domain and perceives an incentive to act first. The 2013 Academy of Military Science's *Lectures on the Science of Space Operations* explicitly states that "space operational forces have the attributes of strong offense and weak defense" and notes that "the imbalance . . . will grow more pronounced" as technology develops.²⁷ The *Lectures* also highlights that "compared to other operations [in other domains], the rhythm of space operations has clearly accelerated, and their processes have clearly been shortened."²⁸ If anything, Chinese writers' confidence in the offensive character of space raises questions about whether U.S. investments in resilience would change their perceptions and contribute to stabilizing the space domain.

Indeed, perceptions of the strategic circumstances in other domains might lead policymakers toward destabilizing rather than stabilizing activities. Awareness of the defensive advantages of survivable strategic nuclear weapons did not always limit policymakers' ambitions to pursue improved offensive capabilities, such as increasing the quantity and quality of counterforce weapons.²⁹ Increasing development of resilient space capabilities might therefore not diminish an adversary's desire to pursue offensive capabilities given their particular perceptions or preferences.

Senior space leaders have articulated a belief in the propositions that current space architectures create an incentive for countries to attack first in space, and they have proposed acquiring resilient capabilities to mitigate this risk. Although the analysis in the academic and other relevant literature does raise questions, especially about the inherent difficulty of accurately assessing the balance absent combat experience, it does not provide evidence that would undermine this proposition. Adversary perceptions might also ultimately determine behavior more than the actual change in capabilities. Even if the United States takes actions to decrease the vulnerability of its space systems, China might still believe it has an incentive to attack first. Although its assessments might not be definitive, USSF doctrine can contribute by transparently analyzing the nature of and balance between offensive and defensive operations in space, which can help to elucidate the benefits, costs, and risks of offensive or defensive operations and related capability investments.³⁰ Exploring how U.S. and adversary incentives to attack change over the course of imagined crises and conflicts could help to elucidate the practical risks of first strike behavior. Examining how adversaries might respond in a crisis to more- or less-resilient U.S. space architectures could also demonstrate costs and benefits of different investment choices.

²⁷ Jiang Lianju [姜连举], ed., *Lectures on the Science of Space Operations* [空间作战学教程], Military Science Press [军事科学出版社], 2013.

²⁸ Jiang, 2013, p. 35.

²⁹ Keir A. Lieber, "Grasping the Technological Peace: The Offense-Defense Balance and International Security," *International Security*, Vol. 25, No. 1, 2000. See also Brendan Rittenhouse Green, *The Revolution That Failed: Nuclear Competition, Arms Control, and the Cold War*, Cambridge University Press, 2020. However, RAND research using a game-theoretical model with imperfect information found that an adversary's misperceptions of space-based capabilities tended to have stabilizing effects, regardless of whether the adversary overestimated or underestimated those capabilities (Triezenberg, Langeland, and Downing, 2022, pp. 50–51).

³⁰ We are grateful to Peter Hays for suggesting a related point.

Leveraging Foreign and Commercial Partners Is Beneficial for Stability

U.S. space policy underscores the importance of strengthening collaboration with international and commercial partners. The 2020 Defense Space Strategy, for example, repeatedly notes the growing capabilities of commercial organizations, allies, and partners, and directed DoD to “enhance space cooperation” with international partners and commercial entities whose space capabilities often “are already integral to collective security.”³¹ DoD documents note that allies can contribute capabilities, partner in space operations, and share space-related information and intelligence.³² Cooperation with allies also enhances resilience and brings a diversity of perspective that benefits the development of effective space capabilities.³³ On the commercial side,³⁴ private-sector space providers might be able to mitigate capability gaps at lower cost or on faster timelines than traditional DoD acquisition processes, especially when commercial partners have readily available off-the-shelf solutions.³⁵ By ensuring civilian and government systems and networks are compatible, greater integration between DoD and the commercial space sector might also enhance the resilience of resident DoD capabilities.³⁶

Beyond these clear advantages, however, increasing the relative balance of DoD leveraging commercial and allied capabilities and DoD-owned capabilities can introduce escalation risks. The United States has publicly messaged its intention to deter and, if necessary, respond to “adversary aggression against the space capabilities of the United States and its allies, partners, and commercial interests,” but concepts for evaluating new target sets and pathways for crisis and conflict initiation are underdeveloped.³⁷ Although commercial and international cooperation address some similar limitations for the United States—and are often referenced together in U.S. government statements—the implications for managing escalation in a crisis differ. The United States has made compelling, if conditional, commitments to defend and respond to attacks on allied or partner systems, which are likely to deter adversary attack. How the United States would respond to an attack on commercial

³¹ DoD, 2020, p. 9.

³² These logics are elaborated in Bruce McClintock, Andrew Radin, Cortney Weinbaum, Stephanie Anne Pillion, Bonnie L. Triesenberg, Jonathan Cham, Daniel Elinoff, Maggie Habib, Mark Hvizda, Kotryna Jukneviute, Adi Rao, and Bryan Rooney, *Allied by Design: Defining a Path to Thoughtful Allied Space Power*, RAND Corporation, RR-A1739-1, 2024, p. 11. See also DoD, *Department of Defense International Space Cooperation Strategy*, January 2017, p. 2; DoD, 2020, pp. 5–7.

³³ McClintock et al., 2024, p. 11.

³⁴ We scope commercial space partnerships as cases when commercial partners provided direct services to DoD space organizations. Examples in which commercial partners provided DoD platforms or systems are more in line with traditional acquisition processes.

³⁵ DoD, 2020, p. 5; USSPACECOM, *Commercial Integration Strategy Overview*, April 2022. For example, the Defense Science Board has suggested that DoD can learn from SpaceX’s agile software development practices (Sandra Erwin, “Pentagon Advisory Panel: DoD Could Take a Page from SpaceX on Software Development,” *SpaceNews*, April 10, 2018). USSF’s acquisition plan for space mobility and logistics seeks to leverage commercial capabilities for on-orbit serving and repair, satellite refueling, and debris removal (Theresa Hitchens, “Space Force, SPACECOM Pushing to Speed ‘Sustained’ Maneuverability on Orbit,” *Breaking Defense*, April 23, 2023d).

³⁶ See Emmi Yonekura, Brian Dolan, Moon Kim, Krista Romita Grocholski, Raza Khan, and Yool Kim, *Commercial Space Capabilities and Market Overview: The Relationship Between Commercial Space Developments and the U.S. Department of Defense*, RAND Corporation, RR-A578-2, 2022; USSPACECOM, 2022.

³⁷ DoD, 2020, p. 8.

space systems, however, is more uncertain. Commercial systems, therefore, seem more likely to be subjected to attack early in a crisis or conflict. Unpacking these risks is useful for DoD space enterprise leaders to consider as they pursue expanded partnerships.

It is widely held that increasing U.S. interconnections with allied and partner systems strengthens deterrence because adversaries will be less likely to attack a wider group of nations.³⁸ Yet U.S. commitments to international allies and partners also creates new pathways for crisis initiation and escalation. The literature on alliances describes the issue of *entanglement*, in which a security relationship could lead the United States to enter a conflict it would otherwise avoid.³⁹ In principle, the development of shared constellations or space services could create a new crisis or conflict pathway for the United States if it were obliged to respond after a partner's satellite was attacked. Another potential risk is that an adversary could decide to attack an ally's space assets as a means of harming the United States and degrading its broader coalition of allies and partners. As with adversary attacks on U.S. commercial systems, such an act could be seen as a lower rung on the escalation ladder that would limit risk of a U.S. response. There are, indeed, cases outside the space domain in which adversaries have sought to punish a U.S. ally for U.S. policy (such as China's detention of Canadian citizens in response to the house arrest of a Chinese national in Canada at the request of the United States) and in which the United States has sought to weaken an adversary by supporting third-party enemies (such as U.S. support to the mujahedeen in Afghanistan), although these examples are not necessarily analogues for attacks in space.⁴⁰

The literature offers competing explanations for the extent to which security relationships have entangled the United States. Analysts who see a greater risk of entanglement argue that partners might engage in "reckless driving" if they are emboldened by U.S. security commitments to act aggressively.⁴¹ A 2021 RAND study identified at least five cases in which entanglement dynamics contributed to U.S. involvement in conflict but revealed no instances of *entrapment*, defined as cases in which a U.S. commitment emboldened an ally to start a conflict.⁴² Conversely, skeptics of entanglement note that allies' dependence provides the United States leverage to influence allies' behavior.⁴³ Moreover, the United States uses "conditional alliance terms" to preserve its flexibility.⁴⁴ For example, Article V of the North Atlantic Treaty specifies that if an ally is attacked, each ally will

³⁸ See DoD, 2017, p. 2.

³⁹ For a review and evaluation of the scholarship on alliance entanglement, see Miranda Priebe, Bryan Rooney, Caitlin McCulloch, and Zachary Burdette, *Do Alliances and Partnerships Entangle the United States in Conflict?* RAND Corporation, RR-A739-3, 2021, p. 9.

⁴⁰ Steve Coll, *Ghost Wars: The Secret History of the CIA, Afghanistan, and Bin Laden, from the Soviet Invasion to September 10, 2001*, Penguin Books, 2004; Scott Kennedy, "Beijing Suffers Major Loss from Its Hostage Diplomacy," Center for Strategic and International Studies, September 29, 2021.

⁴¹ Posen, 2014, p. 44. See also Priebe et al., 2021, pp. 16–17; David M. Edelstein and Joshua R. Itkowitz Shiffrinson, "It's a Trap! Security Commitments and the Risks of Entrapment," in Trevor Thrall and Benjamin Friedman, eds., *U.S. Grand Strategy in the 21st Century: The Case for Restraint*, Routledge, 2018.

⁴² Priebe et al., 2021, p. 64.

⁴³ Priebe et al., 2021, pp. 18–19.

⁴⁴ Priebe et al., 2021, pp. 18–19.

take “such action as it deems necessary . . . to restore and maintain the security of the North Atlantic area.”⁴⁵

It is unlikely that U.S. attempts to increase collaboration in space have increased the risk of entanglement. First, the United States has not extended new security guarantees to spacefaring allies; rather, it is enhancing cooperation with countries that it previously committed to defend. Although some U.S. allies are exploring options for more-intensive space control policies (such as France’s “active defense” concept), U.S. allies do not appear to be pursuing the type of risk-acceptant strategies that would raise concerns of reckless driving.⁴⁶ And although the United States has indicated that it would respond to attacks on allied space systems, it retains significant flexibility in deciding the nature and timing of such a response. The North Atlantic Treaty Organization has clarified that Article V applies to space but has left ambiguous what actions might be required if an ally is attacked in the domain.⁴⁷ Similarly, unilateral U.S. space policy guidance states that any “purposeful interference with or an attack on” allied space systems that “directly affects national rights” would be met with “a deliberate response” at the United States’ discretion, but U.S. space policy does not specify the timing, scale, or nature of such response, including whether it would be limited to the same domain.⁴⁸ Arguably, the greater entanglement risk comes for allies and partners than for the United States because linking their assets with U.S. space systems in support of U.S. operations increases the likelihood that they would be targeted as part of a retaliation against the United States.

Still, there is a risk that U.S. adversaries might underestimate U.S. commitments to its allies and partners and provoke a crisis or conflict by attacking an ally’s space assets. Such a scenario could arise if adversaries assessed that U.S. allies’ capabilities were more vulnerable to cyber or kinetic attacks, or if they determined that the United States would respond less forcefully to an action against a non-U.S. system. In these circumstances, such an attack could be seen as a relatively low-cost means to probe U.S. escalation thresholds or sow uncertainty about the credibility of U.S. security commitments. However, this risk is not unique to the space domain and, instead, reflects general perceptions of U.S. extended deterrence commitments. Furthermore, there is little public evidence that China or Russia believes that the United States would respond differently to an attack on an ally’s space systems than it would to an attack on its assets in other domains. To the contrary, U.S. attempts to enhance space cooperation with allies and partners should convey the importance the United States places on allied and partner systems and reduce uncertainty that could contribute to a miscalculation.

By contrast, whether and how the United States would respond militarily to an attack against a U.S. commercial system is more uncertain, particularly during peacetime. As with other categories of commercial critical infrastructure, the U.S. government has provided limited technical assistance to space firms and developed cybersecurity standards but is not responsible for directly defending

⁴⁵ North Atlantic Treaty Organization, *The North Atlantic Treaty*, April 4, 1949.

⁴⁶ McClintock et al., 2024, Chapter 3; French Ministry for the Armed Forces, *Space Defence Strategy: Report of the “Space” Working Group*, 2019.

⁴⁷ Lorne Cook, “NATO Says Attack in Space Could Trigger Mutual Defense Clause,” Associated Press, June 14, 2021.

⁴⁸ White House, “The National Space Policy,” memorandum of December 9, 2020, *Federal Register*, Vol. 85, No. 242, December 16, 2020, p. 81756.

privately owned and operated satellites or associated systems.⁴⁹ Furthermore, the United States has not articulated specific penalties for an attack against commercial space systems, although it has issued general warnings as described above. The Russian cyberattacks against SpaceX for aiding Ukraine, for example, also raised questions about how potential reactions to attacks against commercial entities would differ from attacks against allied or partner systems.⁵⁰

Research on states' behavior toward their adversaries during war might offer insight into adversary calculations regarding commercial assets. There is a long history of military adversaries attacking their opponents' commercial maritime assets, both as an intentional method of warfare and, in some cases, accidentally when civilian ships are misidentified.⁵¹ However, states do not always target adversary commercial assets and often have nuanced commercial relationships, which might apply to decisions to target commercial satellites as well. One study notes that adversaries assess trade relationships depending on whether trade helps their adversary in the current war and whether trade with the adversary is beneficial to their own security. For some commodities or at certain junctures during the war, the benefits of trade with an adversary might exceed the risk that trade might help an adversary militarily.⁵² A similar logic might apply to states' behavior toward commercial satellites that provide military capabilities to an adversary. A commercial satellite might be a less attractive target if it also provides services to all countries. Attacking a commercial satellite could also set precedent for more widespread targeting of civilian assets, which might more broadly harm the attacking state's interests.

Nevertheless, there are early signs that U.S. adversaries see a disproportionate benefit from attacking commercial systems, rather than U.S. government systems, as a means to degrade U.S. capabilities without provoking unwanted escalation. Senior Russian leaders offered context for their attacks against Starlink by stating that U.S. commercial satellites aiding Ukraine "could be a legitimate target for a retaliatory strike," and Russia also conducted cyberattacks against Viasat, another commercial provider.⁵³ Similarly, PLA publications consistently highlight Starlink's military applications and connections to the U.S. military, indicating the PLA's significant threat perceptions of U.S. commercial systems.⁵⁴ In parallel, an article about Starlink in China's *National Defense Technology* published only months after Russia's invasion suggested "countermeasures," including strengthening China's "space combat system," developing "new disposal methods," and "using a

⁴⁹ See, for example, Suzanne Lightman, Theresa Suloway, Joseph Brule, "Satellite Ground Segment: Applying the Cybersecurity Framework to Satellite Command and Control," National Institute of Standards and Technology, December 2022.

⁵⁰ Elizabeth Howell, "Elon Musk Says Russia Is Ramping Up Cyberattacks on SpaceX's Starlink Systems in Ukraine," Space.com, October 14, 2022.

⁵¹ See Dickey, 2022, pp. 7–16. For discussion of the current risk, see Theresa Hitchens, "Space Force Seeks Ideas or Potential 'Commercial Space Reserve' Fleet," *Breaking Defense*, February 9, 2023a.

⁵² Mariya Grinberg, "Wartime Commercial Policy and Trade Between Enemies," *International Security*, Vol. 46, No. 1, 2021, p. 19.

⁵³ Ann Simmons and Micah Maidenberger, "Russia Says It Could Target U.S. Commercial Satellites in Ukraine War," *Wall Street Journal*, October 27, 2022; Kate Duffy, "A Top Pentagon Official Said SpaceX Starlink Rapidly Fought Off a Russian Jamming Attack in Ukraine," *Business Insider*, April 22, 2022.

⁵⁴ Li Xiaoli [李小历], "Starlink's Militarized Application Ambitions and Its Brutal Expansion Deserve the Vigilance of the International Community" ["星链 的军事化应用野心及其野蛮扩张, 值得国际社会警惕"], *PLA Daily*, May 5, 2022; [孙广博] and Feng Songjiang [丰松江], "From 'Starlink' to 'Star Shield,' the United States' Ambitions for Space Hegemony Are Clearly Revealed," *PLA Daily*, December 12, 2022; Pan Yuxiang [潘宇翔] and Ye Xingguo [叶星国], "Be Wary of 'Starlink' in Civilian Cloak" ["警惕披着民用外衣的"星链"], *PLA Daily*, January 21, 2022.

combination of soft and hard kills for some satellites that are in abnormal states.”⁵⁵ Chinese reactions to Starlink suggest that China could adopt an aggressive approach to targeting commercial systems supporting DoD capabilities.

U.S. government officials also acknowledge that adversaries are likely to hold commercial satellites at risk. USSPACECOM has expressed concern that adversaries might target privately owned space assets that are either perceived to be providing services to the U.S. military or identified as potential future service providers.⁵⁶ Analyses of commercial space capabilities note that dual-use commercial assets providing services to military organizations are legitimate targets.⁵⁷ However, international humanitarian law could restrict such attacks, including a nonkinetic attack if there are “disproportionate effects on the civilian population.”⁵⁸

Our analysis of this proposition reinforces that collaboration with allied, partner, and commercial entities has significant value but is not risk free. By collaborating with commercial and foreign partners, the United States can better take advantage of new capabilities and improve its resiliency. But U.S. adversaries might conclude that the costs of attacking non-DoD systems are lower because the United States is either less likely to retaliate or will respond less forcefully. They therefore could be incentivized to strike these targets earlier in a crisis or conflict. Deepening collaboration with these partners also will lead to growing demands for U.S. assistance or retaliation in the event their assets are attacked.

The risks to commercial systems might be greater than the risk to allied and partner countries. Adversaries have already emphasized the legitimacy of targeting commercial entities and, in some cases, already acted on these threats. Deterring or responding to such attacks might require some combination of enhancing the resilience of commercial systems and perhaps preparing more-extensive DoD responses to attacks on commercial entities.

Active Communications Channels with Adversaries Can Reduce the Likelihood of a Crisis and Alleviate Pressure to Escalate If One Occurs

To address the escalatory pressures noted above, the United States can also pursue measures to reduce the likelihood of a crisis that could escalate into conflict. U.S. government officials have lauded the value of communications channels with adversaries, such as routinized dialogues and emergency

⁵⁵ Ren Yuan-zhen [任远桢] et al., “The Development Status of Starlink and Its Countermeasures” [“星链计划发展现状与对抗思考”], *Modern Defense Technology*, Vol. 50, No. 2, April 2022.

⁵⁶ Lee Ferran, “Space Force Commander Cannot ‘Forgive’ Russia for ‘Reckless’ ASAT Test,” *Breaking Defense*, October 14, 2022.

⁵⁷ Dickey, 2022; Wen Zhou, “Open-Ended Working Group on Reducing Space Threats Through Norms, Rules and Principles of Responsible Behaviours,” presentation, United Nations Office for Disarmament Affairs, May 11, 2022.

⁵⁸ Cassandra Steer, “Application of International Humanitarian Law/Laws of Armed Conflict in Space: Civilians and Neutral States,” remarks to the first session of the United Nations Open-Ended Working Group on Reducing Space Threats, May 11, 2022, p. 5.

hotlines.⁵⁹ These interactions offer a means of alleviating misperceptions and promoting common understanding of operating procedures and behavior. Such mechanisms especially reduce the risk of inadvertent or accidental escalation by enabling leaders to clarify their intent. As U.S. Air Force (USAF) nuclear doctrine explains, “escalation control relies heavily on each side of a conflict understanding the intent of the other,” and communications channels can help ensure that strategic signaling is properly understood.⁶⁰ Enhancing communications channels among space powers is sometimes viewed, as one prominent space researcher writes, as the “single most important non-military action that can be taken” to promote stability.⁶¹

Although theoretically compelling, communications channels are not a panacea for all the factors that contribute to the risk of escalation in space. This is because the *ability* to communicate may not change a state’s *willingness* to share information and cooperate to stabilize, let alone de-escalate, a confrontation. Opening a communications channel is a prerequisite for such cooperation, but it does not guarantee that both sides are willing to engage in meaningful dialogue to advance mutual comprehension and resolve disputes. In the event that conflict is likely or unavoidable, communications channels may enable either party to shape their opponent’s perception of the expected costs and inform their decisionmaking calculus, but the existence of these mechanisms is not, in itself, likely to dissuade a state from going to war. Indeed, states may reject deeper communications for fear that their competitors are manipulating their perceptions to gain strategic advantage. As we explain below, China is wary of U.S. overtures to open communication and might decline to use available mechanisms in a crisis. The current feasibility of this proposition is therefore limited by Chinese views and past behavior.

Robust communications channels are especially important to develop for space because the environment is increasingly congested, the terms of competition are poorly understood, and the risk of accidents is high. As prior RAND research has documented, the growth in space activity has outpaced the development of space traffic management (STM) governance processes, procedures, mechanisms, and institutions that are needed for operators to maintain space situational awareness (SSA) and reduce the likelihood of collisions.⁶² Complicating matters further, information on adversary intent, behavior, and capabilities is sparse, and it can be difficult to distinguish among deliberate actions, accidents, and acts of nature.⁶³ These challenges are exacerbated in an environment in which all parties perceive an advantage to striking first and are under additional pressure to act quickly despite incomplete information. As a result, states might miscalibrate their signals or misinterpret rivals’ escalation thresholds in a crisis.

⁵⁹ Bruce W. MacDonald, “Deterrence and Crisis Stability in Space and Cyberspace,” in *Anti-Satellite Weapons, Deterrence and Sino-American Space Relations*, Stimson Center, 2013, p. 88; Maxwell Simon and Sam Wilson, “Avoiding an Unintentional Space War: Lessons from Cold War Nuclear Diplomacy,” *Bulletin of the Atomic Scientists*, Vol. 77, No. 3, 2021, p. 141; Dennis Blair and Bruce MacDonald, “Crisis Stability, Signaling, and Communications in the Space Domain,” in Bruce W. MacDonald, ed., *Crisis Stability in Space: China and Other Challenges*, Johns Hopkins Foreign Policy Institute, 2022, p. 103.

⁶⁰ Air Force Doctrine Publication 3-72, *Nuclear Operations*, Curtis E. Lemay Center for Doctrine Development and Education, December 18, 2020, p. 21.

⁶¹ MacDonald, 2013, p. 88.

⁶² Dan McCormick, Douglas C. Ligor, and Bruce McClintock, *Cross-Domain Lessons for Space Traffic Management: An Analysis of Air And Maritime Treaty Governance Mechanisms*, RAND Corporation, RR-A2208-2, 2023, pp. 1–2.

⁶³ Simon and Wilson, 2021, p. 140.

The notion that robust and regular communications channels can alleviate risks of unintended escalation is well grounded. Theoretical and historical studies have found that both the process of opening communications channels and establishing mechanisms for information-sharing can reduce mistrust and help stabilize relations. The initial agreement to engage in dialogue serves an important confidence-building function, while the process of constructing a communications channel (such as by exchanging equipment and establishing procedures for a crisis hotline) demonstrates a mutual interest in improving communication and peacefully resolving future disagreements.⁶⁴ Throughout, information-sharing helps to establish a record of positive interaction and reduces uncertainty about capabilities and intentions. This reserve of trust can help arrest escalation in a crisis by relieving pressure on leaders to act quickly and both encouraging and facilitating work toward a peaceful settlement.⁶⁵ Specialized mechanisms such as crisis hotlines convey the importance that both sides place on collaborating to avoid further escalation and provide what Thomas Schelling describes as “last minute reassurance when confidence doesn’t exist.”⁶⁶

Although crisis hotlines attract particular attention, more routine communications channels are often necessary to build trust.⁶⁷ Operator-level mechanisms such as exchanges of information related to military activities and doctrine, procedures for notification and mutual observation of military exercises and tests, and the creation of military-to-military communication links can increase predictability and avoid misperceptions and misunderstandings.⁶⁸ In space, communications channels focused on SSA and STM might reduce the likelihood that an unintended orbital conjunction is interpreted as an offensive action. This can help to calm the “anxiety to strike first” that might arise from inadequate domain awareness.⁶⁹ A prerequisite for successful use of space safety-focused communications channels, however, is that the information shared must be true and that escalation is indeed unintended. Using channels intended to promote safety to convey false information or biased messaging for a particular strategic objective might undermine trust in these channels and contribute to, rather than alleviate, escalatory pressures.⁷⁰

⁶⁴ Thomas C. Schelling, “Confidence in Crisis,” *International Security*, Vol. 8, No. 4, Spring 1984, p. 58.

⁶⁵ Simon and Wilson, 2021, p. 141; MacDonald, 2013, p. 88. For example, U.S. and Soviet leaders used the Moscow-Washington hotline during the 1967 Six-Day War to exchange 20 messages to clarify Israel’s activities in the war and implicitly convey U.S. support for a negotiated ceasefire (Steven E. Miller, “Nuclear Hotlines: Origins, Evolutions, Applications,” *Journal for Peace and Nuclear Disarmament*, Vol. 4, No. 1, 2021, pp. 180–181).

⁶⁶ Schelling, 1984, p. 66. See also Eszter Simon and Agnes Simon, “Trusting Through the Moscow-Washington Hotline: A Role Theoretical Explanation of the Hotline’s Contribution to Crisis Stability,” *Journal of Global Security Studies*, Vol. 5, No. 4, 2020, pp. 658–659; Alan J. Vick, “Building Confidence During Peace and War,” *Defense Analysis*, Vol. 5, No. 2, 1989, p. 98. Scholars commonly regard the Moscow-Washington hotline established in 1963 as an ideal example of a communication-based confidence building measure (CBM).

⁶⁷ Vick, 1989, p. 98.

⁶⁸ Glenn H. Snyder, *Alliance Politics*, Cornell University Press, 1997, pp. 6–7.

⁶⁹ Kevin Pollpeter, *Space Domain Awareness as a Strategic Counterweight*, China Aerospace Studies Institute, 2021, p. 6; Sandra Erwin, “Space Domain Awareness: A Secret Weapon Against Shadowy Threats in Orbit,” *SpaceNews*, April 14, 2022b.

⁷⁰ Alexander L. George, “Crisis Management: The Interaction of Political and Military Considerations,” *Survival*, Vol. 26, No. 5, 1984, p. 224. One example from another domain is the PLA Navy’s counterpiracy operations in the Gulf of Aden. Chinese official media framed these operations as focused on contributing to regional security for the common good. However, Indian officials often point to the PLA’s deployment of submarines, which are poorly suited for constabulary functions, as evidence of Chinese power projection and interference with India’s maritime influence despite Chinese claims to the contrary (China Global

Beyond these state-to-state interactions, nongovernmental communication mechanisms such as Track II dialogues can help create conditions for more formal dialogues and reinforce the value of other communications channels. By fostering information exchanges between nongovernmental experts, such dialogues aim to promote mutual understanding and explore potential avenues for conflict resolution that could be carried forth by official Track I engagements.⁷¹ Academic studies have produced insufficient evidence to determine whether and how Track II dialogues influence the success of Track I outcomes.⁷² Prior RAND research has found that Track II dialogues are effective at shaping views, attitudes, and knowledge of elites in participating countries, but these dialogues are long-term processes that rarely lead directly to significant policy shifts.⁷³

However, the prospects for using communications channels as a robust means of dialogue on security issues between China and the United States appears dim, although there are elements of engagement possible on safety issues. To establish and leverage the benefits of communication ties, all participants need to agree that it is in their national interest to reduce tensions and to avoid accidents that could spark a crisis or escalate to a conflict, and they must perceive a benefit to exchanging information. However, PLA doctrine and military thinking question the underlying concept that information exchange can serve such mutual interests.⁷⁴ Indeed, Chinese authors and officials are more skeptical of the value of military transparency and information-sharing than the U.S. officials cited above. Chinese writings emphasize that transparency measures benefit the stronger power and note the benefits for a weaker state in concealing its capabilities. Beijing suspects that more-established communications channels could embolden the United States to act more aggressively by granting U.S. decisionmakers greater confidence in their ability to initiate crises without triggering undesirable levels of escalation.⁷⁵

During past crises, PRC leaders have chosen not to use the Washington-Beijing hotline established in 1998 and, according to U.S. government officials, declined to answer calls from their U.S. counterparts. Following the U.S. accidental bombing of the Chinese embassy in Belgrade in 1999 and a collision between a Chinese jet and a U.S. EP-3 reconnaissance aircraft in 2001, for instance,

Television Network, “10 Years of China’s Gulf of Aden Journey: A Global Player with More Responsibility,” webpage, December 27, 2018; People’s Republic of China [PRC] Ministry of Defense, “Defense Ministry’s Regular Press Conference on September 5, 2014,” September 5, 2014; Ken Moriyasu and Kiran Sharma, “Indian Ocean Rivalry: China’s Naval Maneuvers Irk New Delhi,” *Nikkei Asia*, September 27, 2022).

⁷¹ Joseph V. Montville, “Transnationalism and the Role of Track Two Diplomacy,” in Thompson W. Scott and Jensen Kenneth, eds., *Approaches to Peace: An Intellectual Map*, United States Institute of Peace Press, 1991.

⁷² Esra Cuhadar and Thaina Paffenholz, “Transfer 2.0: Applying the Concept of Transfer from Track-Two Workshops to Inclusive Peace Negotiations,” *International Studies Review*, Vol. 22, 2020, p. 656.

⁷³ Dalia Dassa Kaye, *Talking to the Enemy: Track Two Diplomacy in the Middle East and South Asia*, RAND Corporation, MG-592-NSRD, 2007, p. 105.

⁷⁴ Academy of Military Science All-Military Military Terminology Committee [全军军事术语管理委员会 军事科学院], *Junyu* [军语], Academy of Military Science Publishing House [军事科学出版社出版], 2011, pp. 5, 51, 58. For analysis of Chinese concepts of deterrence, see Nathan Beauchamp-Mustafaga, Derek Grossman, Kristen Gunness, Michael S. Chase, Marigold Black, and Natalia D. Simmons-Thomas, *Deciphering Chinese Deterrence Signalling in the New Era: An Analytic Framework and Seven Case Studies*, RAND Corporation, RR-A1074-1, 2021.

⁷⁵ RAND subject-matter expert, discussion with authors, February 1, 2023.

U.S. leaders struggled to reach PRC leaders despite the hotline's availability.⁷⁶ Amid false fears that the United States planned to initiate a military crisis ahead of the 2020 U.S. presidential election, senior Chinese military officials did speak with then–Chairman of the Joint Chiefs of Staff Gen Mark Milley, who called to reassure his counterparts that an attack was not forthcoming, but the PLA later declined to participate in a December 2020 dialogue with U.S. Indo-Pacific Command.⁷⁷ More recently, PLA leaders reportedly did not return multiple calls from Defense Secretary Lloyd Austin and Milley related to then–Speaker of the House of Representatives Nancy Pelosi's visit to Taiwan and declined to speak with Austin following the U.S. downing of a suspected Chinese surveillance balloon.⁷⁸

However, China has been known to occasionally communicate on specific space safety issues. The two countries established a space hotline in 2015; the extent to which this mechanism has been exercised is unclear.⁷⁹ China has responded to U.S. space safety messages, unlike Russia, which has not responded to such messages for the past several years despite having a more robust history of crisis communication with the United States in other domains.⁸⁰ Nevertheless, China's broader willingness to engage in space security collaboration is doubtful given its past behavior.

Chinese distrust of U.S. intentions and apparent disinclination to use existing communications channels put clear limits on what the United States can achieve. Yet there are no obvious benefits to giving up on the prospect of dialogue; to the contrary, ceasing efforts at engagement is likely to only validate Chinese views that U.S. overtures are insincere and make communication in a future crisis more difficult. Instead, the United States might prioritize its resources by focusing on safety issues—such as programs to reduce the likelihood of a collision between spacecraft and debris—in which areas of common interest are more apparent.⁸¹ Although these information exchanges would be more limited in scope than the strategic channels U.S. policymakers have envisioned, their success could demonstrate the utility of expanded communications and, over time, encourage greater information-sharing.

In the near term, however, it is unlikely that both countries will soon overcome the fundamental obstacles presented by their differing perceptions of the value of communication and the dangers of instability. As a result, any mechanisms established with China likely will be less extensive and successful than those with Russia. DoD should manage expectations in the near term.

Finally, the literature suggests that regular communication is particularly effective in building confidence in low-information environments but might be insufficient to arrest crisis escalation unless

⁷⁶ Avery Goldstein, "First Things First: The Pressing Danger of Crisis Instability in U.S.-China Relations," *International Security*, Vol. 37, No. 4, 2013, p. 63.

⁷⁷ Office of the Chairman of the Joint Chiefs of Staff, "General Milley's Engagements with the People's Liberation Army Leaders," memorandum for the record, September 27, 2021, pp. 6–7.

⁷⁸ Lara Seligman and Alexander Ward, "Pentagon Chiefs' Calls to China Go Unanswered Amid Taiwan Crisis," *Politico*, August 5, 2022; Phil Stewart and Idrees Ali, "China Declined U.S. Request for Call Between Defense Chiefs After Balloon Shootdown," Reuters, February 7, 2023.

⁷⁹ Sam Jones, "US and China Set Up 'Space Hotline,'" *Financial Times*, November 20, 2015; U.S. official and Russian Track-II participants, interviews with the authors, 2018–2020.

⁸⁰ See, for example, Phil Stewart and Idrees Ali, "Exclusive: U.S., Russia Have Used Their Military Hotline Once So Far During Ukraine War," Reuters, November 29, 2022.

⁸¹ McClintock et al., 2021, pp. 30–31.

the United States and China implement mechanisms that limit provocative force positioning, demonstrations, and employment. The following section evaluates prospects for U.S. norms promotion and arms control initiatives intended to spur related restrictions.

Developing Shared Norms for Responsible Behavior in Space Can Promote Stability in the Near Term

U.S. space strategy documents also contend that the United States can enhance crisis stability by promoting norms for responsible behavior in space. Previous RAND work has found that the expansion of space activities and emergence of new technologies have outpaced the development of governance frameworks that would regulate behavior and preserve the domain's long-term stability.⁸² USSF is particularly concerned with issues regarding space militarization, notifications of test and maneuvers, and other information-sharing obligations that are unresolved, contributing to a heightened risk of miscommunication, misperception, and accidents that could lead to unintended escalation.

Norm development plays a prominent role in U.S. space policy. The National Security Council's *U.S. Space Priorities Framework* directs the United States to take the lead in promoting favorable standards and norms to "contribute to the safety, stability, security, and long-term sustainability of space activities."⁸³ U.S. policy guidance and public statements propose norms regarding the safe maneuvering of satellites, self-imposed limits on the generation of long-lived debris, avoidance of the creation of harmful interference, and regularized information-sharing and notification practices.⁸⁴ Reflecting these objectives, the United States has made formal submissions to the United Nations (UN) on developing and implementing transparency and CBMs and establishing best practices for the conduct of satellite operations, among other recommendations.⁸⁵ The United States has also acted outside multilateral forums to promote broader norms, rules, and principles of responsible behavior in space. In April 2022, the United States committed not to conduct "destructive direct-ascent anti-satellite missile testing" and expressed a desire to establish this "as a new international norm."⁸⁶ That same month, the USSPACECOM commander provided the secretary of defense with a list of recommended responsible behaviors (replicated in the box below) derived from the tenets described previously.⁸⁷

⁸² McClintock et al., 2021.

⁸³ White House, 2021, p. 7. See also United States of America, "National Submission to the United Nations Secretary General Pursuant to UN General Assembly Resolution 75/36: Reducing Space Threats Through Norms, Rules and Principles of Responsible Behaviours," April 29, 2021.

⁸⁴ See, for instance, White House, 2020, pp. 81755–81773; DoD, 2020, p. 8; DoD, 2021b; DoDD 3100.10, 2022. For a detailed history of U.S. policy regarding norms of responsible space behavior, see McClintock et al., 2021.

⁸⁵ A U.S. submission to the UN explained, "[h]ow spacecraft interact with one another, including the degree to which their operations are transparent and predictable, affects the potential for misinterpretation and miscommunication. Unpredictable or non-transparent operations conducted in deliberate proximity to other spacecraft might be viewed as posing a safety risk or a threat" (United States of America, 2021).

⁸⁶ White House, "Remarks by Vice President Harris on the Ongoing Work to Establish Norms in Space," April 18, 2022a.

⁸⁷ DoD, "Tenet Derived Responsible Behaviors in Space," Office of the Secretary of Defense, February 9, 2023. The text states that the USSPACECOM commander submitted a list dated May 16, 2022 (United States of America, 2021, p. 6).

Tenets of Responsible Space Behavior proposed by U.S. Space Command

Tenet #1: Operate in, from, to, and through space with due regard to others and in a professional manner

- When conducting a rendezvous or operating in proximity to the space objects owned or operated by non-U.S. Government entities, avoid actions (1) that might harmfully interfere with the function of the other space object, or (2) where the effect will cause or significantly increase the risk of a potential collision.

Tenet #2: Limit the generation of long-lived debris

- Design, operate, and maintain space objects through end-of-life disposal in ways that limit the generation of long-lived debris.

Tenet #3: Avoid the creation of harmful interference

- Take all practicable steps to prevent affecting the command and control of space objects in a manner that increases the risk of loss, damage, or destruction of a space object.
- Take all practicable steps to prevent interference with capabilities that contribute to strategic stability, including but not limited to: national technical means of verification; strategic missile warning space systems; and nuclear command, control, and communications (NC3) space systems.

Tenet #4: Maintain safe separation and safe trajectory

- Ensure space objects designed to conduct rendezvous or proximity operations have appropriate collision avoidance systems and follow trajectories that allow other space objects to maneuver in a safe manner.

Tenet #5: Communicate and make notifications to enhance the safety and stability of the domain

- Provide notifications to affected parties if a potential collision is predicted, and provide public notification as soon as practicable in the event of an uncontrolled or anomalous reentry.
- Share space situational awareness data, including space objects and debris locations, as necessary to facilitate spaceflight safety, avoid collisions, and minimize launch and reentry risks.
- As soon as practicable, provide notifications to affected parties of the loss of control of a space object, if that loss of control might result in a collision, cause interference with other space objects, or cause an uncontrolled reentry.

SOURCE: Reproduced from DoD, 2021b.

Developing a normative regime that redresses the drivers of space instability is complicated because the perceived interests of the United States and its major competitors appear to be incompatible.⁸⁸ The United States might be able to instill its desired norms among U.S. allies and partners and advance space sustainability. Gaining common ground with adversaries will be more fraught because the United States, Russia, and China have so far been unwilling to engage in meaningful cooperation on the most important security issues for U.S. policymakers—such as restraints on the employment (versus testing) of debris-generating ASAT weapons. Absent a meaningful change in how Russia and China perceive the strategic value of these activities for their national interests—or significant U.S. concessions to its competitors' terms—the major space powers are unlikely to reach agreement because they do not perceive the same dangers and disagree about the benefits of promoting a normative regime on the terms that the United States has proposed.

⁸⁸ As of early 2024, 12 countries had joined the United States in pledging not to perform destructive, debris-generating ASAT tests: Australia, Austria, Canada, France, Germany, Italy, Japan, the Netherlands, New Zealand, South Korea, Switzerland, and the United Kingdom (Secure World Foundation, "Netherlands, Austria, and Italy Add Momentum to Growing International Commitment Not to Conduct Direct-Ascent Anti-Satellite Missile Tests," April 6, 2023).

Achieving progress toward formal arms control agreements, which can both reinforce emerging norms and confer additional expectations, will be an even greater challenge.

The academic literature describes *norms* as collective expectations for behavior.⁸⁹ In the context of U.S. space policy, norms can be defined as shared understandings regarding the development or use of specific military capabilities and activities. Norms might prohibit or prescribe specific actions or obligations. They draw their normative force from a variety of sources, including rules and professional standards, codes of conduct, international law, treaties, and other bilateral or multinational agreements. Some emerge organically, while others are developed and promoted by so-called norm entrepreneurs.⁹⁰ In principle and by past experience, norm advocates might be able to start with smaller, like-minded groups and eventually persuade a critical mass to adopt a desired behavioral standard and achieve what social scientists describe as a *norm cascade*, in which the rate of adoption increases, resistance decreases, and norms are internalized.⁹¹ Because conformity emerges from states' desire to be identified as in good standing within their community, persuasion of prominent actors within different sectors can help to maximize the number of states that comply.⁹² These influential states might produce a specific weapon, have special moral stature, or otherwise enjoy a unique status or sway.⁹³ Examples of effective norms that limit state behavior or capability development include the emergence of international humanitarian law, the establishment of anti-land mine agreements, and the nuclear nonproliferation regime.⁹⁴

There appears to be growing support within major multilateral forums for U.S.-backed efforts to advance norms development related to space safety, sustainability, and—eventually—security. One example was the 2021 introduction and acceptance of the UN Report of the Secretary-General on reducing space threats through norms, rules, and principles of responsible behaviors, as well as the positive rhetorical response of 30 countries (including the United States, China, and Russia), the European Union, and the open-ended working groups at the UN.⁹⁵ The international response to the U.S. announcement of a unilateral moratorium on debris-generating ASAT tests was also promising. In December 2022, 155 nations voted in favor of a similar UN resolution introduced by the United States and several other nations, and 12 countries in addition to the United States have committed to not conduct destructive ASAT tests.⁹⁶

⁸⁹ This definition is adapted from Peter J. Katzenstein, ed., *The Culture of National Security: Norms and Identity in World Politics*, Columbia University Press, 1996, p. 5.

⁹⁰ Martha Finnemore and Kathryn Sikkink, "International Norm Dynamics and Political Change," *International Organization*, Vol. 52, No. 4, Autumn 1998, p. 901.

⁹¹ Cass R. Sunstein, "Social Norms and Social Roles," *Columbia Law Review*, Vol. 96, 1996.

⁹² Martha Finnemore and Duncan B. Hollis, "Constructing Norms for Global Cybersecurity," *American Journal of International Law*, Vol. 110, No. 3, July 2016, p. 452; Dickey, 2022, p. 51; United Nations General Assembly First Committee, "Approving 21 Drafts, First Committee Asks General Assembly to Halt Destructive Direct-Ascent Anti-Satellite Missile Tests in Outer Space," press release, November 1, 2022.

⁹³ Sunstein, 1996, pp. 909, 912.

⁹⁴ Finnemore and Sikkink, 1998.

⁹⁵ For a list of member states' replies, see UN Office for Disarmament Affairs, "Report of the Secretary-General on Reducing Space Threats Through Norms, Rules and Principles of Responsible Behaviors (2021)," webpage, undated.

⁹⁶ Nine voted against it and nine others abstained (Jeff Foust, "United Nations General Assembly Approves ASAT Test Ban Resolution," *SpaceNews*, December 13, 2022). For earlier advocacy in support, see United Nations General Assembly First Committee, 2022. For unilateral commitments, see Secure World Foundation, 2023.

Yet differences in how the United States, Russia, and China perceive their interests in space and understand the goals of U.S. normative proposals suggest that there is reason to be skeptical of future Russian and Chinese support—let alone compliance. Russia and China hold diametrically opposed views from that of the United States on the strategic utility of space and the necessity of developing new norms. According to one analysis of Chinese and Russian native-language sources, both countries tend to perceive U.S. space activities as threatening and evidence of hostile U.S. intent.⁹⁷ Although the United States frames its normative appeals as efforts to mitigate mutual vulnerabilities and advance common interests, Chinese officials view this advocacy as part of a broader U.S. attempt to preserve strategic superiority and claim new military advantages.⁹⁸ Chinese military writers have accused the United States of stoking fears of a “space Pearl Harbor” to justify agreements that would enshrine U.S. advantages, permit continued weaponization, and ultimately undermine Chinese security.⁹⁹ As one analysis from China’s National University of Defense Technology summarized, “the United States has the illusory belief that, if it can widen the gap in space capabilities between itself and China, it can increase its relative benefits by throwing off China as a rival.”¹⁰⁰

Russia shares China’s disdain for a U.S.-developed normative order for space, which it perceives as antithetical to Russian interests in the domain and part of a broader U.S. effort to weaken its global influence.¹⁰¹ Compared with China, Russia has expressed greater concerns about the prospect of an arms race in space and has a history of cooperation with the United States in other domains to promote stability.¹⁰² Yet Russia has also seized on U.S. space strategy documents as evidence that the United States aims to claim superiority in space, and the Russian Ministry of Foreign Affairs has accused the United States of purposefully mischaracterizing Russian strategic aims.¹⁰³ Russian military leaders and space analysts maintain that their counterspace weapons contribute to strategic stability by strengthening Russian capabilities and denying U.S. attempts to attain a “comprehensive military advantage” in space.¹⁰⁴ Moscow opposed the establishment of a UN working group on reducing space threats through norms, rules, and principles of responsible behaviors following Russia’s November 2021 destructive ASAT test and succeeded in delaying the organization’s first-ever meeting to

⁹⁷ Blanc et al., 2022.

⁹⁸ Xu Nengwu [徐能武], Long Kun [龙坤], and Meng Xin [孟鑫], “Space Arms Control from the Perspective of International Security: Origins, Evolution, and Trends” [“国际安全视角下太空军控的缘起、演进和发展动向”], *Journal of International Security Studies* [国际安全研究], Vol. 5, 2022, p. 122.

⁹⁹ Xu Nengwu [徐能武] and Long Kun [龙坤], “The Points of Debate, Theoretical Logic, and Engagement Strategies for Arms Control in Space” [“太空军备控制的现实争辩、理论逻辑和参与策略”], *Global Review* [国际展望], Vol. 6, 2021, p. 59.

¹⁰⁰ Xu, Long, and Meng, 2022, p. 124.

¹⁰¹ Russian skepticism of the West predated the 2022 invasion of Ukraine. Speaking at the 2014 Valdai Discussion Club, for instance, Russian President Vladimir Putin dismissed U.S. norms promotion generally and indicated that Russia should “choose not to live by the rules” or “live without any rules at all” (Vladimir Putin, “The World Order: New Rules or a Game Without Rules,” speech at the meeting of the Valdai International Discussion Club, October 24, 2014). See also Andrew Radin and Clint Reach, *Russian Views of the International Order*, RAND Corporation, RR-1826-OSD, 2017.

¹⁰² Raphael S. Cohen, Marta Kepe, Nathan Beauchamp-Mustafaga, Asha Clark, Kit Conn, Michelle Grisé, Roby Valiaveedu, and Nathan Vest, *Assessing the Prospects of Great Power Cooperation in the Global Commons*, RAND Corporation, RR-A597-4, 2023, p. 37.

¹⁰³ Cohen et al., 2023, p. 41.

¹⁰⁴ Jaganath Sankaran, “Russia’s Anti-Satellite Weapons: An Asymmetric Response to U.S. Aerospace Superiority,” *Arms Control Today*, March 2022.

consider norms for military activities in space by raising procedural complaints.¹⁰⁵ Like China, Russia also voted against the 2022 UN resolution against destructive ASAT tests.¹⁰⁶ The rift between the United States and Russia has deepened since the war in Ukraine began, raising questions about even long-standing areas of cooperation, such as the International Space Station, which Russia announced it would withdraw from after 2024, and the New START Treaty, which Russia suspended participation in in late February 2023.¹⁰⁷

Further complicating U.S. norms promotion efforts, China and Russia have advocated specific alternatives to the preferred U.S. approach. These include proposals for a formal arms control treaty, known as the Treaty on the Prevention of the Placement of Weapons in Outer Space, restricting the placement of weapons in space.¹⁰⁸ U.S. officials have focused on constraints on employment and have expressed little interest in formal arms control measures that would limit the development, storage, or fielding of specific space capabilities. U.S. space officials across different administrations have argued that arms control agreements are inappropriate for space.¹⁰⁹ U.S. criticisms include that proposed bans on specific capabilities are unverifiable, unenforceable, and likely made in bad faith, given evidence of Russian and Chinese development of the very systems they claim to want to ban by formal treaties.¹¹⁰

Chinese and Russian opposition exemplifies a broader challenge to the development of normative regimes: Actors' willingness to adhere to new norms depends on their varied interpretations of the proposal's validity and alignment with their individual interests. For instance, such countries as North Korea, India, and Pakistan have pursued nuclear weapons despite international norms of nonproliferation because they perceive the national security benefits as greater than the benefits of compliance.¹¹¹ The United States too has, in certain circumstances, taken a divergent stance on international norms restricting combat capabilities. For example, the United States has resisted international prohibitions on the production and use of land mines and declined to sign the Anti-Personnel Landmines Convention to preserve its ability to use these munitions in the Korean peninsula.¹¹² U.S. statements on space similarly make clear that norms should "protect and advance

¹⁰⁵ Theresa Hitchens, "No Love from Russia for UN Military Space Norms Meeting," *Breaking Defense*, February 9, 2022; Nuclear Threat Initiative, "PAROS Treaty," May 31, 2022; Sandra Erwin, "International Talks on Space Norms to Continue but U.S. Will Not Engage Directly with Russia," *SpaceNews*, March 17, 2022a.

¹⁰⁶ Foust, 2022.

¹⁰⁷ Mary Ilyushina and Christian Davenport, "Russia Says It'll Withdraw from International Space Station After 2024," *Washington Post*, July 26, 2022; David E. Sanger, "Putin's Move on Nuclear Treaty May Signal End to Formal Arms Control," *New York Times*, February 21, 2023.

¹⁰⁸ For a history and description of this treaty and related proposals for nonbinding codes of conduct, see McClintock et al., 2021, pp. 6–10.

¹⁰⁹ DoD, 2020, p. 8; White House, 2021, p. 7; DoD, 2022, p. 9; DoDD 3100.10, 2022, pp. 3–4; Kari A. Bingen and John F. Plumb, "Emerging Security Issues in Space Policy" transcript, Center for Strategic and International Studies, December 14, 2022.

¹¹⁰ Stephen J. Flanagan and Bruce McClintock, "How Joe Biden Can Galvanize Space Diplomacy," *Politico*, January 15, 2021; McClintock et al., 2021, p. 22.

¹¹¹ See, for example, Toni Johnson, "The Four Nuclear Outlier States," Council on Foreign Relations, May 19, 2020.

¹¹² Rachel Stohl, "Biden Administration Announces New APL Landmines Policy," Stimson Center, June 24, 2022. On the emergence of norms inhibiting the development, stockpiling, and use of antipersonnel mines, see Richard Price, "Emerging Customary Norms and Anti-Personnel Landmines," in Christian Reus-Smit, ed., *The Politics of International Law*, Cambridge University Press, 2004, pp. 106–130.

U.S., allied, and partner interests in space” and preserve U.S. “space superiority.”¹¹³ Official statements related to the U.S. announcement that it would abstain from debris-generating ASAT tests were carefully worded to preserve U.S. freedom of action, including not limiting the development of the capability or its future use outside of tests.¹¹⁴ Even close U.S. allies might have divergent preferences and seek to collectively develop norms rather than accept specific U.S. proposals, especially because information-sharing limitations often obscure the reasoning behind U.S. policy.¹¹⁵ These examples show how countries’ responses to normative development reflect perceived strategic interests, leading them to reject norms, develop nascent norms to reflect these interests, and shape their policies to allow partial compliance.

Overall, the proposition that U.S. norms promotion might promote greater space stability is theoretically sound but practically difficult to implement. It is plausible that the U.S. strategy of working with a broad coalition of space entities could, eventually, trigger a norm cascade that constrains or inhibits irresponsible behavior in space. Yet it could take decades for such effects to be seen among the wider international community—if indeed U.S. officials persist in underwriting the policy—and it will be particularly difficult to bind Russia and China to these standards. One fundamental problem is that neither country currently sees specific U.S. proposals as in their interests, and both countries view the broader norms promotion project as part of a larger effort to reinforce U.S. advantages that are antithetical to their own security. The United States will also not pursue norms that are more advantageous to these countries, especially given its explicit policy of pursuing norms that favor U.S. and allied interests.¹¹⁶

This suggests a need for realism when considering the consequences of ongoing efforts but is not a reason to abandon norm promotion efforts entirely. The alternative would entail an increased risk of miscommunications, misperceptions, and accidents that could, in the best case, increase the cost of U.S. operations in space or, in the worst case, spark a crisis that could escalate to a broader conflict. Even if Russia and China do not comply, promoting a common understanding of responsible behavior among other spacefaring entities still furthers the U.S. aim of promoting safety and sustainability. There is also a need for additional analysis of the operational and strategic implications for the United States if other actors succeed in promoting norms antithetical to U.S. interests. Likewise, the implications of Chinese compliance to U.S. proposals—such as limitations on direct-ascent ASAT weapons—are poorly understood. Future analysis should consider the relative benefits and, if any, disadvantages for the United States that could emerge in such an environment.

¹¹³ DoDD 3100.10, 2022, p. 7. See also DoD, 2020, p. 8; Hitchens, 2023b.

¹¹⁴ As Deputy Assistant Secretary of Defense John Hill explained, “Will this norm put the United States at a disadvantage? No . . . we’re not disarming” (as quoted in Sandra Erwin, “DoD a Main Proponent of Anti-Satellite Test Ban: ‘We Are Not Disarming,’” *SpaceNews*, April 20, 2022c; Brian Chow and Brandon Kelley, “U.S. Antisatellite Test Ban Reveals a New Approach for Security and Sustainability in Space,” *SpaceNews*, May 12, 2022).

¹¹⁵ Aaron Bateman, “Intelligence and Alliance Politics: America, Britain, and the Strategic Defense Initiative,” *Intelligence and National Security*, Vol. 36, No. 7, 2021; McClintock et al., 2024.

¹¹⁶ See DoD, 2020, p. 8.

Selectively Revealing New Capabilities Can Enhance the Credibility of U.S. Threats and Deter Adversary Escalation

Although a degree of concealment might be necessary to preserve or maximize the military effectiveness of specific capabilities, some U.S. officials have expressed concern that excessive secrecy is undermining the United States' ability to deter its primary adversaries.¹¹⁷ As former Secretary of the Air Force Heather Wilson has summarized, U.S. competitors "need to know there are certain things we can do . . . and the final element of deterrence is uncertainty. How confident are they that they know everything we can do?"¹¹⁸ Other senior military officials have suggested that an over-classification of space information might weaken the United States' ability to promote stability. "In space, we over-classify everything," Vice Chairman of the Joint Chiefs of Staff Gen John Hyten remarked to the National Security Space Association in 2021. Hyten emphasized that: "deterrence does not happen in the classified world."¹¹⁹

The notion that selective revelation of military capabilities offers leaders a means to enhance the credibility of their threats is well grounded in the academic literature. The underlying rationale is similar during peacetime, crisis, and conflict, although the associated risks and benefits might differ depending on context. A state might choose to disclose a new capability to dispel uncertainty about its abilities, inform assessments of the military balance, create new functional and geographic challenges for a competitor, and divert adversary attention and resources—all with the ultimate aim of deterring and weakening a potential challenger.¹²⁰ By revealing an unknown capability, a state can communicate additional information about its resolve and military effectiveness and the balance of power to dissuade an opponent from either initiating a confrontation in peacetime or from escalating a crisis or conflict further. The United States has not acknowledged any offensive space capabilities, although Air Force Secretary Frank Kendall has confirmed publicly that the United States is funding "hard kill

¹¹⁷ Joseph Trevithick, "USAF Secretary Gives Ominous Warning That Show of Force Needed to Deter Space Attacks," *The Drive*, April 12, 2019; Fahs, 2020; Robert Fahs, "Space Operations Chief Decries Over-Classification and Its Effect on Operations," U.S. National Archives, March 8, 2021; Theresa Hitchens, "Exclusive: Pentagon Poised to Unveil, Demonstrate Classified Space Weapon," *Breaking Defense*, August 20, 2021b; Greg Hadley, "To Deter Attacks in Space, US Needs Resilience—and an 'Offensive Threat,' Experts Say," *Air and Space Forces Magazine*, April 6, 2023a; Greg Hadley, "Why Can't They Declassify the Space Force? Sorry. That's Classified," *Air and Space Forces Magazine*, April 27, 2023c.

¹¹⁸ Trevithick, 2019.

¹¹⁹ Theresa Hitchens, "DoD Faces Tough Decisions on Space Rules," *Breaking Defense*, February 2, 2021a. Raymond expressed a similar position during a National Press Club event, in which he remarked: "The main mission of the [USSF] is to deter conflict from beginning or extending into space, and I'm convinced that if you want to change the deterrence calculus of an adversary, you have to be able to communicate. . . . If you have everything classified, that really erodes your ability to deter conflict" (Frank Wolfe, "U.S. Space Force Developing De-Classification Strategy to Aid Deterrence," *Defense Daily*, March 3, 2021).

¹²⁰ Evan Braden Montgomery, "Signals of Strength: Capability Demonstrations and Perceptions of Military Power," *Journal of Strategic Studies*, Vol. 43, No. 2, 2020, pp. 313–314, 321. In addition to revealing genuine strengths, a state might also reveal information that misrepresents its capabilities to dissuade a challenger or compel them to misdirect resources in a way that provides an advantage to the United States (Thomas G. Mahnken, *Selective Disclosure: A Strategic Approach to Long-Term Competition*, Center for Strategic and Budgetary Assessments, 2020). See also Robert Jervis, *The Logic of Images in International Relations*, Princeton University Press, 1970, pp. 38–39; Brendan Rittenhouse Green and Austin Long, "Conceal or Reveal? Managing Clandestine Military Capabilities in Peacetime Competition," *International Security*, Vol. 44, No. 3, Winter 2019–2020.

and soft kill capabilities.”¹²¹ Yet were the United States to reveal, for example, that it had clandestinely fielded a co-orbital ASAT capability that could destroy constellations critical to an adversary’s planned operation, it might alter an adversary’s assessment of the likelihood of success and deter conflict. As a signaling mechanism, selective disclosures also allow a state to leverage its investments in emerging capabilities in peacetime. A state that has invested in novel or immature technology might, for instance, want to reduce uncertainty about the military value of such technology.¹²²

Like other military signaling activities that are intended primarily to communicate intent or capability to adversaries, selective disclosures carry a risk of misperception or misinterpretation that can cause counterproductive outcomes. To be effective, a disclosure must persuade an adversary that the military balance is more favorable to the United States than they had previously assessed. However, the same attributes of the space domain that complicate attempts to assess the military balance might distort or degrade the intended message. For instance, rapid technological innovations might diminish the apparent military utility of whatever capabilities or operational concepts might be revealed, obscuring, rather than clarifying, real U.S. capabilities, resolve, or intent.¹²³ Moreover, the absence of common expectations for military use raises questions about whether or when the United States would be willing to employ a demonstrated capability given U.S. and allied rhetoric about responsible behavior in space.¹²⁴

In some cases, problems with a signal might diminish the deterrent effect of a revelation, which might make it less likely for a rival to change their behavior. In others, a disclosure might inadvertently escalate a confrontation if it is misinterpreted as more threatening than intended. In peacetime, disclosures could provoke escalation by heightening an opponent’s sense of vulnerability and introducing a security dilemma in which one party’s attempt to protect itself exacerbates another’s sense of insecurity and incentivizes their own military developments, resulting in further insecurity and a spiral of capability development.¹²⁵ Indeed, both China and Russia have seized on evidence of U.S. space capability development to promote narratives that the United States is weaponizing space and to justify their own investments.¹²⁶ Similarly, a demonstration of capability during a crisis could be misinterpreted as evidence that a state has already decided or is preparing to escalate further. For example, a U.S. announcement or demonstration of a counterspace capability that left no doubt of U.S. willingness to destroy adversary satellites in a conflict could be interpreted as evidence of an impending attack. Believing that war was unavoidable, an adversary might then be incentivized to

¹²¹ Theresa Hitchens, “Space Force’s FY24 Budget Includes ‘Offensive’ Options for Space. What Does That Mean?” *Breaking Defense*, March 13, 2023c.

¹²² Montgomery, 2020, pp. 311, 321.

¹²³ Montgomery, 2020, pp. 323–324.

¹²⁴ For a model of how conflict can occur when states disagree over likely force employment concepts, see Alastair Smith and Allan C. Stam, “Bargaining and the Nature of War,” *Journal of Conflict Resolution*, Vol. 48, No. 6, December 2004.

¹²⁵ Robert Jervis, *Perception and Misperception in International Politics*, Princeton University Press, 1976.

¹²⁶ See Mahnken, 2020. Also see the comment from Jacqueline Schneider, security expert at Stanford’s Hoover Institute, as reported by John Grady, “‘Selective Disclosure’ Can Serve as Counter to Russia and China, Says Report,” U.S. Naval Institute, December 1, 2020; William J. Broad, “How Space Became the Next ‘Great Power’ Contest Between the U.S. and China,” *New York Times*, January 24, 2021. Recent accusations from China assert that “Washington is the main driving force behind the weaponization and militarization of outer space” (China Global Television Network, “China Urges U.S. to Stop Militarization of Outer Space,” webpage, July 19, 2022).

strike first preemptively. In either scenario, an attempt to promote stability by highlighting one side's advantage could instead prompt a destabilizing response.

Even if the revelation does not lead the adversary to escalate, there are additional potential challenges and trade-offs. The value of a disclosure will vary based on the specific capability and circumstance but can be derived by comparing (1) the benefits gained by signaling military capabilities against (2) the benefits lost if a hidden operational advantage is sacrificed.¹²⁷ A revelation might restrict the circumstances in which a capability can be employed or incur political penalties if the revelation violates established norms or agreements.¹²⁸ These public costs can allow states to send more credible signals of resolve because they communicate how much the sender values its desired outcome and suggest a strong willingness to carry out the threat.¹²⁹ Yet allowing an adversary to learn of a new capability might also reduce its military utility, narrowing U.S. options and potentially undermining U.S. strategic advantages in the future.

Several considerations inform the military costs of revelation and, in turn, the relative attractiveness of disclosing a capability. These include the following:

- **The extent to which revelation will degrade the capability's military effectiveness.** The opportunity costs of disclosing a capability whose operational benefits depend on secrecy will be greater than a disclosure that exploits an unknown or broad set of vulnerabilities.
- **The likelihood that an adversary can develop a countermeasure,** as well as time and resources required to do so. For example, the revelation of a cyber exploit might lead an opponent to delay further action but not ultimately deter further unwanted escalation. The greater the military imbalance revealed, the more enduring the benefits. Although China has significant economic and technological resources to support development in the space domain, Russia has a more limited budget because of competing modernization priorities.¹³⁰ China might be better resourced to develop countermeasures to restore the military balance of power in response to a selective revelation from the United States, while Russia's response could be more unpredictable if its perception of the military balance of power is tipped further in favor of the United States.
- **The likelihood that an adversary can emulate the capability,** as well as the time and resources required. In addition to the opportunity costs associated with the reduced military effectiveness of a revealed capability, additional penalties could emerge if a competitor is able to employ a similar capability against the United States.¹³¹

¹²⁷ MacDonald, 2013. For a discussion of the incentives to keep military strengths secret, see Branislav L. Slantchev, "Feigning Weakness," *International Organization*, Vol. 64, No. 3, 2010; David Lindsey, "Military Strategy, Private Information, and War," *International Studies Quarterly*, Vol. 59, 2015.

¹²⁸ See James D. Fearon, "Signaling Foreign Policy Interests: Tying Hands Versus Sinking Costs," *Journal of Conflict Resolution*, Vol. 41, No. 1, 1997.

¹²⁹ For a brief summary of the relationship between publicity and credibility, see Allison Carnegie, "Secrecy in International Relations and Foreign Policy," *Annual Review of Political Science*, Vol. 24, 2021, p. 214.

¹³⁰ Defense Intelligence Agency (DIA), *Challenges to Security in Space: Space Reliance in an Era of Competition and Expansion*, March 2022.

¹³¹ On the risk of emulation, see Montgomery, 2020, p. 322; Bernard Brodie, "Military Demonstration and Disclosure of New Weapons," *World Politics*, Vol. 5, No. 3, April 1953, p. 290.

- **The likelihood that the United States can develop and conceal a strategic replacement**, as well as the length of time and resources required. Any disadvantage from revealing a capability might be offset by the development of an alternate clandestine capability that would grant equivalent or greater battlefield effects. As two theorists have noted, “the less unique the capability, the more attractive signaling is relative to concealment.”¹³²
- **The selected capability’s importance to the United States’ overall military strategy.** The opportunity cost of revealing a capability vital to the U.S. theory of victory would be greater than that of a capability that might provide limited operational benefit, regardless of the likelihood that an opponent will develop a countermeasure.¹³³

These prospective costs can be reduced by controlling the information revealed about a capability. As one theorist has noted, “concealing or revealing . . . is not an either/or proposition.”¹³⁴ Rather, “[t]he trick [is] to gauge just what to divulge about weaponry without giving away too much” information that would allow the target to redress their vulnerability revealed or to develop countermeasures.¹³⁵ Revelation mechanisms in which the information divulged can be controlled, such as public statements or exhibitions, might produce fewer penalties than such mechanisms as exercises or demonstrations that reveal greater information.¹³⁶ Yet any steps taken to conserve the military advantage by reducing the information shared might also weaken the credibility of the threat conveyed, thereby reducing the signaling advantage gained.

The circumstances surrounding a revelation also matter. Routine disclosures of investment priorities or capabilities in peacetime, which could occur if the United States were to reduce classification restrictions on space programs as many senior officials have suggested, would provide an adversary with information about U.S. capabilities that might prevent a crisis from occurring in the first place. Such disclosures likely would incentivize adversaries to develop equivalent capabilities or countermeasures that could impose long-term costs on the United States but would be less likely to provoke military escalation than a revelation in an emergency. By contrast, a revelation during a crisis or conflict might entail higher risks and higher rewards in the near term.

Overall, the proposition that selective revelation of U.S. space capabilities might promote greater space stability is generally valid but difficult to operationalize. Producing strategic advantage from a selective revelation during crisis or conflict likely requires a rare combination of the following factors:

- The capabilities revealed must change the adversary’s perceptions of the overall military balance in space to the point where the adversary is less likely or unable to achieve their military objective.
- The adversary has not already committed to offensive actions regardless of cost.

¹³² Green and Long, 2019–2020, p. 50.

¹³³ Lindsey, 2015, p. 635.

¹³⁴ James Holmes, “Article Review 145 on ‘Conceal or Reveal? Managing Clandestine Military Capabilities in Peacetime Competition,’” ISSF Forum, November 26, 2020.

¹³⁵ Holmes, 2020.

¹³⁶ Montgomery, 2020, p. 323.

- The disclosure should reveal a vulnerability that the target country cannot resolve or reverse engineer quickly.
- The revelation does not damage wider U.S. military advantage by undermining key capabilities that could be central to future warfighting.

Policymakers should evaluate whether these conditions are present before disclosing a capability to delay or deter unwanted escalation in a crisis.

Developing and Employing Reversible Options Can Be Useful to Manage Escalation Amid Crisis and Conflict

Reversible counterspace capabilities allow a user to achieve a desired end goal without permanent damage to a targeted space system or harm to other spacecraft through the creation of long-lived space debris. Counterspace capabilities that inflict temporary outcomes can be employed for operational effect—such as to blind an adversary’s sensor prior to an attack or to signal capabilities or resolve.¹³⁷ Because their effects are fleeting, such reversible options are viewed by U.S. policymakers as less provocative than irreversible alternatives. As a result, reversible capabilities are especially attractive signaling instruments because they provide decisionmakers with the ability to capture an adversary’s attention and convey a message—such as a threat of additional punishment—without increasing the intensity or scope of a conflict. As theorists have speculated for cyber capabilities, reversible capabilities might also function as a release valve, allowing leaders to convey displeasure while communicating an implicit message of restraint.¹³⁸ Put otherwise, reversible counterspace capabilities provide policymakers with an additional portfolio of options to impose punishments, convey opposition, and demonstrate resolve while keeping a contest below a desired escalation threshold.

DoD documents indicate that counterspace capabilities are understood on a “continuum” arranged from most reversible to irreversible options (see Figure 3).¹³⁹ Although more-detailed descriptions of how specific reversible options might be arrayed across this continuum are not publicly available, this figure illustrates how DoD generally ranks the relative intensity of different counterspace capabilities, and, hence, how these capabilities might be used for signaling in the middle of a crisis. To be sure, identifying a continuum between reversible to irreversible need not imply that these capabilities will be used in such an order or in a consistent way following the metaphor of an escalation ladder. The illustrations do, however, suggest a consistent ranking of intensity.

The depictions of the counterspace continuum from the National Air and Space Intelligence Center (NASIC), the DoD Space Defense Strategy, and DIA’s *Challenges to Security in Space* each contain the same counterspace activities on different rungs but with slight differences in design. In particular, NASIC’s continuum includes SSA—which is a supporting activity to other counterspace actions—as an activity that proceeds up through the other less-reversible options. DIA’s figure also includes a bi-directional arrow between reversible and nonreversible rather than a single direction

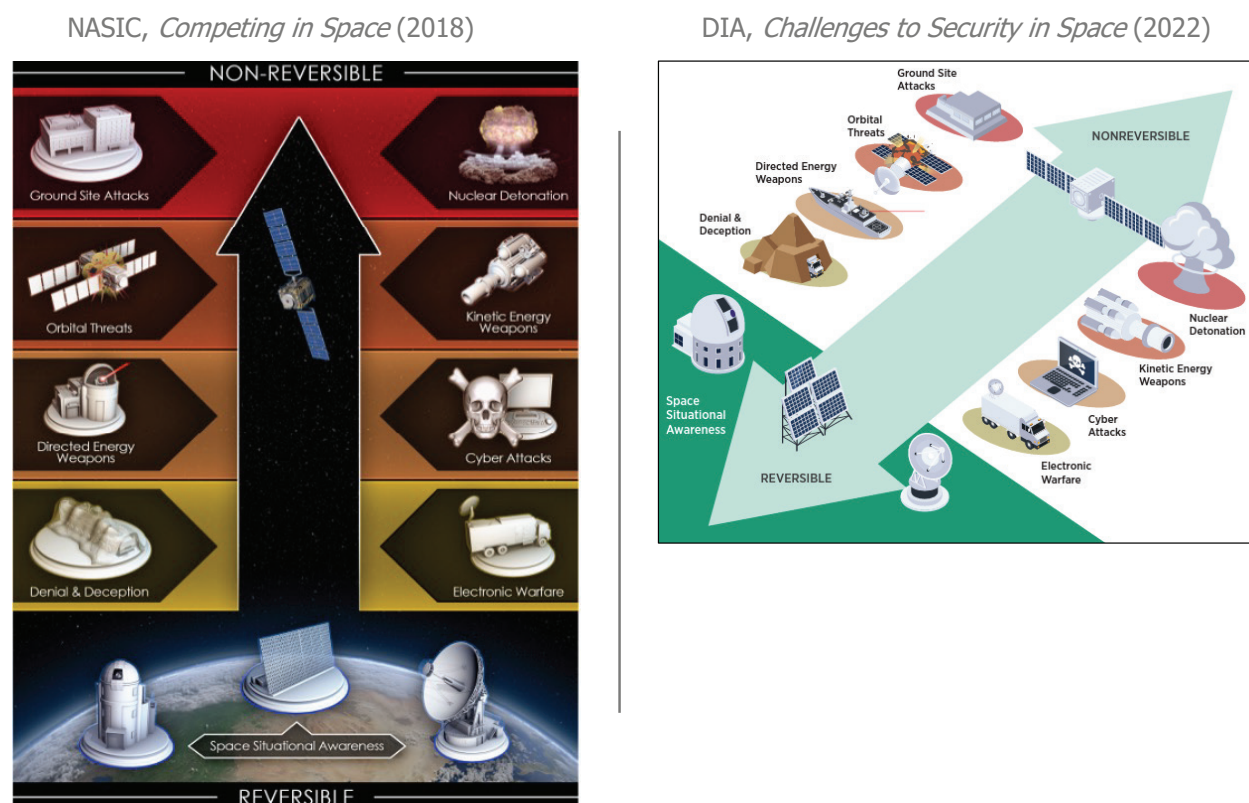
¹³⁷ MacDonald, 2013.

¹³⁸ Jason Healey and Robert Jervis, “The Escalation Inversion and Other Oddities of Situational Cyber Stability,” *Texas National Security Review*, Vol. 3, No. 4, 2020.

¹³⁹ The continuum in the 2020 DoD Space Defense Strategy first appeared in DIA, *Challenges to Security in Space*, January 2019.

toward nonreversible activities. But these do not appear to reflect any substantive difference of opinion on the use of these activities.

Figure 3. Proposed U.S. Counterspace Continuums



SOURCES: Reproduced from NASIC, *Competing in Space*, December 2018; DIA, 2022, p. 3.

NOTE: The DoD Space Defense Strategy (DoD, 2020) contains a version of this continuum with identical categories and ranking as the DIA figure but with a different graphic design.

The United Kingdom's (UK's) 2022 Defence Space Strategy includes a similar continuum but with some variations that might reflect differences in thinking about space escalation (Figure 4).¹⁴⁰ The UK continuum specifically distinguishes jamming of satellite command and control from other forms of electronic warfare, and it positions these options on higher rungs than other electronic warfare options.¹⁴¹ Similarly, the UK depiction differentiates laser dazzling, a specific directed energy weapon (DEW) that can temporarily disrupt a space asset without causing a permanent effect, from other DEWs, which might be more damaging and are placed on higher rungs.¹⁴² Finally, while the U.S. continuums place ground site attacks and nuclear detonation in space at the same level, the UK

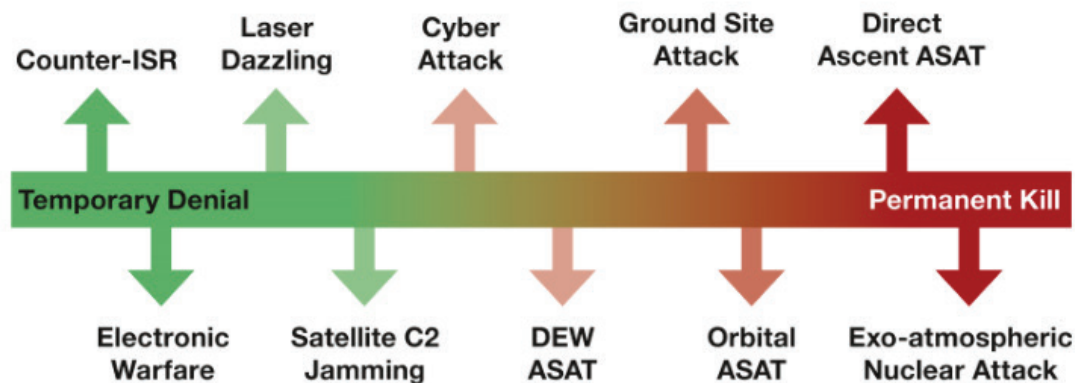
¹⁴⁰ UK Ministry of Defence, "Defence Space Strategy: Operationalising the Space Domain," February 1, 2022.

¹⁴¹ UK Ministry of Defence, 2022.

¹⁴² UK Ministry of Defence, 2022.

continuum sets a notional ground site attack three rungs to the left of “exo-atmospheric nuclear attack,” potentially to reflect a range in intensity of attacks against ground stations.¹⁴³

Figure 4. UK Ministry of Defence Proposed Counterspace Continuum



SOURCE: Reproduced from UK Ministry of Defence, 2022.

Placing counterspace capabilities along the spectrum of reversibility likely shapes U.S., allied, and adversary thinking about how the use of these capabilities is associated with levels of escalation. Because it conveys U.S. perceptions of the relative intensity of different space activities, the continuum helps to reinforce the overall proposition that developing and employing reversible options can be useful to manage escalation. To be sure, multiple factors will determine how a state interprets the level of escalation associated with a particular action, including the magnitude of effect of a capability, the number of systems used, or the target selected. Yet relative ranks of capabilities—such as the placement of cyber effects or DEWs at the same step—might frame how the use of these capabilities are interpreted in a crisis or conflict. Items placed lower on the counterspace spectrum might be more likely to be read as less provocative steps than items placed on higher rungs. The presence of more-destructive actions (such as an exo-atmospheric nuclear blast) at the top of the spectrum above activities that might be just as difficult to reverse but less destructive (such as some Orbital or Direct Ascent ASATs) reinforces the applicability of the spectrum as a measure of intensity. Following the logic that items lower on the reversibility spectrum are also likely to be more useful and less risky as initial signals, they might be selected earlier in a crisis than the less reversible options.

At the same time, two problems likely limit the utility of reversible options for signaling.¹⁴⁴ First, a counterspace action that is intended to be reversible might actually cause irreversible effects because of their lack of precision. Several of the counterspace capabilities that exist on the middle of the continuum between reversible and irreversible have uncertain potential for the amount of damage they might deliver to an adversary's space system. A cyber exploit might do more damage or be longer

¹⁴³ UK Ministry of Defence, 2022.

¹⁴⁴ MacDonald, 2013.

lasting than intended. DEWs such as lasers or high-powered microwaves targeting satellites could lack the accuracy to limit damage to a reversible effect and unintentionally cause permanent damage to a satellite, especially if an attacker lacks detailed information about the design of an adversary's satellite. With limited SSA, attackers might not be able to verify the degree to which they inflicted damage on their adversary's satellite, or the adversary might not trust that the damage was intended to be reversible even if it is a temporary effect.¹⁴⁵

A second related problem is that the recipient of a signal might interpret reversible actions differently from how the originator of the signal intended. Adversaries might perceive an operational motivation to a reversible action even if the attacker intends only to send a signal. They might also simply read the signal differently than intended. When interpreting a signal, context matters. Many of the same challenges for signaling and managing escalation in general apply to the application of reversible capabilities. Target location or target type might be intended to limit or increase escalation, but the attacker might misperceive the role of the target in the eyes of their adversary. For example, nuclear command and control systems have space components, and a reversible attack might unintentionally affect nuclear command and control, leading to a significant potential for unintended escalation.¹⁴⁶ More widely, the inevitable lack of knowledge or certainty about how an adversary will perceive a signal creates a significant challenge of using reversible capabilities as a signal for managing escalation.¹⁴⁷

Conclusions and Implications

Given the growing importance of space to our way of life, policymakers' concerns about the risks of intensified competition and instability in the domain are justified.¹⁴⁸ The ongoing effort to deepen understanding of the risks and implications of conflict in space marks an important step toward developing an effective strategy to reduce the dangers and safeguard U.S. interests. The six propositions described in this report inform how U.S. policymakers characterize the space domain and assess the tools available to promote awareness of the dangers, reduce the risks of escalation, and prepare to prevail in a crisis or conflict if necessary. By analyzing and critiquing these propositions, we have sought to identify ways that USSF and other stakeholders can be best prepared for the future strategic environment in space. In the box below, we summarize our findings of the propositions and any proposed changes based on our review of the literature.

Our investigation of commonly held propositions highlights several implications for USSF. First, the assessment that space advantages the first to go on offense has significant consequences for U.S. strategy and the development of associated capabilities to manage escalation. Although the general logic that an offensive advantage might lead to destabilizing incentives to attack first is plausible, it is difficult to be certain about the offensive or defensive advantages in a domain prior to the experience of

¹⁴⁵ Todd Harrison, Zack Cooper, Kaitlyn Johnson, and Thomas G. Roberts, *Escalation & Deterrence in the Second Space Age*, Center for Strategic and International Studies, October 2017.

¹⁴⁶ Matthew R. Crook, "Nuclear Deterrence and the Space and Cyber Domains," Naval Postgraduate School, October 2022.

¹⁴⁷ See Air Force Doctrine Publication 3-72, 2020, p. 21.

¹⁴⁸ White House, 2021, p 3.

Revised Propositions

1. **Current space architectures create an incentive for countries to attack first in space.**
The literature does not challenge this proposition, but the lack of operational observation might cause misjudgments about the extent of offensive advantage in the space domain.
2. **Leveraging foreign partners likely strengthens stability. Leveraging commercial partners might enhance DoD capabilities but might make escalation more likely by creating attractive targets for adversaries.**
Allies and partners are unlikely to entangle the United States in conflict and might improve deterrence of unwanted space activities. Commercial systems provide capability, but additional options for responding to attacks on commercial systems might be needed because they are viewed by adversaries as viable targets.
3. **Active communications channels with adversaries can reduce the likelihood of a crisis and alleviate pressure to escalate if one occurs, but China's rejection of crisis communications channels undermines their practical applicability.**
Chinese leaders see U.S. efforts to open communication as insincere and a means for the United States to manipulate crises to its advantage.
4. **The development of shared norms for responsible behavior in space could promote stability, but current U.S. proposals are infeasible given Russian and Chinese opposition.**
U.S. efforts to use norms to constrain behavior will achieve limited success so long as adversaries explicitly reject U.S. proposals and do not adhere to behavioral restrictions.
5. **A selective revelation during a crisis or conflict can produce strategic advantages but requires a rare combination of factors to be effective.**
To influence adversary calculations and shape behavior, the disclosure must alter adversary perceptions of the overall military balance, reveal a vulnerability that requires substantial time and resources to redress, and undermine confidence in their ability to achieve their military objective—without sacrificing vital U.S. advantages.
6. **Reversible options are likely less provocative than irreversible alternatives when adversaries accurately perceive U.S. intent to exercise restraint.**
The exact consequences of some reversible capabilities are difficult to predict, control, and verify after an attack. An operation might be more provocative than intended if it causes accidental damage or if the adversary or targeted adversary perceives that the damage is less than the attacker intended.

conflict in space. Adversary perceptions are also likely to determine their reactions to the changing strategic environment more than any objective analysis of the offense-dominant character of the space domain. *Nevertheless, further exploration of U.S. and adversary incentives to undertake attacks at different stages of crisis and conflict, and in response to more- or less-resilient architectures, might elucidate the risks of unwanted escalation in the space domain.*

Second, expanding collaboration with allies, partner countries, and commercial organizations is a central plank in the DoD space strategy, but doing so raises the risk of adversary escalation against commercial organizations. China and Russia have both clearly stated their intention to target commercial assets providing space support to DoD capabilities. Allied and partner countries could also be subject to attack, but the likelihood of that might be lower given adversaries' desires to avoid expanding the conflict horizontally and to dissuade other states from supporting the United States. *Enhancing the resilience of commercial, allied, and partner country constellations can help deter attacks but might be insufficient.* Commercial satellites are likely to be targeted alongside U.S. government assets. *Articulating potential U.S. responses to attacks on commercial satellites can bolster deterrence.*

Third, communications channels can be a useful tool to ensure that signals are properly understood and to facilitate de-escalation. Yet *effective communications channels might be more difficult to establish in space because of China's reticence to use existing vehicles for information-sharing or engage in meaningful dialogue.* Indeed, China has rejected U.S. attempts to improve bilateral and

international communications channels based on a belief that improved communications would benefit the United States and embolden the United States to pursue more-provocative policies. Despite these obstacles, *it might be worth keeping open the offer to develop communications channels for if, and when, China's perspectives change.*

Fourth, the United States is unlikely to soon achieve the norm diffusion necessary to restrict what U.S. policymakers describe as irresponsible Chinese and Russian activities. Chinese and Russian resistance reflects deeply rooted assumptions about U.S. intent and dependence on space that will be difficult to change without compromising capabilities that the United States has indicated it wishes to preserve. Persuading the broader international community, including members of the commercial sector, of the need to adopt and enforce new expectations for behavior is also complicated by the number of space actors with divergent interests and priorities. Nonetheless, *persistent attempts to open dialogue are still valuable to preserve the possibility of future improvements. U.S. norms advocacy might also foster greater cohesion among U.S. allies and partners and help counter Russian and Chinese alternatives that are contrary to U.S. interests.* However, U.S. restrictions on information-sharing policies present barriers to a meaningful discussion of current dangers, options for behavioral and capability limitations, and technical mechanisms for verification, monitoring, and enforcement. *To be able to persuade other actors of the dangers inherent to the current environment, the value of U.S. proposals, and the risks associated with Russian and Chinese alternatives, a greater ability to release information on current capabilities and emerging risks is needed.*

Fifth, the selective revelation of information about concealed U.S. space capabilities might reduce uncertainty about U.S. advantages and help deter adversary aggression in space. However, *decisionmakers should weigh the prospective signaling benefit against the opportunity costs associated with enabling an adversary to develop countermeasures that might reduce the disclosed capability's military utility.* Moreover, the same factors that hinder attempts to assess the military balance in space might also complicate adversary assessments of the revealed information, reducing the deterrent effect or even provoking undesired escalation. *Although a degree of ambiguity might advantage the United States, demonstrations or revelations of U.S. space capabilities should be accompanied with additional strategic messaging to improve the likelihood that an adversary accurately interprets the information conveyed.* These messages should consider adversaries' baseline assumptions about U.S. capabilities, which might include inaccurate assessments of unrelated systems or operating concepts that could skew how the disclosed information is understood.

Sixth, DoD entities have described a range of reversible capabilities that implicitly ties the extent to which they are reversible to their intensity of escalation. Although a counterspace continuum is not the same as an escalation ladder, this framing likely shapes DoD, allied, partner, and adversary thinking. Because reversible capabilities are fleeting and often have lower costs, they are often viewed as useful means of signaling and achieving operational effect. However, *reversible capabilities might risk escalation if they cause accidental damage. Adversaries might also not interpret signals as intended, which points to the importance of understanding adversary perceptions of U.S. actions.*

Developing adversary and U.S. space capabilities make escalation in space particularly concerning. The six propositions studied in this report cover a variety of beliefs in the U.S. government and supporting organizations and suggest new areas for study and policy change. There might be other areas worthy of further investigation related to additional propositions or concepts, especially given

the rapidly evolving nature of space capabilities. We hope that this report can serve as a starting point and inspiration for future work exploring strategic concepts related to space.

Abbreviations

ASAT	anti-satellite
CBM	confidence building measure
DEW	directed energy weapon
DIA	Defense Intelligence Agency
DoD	U.S. Department of Defense
LEO	low Earth orbit
PLA	People's Liberation Army
PRC	People's Republic of China
SSA	space situational awareness
STM	space traffic management
UK	United Kingdom
UN	United Nations
USAF	U.S. Air Force
USSF	U.S. Space Force
USSPACECOM	U.S. Space Command

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Improvements in Russian and Chinese counterspace capabilities could endanger the space-based capabilities that the United States relies on for a broad array of military and economic functions. The proliferation of U.S. and adversary capabilities could lead to unstable competition in space, raising the risk of unintended military escalation. In this report, the authors examine the conventional wisdom on escalation in the space domain to offer recommendations for how the U.S. Space Force and other stakeholders can better prepare to deter and manage escalation. They investigate the implications of six propositions related to stability: (1) the incentives to employ offensive capabilities early in a conflict, (2) the benefits of leveraging foreign and commercial systems, (3) the utility of communications channels for crisis prevention and de-escalation, (4) the feasibility of promoting shared norms of responsible behavior, (5) the strategic benefits of selective revelation, and (6) the use of reversible capabilities to manage escalation.

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