



Lawrence Livermore National Laboratory 

Rethinking Strategic Competition in Space and Space in Strategic Competition

Workshop Summary

October 7-8, 2025



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Rethinking Strategic Competition in Space and Space in Strategic Competition

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On October 7-8, the Center for Global Security Research (CGSR) at Lawrence Livermore National Laboratory (LLNL) hosted a workshop titled “Rethinking Strategic Competition in Space and Space in Strategic Competition.” This session brought together participants drawn across the policy, military, and technical communities. The workshop aimed to examine the evolving strategic, technological, and policy challenges facing the United States in the space domain, focusing on competition with China, the maturation of the U.S. Space Force, allied cooperation, and the role of commercial and civil space in shaping future security and stability. Participants identified priorities, risks, and opportunities for U.S. leadership and resilience in an increasingly contested space environment.

The discussion was guided by the following key questions:

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

Key takeaways:

1. The dilemma is stark. In the competition with China for strategic advantage in space, the United States has everything that it needs to compete successfully—not least, a pathbreaking NASA, a well-led and well-motivated Space Force and Space Command, decades of operational experience, and unparalleled commercial assets. But the US position has eroded badly. It is now poised to lose its long dominant position. This is due to the failure to sustain leadership focus and to tackle the hard work needed to turn the vision

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of competitive advantage into direction and momentum. China competes. The US does not.

2. China has long positioned itself to be a “fast follower.” It has invested in the needed S&T base and industrial capacity to compete where it chooses, while often choosing not to compete with the US for military advantage. But this pattern is giving way, as China has begun to move into a few superior positions. This is most troubling in counterspace and space control. It is also evident in the realm of space strategy, where China’s ambitions are clear and plans and programs are well aligned. China has also developed a robust space-focused tech start-up sector. This power transition in space aligns with the larger thrust of China’s grand strategy, as China navigates its way through that “moment” when China’s rise and America’s decline intersect—which it seeks to do subtly but decisively. In China, this is seen as a moment of great danger, when too direct a challenge to a declining America may prompt an unwanted military response.
3. In the race (back) to the moon, it appears increasingly likely that China will make it by 2030 and the US will not. If the US is unwilling or unable to adjust course quickly to improve its chances, it needs a new strategy built on the premise that it will get back to the moon a year or two after China. It also needs a clear vision of a lunar legal and normative order that grapples reasonably with competing security, commercial, and scientific interests. NASA needs a better plan for building up needed lunar base infrastructures to enable commercial success.
4. In the military domain, the US Space Force is still charting its course after five years. The process of building an identity has been multi-stage—perhaps best thought of as “forming, storming, and norming.” In the first, forming stage (which occurred with unexpected speed), the focus was largely organizational; fundamental questions about mission and vision were left unsettled. In the current second stage, key stakeholders in the larger community of interest are energetically debating essential questions about roles, authorities, resources, and unity of effort. The “norming” stage lies in the future, when the Force has a sustained approach to organizing, training, and equipping well aligned with operational requirements.
5. The US military must also chart a course to an effective warfighting role. Having embraced space as a warfighting domain, leaders face many new questions. How does the Force organize, train, and equip for this mission? How does it write new doctrine without operational experience? What operational lines of effort should US Space Command pursue? How can Service acquisition strategies be re-focused on buying what’s needed rather than buying what’s available?
6. The embrace of space as a warfighting domain brings with it a need for a new model for space military operations. The existing model derives from attrition warfare, with strategic advantage gained by those with mass and depth. A better model can be derived from maneuver warfare, with strategic advantage gained through agility, deception, and speed. The latter model puts the US in a stronger position to seize the initiative in war and sustain unity of effort and command.



7. Maneuver warfare in space requires military capabilities different from those being acquired for the Space Force today. Above all, it requires maneuverable vehicles and the capacity to refuel them. The US should refrain from building separate space architectures for offense and defense. Space platforms can deliver on both missions, improving agility and efficiency. The US should also seize the opportunity for multi-role defenders in space, capability defending the homeland from ballistic threats as well as space-based assets.
8. Golden Dome will result in an enduring presence in space of capabilities for defense—both sensors and interceptors. The political basis for moving forward with homeland protection against limited strikes (aka coercive strikes) has firmed up over the last decade as missile threats from Russia, China, and North Korea have matured. There is still no political basis for moving forward with an effort to try to negate the strategic deterrents of Russia and China. As Golden Dome cannot provide 100 percent protection of the US homeland, the US must maintain some nuclear counterforce capabilities for damage limitation purposes and coercive bargaining leverage.
9. Golden Dome's chief strategic virtue will be in reducing the new risks posed by nuclear-armed adversaries who may attempt to escalate their way out of a failing act of conventional aggression with limited nuclear strikes. Such adversaries would attempt such an extreme measure only if they believe that the US will not retaliate because (1) its stake is not sufficient to run these new risks and (2) it will be fearful of further counter-escalation. Golden Dome addresses both factors. Limited homeland defenses would drive up the aggressor's "price to entry." That is, to overwhelm the defense would require a large salvo launch that would drive up US perception of stake. At the same time, the defense would greatly reduce US vulnerability to counter-escalation. Thus, the nuclear challenger's theory of victory is no longer credible. This strategic virtue may come with a price in the form of additional steps by Moscow and Beijing to assure retaliation. It is a price worth paying in the current security environment.
10. There is now an open question on the table about how best to benefit from military partnerships with private sector actors in space (the term 'private sector' is a bit of a misnomer for an industry that remains so heavily dependent on government funding). Looking back a decade, the US won the race to low earth orbit (LEO) by empowering the private sector. Looking ahead a decade, much more is possible. But commercial solutions will not simply fall into military hands. Hard conceptual, political, and legal work lies ahead in putting together the key elements of a framework that exploits the full potential of commercial entities to realize the vision of an integrated offense/defense maneuver warfare posture in space. History is rich in examples of success in tailoring integrated public/private approaches to emerging security challenges (e.g., the merchant marine in the 1770s and the Civilian Reserve Air Fleet in the 1960s). Different space missions lend themselves to different approaches; in each, decisions must be made about which functions are essentially governmental and which ones can be handled by the commercial sector. In launch services, for example, rapid reconstitution should be considered an inherently governmental function, whereas scheduled launch should be considered well served by the commercial side. Legal indemnification will be a key issue. So too will be the potentially conflicting interests of powerful private sector actors.



11. Allies are essential partners in an effective US space strategy. They have capabilities to contribute and vulnerabilities to account for. Many are very eager to partner, not least because they see such partnership as essential for their security. Japan has the third largest space budget in the world (larger than Russia's) with a large and growing military component. But allies see many unnecessary barriers to partnership. Some are administrative (e.g., constraints on sharing secure information). Some are economic (e.g., new tariffs in the space sector). Some are political (e.g., reluctance to rely on allies). Allies hope that Washington will interpret their space engagement strategies as a positive sign of their readiness to assume new roles and burdens.
12. At this critical juncture, US space strategy is a captive of larger forces. With neither strategy nor policy nor people in place, the new US administration is largely invisible in efforts to address these challenges. This judgment was only reinforced by the absence of USG participation in the workshop. The administration's notable antipathy to alliances and allies and its strong affinity for private sector interests are also playing a role, albeit uncertain, in shaping future trajectories. There is some conjecture about what the "musk-ification" of US space strategy might mean. The president's enthusiasm for Golden Dome will be critical in setting administration priorities. But beyond this, it is unclear how the "laser-like focus" on homeland security will shape the administration's thinking about space strategy.
13. The opportunities to cooperate in space with Russia and China are few and far between. The prosaic work of "traffic management" in LEO may lend itself to some new cooperation. So too the continuing effort to mitigate debris effects. More ambitious would be cooperation for planetary defense—that is, joint preparations to protect the earth from an asteroid collision (though there are many practical reasons to think that national leaders would prefer a national solution). A joint project to go to Mars could be motivating but does not appear likely at this time. But new approaches to manage the space competition are hostage to opposition in Moscow and Beijing to new forms of transparency and restraint.
14. The talent pool on space strategy, whether civil or military or both, is very modest in the US. It is even more modest in allied countries. It is also dominated by technologists. Policy and strategy development gets short shrift. This is part of why the US is falling behind China. Stakeholder institutions need to build out some of the needed capabilities and capacities.



Panel 1: The New Policy Context

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

The group's conversation about "The New Policy Context" continuously emphasized the current lack of leadership in space and the need for clear policy guidelines in space. The panelist and several participants illuminated a number of implications for the space domain that exist given current U.S. national security policies and priorities, the role of strategic competition with China, expectations for the administration's space policy priorities, and insights from the program and budget for the Space Force.

It was noted that the Trump administration is shifting national security priorities to address threats involving domestic missions and industrial base challenges. The prioritization of border security, homeland defense and the defense industrial base will have profound implications for the Department of Defense (DOD), including its personnel, equipment, intelligence, surveillance and reconnaissance (ISR). The reshaping of DOD's mission will also have implications for overall force design and force structure. Further, it was emphasized that the administration has a focus on acquisition and regulatory reforms and leveraging commercial solutions for national security problems. Amid these changes, the administration has also undertaken personnel cuts, scrutinized major programs, and emphasized autonomy and AI—shifts which have caused uncertainty about the administration's ability to implement its policy objectives in the space domain.

China's rapid advancements in space technology, driven by both state and private investments, pose significant national security and economic challenges for the U.S. and allies. China's space capabilities have become a source of national pride and the country's commercial sector is thriving. China's mounting production capacity for satellites, the construction of satellite giga factories, and advancements in a Starlink-like technology were defined as major concerns by the group. One key asset China has leveraged to catalyze these developments is state-sponsored funding. State-sponsored funding and civil-military fusion programs have facilitated rapid manufacturing and optimizing processes in China's space industry. China appears to be chasing Starlink's capabilities, but in other space technologies it may already equal or surpass U.S. capabilities. China is building out intelligence, surveillance, reconnaissance (ISR) capabilities to target U.S. ground forces, which is a concerning development to the United States and its allies.

Participants also identified gray-zone conflict as a key area for China to exploit, as the United States has been reluctant to respond to low-level conflict in space. Denying China these advantages will mean integrating weapons previously viewed as strategic into the tactical fight. Further, the prospects for arms control with China does not look to be likely. Some areas with more optimism



included potential discussions between private industry stakeholders out of necessity—for example, to discuss space traffic management. Participants also agreed that the Outer Space Treaty’s (OST) persistence, despite the tense environment, is a positive. However, some argued that the treaty is likely to be tested as space capabilities develop.

There is a lack of clear direction and leadership in shaping U.S. space priorities, with key positions unfilled and debates over the right balance between military, commercial, and civil space efforts. As of yet, there is no National Space Council and major programs face uncertain futures amid budget cuts. The current administration has announced plans for a “Golden Dome” missile defense system, with a focus on sensing, kill chains, and space-based interceptors (SBIs); however, there has been no statement of policy, and the Space Force has only recently begun engaging with Congress on the program. Further, the ambiguity around space priorities leaves allies uncertain about how they can contribute. Allies which have previously had significant partnerships with the United States on space capabilities can continue to play a role, but only if they know where to invest.

Despite this slow start, there is reason to suspect that this administration will make space a priority, as key stakeholders who were involved in shaping the U.S. space force hold positions of influence. Clarity on the threats from both China and Russia presents a “North Star,” guiding U.S. development. The panelist suggest that policymakers take advantage of the current flexibility and continuity on space, driving forward survivable, resilient space capabilities for precision, navigation, and timing (PNT), communications, and ISR. Participants also identified the administration’s core value of peace through strength, which could drive the administration to project power in the space domain and reinforce the U.S. Space Force to cement its legacy.

Budgets in the United States have reflected increased investments in space and missile defense, but key areas remain underfunded and current integration efforts may not be sufficient to meet emerging threats. The administration has invested heavily into long-range kill chains, missile warning, and missile launch. On the other hand, space situational awareness (SSA), electromagnetic spectrum operations, resiliency, minimally resilient GPS, and surveillance, reconnaissance, and tracking (SRT) were not as well funded. These investments are important to watch as acquisition, fielding, and defense of space abilities will be key to meeting U.S. space policy objectives. Existing capabilities could also play a greater role, particularly in missile defense. The space domain is one area in which there has been significant bipartisan consensus, particularly within the Senate Armed Services Committee; however, there is tension among U.S. Congress members over how investments translate into tangible results, which has been a weakness of the space force in the past. As the administration settles in and clarifies its space priorities, it should focus on demonstrating the Space Force’s contributions as part of their military service responsibilities, prioritizing cross-domain assets.



Panel 2: China, Strategic Competition, and Space

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

Panelists and participants framed the conversation around China and strategic competition in space around how China perceives the current state of space competition. Publicly available information on China's approach to space competition is limited, leading to a large emphasis being placed upon the contents of China's 2021 white paper. Therefore, based on the sparse publicly available data, it might appear that most of Beijing's ambitions in space are civilian and that China lacks a comprehensive military space strategy. However, many participants cautioned against taking this at face value, suggesting that China likely has robust visions for space both in terms of commercial and military aspirations.

There was wide agreement among the group that China views its space program as integral to its broader vision of national rejuvenation and global leadership. President Xi Jinping has repeatedly expressed support for making China a leading space power, and these statements are often deliberately flexible. Within the Chinese Communist Party (CCP), space is also seen as a military objective. The chairman of the China Aerospace Science and Technology Corporation (CASC) has stated that their mission is to strengthen China's space capabilities, support the modernization of its military, and help make China a world-class military power. According to a participant, achieving space preeminence inherently includes achieving military superiority in space.

China perceives the United States and its allies as actively contesting its ambitions in space and beyond. Chinese leaders believe that the "East is rising, and the West is declining," viewing this as an ongoing, dynamic process that could lead to conflict. The Chinese leadership is convinced that as the power transition between the U.S. and China intensifies, the United States may resort to military coercion out of desperation. Xi Jinping is reportedly convinced that the U.S. is trying to provoke China into a war over Taiwan.

Participants emphasized that China is determined to achieve and maintain a dominant position in space. In developing its strategy, China must contend with what it sees as a declining United States that seeks to draw Beijing into a conflict over Taiwan. The United States is considered China's primary pacing threat, and China aims to be a "fast follower," quickly building up its own capabilities in response to American advancements. There is a strong sense of urgency, particularly in developing military applications such as spaceplanes.

Interestingly, China also believes that the United States is even further ahead in space capabilities than is commonly assumed. For example, Chinese analysts have suggested that Starlink could



intercept hundreds of intercontinental ballistic missile (ICBM) strikes on the U.S. homeland, a claim that appeared in a 2020 internal study. Leading analysts in the People's Liberation Army (PLA) believe the U.S. will soon reach a major inflection point in its space capabilities. The publication of numerous U.S. space doctrines and strategies has led some in China to conclude that the U.S. has achieved a "systemic advancement" in the space domain. As a result, an October 2021 Chinese document claimed, "The U.S. is eager to give space warfare a try." Observing Starlink's performance in Ukraine has, in the eyes of some CCP members, validated these beliefs.

This dynamic raises an important point: China's inflated perception of U.S. capabilities, coupled with a tendency to downplay its own, may eventually prompt a reassessment. When Chinese leaders realize that their estimates of U.S. capabilities are exaggerated, they may seek to deploy low-cost, high-efficiency measures to counter systems like Starlink and other space-based assets. This could spark debates within China about the best strategies for revealing or concealing their own capabilities.

China sees itself as a fast follower, racing to develop whatever capabilities it believes the U.S. possesses, even if those beliefs are based on overestimations. This approach has clear drawbacks. China's strategy is often reactionary, responding to American innovations rather than setting its own independent course. Beijing's ability to engage in long-term planning is limited, as it tends to develop its agenda in response to Washington's moves. Despite these challenges, Chinese leaders remain convinced that time is on their side. They believe that if China stays the course, it will eventually surpass the United States and be able to confront Washington from a position of strength. Until then, China seeks to preserve decision-making flexibility in potential conflict scenarios and avoids committing to a single vision of future warfare.

In the near term, China expects to invest considerable resources to keep pace with the U.S. and to be able to compete in a conflict, particularly one that it believes the U.S. might provoke over Taiwan. In the long run, Chinese leaders are confident they will surpass the U.S., but in the short term, they recognize the need to take incremental steps to remain competitive.

The CCP genuinely believes in the narrative that the East is rising while the West is declining. They are waiting for what they see as an inevitable power transition, and they trust that the party will recognize the moment when this shift occurs, allowing them to adjust their strategy accordingly. However, this is a difficult situation to assess. There is significant uncertainty surrounding how quickly or effectively China can replicate U.S. achievements in space or how many resources the U.S. will ultimately commit to maintaining its lead. A core assumption driving Chinese strategy is that they are already in the midst of a favorable power transition, which complicates efforts to evaluate their actual position.



What is clear is that China's approach often underestimates its own capabilities while overestimating those of the United States. As a result, China may continue to chase a misperception of U.S. capabilities long after it has, in reality, caught up or even surpassed the United States. For instance, some "highly authoritative sources" in China claim that the U.S. can intercept missiles in space using Starlink, a belief that is likely exaggerated. This misperception presents a potential opportunity for the U.S. to exploit, but it could also lead to escalation if China suddenly realizes it holds a stronger position than previously thought.

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

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

Panel 3 examined the evolving concept of space offense, and how the United States should design, develop, and deploy capabilities that ensure freedom of action in space while deterring or, if necessary, defeating adversary aggression. Speakers framed the discussion within the broader shift in U.S. policy toward recognizing space as a warfighting domain—a change that has moved from conceptual acknowledgement to operational urgency. The panel and following discussion made clear that offensive capabilities are no longer theoretical; they represent a critical frontier for achieving strategic advantage and operational endurance in an era of major power competition.

The conversation on the Space Force emphasized the service's ongoing effort to evolve from legacy satellite operations toward true space superiority missions. Panelists referenced the concept of "competitive endurance," a strategic framework focused on avoiding operational surprise, denying adversary first-mover advantage, and conducting responsible counterspace campaigning. These ideas form a foundation for the Space Force's doctrinal thinking and resource allocation. The Space Force appears to view its contributions as essential to the "American way of war," where precision, timing, and global connectivity depend fundamentally on orbital infrastructure.

Participants extensively discussed the rapid reorganization underway to enable integration across combatant commands. When the Space Force was established, much of its operational portfolio existed under highly classified special access programs (SAPs), which limited coordination and cooperation with other services and commands. Discussion also touched on the Space Force's progress in downgrading classifications to Secret or Top-Secret levels for greater and more timely information sharing, allowing broader collaboration, and joint operational planning. This shift has already improved how space assets contribute to global missions. However, the panel noted that as more capabilities come online, the challenge will shift from classification barriers to ensuring



scalable and efficient battle management. Without clear command-and-control frameworks, space power risks being underutilized or misapplied in a crisis.

Discussion of future capabilities centered on three pillars: people, kit, and lethality. Currently, the Space Force employs roughly 15,000 Guardians—about 5,000 officers, 5,000 enlisted personnel, and 5,000 civilians. That number is projected to nearly double by 2040, accompanied by parallel civilian expansion and greater integration of artificial intelligence and automation into operations. On the material side, the Space Force possesses fewer than ten operational electronic warfare jammers, a number of participants described as “shockingly low” given the scope of global threats. A substantial share of the FY2026 budget is dedicated to addressing this imbalance, investing in both offensive electronic warfare capabilities and testing infrastructure to ensure resilience and readiness. These investments aim to transition the Space Force away from an era of “deception trough scarcity” toward one of capable credibility.

From a warfighting perspective, a shift from attrition warfare to maneuver warfare in space is needed. Direct head-to-head competition in orbital regimes would be unsustainable and escalatory. Instead, the United States should seek positional advantage, rapidly relocating, concealing, and reconstituting assets to confound adversary targeting and sustain operations through protracted conflict. Maneuver warfare in this context relies on unity of command, unity of effort, and a shared understanding of objectives across allied and joint forces. Space, cyber, and electronic warfare were described as joint fires—tools that must be synchronized rather than stove-piped by separate authorities. Future offensive space forces will require the ability to refuel on orbit, reload software in real time, and rapidly adapt to adversary countermeasures.

Panelists stressed that training and experimentation are as vital as hardware. While development can occur through simulation, not all tactics can be validated virtually. “You cannot simulate an adversary’s creativity,” one participant argued. As such, a portion of training must involve real-world demonstrations to develop and refine maneuver concepts. Deterrence depends on visible competence, showing adversaries that U.S. forces are prepared, adaptable, and capable of fighting through initial attacks.

The discussion expanded on several operational and political challenges. Participants debated the proper pace of offensive buildup. Many agreed that speed is necessary to stay ahead of peer competitors but warned that resistance to change, whether budgetary, bureaucratic, or cultural, remains a major barrier. Allies, they noted, generally respond positively to U.S. offensive investments, interpreting them as signs of resolve and reassurance. Adversaries, by contrast, react with fear, uncertainty, and doubt, which can cut both ways: strengthening deterrence but also heightening the risks involved.



A recurring theme was unity of effort among U.S. agencies and allies. Participants emphasized that there is a need for strong coordination between the National Reconnaissance Office (NRO) and U.S. Space Command. Additionally, there is less clarity between Space Command and the Space Force on questions of operational authority. Over time, these relationships must “lay flat,” which means to align responsibilities and eliminate redundancy. On the allied front, Germany’s participation in Olympic Defender and its significant investments in dual-use capabilities were cited as models for cooperation. Panelists advocated for an “allied-by-design” approach, with coalition planning integrated from the start rather than appended to U.S. strategy.

Participants revisited the long-standing challenge of space domain awareness (SDA). Despite more than \$40 billion invested since 2008, gaps persist particularly in low and medium Earth orbit. The proliferation of satellites offers opportunities for a distributed sensor network, but this will require new architecture for synthesizing and analyzing data. SDA is not merely a technical problem, some participants argued, but a leadership and mission-focus issue. “We succeed in space missions where someone is clearly in charge; we fail when no one is.”

Finally, the group considered the strategic and political dimensions of space offense. Escalation control remains inherently complex. In an environment where offensive and defensive systems are dual-use and ambiguous, deterrence will depend less on declaring red lines than on managing uncertainty. While the U.S. can expect adversaries to push boundaries, large-scale counterspace attacks would yield only temporary advantage. The greater risk lies in misperception, assuming the other side’s tolerance for risk or misunderstanding the purpose of space action.

Domestic politics also shape the pace of progress. Participants noted that sustained public and congressional support will be critical to continue progress in space. Historically, skepticism toward unproven technologies and over-classification has limited investment. As one participant put it, “We once had a strategy of deception out of necessity—because we’ve lacked the kit. Now that we’re finally investing, we must also invest in the trust to use it.”

The panel concluded that U.S. space offense must advance deliberately and decisively. Building a credible warfighting posture in space requires not only hardware, but doctrine, training, partnerships and strategic patience. The United States must balance maintaining superiority while preventing escalation, ensuring that offensive capabilities reinforce rather than undermine deterrence.



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

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

This panel covered the topic of space defense, an area which has received little interest and attention in the past. To start the discussion, the panelists focused their remarks on the question of capabilities, specifically, space-based interceptors. There are at least two reasons why space-based interceptors are important. First, having space-based interceptors helps supplement U.S. counterforce capabilities. Currently, U.S. damage limitation capabilities are based on U.S. nuclear and conventional capabilities. However, on the nuclear side, the Program of Record is already taxed and deemed insufficient to confront both Russia and China. Moreover, even if the U.S. chooses to expand its nuclear force to bolster its nuclear posture, there is a limit to the strategic value that can be derived from doing so or the amount of damage that can be inflicted upon an adversary.

In contrast, a missile defense architecture may not only expand the damage the U.S. can do to adversaries, but also limit the damage that adversaries can bring upon the United States. In this sense, investing in Golden Dome allows the United States to develop alternatives that are not limited to nuclear or conventional options, and it can bring the United States a form of global protection against limited strikes. This latter point is notable, because traditional missile defenses can be challenged if adversaries were to impose coercive threats using capabilities such as fractional orbital bombardment systems, multiple orbit bombardment systems, or hypersonic weapons. Second, space-based interceptors are valuable because space is an important domain. It would be hard for the U.S. and its allies to send assets to space if the domain cannot be protected. From the alliance standpoint, a stronger homeland defense in the United States can also reinforce U.S. ability to project power and assure allies. Thus, there is strategic value to having a strong architecture like Golden Dome.

At present, there is no clear idea, cost, or plan on what Golden Dome architecture entails. However, actions and thinking on the capability must be undertaken now to ensure that space-based interceptors and Golden Dome stay relevant moving forward, and that strategy can proceed in an ambitious manner. The group agreed though that there is a need to sharpen arguments on the value of this capability. This includes addressing concerns about potential regrets and trade-offs that might come with pursuing space-based interceptors and Golden Dome and addressing cost concerns. One point of discussion, for instance, was about if full spectrum counterspace operations and space control cross a boundary. Some argued that it does, because the United States would not just be saying that it will pursue full spectrum counterspace operations, but it would be doing so. While others argued that crossing the boundary is not a huge concern for the



United States. Rather, it helps the U.S. project power with space-based capabilities, which in turn, strengthens the defense of the U.S. and allies' interests.

Another major point of discussion focused on strategic stability. China and Russia assert that the U.S. is seeking space-based interceptors to attain a first strike capability. However, this assertion does not reflect the United States' position and is invalid. To refute such claims, models and analytic frameworks should be built to provide evidence if space-based interceptors would threaten minimum survivability and thus impact arms race dynamics. A third area, escalation dynamics, emerged as a topic of discussion, and there was a disagreement on how escalation might play out and how adversaries will respond. For some, having a missile defense system will remove the option of cheap shots and hence raise the stakes for adversaries. This outcome could be favorable, because adversaries like North Korea might be more deterred. Conversely, because stakes are raised, the United States may have to escalate in conflicts if they arise. To counter the missile defense system, adversaries might also choose to either launch more weapons or use more coercive strikes. In such situations, it is unclear if the United States would be safer.

In addition to sharpening arguments on the value of space-based interceptors, more thought about space as a warfighting domain is needed. For some time, the analytic community has argued that the lack of political will is the reason why capabilities are yet operationalized. However, there are bigger problems such as the United States' ability to conduct mass fires. Without the fielding of the relevant capabilities, the approach to thinking about missile defense remains more about messaging than warfighting. More imagination is needed, and questions need to be answered to advance thinking on space-based interceptors and space as a warfighting domain. One way forward is to introduce a mix of capabilities to counter threats in and through space. Some examples include responsive launches; more mature, sustained, and controlled hypersonic flights; high altitude, long endurance munitions; and mass fires. A variety of new delivery platforms, such as space bombers, can be explored to consider how they can deliver desired effects. The idea here is to steer away from focusing excessively on the proliferated low Earth orbit (pLEO) constellation and to encourage the interrogation of assumptions, so that new possibilities can be obtained.

Overall, the panel conversation suggested that the United States will benefit from moving as far and fast as possible. While getting to desired ends may require an indirect path and a mix of organic developments, homeland missile defense is important for competition.



Panel 5: Space Competition and Strategic Stability

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

The discussion surrounding “Space Competition and Strategic Stability” explored the increasingly entangled relationship between space security and nuclear stability. Specifically, the panel examined how the character of strategic competition has shifted from the bilateral nuclear deterrence logic of the Cold War to a far more complex multipolar environment, in which the space domain plays an indispensable role in both competition and crisis management. While the Cold War concept of “strategic stability” emphasized preventing surprise attacks and discouraging arms racing, today’s dynamics, driven by rapid technological change, the proliferation of dual-use systems, and the rise of China, require a significant reassessment of what stability means in practice.

Panelists reviewed the traditional U.S. understanding of strategic stability, which rests on three principles: that either side perceives a need to strike first, that arms racing incentives are mitigated, and that crisis decision-making remains predictable enough to avoid miscalculation. During the Cold War, the United States tended to define stability through force-posture balance and survivability, while the Soviet Union viewed it more broadly through a geopolitical lens that encompassed alliance commitments and ideological competition. That conceptual divergence still shapes current approaches: Washington continues to focus on credibility and extended deterrence, while Moscow frames stability in terms of U.S. global influence and military encroachment.

Turning to the contemporary environment, panelists agreed that the most consequential developments now stem from China’s growing integration of space capabilities into its broader nuclear and conventional posture. Within the People’s Liberation Army (PLA), scholars have begun arguing that traditional safeguards against nuclear use are eroding and that the United States bears responsibility for destabilizing the balance through its pursuit of space superiority, missile defense, and advanced conventional prompt-strike capabilities. This perception, they suggested, could make China more sensitive to relative losses in space capability and more willing to act preemptively if it believes its advantage is narrowing. One panelist warned that “if Beijing perceives a window of vulnerability closing, it may conclude it is losing the chance to act, creating a classic danger zone for escalation.”

The discussion then addressed the technological and doctrinal feedback loop between space and nuclear domains. The United States, panelists noted, continues to develop capabilities such as space-based interceptors, the notional Golden Dome missile-warning architecture, and improved counter-C5ISR systems. These developments strengthen U.S. ability to limit damage and preempt



attacks, but they also reinforce adversary fears that Washington might seek a first-strike advantage. In this environment, asymmetries in technology and perception become more important than absolute numbers of weapons. Even if the United States maintains defensive intent, Chinese and Russian strategists may view the combination of advanced sensing, missile defense, and offensive space control as a destabilizing enabler of preemption.

Several participants drew historical analogies to the Strategic Defense Initiative (SDI) of the 1980s, when Soviet planners responded to U.S. missile-defense concepts not only by developing new systems but also by diversifying delivery platforms and pursuing novel counterspace technologies. A similar dynamic is now emerging: intensified space competition will likely prompt not just symmetrical arms buildups but asymmetric innovations—new jammers, dazzlers, and non-kinetic systems designed to degrade U.S. command-and-control and surveillance networks. While this environment may appear volatile, panelists argued that the United States remains relatively well positioned. Its industrial base, space-launch infrastructure, and alliance networks provide a degree of resilience that neither Russia nor China can currently match, although missile-warning and nuclear command-and-control (NC3) modernization lag behind the broader recapitalization of the U.S. nuclear triad.

A major portion of the discussion centered on crisis stability and how leaders might behave under pressure in a confrontation that includes both space and nuclear dimensions. Panelists debated whether new space capabilities would make conflict more controllable or more unpredictable. On one hand, the proliferation of sensors and communications systems could enhance situational awareness, reducing the risk of misinterpretation. On the other, the dual nature of most space assets makes it difficult to distinguish between actions intended for intelligence, signaling, or attack. “Potshots in space are likely to occur,” one participant observed, “but large-scale counterspace warfare is unlikely to provide enduring advantage.” The key question, they concluded, is how to prevent such incidents from spiraling into broader confrontation.

The discussion also focused on the question of defining red lines. Some participants favored articulating clearer thresholds to discourage miscalculation, while others argued that excessive precision could limit U.S. flexibility and enable adversaries to operate just below declared limits. Ambiguity can contribute to deterrence by uncertainty, especially in an environment where the United States must safeguard both its homeland and its allies. Yet all agreed that the United States must first “get its own house in order” by aligning departmental policies and ensuring consistent messaging about risk reduction. Track 2 and commercial dialogues were seen as useful starting points for clarifying expectations, though they are unlikely to substitute for direct strategic engagement with Beijing or Moscow.

When asked about nuclear weapons in space, panelists expressed strong concern. One described the potential deployment of a nuclear device in orbit as “Cuban-Missile-Crisis serious,”



emphasizing that even the perception of such a system would demand an immediate U.S. response. Others noted that Russia would be unlikely to deploy a space-based nuclear weapon long before using it, given the escalatory visibility of such a move. Still, the possibility underscores how intertwined the space and nuclear realms have become. As one participant put it, “Old concepts of deterrence no longer apply cleanly when the same sensors and systems that enable early warning also enable targeting.”

Allied assurance emerged as another recurring theme. Strategic stability, panelists reminded the group, depends not only on deterring adversaries but also on reassuring allies that the United States can protect shared space assets and extend deterrence across domains. Yet allies are often excluded from detailed U.S. discussions about NC3 resilience or missile-warning modernization. Incorporating allied capabilities (especially those of technologically advanced partners like Japan, the United Kingdom, and Germany) could strengthen deterrence while distributing risk and cost.

In closing, participants emphasized that stability is dynamic, not static. During the Cold War, stability was maintained through continuous motion: both sides adapted, balanced, and rebalanced their forces and doctrines. The same will hold true in the emerging tripolar space environment. The United States should not aim for a perfectly symmetrical equilibrium, but rather a manageable asymmetry in which it stays agile, credible, and transparent enough to deter aggression without foreclosing the possibility of restraint. As one participant summarized, “We are winning a game of vulnerability, convincing our adversaries that we can be attacked but that attacking us would never be worth the risk.”

The panel concluded that the United States is reasonably well positioned for the coming era of space competition, but success will depend less on new hardware than on disciplined strategy: integrating space and nuclear policy, clarifying objectives, modernizing NC3, and maintaining allied confidence. Strategic stability in the 21st century will require not merely surviving competition in space but shaping it toward predictability, resilience, and credible deterrence.

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

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



The panel discussion on civil space and privatization explored the dynamic and sometimes tricky partnership between the U.S. government and the commercial space sector. The discussion emphasized that while the United States has established itself as a leader in space, this position is not guaranteed and requires continued action. The rapid advancement of China's space program, particularly its lunar ambitions, has injected new urgency into U.S. space policy. Participants warned that if China continues on its current trajectory, it may well reach the Moon before the United States, a symbolic and strategic blow that could reshape global perceptions of leadership in space.

A central theme of the conversation was the need for the U.S. government to harness the full potential of civil space to prepare for and keep pace in the ongoing competition in space. The commercial sector has already transformed the landscape, with companies like SpaceX and others driving innovation, lowering costs, and expanding capabilities. However, some participants argued that government policy and funding have not kept pace with these changes. Too often, agencies like NASA and the Space Force apply a one-size-fits-all approach to commercial partnerships, failing to recognize that each arrangement serves different purposes including resilience, augmentation, innovation, cost-saving, or allied sharing.

Conversation was largely critical of certain government programs that lack clear vision or effectiveness. For instance, the Commercial Augmented Space Reserves (CASR) initiative was mentioned as an example of a program without a real product or coherent model. Similarly, the International Space Station (ISS), while successful as a diplomatic tool, was seen as having delivered less than expected in terms of research output. The Artemis program, intended to return Americans to the Moon, was described as lacking urgency, especially in light of China's steady progress to the moon. Participants largely agreed that NASA and Congress must treat Artemis with greater seriousness and speed, emphasizing that even a small lead in returning to the Moon could have significant strategic value.

A recurring recommendation was for Congress to redirect funding from government agencies like the National Reconnaissance Office (NRO), particularly for low-resolution imaging, toward the commercial remote sensing industry. This would help break government monopolies, stimulate private investment, and drive the development of a more robust commercial sector. Participants pointed out that many leading space companies rely heavily on government contracts, but that the future of commercial space lies in creating business models that attract both public and private investment.

The panel discussion also addressed the complex relationship between commercial space and national defense. While commercial capabilities can provide valuable resilience and flexibility, their integration with defense makes them potential targets in wartime. Many agreed that core "combat arms" functions, such as space control and nuclear warfighting, should remain strictly government



owned. However, many support and service functions, including intelligence, surveillance, reconnaissance (ISR), navigation, and space situational awareness (SSA), can be effectively commercialized, provided the private sector can meet government standards for reliability and security.

One of the most important policy levers identified was the government's ability to send strong demand signals to the market. Money and contracts are the clearest indicators of government priorities. The Department of Defense (DOD) and NASA should provide long-term contracts, co-funding arrangements, and performance-based milestones that give commercial companies "skin in the game." This approach, which has worked well in some NASA programs, ensures that commercial partners are invested in the success of national space objectives. At the same time, the government should avoid over-specifying requirements, allowing the private sector the flexibility to innovate and propose the best solutions.

Historical analogies featured prominently in the discussion. The panel referenced the Merchant Marine and the British East India Company as examples of how government support and clear business arrangements can enable commercial growth in strategic sectors. Concepts like letters of marque were mentioned as potential models for contracting commercial space services in areas where only private entities can operate effectively.

The panel also highlighted the importance of international collaboration in space. The United States has benefited from keeping civil and military space efforts distinct, which has made it easier for allies to participate in civil programs without being drawn into great power competition. However, some panelists expressed concern that NASA's current focus on outpacing China with Artemis might alienate allies who are more interested in expanding human presence in space for its own sake. A key takeaway was the need for the government to clearly categorize space services. Combat arms should remain government-owned, while combat support and combat service support functions can often be commercialized. The government must articulate where it draws the line between government and commercial services for each space activity, a clarity that is currently lacking and that hinders both planning, investment, and international cooperation.

The panel acknowledged that some government programs have not lived up to expectations, either because of market failures or because government competition has crowded out private providers. The ISS, for example, was seen as a diplomatic success but a research disappointment. NASA's Commercial LEO Destinations (CLD) program was criticized for lacking clear rationale and for being unable to match the exponential growth of the private sector.

Looking ahead, the panel called for greater urgency in the Artemis program and for a more strategic approach to public-private partnerships. They recommended that the government develop long-term, service-based relationships with commercial providers, use contracts and funding to drive



innovation and resilience, and frame civil space programs in ways that appeal to both U.S. interests and those of its allies.

In conclusion, the U.S. commercial space sector remains a cornerstone of national leadership, but continued success will require clear policy, strategic funding, and effective public-private collaboration. By learning from history, categorizing services, and sending strong demand signals, the United States can maintain its edge in space, respond to the Chinese challenge, and ensure a robust, innovative, and resilient space ecosystem for the future.

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

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

As the Space Force approaches its 6th anniversary, the formation of its identity, purpose, and direction remains critical in understanding its role. Panelists explored the Space Force's institutional growing pains, its evolving relationship with Space Command and the intelligence community (IC), and its struggle to define missions beyond supporting terrestrial operations. Much of the discussion centered on the tension between identity formation and operational readiness, emphasizing how Space Force must evolve to credibly execute its mission of ensuring U.S. space superiority.

Drawing from existing research on the stages of group dynamics, participants described the Space Force as entering a period in which internal debates and boundary-setting are necessary precursors to institutional maturity. This process has been complicated by the absence of a shared national articulation of the Space Force's purpose at its founding. The service began its life without a unified strategic vision, which has left questions of identity unresolved.

The conversation emphasized the issue of space superiority, a precondition for all other military operations. Without control of the space domain, the Space Force cannot guarantee support for other services. The mission of "warfighting in space" narrows the service's mission and diverts attention from its broader responsibility to enable joint operations and provide daily capabilities to other military services. Balancing the long-term pursuit of space dominance with the near-term need to deliver support remains a central challenge.

Identity formation for the Space Force is not merely an internal exercise but a communication problem with Congress and the American public. Many Americans still question the role and existence of the Space Force. The service must therefore clarify its distinct purpose in terms that resonate outside the national security community. The group argued that that identity should be



grounded in deterrence: the Space Force's creation was a proactive measure to prevent future conflict in space rather than a reactive response to it. Additionally, the service must convince Congress that its investments are producing tangible, usable outcomes.

The relationship between the Space Force and Space Command, was described by some participants as “transactional at best,” and was another major point of discussion. Ideally, the two forces should function as complements. In practice, gaps in coordination and messaging blur their respective roles. This rivalry mirrors tensions in the formation of the Air Force, when competing factions defined the service's core mission. Panelists similarly highlighted tensions between the Space Force and the IC, particularly the National Reconnaissance Office (NRO), where overlapping authorities, such as Title 10 and Title 50, create ambiguity. Some participants suggested the Space Force distance itself from intelligence functions to more clearly define its military role.

Another major point of conversation was the current acquisition process in the United States. The acquisition process suffers from fragmentation, slow delivery, and limited accountability. There was skepticism that current changes amount to more than “rearranging deck chairs,” though some noted that the shift toward system-aligned mission deltas may eventually improve unity of command between operators and acquirers. Several participants underscored that innovation inherently entails risk and failure, yet current acquisition culture remains too risk averse. While organizations such as the Space Rapid Capabilities Office and Space Development Agency show promise, they have not yet delivered the scale necessary to meet emerging threats. With over half of the Space Force budget devoted to R&D, participants questioned whether sufficient emphasis was placed on procurement and fielding operational capabilities.

Consensus held that the Space Force's current framework remains largely theoretical. Without combat experience in space, doctrine continues to rely on extrapolation rather than empirical lessons. The service must translate exercises, simulations, and operational experiences into doctrinal development to move beyond abstract principles. Relatedly, the lack of a comprehensive “space range” for realistic training and experimentation was identified as a critical gap. Without such infrastructure, guardians cannot build the skills necessary to prevail in a contested domain. Training and education are also works in progress. Cadets and new officers have expressed uncertainty about career paths and curriculum. Participants acknowledged that while early training mirrored Air Force models, efforts are underway to create a distinct educational pipeline emphasizing the history, threats, and future of space operations.

Looking ahead, participants called for proactive planning for missions beyond Earth's orbit, including cislunar operations, logistics, and mobility. These capabilities may be essential for protecting national and commercial interests as human and economic activity expands into lunar and deep-space environments. However, the Space Force's current investment in such missions remains minimal. Without early investment, the service risks being unprepared for when domains



become strategically contested. A dedicated Space Futures Command or an eventual Department of the Space Force may better address these emerging missions.

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

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

The strategic landscape of space is undergoing rapid transformation, compelling the United States and its allies to rethink how they approach space security, industrial collaboration, and operational integration. With China and Russia advancing their own space and counterspace capabilities, the urgency for allied innovation and closer cooperation has never been greater. The panel discussion revealed a complex but promising picture of how nations are adapting to new realities in space. One of the major points of conversation was Japan's approach to space defense, and how it has changed dramatically since 2008, when legal restrictions on military space activities were lifted.

The Ministry of Defense (MOD) now leads Japan's space spending, with a budget that, while still only about a third the size of China's, is growing quickly in response to regional competition and security concerns. Japan is taking concrete steps to strengthen its space posture: it is planning to create a dedicated space operational command, led by a high-ranking general, and is focusing on building a robust low earth orbit (LEO) satellite constellation. This will support not only space situational awareness (SSA) and missile detection, especially against emerging threats like hypersonic glide vehicles (HGVs), but also mission assurance and classified counterspace activities.

A key part of Japan's strategy is to engage the private sector more actively. By signaling its needs and priorities to industry, Japan hopes to foster innovation and ensure that its space capabilities support both national defense and broader alliance objectives. Integration with U.S.-led initiatives, such as the Space Development Agency (SDA) and the Proliferated Warfighter Space Architecture (PWSA), is also seen as essential for enhancing missile tracking and ISR (intelligence, surveillance, reconnaissance) capabilities. However, these ambitious plans face challenges, particularly in recruiting and retaining the specialized talent needed for military space operations. Japan's Self Defense Force (SDF) is working to attract new personnel and convert existing air staff to space roles, but the talent pool remains thin, which is a problem shared by many European allies.

Cybersecurity is another area of growing concern that intersects with concerns in the space domain. Japan has recently enacted an active cyber defense law, empowering its national police and the MOD to take more proactive measures against cyber threats. Still, there is a strong desire for deeper cooperation with the United States and commercial partners to share threat intelligence



and best practices, recognizing that cyberattacks on space systems could have devastating consequences.

Participants emphasized that U.S. space policy continues to be a central reference point for allied decision-making. The Biden administration's focus on the stable and responsible use of outer space, including a moratorium on direct-ascent anti-satellite (ASAT) tests, has been welcomed by allies and has helped reinforce U.S. credibility as a leader in space governance. However, there are ongoing concerns about how U.S. "dynamic space operations" might affect the predictability and safety of the shared space environment, especially for civil and commercial users.

Another area of debate is regarding the U.S. emphasis on homeland missile defense—sometimes referred to as the "Golden Dome." Allies worry that heavy investment in costly space-based interceptors could draw resources away from other critical capabilities and potentially create new vulnerabilities. Given their reliance on U.S.-provided services like GPS, missile warning, and space domain awareness, allies are keen to see a balanced U.S. approach that considers their needs as well.

There is also a sense that U.S.-allied space cooperation has become more transactional in recent years. This has prompted Japan and Europe to explore partnerships beyond the United States, even as they recognize that American leadership remains indispensable for effective collective security. Despite these concerns, there are significant opportunities for deeper cooperation. The proliferation of small satellites and the development of architectures like Proliferated Warfighter Space Architecture (PWSA) make it more feasible for allies like Japan to participate in space-based missile detection and tracking. Likewise, there is strong interest in integrating commercial and government efforts to bolster the cyber resilience of space assets.

Europe finds itself at a critical juncture, facing a volatile geopolitical environment shaped by the war in Ukraine and growing cooperation between China and Russia. This has spurred renewed investment in defense and efforts to integrate Europe's fragmented defense industrial base. While NATO remains the cornerstone of continental security, European leaders are pushing for greater strategic autonomy and a more balanced partnership with the United States.

Recent commitments to increase defense spending and develop independent launch and space asset maintenance capabilities signal a fundamental shift in Europe's approach. However, Europe remains heavily dependent on U.S. space capabilities, particularly in areas like ISR and satellite communications. Efforts are underway to build more resilient supply chains, prioritize European assets for key technologies, and develop dual-use infrastructure that can serve both civilian and military needs.



Europe is also active in shaping international norms for the peaceful use of space, working through the UN and NATO to align standards and governance frameworks. Industrial cooperation is also evolving rapidly, with new business models and innovation funds like NATO's Defense Innovation Accelerator for the North Atlantic (DIANA) supporting joint ventures, start-ups, and competition in emerging technology spaces of interest to the alliance. Both Japan and Europe recognize the need to balance the development of domestic industries with timely access to allied capabilities, especially as supply chain resilience becomes more important.

Integrating space capabilities into joint force operations is a work in progress for both Japan and Europe. Regular cross-service meetings, co-location of offices, and the establishment of dedicated space commands are seen as ways to foster a more integrated, all-domain approach to security. Escalation management exercises and wargames are helping to raise the "space IQ" of alliance members and prepare for crisis scenarios.

For Japan, aligning with U.S. frameworks like the PWSA is important, but there is a growing emphasis on ensuring that space capabilities address Japan's unique sovereign needs—particularly in response to the threat posed by Chinese HGVs. Similarly, European countries are navigating the tension between national priorities and collective alliance goals, especially as new funding becomes available and the need for deeper integration grows.

Participants agreed that the future of allied space cooperation depends on moving beyond a "what can you do for us" mindset. Instead, cooperation should begin with a clear understanding of each ally's needs and how their solutions can be integrated into a collective architecture. Strategic competition with China and Russia demands speed, urgency, and persistent innovation. While NATO and allied processes can be slow, recent progress in areas like cyber cooperation and industrial integration offers hope for more agile and effective responses.

Key recommendations include fostering joint research and development that translates into real operational capabilities, expanding talent pools through flexible hiring and reserve programs, collaborating on doctrine and operational concepts, and balancing the need for speed with the imperative to build resilient domestic industries.

U.S. and allied cooperation in space stands at a pivotal moment, shaped by emerging threats, technological change, and shifting policy priorities. While challenges remain in talent, industrial integration, and operational coordination, the overall trajectory is toward greater collaboration, innovation, and strategic alignment. By focusing on shared needs, leveraging complementary strengths, and maintaining a sense of urgency, the United States and its allies can ensure that space remains a domain of collective security and opportunity.



Panel 9: Cooperation with Competitors: Any Prospect?

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

Cooperation with competitors in the current geopolitical climate is difficult. Participants expressed throughout the discussion that today's environment is much closer to that of 1957-58, where cooperation was much more difficult than that of the 1970s, a period of détente. Some participants thus challenged the efficacy of engaging with competitors in space. Regardless of whether cooperation with competitors is fruitful, it is important to consider the perspectives of other countries. In cooperating with China and Russia, the audience is not merely those countries but also allies and partner states.

Tacit agreements and treaties were not discussed at length. In seeking treaties and cooperation, the United States should consider its strengths and areas of weakness for China and Russia. Despite challenges presented by the current geopolitical climate, there are examples of collaboration in space. In the past, Russian vulnerabilities brought the country to the table for cooperation in space. The United States and Russia have worked together from docking exercises during the Cold War to a Russian spacecraft carrying U.S. astronauts to the International Space Station in 2025. However, mutual dependence between the U.S. and its competitors is not currently likely as a driver of cooperation, as neither China nor Russia would want to take on mutual dependency. It is possible that the United States will depend on competitors in the future if it falls behind on endeavors such as landing on the moon. Ultimately though it was agreed that we are not likely to see new agreements or treaties in the space domain that are endorsed by all major powers. We may see much lower levels of cooperation though, when interests align and benefits will be equally distributed.

Planetary defense raises opportunities and challenges for cooperation. Namely, if cooperation in planetary defense proceeds, it could lower the geopolitical temperature through countries working together to address an existential threat to Earth. Verification in planetary defense measures is an area where competitors could cooperate, although this notion is challenged by the idea that verification likely would not be the highest priority compared to an existential threat. Progress in this area has yet to be seen in a meaningful way though, it will likely require a major catalyst.

If it were to happen, cooperation on planetary defense would require a high level of transparency. Other countries would be alarmed if the United States placed a nuclear weapon in space, even if for the purpose of deflecting an incoming asteroid. Adversaries would want assurance that a nuclear weapon in space would not target them. Moreover, nuclear planetary defense raises questions about accountability.



Some participants argued though that the United States cannot wait until an existential planetary threat emerges to cooperate with competitors. Some view cooperation as important for dealing with issues of the commons in space and to open channels of communication for de-escalation. There are other avenues of cooperation such as the development of research telescopes and data sharing for enhanced situational awareness. One participant brought up that the recently established United Nations expert group on Space Situational Awareness (SSA), which includes the United States, China, and Russia, presents an opportunity for dialogue.

Participants expressed hope that interest in cooperation is universal. One participant proposed that there could be meaningful collaboration in Mars exploration. Landing on Mars is a difficult endeavor to achieve as a singular country. If a Mars mission was purely focused on scientific goals, rather than military or security, it could rally international support in the future. Participants proposed that competitors could jointly fund a project such as one that travels to Mars. Some participants though remained skeptical about this.

Cooperation is also possible between the U.S. private sector and Chinese companies to manage collision in low earth orbit. Furthermore, the private sector can help enhance U.S. soft power in space. However, technical vulnerabilities may emerge if U.S. and allied private space companies work with competitors. Although competitors would not necessarily trust satellites manufactured by U.S. companies, collaboration is still foreseeable. Private companies follow money, and the United States should support their endeavors while incentivizing them to support U.S. interests. Interest and historical precedent for cooperation remain a factor in the conversation on cooperation. Exploratory missions and planetary defense have the potential to engage the international community. However, it remains ambitious to strengthen cooperation with competitors. The United States should harness its private space sector to collaborate with other countries on issues such as traffic control but restrain companies from collaborating technically with competitors. Progress still needs to be made to strengthen agreements on space conduct.