Space Superiority Through the Spectrum of Conflict:

Findings and Recommendations from the Conflict in Space Workshop

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MITCHELL INSTITUTE FOR AEROSPACE STUDIES

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Acknowledgments

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Cover design by Charles Galbreath, Kamilla Gunzinger, and Eric Lee

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Foreword

Space is rapidly evolving as a warfighting domain. As we've seen in recent operations, space is no longer only a supporting element to joint operations. Space superiority operations are now indispensable first movers. As such, the ability to establish and maintain space superiority has never been more critical.

Despite this, the lack of historical context to build a solid understanding of conflict in space hampers widespread understanding to advance the operational capability and capacity necessary to respond appropriately to hostile actions in space. Moreover, until recently, any discussion of conflict in space would have been classified, further limiting the advancement of understanding. This compounding challenge is ripe for additional clarity and examination.

To this end, the Mitchell Institute's Spacepower Advantage Center of Excellence (MI-SPACE) convened an unclassified space workshop in January 2026. The workshop assembled over 50 subject-matter experts from across the national security space landscape to examine conflict in space. This workshop provided participants with a venue to explore a range of scenarios designed to stress different aspects related to the perception of and response to hostile actions. By exploring how the United States, our allies, and partners collectively respond to attacks and take actions to preserve U.S. and coalition space superiority, the workshop offers a glimpse into the challenges we may soon face and what steps we must take now to prepare. Perhaps most importantly, it provided an unclassified venue for this discussion so the lessons learned can be widely shared to advance the common understanding of conflict in space.

The insights and analysis from this workshop mark a milestone in the examination of conflict in space. In this report, the MI-SPACE team masterfully summarizes the workshop's findings and recommendations. We highly recommend that Space Force leadership, all Guardians, and spacepower advocates from industry, government, and our international partners study this report and take its recommendations to heart. Collectively, we can promote the continued development and fielding of the capabilities and operations to assure our continued space superiority across the spectrum of conflict.

Lt Gen David A. Deptula, USAF (Ret.)
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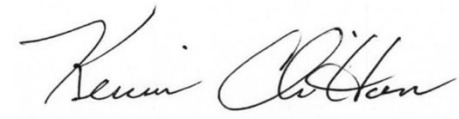

Gen Kevin Chilton, USAF (Ret.)
Explorer Chair, MI-SPACE

Abstract

Space has become an indispensable element of modern military, economic, and societal functions, yet the character of conflict in the space domain is only just taking shape and is not well understood. The Mitchell Institute held a two-day unclassified workshop in January 2026, bringing together more than fifty experts from the military, government, industry, allied forces, and academia to examine how conflict in space may emerge, evolve, and be managed across the spectrum of military engagement, from competition to armed conflict. The workshop sought to clarify how hostile acts in space might be identified, how escalation thresholds could be assessed, and what effects and response options the United States and its allies should prioritize to achieve and maintain space superiority.

Using recently released U.S. Space Force and U.S. Space Command doctrinal documents as a foundational context, participants engaged in a structured series of near-term scenarios that represented escalating hostile actions across multiple geographic combatant commands. These scenarios ranged from shows of force and reversible interference, such as jamming, cyber intrusion, and co-orbital maneuvering, to kinetic attacks, loss of life, and ultimately a nuclear detonation in low-Earth orbit (LEO). The vignettes were designed to stress key variables, including attribution, intent, type of weapons used, capability affected, and relation to other geopolitical conditions, without exposing real-world vulnerabilities.

Workshop discussions highlighted the inherent complexity of space as a domain that defies traditional geographic and legal constructs, complicates attribution, and enables adversaries to normalize coercive behavior below clear thresholds of armed conflict. Participants emphasized that this ambiguity favors competitors by slowing decision-making and conditioning acceptance of increasingly hostile actions.

Across all teams, participants reached a consistent conclusion: the United States is already operating in a sustained gray zone in space, particularly with China. However, a lack of shared definitions, clear delineations, decision frameworks, and communication mechanisms to control escalation and impose costs effectively limits available response options. The absence of credible options could lead to unintended escalation.

Key findings underscore the importance of robust space domain awareness, credible and proportional response options, strategic communication, and partner integration as decisive elements of spacepower. The United States must continue to build combat credibility by reducing ambiguity through clearer norms and frameworks, integrating allies and commercial partners, shaping perceptions through timely messaging, enhancing mission resilience and infrastructure protection, expanding response and reconstitution capacity, and sharpening conflict-winning skills through training and exercises. Collectively, these measures form a virtuous cycle that increases combat credibility, deters hostile behavior, controls escalation, and ensures the United States' ability to prevail in future space conflict.

Executive Summary

Space is no longer a peaceful or principally enabling domain. Space is now contested in a murky gray zone between competition and conflict, and space capabilities have recently demonstrated that they are critical first movers in joint operations. Despite the indispensable benefit of integrating space effects into joint operations over the past few decades and the growing list of counterspace threats emerging in that same period, little is publicly understood about conflict in space. The historic lack of conflict, the vastness and remoteness, and the technical nature of the space domain have prevented a wider understanding of the character of space conflict.

However, because the nature of conflict does not change, lessons from other domains and centuries of warfare can illuminate some aspects of a potential conflict in space. Building on existing precedent, U.S. Space Command and the Space Force have published foundational documents and tenets to mature thinking and understanding of conflict in space, including:

1. Space Force Doctrine Document 1 (SFDD – 1)[1]

2. USSPACECOM Elements of Victory: Achieving War-Winning Advantage in Space[2]

3. Space Warfighting: A Framework for Planners[3]

These documents form the initial thinking about conflict in space in the 21st century. Through its January 2026 Conflict in Space Workshop, the Mitchell Institute sought to apply key concepts of these documents and advance the wider understanding of space warfare. This two-day unclassified exercise brought together more than fifty subject matter experts from the military, government, industry, allied forces, and academia to examine how space conflict may manifest and escalate, and what the United States and its allies must do to achieve and maintain space superiority throughout the spectrum of conflict.

Workshop Methodology

The Conflict in Space Workshop presented four teams of experts with a series of vignettes that escalated over the exercise's timeframe, set in the near future, in terms of threats, risks, and level of military engagement, to examine multiple variables that could impact the interpretation and response to hostile actions. These variables included: the type of mission attacked, the type of weapon used, the scope of effects generated, where the attack occurred, the adversary that executed the attack, and the influence these acts imposed on activities occurring in other domains. Based on background and experience level, the Mitchell Institute divided workshop participants into regionally focused teams: INDOPACOM, EUCOM, CENTCOM, and NORTHCOM. The workshop incrementally introduced the series of vignettes to these groups and asked them to characterize the severity of each and provide a set of unconstrained courses of action for senior decision-makers to select as a response option. The Mitchell Institute also asked participants to identify what additional information and criteria would be critical to selecting an option. After five sets of vignettes, the Mitchell Institute asked participants to identify steps the United States and its allies should start taking today to either prevent similar scenarios from happening or prevail should they occur.

Findings

Through the Mitchell Institute's analysis of participants' insights, several findings about the character of conflict in space emerged. These findings are intended to advance the discussion of conflict in space, not resolve a unique challenge associated with a specific vignette. These findings suggest a critical need to rapidly advance a wider discussion of the subject, aimed at aligning the proper resources and priorities to means and methods that credibly advance a strong deterrent posture and, if necessary, win a conflict in space.

- **Conflict in space is complex:** Conflict in space is more complex than many participants anticipated, hindering efforts to interpret actions, assess escalation, and select appropriate responses. Participants consistently found that the challenge is a combination of a lack of policy clarity and the fundamental nature of the domain itself. A lack of historical precedent also led to disagreement on whether certain thresholds of conflict were met.

- **Gray zone activity and the normalization of hostile behavior:** Participants assessed that the United States is already operating in a sustained gray zone with China in space. Repeated hostile actions below the threshold of armed conflict are already shaping the operational environment and increasing the risk of escalation. This state is characterized by actions that are coercive, often deniable, and deliberately calibrated to avoid triggering a decisive response.

- **Adversary cooperation escalates perception of hostility:** Adversary cooperation amplifies both the perceived hostility and strategic impact of actions in space, complicating U.S. response options and increasing escalation risk. When viewed collectively, activities attributed to Russia, China, and Iran were interpreted as intended to stretch U.S. capacity to respond.

- **Attribution is essential for deterrence and effective response options:** Attribution is a prerequisite for effective response, but remains uniquely challenging in the space domain. Participants consistently identified attribution as essential to formulating credible response options that deter escalation. This extends beyond identifying which actor was responsible for a given action to include understanding the nature and scope of the effect, the systems involved, and whether the outcome was intended. Without this broader context, decision-makers lack the clarity needed to determine appropriate responses and risk unintentional escalation.

- **Strategic communication is a decisive element of competition and conflict:** Strategic messaging is a critical element across competition and conflict to shape how actions are perceived, enable coalition alignment, and reinforce the legitimacy of U.S. responses. Participants emphasized that the ability to rapidly identify, characterize, and communicate hostile or unsafe behavior is essential, particularly in the gray zone where ambiguity allows adversaries to shape narratives to their advantage. If the United States does not define events early, competitors are likely to do so in ways that obscure their actions and complicate U.S. response options.

- **A range of credible military response options is needed:** Credible, flexible, and scalable military response options are essential to deter adversary actions, control escalation, and achieve space superiority in a contested domain. Participants universally emphasized that the United States must possess a broad and capable suite of military response options to address the expanding range of threats

in space. As adversary actions increase in frequency and sophistication, possessing limited response options constrains decision-making and risks forcing reliance on tools that may be inappropriate for the situation. In such conditions, the absence of tailored options can inadvertently increase escalation, rather than manage it, or otherwise fail to discourage an adversary's hostile action.

Recommendations

Based on insights from workshop participants and analysis by the Mitchell Institute, the following recommendations are aimed at addressing the findings and building a combat-credible Space Force and U.S. Space Command. Many of the recommendations tie directly to ongoing efforts within the service, the combatant command, and across the national security space landscape. Emphasizing them here is intended to add advocacy and priority to these critical steps.

- **Decrease ambiguity to accelerate decision-making:** The United States must work to establish comprehensive, universally understood standards, norms, or laws for outer space in order to speed the delivery of credible responses and bolster broad support for them. Even if the United States unilaterally defines a set of acceptable behaviors, communicating and adhering to them will aid future comprehension of aggressive actions and support the legitimacy of a needed response.

- **Build strategic weight through partner integration:** Allies and partners are invaluable when engaging with competitors and adversaries in a mostly anarchic outer space environment. Competition becomes a numbers game; those with the greatest capacity and widest range of response options will quickly gain an advantage in conflict. The greater the number of allies and partners who agree to the same set of rules and norms, the more entrenched these rules become; the more entrenched the rules are, the more legitimate response options become when those rules are broken.

- **Shape perceptions through strategic messaging:** While those who operate and defend space capabilities are intimately familiar with the importance of spacepower and the extreme risk of ceding the space high ground to adversaries, much of the public is unaware of its criticality. A framework for acceptable behavior, paired with strong global partnerships, is strengthened by broad public support, nationally and internationally. The ability to strategically communicate when an adversary conducts a hostile act can be a proactive means to control escalation and gain support for a credible response.

- **Deny benefits of hostile actions through mission resilience:** Mission resilience can deter adversaries' unacceptable behavior in space by denying them their objectives. An established framework for acceptable space domain behavior does not make U.S. space operations invulnerable. Diplomatic pressure might limit adversary actions taken to degrade space capabilities needed by joint warfighting should conflict in space occur, but there will still be degradation. Mission resilience is key and must be pursued by building force structure for both the Space Force and terrestrial capabilities that support space superiority in the sister services.

- **Tenaciously defend critical infrastructure:** Spacepower begins and ends with data networks, which enable command and control of satellites and the utilization of their sensor outputs. The global nature of data networks, particularly when critically important commercial space assets are considered, results in numerous access points to disrupt large numbers of satellites asymmetrically via cyber-attack. Consequently, the Space Force has made cyber defense a core mission of its force structure. However, cyber defense tools and monitoring capabilities must scale and be constantly validated to ensure the credible defense of these networks. Similarly, the Pentagon must view commercial space systems' cyber protection as critical to national security and work with commercial companies to test and validate their defenses.

- **Build credible capability and capacity to execute military response options:** The ability to prevail in space conflict requires credible capabilities and capacity to respond to unacceptable space behaviors by imposing costs on the adversary. The Space Force must continue investment in space superiority weapon systems designed to disrupt and disable adversary space systems to ensure it possesses the breadth and depth of capabilities to deliver credible and meaningful response options.

- **Sharpen a winning edge through training and exercises:** Humanity has yet to experience high-intensity conflict in space. Therefore, operational concepts and capabilities are just beginning to evolve. While the Space Force and U.S. Space Command establish these key elements, the Pentagon, allies, and partners must all refine space warfighting skills and deepen understanding of space superiority, not just academically but practicably. Training and exercises will increase proficiency and identify shortfalls in execution, iteratively leading to better understanding, capability, and operational practices.

These recommendations form a virtuous cycle. An initial understanding and framework lead to more effective engagement with allies and partners to increase force strength. Collectively, these are communicated to shape the future operating environment and respond to hostile actions. By denying the benefit of hostile acts through mission assurance and protected critical infrastructure, decision-makers have more time to consider options. Those options are expanded by the development of U.S. and allied capabilities, informed by previous collaboration and shared objectives. Those options are then exercised and trained to increase their effectiveness and to inform subsequent updates to the original framework. The result of this iterative cycle is a strengthened military capability, broader support, a more robust deterrent posture, and the ability to win in a conflict if deterrence fails.

Conflict in Space Workshop

In January 2026, the Mitchell Institute held a two-day unclassified workshop with over 50 subject matter experts from across the space community to examine conflict in space. This broad swath of experts included military, government, industry, allied force, and academia personnel to gain insights into a future conflict in space and what it takes to gain superiority in the domain.[4] The workshop sought to increase understanding of what defines conflict in space, how it might manifest in a variety of scenarios, and what effects and conditions the United States and its allies should prioritize to achieve space superiority across the spectrum of conflict. While it is widely recognized that space operations are now an indispensable element of all military operations, little is publicly known about the challenges associated with the preservation of superiority in a contested space domain.

A **hostile act** is defined in joint force doctrine as an attack or other use of force against the United States, United States forces, or other designated persons or property to preclude or impede the mission and/or duties of United States forces, including the recovery of United States personnel or vital United States Government property. (see JP 3-28)

Unlike other domains, which have an extensive history of kinetic and non-kinetic warfare, space has not yet experienced conflict on a significant scale. Despite frequent jamming, lazing, and cyber events, there have been no sustained exchanges of hostile actions between nations in space.[5] The recognition that space is a warfighting domain, however,

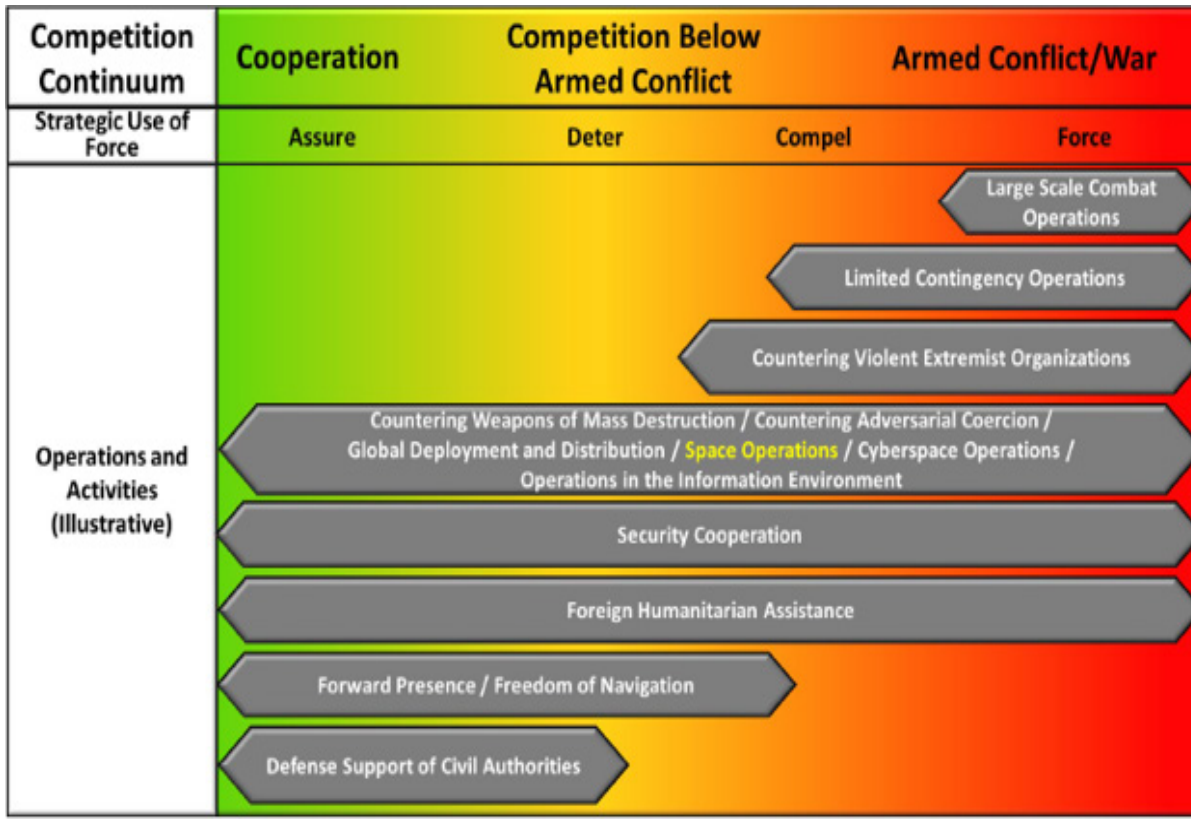

Figure 1: The Competition Continuum and the importance of space operations across the spectrum of conflict.

Source: U.S. Space Force, Space Force Doctrine Document – 1 (SFDD-1), April 3, 2025.

means the Space Force and U.S. Space Command must prepare for this eventuality. Given the presence of ongoing interference by China and other aggressors and the lack of an overt U.S. response to date, it remains unclear what actions would be significant enough to warrant a response or be considered the beginning of conflict. Understanding how a hostile act in space might manifest, how it might evolve across the spectrum of conflict, and what options the United States may need to respond to different scenarios to gain and maintain space superiority had not been explored—at least not in an unclassified setting—until this workshop. Although it prevented a detailed examination of specific threats and response options that would be possible in a classified setting, by staying unclassified, the workshop was able to focus on the broader characteristics and implications of conflict in space without the distraction of specific weapon system parameters. Since the objective of this workshop was to broadly examine conflict in space, define factors that could shape the perception of hostile acts, and identify categories of response options to achieve desired effects, the Mitchell Institute believes remaining at the unclassified level was warranted.

Foundational Documents

Since their establishment, the Space Force and United States Space Command have published several documents seeking to normalize military operations in space with those of other domains. These build on accepted and proven terminology and practices refined over centuries of warfare. With a lack of historical hostilities in space to build from, these documents collectively create critical early steps in the evolution of thinking about warfare in space. As a result, these documents provided a basis for the creation of this workshop and discussion among workshop participants.

Space Force Doctrine Document 1 (SFDD –1)

Released in April 2025, SFDD-1 is the foundational doctrine document for the service. It articulates the criticality of achieving and maintaining space superiority and defines activities that may be required by the Space Force in the conduct of space warfare. These activities include deterring or denying attacks on friendly space capabilities, compelling an adversary to cease aggressive actions, undermining an adversary's strategy, and enabling the application of force in all domains.[6]

Space Command's Elements of Victory

Also released in April 2025, Space Command's Elements of Victory identifies five strategic principles to achieving a war-winning advantage in space.[7] Collectively, these principles provide a structure for the activities and effects necessary to respond to hostile actions in space.

- Operate through a first strike
- Transition from crisis to conflict
- Integrate and synchronize effects
- Deploy, regenerate, and reconstitute
- Achieve space superiority

Space Force's Space Warfighting: A Framework for Planners

Released by the Space Force in March 2025, the Space Warfighting Framework provides the most detailed discussion of space superiority and the types of counterspace operations that might be employed during conflict in space. It also describes the spatial and temporal dimensions of space superiority that pragmatically characterize aspects of superiority in the expansive operational domain of space.[8]

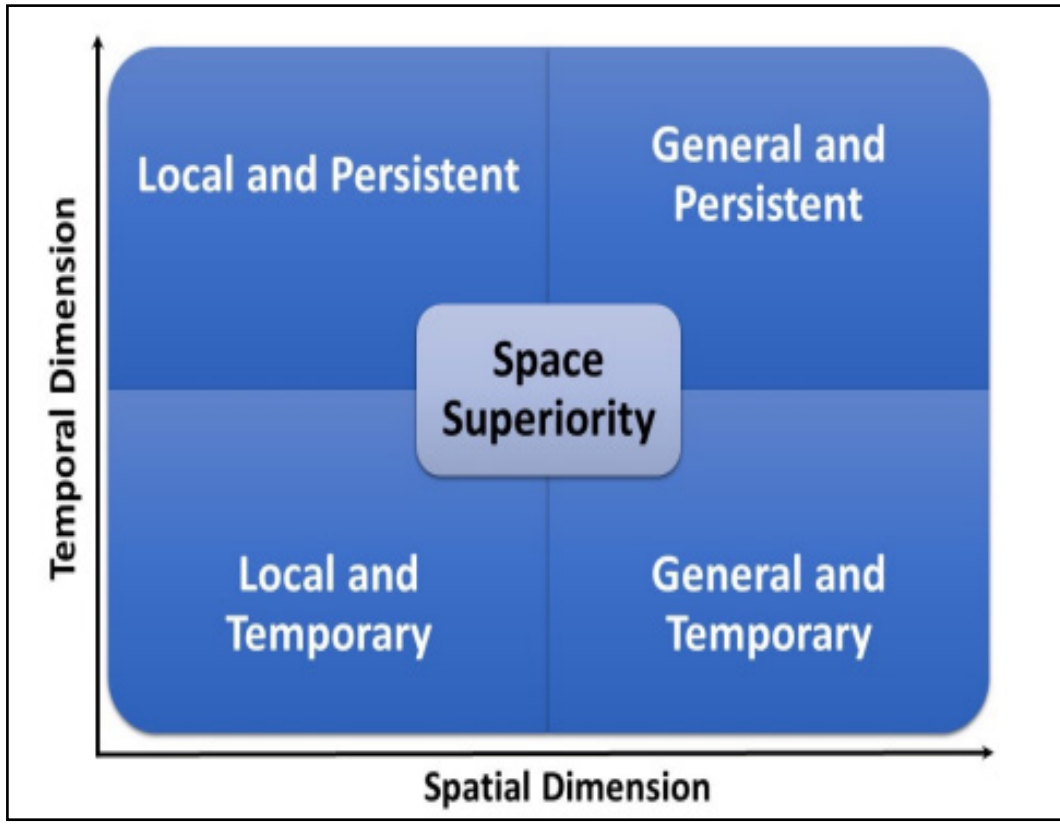

Figure 2: Dimensions of Space Superiority from "Space Warfighting: A Framework for Planners"

Source: U.S. Space Force, Space Warfighting: A Framework for Planners, March 2025.

Key Questions to Inform the Understanding of Conflict in Space

Despite the presence of foundational documents, the lack of prior conflict in space leaves many questions unanswered. The Mitchell Institute workshop explores these questions further; it does not definitively answer them. Foremost among these questions is determining if there is a definable tipping point from competition to conflict and what factors influence that transition.

Once a hostile action is significant enough to justify a response, the Mitchell Institute sought to determine the elements of that response as part of a space warfighting campaign and larger whole-of-government response. How the United States and its allies and partners could preserve the continued use of space systems and deny an adversary the ability to achieve its objectives in the space domain were of utmost importance. The Mitchell Institute sought to

capture expert insights into the force structure and supporting elements needed to respond to multiple space threats simultaneously and at the scale and scope of a potential space warfighting campaign, as these could inform future policy and budget decisions. Finally, the Mitchell Institute sought perspectives on how response options as part of a space warfighting campaign could be implemented to control escalation and establish deterrence.

Methodology

The objective of this workshop was to inform the discussion about conflict in space and examine multiple factors associated with improving the understanding of conflict in space. By doing so, the Mitchell Institute hopes to raise awareness of the capabilities and concepts essential for the United States to gain and maintain space superiority, not to provide definitive answers to discrete challenges. By presenting a range of near-term vignettes that employ multiple variables impacting the perception and response to hostile acts to groups of space experts with diverse backgrounds, the Mitchell Institute intended to illuminate key aspects of conflict in space to better inform future planning and budget decisions.

Before the workshop participants were divided according to their expertise into regional groups, representatives from the Space Force and Department of the Air Force discussed the growing threat landscape and legal perspective on conflict in space. The threat presentation enumerated multiple attack vectors, risks, and recent operational practices. The legal presentation focused on the application of the law of armed conflict to the space domain and existing frameworks such as the 1967 Outer Space Treaty.[9] With these presentations and foundational documents as context, the workshop transitioned to small group discussions of vignettes.

The workshop presented a series of vignettes to participants and asked them to characterize the severity of each and provide a set of unconstrained courses of action for senior decision-makers to select as a response option. The Mitchell Institute also asked participants to identify what additional information and criteria would be critical to choosing which option to select. After five sets of vignettes, the Mitchell Institute asked participants to identify steps, across the range of DOTMLPF-P and DIME, that the United States and its allies should start taking today to prevent such scenarios from happening or prevail should they occur. The Mitchell Institute then synthesized this information into a set of findings and recommendations.

Teaming Approach

To ensure a balanced look at the variety of factors impacting conflict in space, the Mitchell Institute sought to create four teams as equally balanced as possible relative to background, experience, and views. The Mitchell Institute gave each team the same opening vignette to understand relative perspectives as a benchmark of the team's views and an assessment of whether one was more prone to have an aggressive interpretation and response. After the first vignette, the teams collectively shared findings and approaches to streamline subsequent examination of remaining vignettes.

During the second vignette, the Mitchell Institute allowed the teams to compare injects and perspectives to determine how they would interpret and respond to a collective and coordinated set of hostile actions from around the world. For the third and fourth vignettes, each team acted independently. Finally, each team

"DOTMLPF-P is a tool that allows senior leaders to analyze their organizational capabilities from the perspective of "Doctrine, Organization, Training, Materiel, Leadership, Personnel, Facilities, and Policy" when making future strategic decisions." See JCIDS Process: DOTMLPF-P Analysis.

DIME is an acronym for the instruments of national power, including Diplomatic, Informational, Military, and Economic means. Alternate forms of this mnemonic add Financial, Intelligence, Law (or Law Enforcement), and Development to create DIMEFIL or MIDFIELD as the acronym. See NDU, "Putting the 'FIL' into 'DIME'," Joint Forces Quarterly.

examined the same fifth vignette from their unique perspectives developed during the discussion of their team-specific scenarios. Like the first vignette, this was done to compare relative assessments, given the different assumptions and conditions that each team experienced as they worked through varied risks and threats.

Workshop Key Assumptions & Vignettes

At the core of this workshop are a series of assumptions that the Mitchell Institute believes are essential to understanding the role of space in future conflict. First, gaining and maintaining space superiority will be a fundamental prerequisite for the success of any future conflict. This is based on decades of military operations, illustrating how the integration of space capabilities and effects has significantly improved effectiveness and lethality in joint operations. The Mitchell Institute also assumes that as the United States faces different adversaries, there will be an equally diverse set of hostile actions in space that the United States might face. The most stressing is likely to be conflicts with Russia and China. Whether through coordination, serendipity, or exploitation of emerging opportunities, such conflicts have a disproportionate risk of escalation and expansion across multiple theaters in what could become a series of prolonged operations. The Mitchell Institute assumes that the United States, its allies, and partners must be prepared to achieve space superiority in the face of all these potential threats. It further believes that consistent and persistent efforts by the United States, its allies, and partners will be required to preserve long-term space superiority across the entire spectrum of conflict. This workshop sought to identify what those efforts might be and the impact they could have on success and victory in any future conflict or against any potential hostile action in space.

Key Variables

The Mitchell Institute constructed the workshop to examine multiple variables that could significantly impact how the United States might respond to hostile actions. These variables include the type of mission attacked, the type of weapon used, the scope of effects generated, where the attack occurred, the adversary executing the attack, and the relationship to activities occurring in other domains. Additionally, the level of U.S. certainty or confidence associated with each of these variables could alter response options.

To systematically evaluate each of these variables, the Mitchell Institute created a series of vignettes, set in the near future and based on current geopolitical contexts. The objective was to inform the understanding of which variables were most critical and how they interact with each other.

	D=0	D=45	D=60	D=90	D=180
	Vignette 1	Vignette 2	Vignette 3	Vignette 4	Vignette 5
	Show of force	Non-kinetic	Loss of life	Significant terrestrial hostilities	Widespread destruction
INDO-PACIFIC	China live-streams repositioning of a recently inoperable European commercial satellite without prior coordination with owner or host nation	Increased jamming, lasing of U.S. satellites over China	Direct ascent ASAT test/demonstration with debris that damages ISS, killing a U.S. astronaut and positioning of satellites near U.S. systems	Attempted overwhelming strike, GBL using increased power to damage, co-orbitals engage, massive jamming over Western Pacific to aid invasion of Taiwan	***Unattributed*** Nuclear detonation in LEO
EUCOM		Russia increases force presence in Belarus. Cyber-attack against multiple commercial comm sats over Europe impacting U.S. military operations	GPS jamming across Europe impacting commerce, communication, and navigation resulting in a mid-air collision including a U.S. airliner	Co-orbital kill of ISR platform in LEO in conjunction with invasion of Latvia	
CENTCOM		Regional GPS jamming disrupting airlines in region	Iran conducts massive missile attack against U.S. base in Middle East. Several personnel killed and wounded. Facility destruction includes SATCOM antennas	Saman-1 used to re-enter a satellite from LEO and other satellites as brute force co-orbital ASATs. Iran invades Iraq	
NORTHCOM		***Unattributed*** Cyber-attack takes down power and disrupts communication in Midwest	***Unattributed*** Supposed-SOF explosions against all bridges connecting the mainland with Cape Canaveral; East Coast launch operations at a halt	***Unattributed*** A submarine launched a volley of 20 conventional ballistic and cruise missiles at Naval Base San Diego, Nellis AFB, Vandenberg SFB, Beale AFB, and Fort Irwin	

Table 1: Summary of workshop vignettes spanning the spectrum of conflict

The Mitchell Institute created five different sets of vignettes spread across 180 days of workshop gameplay against four different regional Combatant Commands. This enabled an examination of differences in how each would perceive the same type of action being executed by one nation versus another. It also allowed an examination of vignettes going from a show of force to a non-kinetic attack, to an attack that resulted in the loss of life, whether that be intentional or unintentional, as well as an attack that coincided with significant terrestrial actions. Finally, the workshop looked at a nuclear detonation in space as a worst-case scenario to assess how the United States and its allies might want to respond.

In all cases, the Mitchell Institute identified who the attacking nation was, except for those attacks against NORTHCOM. They remained unattributed to better assess how that might shape a U.S. response.

The vignettes moved through an escalation of hostility, employing non-kinetic means, including cyber, jamming, and lasing, and then moved to kinetic attacks, direct ascent ASATs, increased jamming that resulted in loss of life due to mid-air collisions, and missile attacks against fielded forces and U.S. bases. Finally, teams were confronted with attacks in space that coincided with terrestrial actions.

The Mitchell Institute designed each of the vignettes to examine different aspects potentially impacting the interpretation of hostile actions without identifying any real-world vulnerabilities or shortfalls in U.S. capabilities. By keeping the focus of the workshop on the achieved effect, rather than the specifics of how an adversary might achieve that effect, the Mitchell Institute was able to abstract any discussions of capabilities, limitations, and vulnerabilities. The vignettes were created in September of 2025, prior to the operations in Venezuela and Iran.

Vignette #1-All Groups: China Show of Force (Day 0)

A commercial communications satellite, Valuable Communications To Many (VCTM-1), ceased operations when a pair of Chinese satellites traveling along the GEO belt came within 200 km. The Chinese government livestreamed video taken by one of the two Chinese satellites showing the second satellite using a robotic arm to capture and relocate VCTM-1 to a disposal orbit. Chinese state media claimed VCTM-1 was a danger to other satellites and hailed the operation as a symbol of PLA space leadership to "preserve the space domain for safe and peaceful operations for all humanity."

Vignette #2 (Day 45):

INDOPACOM

China continues to deploy increasingly sophisticated and prolific space capabilities in all orbital regimes. China also continues the sporadic jamming and dazzling of U.S. satellites as they overfly Chinese territories. Over the prior two days, PLA forces increased the intensity and rate of jamming and lazing activities. What was once occasional is now constant and at increased levels of power. While the effects are still temporary, the time to regain normal operations has increased, impacting the collection and delivery of space effects in the regions around China. Imaging, SATCOM, and GPS systems are all affected.

EUCOM

Several undersea cables in the North Atlantic are cut, impacting communications between Europe and North America. Over the prior week, Russia began deploying two divisions of ground forces to multiple bases across Belarus. A pattern of persistent jamming in and around Ukraine continues. Sporadic and temporary increases in jamming and cyber intrusions also continue. One day prior, thousands of ground

modems associated with three different commercial communications satellite systems suffered a cyber-attack, disrupting communications across Europe and Africa. The disruption has impacted trade, power generation via wind turbines, and command and control of RPAs using those SATCOM links.

CENTCOM

Over the past 48 hours, multiple commercial airlines transiting the Persian Gulf region reported intermittent GPS disruptions near the Strait of Hormuz. Cascading delays of all flights through the Middle East interrupted international air travel. Investigations suggest the disruptions are the result of high-power ground-based jammers operating from southern Iran, synchronized with BeiDou signal spoofing to confuse receivers. U.S. intelligence assesses that Iranian EW units conducted the jamming with aid from Russia. China denies involvement but promotes BeiDou as a "reliable alternative."

NORTHCOM:

In the past 36 hours, a coordinated cyber-attack disrupted power and communications across several Midwestern states, including Colorado. Temporary outages affected Denver and Colorado Springs, slowing operations at U.S. Space Command and NORAD. Emergency services reported disruptions to 911 call routing and regional air traffic control. Power grids and communications networks in the Midwest were taken offline for several hours. Malware analysis is underway. Whether state actors directly conducted the attack or enabled proxies remains unclear.

Vignette #3 (Day 60)

INDOPACOM

China is massing its military in what appears to be preparation for a military unification of Taiwan. Increased frequency and scope of non-kinetic attacks on U.S. space systems persist around the globe. In an apparent show of force, China demonstrated its direct-ascent anti-satellite capability with a destructive intercept of one of its retired satellites in LEO. The resulting debris damaged the International Space Station, causing the death of a U.S. astronaut and subsequent evacuation of the ISS. Additionally, several satellites were damaged by debris, rendering a dozen satellites inoperable. It is unclear whether the ASAT engagement planning accounted for debris generation that would impact other satellites or the ISS.

EUCOM:

Russia's intense GPS jamming across Eastern Europe significantly affected the region. Spillover effects are disrupting navigation across most of Europe. As a result of the Russian jamming, two commercial aircraft collided this morning over Poland. 438 lives were lost, including 16 Americans. Russia has remained silent on the incident. The GPS jamming is traced to Russian forces in the region. The midair collision appears to be collateral damage from the widespread GPS jamming.

CENTCOM:

Within the last 24 hours, Iran launched a coordinated missile strike against a U.S. base in the Middle East. The attack destroyed SATCOM antennas, command facilities, and housing units. Several U.S. personnel were killed or wounded, and operations were disrupted across the region. The strike employed both ballistic and cruise missiles, demonstrating significant planning and coordination. Iran claimed the attack was a "defensive response" to perceived U.S. aggression. Some analysts suspect the attack was enabled by space-based ISR data shared under the new bloc agreement with Russia and China.

NORTHCOM:

In the past 12 hours, coordinated explosions killed dozens and disabled every bridge connecting the Florida mainland to Cape Canaveral. It is suspected that the attacks were conducted by covert SOF teams or proxies. No group claims responsibility. Multiple bridges were damaged and destroyed, cutting off vehicle access to Cape Canaveral. East Coast launch operations are halted, preventing both military and commercial launches. Initial estimates indicate repair and inspection will take 6-8 weeks.

Vignette #4 (Day 90):

INDOPACOM

Prior to China's invasion of Taiwan, it began maneuvering several satellites to be co-planar with U.S. and allied systems. As the invasion of Taiwan began, China executed multiple counterspace operations. Ground-based lasers began targeting U.S. satellites in LEO with destructive levels of power. SATCOM and GPS jamming in the Western Pacific continued. Ten different co-orbital attacks also occurred. These included attempted ramming, grappling, and directed energy attacks, including attacks against U.S. missile warning satellites in GEO.

EUCOM

Suspected Russian co-orbital ASATs are positioned near U.S. high-value satellites in LEO. Last night, one of the Russian co-orbital ASATs appeared to attack a U.S. ISR satellite, causing its destruction. Initial assessment indicates only a small debris field. It is a near certainty that Russia used its co-orbital ASAT to destroy the U.S. ISR satellite. It is unclear why Russia only executed one attack or if any further attacks are planned.

CENTCOM:

Last night, Iran used its Saman-1 tug to forcibly deorbit a U.S. military weather satellite. Simultaneously, several Iranian co-orbital ASAT vehicles conducted high-speed ramming attacks on other U.S. satellites in LEO. The debris field now threatens multiple commercial constellations. Iran claims it is "defending its sovereignty in space."

NORTHCOM:

Earlier today, a submarine launched a coordinated volley of 20 ballistic and cruise missiles against multiple U.S. targets: Naval Base San Diego, Nellis AFB, Vandenberg SFB, Beale AFB, and Fort Irwin. The attacks caused significant destruction and casualties. Damage at Vandenberg SFB included the destruction of two Cook Satellite Control Network antennas and damage to launch infrastructure. The perpetrators remain unconfirmed, though initial indications suggest Russian or Chinese submarines.

Vignette #5-All Groups: Nuclear Detonation in LEO (Day 180)

Five hours ago, a nuclear weapon detonated in LEO over the North Atlantic. The initial radiation energy release destroyed only a few satellites. However, the resulting EMP disabled hundreds of satellites. The residual radiation trapped in LEO is expected to significantly impact several hundred more satellites in the coming days, resulting in loss of operations, communication, and causing cascading anomalies. LEO satellites with inclinations above 45 degrees, particularly those in polar orbits, appear the most likely to be affected. It is unclear which nation detonated the nuclear weapon.

Workshop Results

Regardless of which regional team they were assigned to, workshop participants consistently believed that the United States is already responding to gray zone activities in space. Participants also identified that additional refinement of shared definitions, decision frameworks, and communication clarity will enhance the ability to effectively compete and control escalation. Conflict in space is not a future contingency; it is unfolding now in complex, ambiguous ways that challenge traditional approaches to deterrence, attribution, and response.

Space conflict cannot be understood through isolated incidents, but must be viewed as part of a broader, dynamic strategic environment.

Across the workshop, participants examined a series of vignettes designed to explore how space-related actions might be interpreted and responded to across the spectrum of competition and conflict. While these scenarios were initially considered independently, discussions quickly revealed the interconnected nature of events in space and their potential to influence multiple theaters, domains, and instruments of national power simultaneously. This reinforced a central insight: space conflict cannot be understood through isolated incidents, but must be viewed as part of a broader, dynamic strategic environment.

A recurring theme throughout the discussions was the gap between the increasing operational importance of space and the nascent nature of the frameworks used to understand and respond to conflict within it. Participants highlighted challenges related to attribution, escalation thresholds, strategic communication, and the availability of response options, each of which complicates timely and effective decision-making. At the same time, they emphasized that adversaries are actively exploiting this ambiguity, using gray zone activities to shape conditions in their favor while avoiding decisive responses.

Taken together, these discussions revealed a domain in which physical realities, policy ambiguity, and strategic competition intersect to create a uniquely complex operating environment. The following findings reflect areas of broad convergence among participants and highlight key challenges the United States must address to effectively compete in and, if necessary, fight in space.

Conflict in Space is Complex

Conflict in space is more complex than many workshop experts anticipated, hindering efforts to interpret actions, assess escalation, and select appropriate responses. The teams consistently found that the challenge is not simply a lack of policy clarity, but the fundamental nature of the domain itself. Space is difficult to observe, interpret, and explain. Unlike terrestrial domains, where actions are often visible and intuitively understood, space operations require a sophisticated network of sensors to detect activity at all. Even when activity is observed, the behavior of objects in orbit, driven by physics unfamiliar to most decision-makers, can be counterintuitive and difficult to interpret. This limits shared understanding across policymakers,

operators, and the public, and complicates efforts to assess intent in real time. These team-wide considerations raised four substantial mitigating factors to any response:

1. Space is inherently global and does not conform to traditional geographic boundaries.

2. Actions taken to achieve an effect in one theater can generate consequences elsewhere.

3. Military effects in space may require actions initiated from entirely different regions or domains.

4. The ability to attribute hostile acts in space is extremely challenging but necessary.

These physical realities are compounded by gaps in policy and conceptual frameworks. Participants highlighted the absence of clear, internationally accepted definitions of what constitutes conflict in space, as well as limited guidance on how the United States characterizes and prioritizes space capabilities. This ambiguity extends to foundational questions: whether space systems should be treated as critical national infrastructure or as operational military assets, and how hostile actions against them should be interpreted.

Notably, participants found the term "act of war" to be of limited utility in this context. Rather than focusing on whether a particular action meets a formal legal threshold, discussions centered on identifying hostile acts that warrant a response and determining what form that response should take. This reflects a broader shift toward practical decision-making in a domain where traditional constructs do not map cleanly to operational reality.

Participants also examined the role of norms and red lines in reducing ambiguity. While clearer expectations could help guide behavior and improve decision speed, establishing explicit thresholds presents trade-offs. Clearly defined red lines risk constraining U.S. decision space while incentivizing adversaries to operate just below those thresholds, achieving meaningful effects without triggering a response.

Taken together, these factors create a decision environment characterized by uncertainty and delay. In the absence of a shared framework for interpreting and responding to hostile actions, U.S. responses risk remaining ad hoc and reactive, ceding initiative to adversaries.

Gray Zone Activity & The Normalization of Hostile Behavior

Across the workshop teams, there was a strong consensus that ongoing activities in space have already progressed beyond traditional peacetime activity and even competition. While participants acknowledged variation in how the spectrum of conflict is defined, most agreed that U.S.-China interactions in space are firmly within the gray zone, characterized by actions that are coercive, often deniable, and deliberately calibrated to avoid triggering a decisive response. China's repeated hostile actions remain below the threshold of armed conflict, shaping the operational environment and increasing the risk of escalation.

These activities include non-kinetic attacks such as jamming, directed energy interference, and cyber operations against space-enabled systems. Participants noted that, over time, the frequency of these actions and the absence of proportional U.S. responses have altered perceptions of what constitutes unacceptable behavior. Actions that would have been considered highly escalatory a decade ago are increasingly viewed as routine.

This dynamic reflects a broader structural challenge: the lack of widely accepted international norms and clearly communicated consequences for hostile behavior in space. In this environment, adversaries can probe U.S. thresholds, test response options, and incrementally expand the scope of acceptable activity. The cumulative effect is not isolated incidents, but a gradual shaping of the operational environment in ways that advantage aggressors.

Participants emphasized that this trend risks placing the United States in a persistently reactive posture. Absent deliberate efforts to define expectations and impose costs, adversaries retain the initiative and the ability to select when, where, and how to apply pressure. Over time, this can create conditions in which escalation is driven less by a single decisive event and more by the accumulation of tolerated actions.

At the same time, participants highlighted that gray zone competition presents an opportunity as well as a risk. The United States can take proactive steps to shape the battlespace prior to a crisis or conflict. Actions taken today across diplomatic, informational, military, and economic lines of effort can influence adversary behavior, reinforce norms, and improve U.S. positioning should competition escalate.

This conditioning, discussed by teams across the scenarios, reflects a gradual but consequential shift in the character of competition in space in which incremental actions, left unaddressed, can cumulatively reshape the strategic environment. Several participants observed that the United States risks being slowly conditioned to accept increasingly aggressive behavior, a dynamic often described as "boiling the frog."

Adversary Cooperation Escalates Perception of Hostility

Adversary cooperation amplifies both the perceived hostility and strategic impact of actions in space, complicating U.S. response options and increasing escalation risk. While workshop vignettes were initially designed to be considered independently, participants quickly recognized that actions occurring across regions could be connected in time and purpose. When viewed collectively, activities attributed to Russia, China, and Iran were interpreted as coordinated or, at a minimum, mutually reinforcing efforts to achieve strategic objectives while stretching the U.S. capacity to respond.

This shift in perspective had a clear effect: actions that might be assessed as limited or ambiguous in isolation were viewed as significantly more hostile when conducted alongside parallel activities by other adversaries. Adversary cooperation, whether deliberate or opportunistic, complicated efforts to characterize and respond to individual actions and drove a more aggressive U.S. response than if the actions were viewed in isolation.

Participants further noted that simultaneous or overlapping activities create compounded operational challenges. Multiple crises unfolding at once, potentially across combatant commands, increased demand on U.S. decision-making, force posture, and escalation management. In such conditions, maintaining space superiority becomes more complex, as actions in one theater may influence or constrain options in another. As adversary relationships deepen, even loosely coordinated actions have the potential to increase pressure on the United States, complicate escalation control, and raise the risk that localized competition could contribute to broader, potentially global, conflict.

Attribution is Essential for Effective Response Options

Participants consistently identified attribution as essential to formulating credible response options. And, while attribution is a prerequisite for an effective response, it remains uniquely challenging in the space domain. Notably, attribution must extend beyond identifying which actor was responsible for a given action. It also requires understanding the nature and scope of the effect, the systems involved, and whether the outcome was intended. Without this broader context, decision-makers lack the clarity needed to determine appropriate responses. A lack of attribution limits decision-making, complicates escalation control, and undermines the development and implementation of credible coalition actions.

This challenge is compounded by the inherent characteristics of the domain. Space operations are difficult to observe and interpret. Even when activity is detected, distinguishing between benign anomalies, unintended effects, and deliberate hostile actions can be unclear. This ambiguity directly affected workshop participants, who frequently cited insufficient information as a primary obstacle to selecting response options.

Attribution also underpins legitimacy. Participants emphasized that the ability to confidently identify both the actor and the nature of the action is critical to aligning responses with the Law of Armed Conflict and building support among allies, partners, and industry stakeholders. Without a shared understanding of events, unity of effort becomes difficult to achieve, and response actions risk being perceived as disproportionate or unjustified.

Importantly, attribution is a decision-making enabler. The absence of timely, credible attribution introduces hesitation, delays response timelines, and increases the likelihood of either underreaction or unintended escalation. In this sense, gaps in attribution do not simply obscure events; they shape outcomes. For these reasons, participants concluded that robust space domain awareness is foundational to the U.S. ability to generate the clarity required to act decisively, communicate credibly, and control escalation.

Strategic Communication is a Decisive Element of Competition & Conflict

Strategic messaging is a critical element of competition and conflict in space, shaping how actions are perceived, enabling coalition alignment, and reinforcing the legitimacy of U.S. responses. Participants emphasized that the ability to rapidly identify, characterize, and communicate hostile or unsafe behavior is essential, particularly in the gray zone, where ambiguity allows adversaries to shape narratives to their advantage. If the United States does not define events early, competitors are likely to do so in ways that obscure their actions and complicate U.S. response options.

Effective messaging serves multiple purposes: it informs domestic audiences, aligns allies and partners around a shared understanding of events, and builds the foundation for coordinated responses. It also enables the United States to clearly articulate why specific actions are considered hostile or destabilizing, helping to establish expectations for responsible behavior in the domain. In this way, messaging is a valuable tool for shaping the operational environment and achieving credible response options across the DIME.

Participants further noted that strategic communication can play a role in broader geopolitical competition. Clear and consistent messaging can help counter adversary influence, particularly in regions where nations may be weighing alignment decisions. By reinforcing transparency and responsible behavior, the United States can strengthen partnerships and mitigate efforts by competitors to expand their influence through ambiguity or misinformation.

At the same time, participants identified a persistent gap in shared understanding between stakeholders within the Department of Defense and the broader space community. While significant progress has been made in developing frameworks, doctrine, and operational concepts, it is not always well understood outside of government channels. Classification constraints and the technical complexity of space operations further limit the ability to communicate effectively with external audiences.

Addressing this gap will require sustained effort. Expanding engagement with allies, partners, industry, and the public will be essential to building a common operating picture and reinforcing credibility. Overly restrictive security classification guidance will continue to hinder the success of these requirements.

Ultimately, participants concluded that timely, accurate, and credible strategic messaging strengthens the perceived legitimacy of U.S. actions, enables faster and more coordinated responses, and plays a central role in shaping both competition and conflict in space.

A Range of Credible Military Response Options is Needed

Credible, flexible, and scalable military response options are essential to deterring adversary actions, controlling escalation, and achieving space superiority in a contested domain. Participants universally highlighted that the United States must possess a broader and more capable suite of military response options to address the expanding range of threats in space. As adversary actions increase in frequency and sophistication, possessing limited response options constrains decision-making and risks forcing reliance on tools that may be inappropriate for the situation. In such conditions, the absence of tailored options can inadvertently increase escalation, rather than manage it.

A central and recurring theme among participants was the importance of responding proportionally. The ability to "respond in kind" was viewed as a critical enabler of escalation control, allowing the United States to impose costs, maintain legitimacy, and avoid unnecessary expansion of conflict. Without this capability, participants noted that it becomes more difficult to justify response actions and more challenging to shape adversary behavior.

Participants stressed that military response options must extend beyond the space domain and be synchronized across combatant commands. Space operations are inherently joint and global, requiring coordination across geographic and functional boundaries to ensure that responses are coherent and effective. U.S. Space Command plays a central role in this integration, aligning actions across domains to achieve desired effects while managing escalation dynamics.

Equally important are defensive and resilience measures that enable the United States to absorb and recover from attacks. Participants highlighted the value of architectural resilience, including hardening and redundancy, as well as the ability to rapidly reconstitute capabilities. These measures not only preserve operational effectiveness, but they also create the conditions necessary to respond from a position of strength following an initial adversary action.

In the context of prolonged conflict, the ability to regenerate and sustain capability faster than an adversary was viewed as a decisive advantage. Resilience and reconstitution are integral to maintaining the initiative and, indeed, superiority, over time.

Overall, participants concluded that without a range of credible military response options, the United States risks ceding first-mover advantage to adversaries and undermining its ability to deter, respond, and prevail.

Summary

Taken together, the workshop's findings highlight a central challenge: the United States must simultaneously improve how it understands, communicates, and responds to actions in space while competing within an already active and evolving gray zone. Without more widely understood frameworks, stronger attribution and messaging, and credible response options, the United States risks remaining reactive in a domain where adversaries are increasingly shaping the strategic environment. Addressing these gaps will be essential to maintaining space superiority and ensuring the ability to deter and, if necessary, prevail in conflict.

Recommendations

The ability of the United States and its allies and partners to compete in, dominate, and win conflicts in space hinges on establishing a framework that connects a shared understanding of hostile space activities with credible, legitimate responses. The bulk of the following recommendations carries forward current U.S. Space Command and Space Force initiatives, while adding fidelity and an emphasis on the elements necessary to achieve an enduring spacepower advantage.

Decrease ambiguity to accelerate decision-making

To speed the delivery of credible responses and bolster broad support for that response, the United States must work to establish comprehensive, universally understood standards, norms, or laws for outer space. Even if the United States unilaterally defines a set of acceptable behaviors, communicating them and adhering to them will aid future comprehension of aggressive actions and support the legitimacy of a needed response.

The lack of comprehensive, universally understood standards, norms, or laws for outer space often leaves ambiguity when determining if an action is hostile or not. This lack of clarity results in the competitor's action being analyzed and assessed rather than immediately responded to. The indeterminate time of inaction cedes an advantage to aggressors as they operate in this gray zone. Every lack of meaningful response sets a new norm of allowable behavior, often behavior that the United States and its allies consider unacceptable.

A strategic framework of acceptable and unacceptable behavior in space, which includes elements of definitions, norms, standards, thresholds, tripwires, red lines, and rules of engagement, all underpinned by the traditional Law of Armed Conflict, is a necessary component to prevail in space conflict. Clear definitions and expectations allow rapid decisions rather than time spent on analysis of adversary actions. Additionally, the United States and its allies gain credibility for their response options designed to deter aggressive behavior by imposing costs. The more broadly this strategic framework is accepted, the more legitimate response options become.

U.S. Space Command and Space Force have led the way in developing doctrine and lexicon as it pertains to space warfighting. This work should continue and be applied broadly within government agencies and allies. Additionally, Joint Professional Military Education must continue to evolve the thinking and understanding of a common framework and its competitive advantage during workshops and wargames.

Build Strategic Weight through Partner Integration

Allies and partners are invaluable when engaging with competitors and adversaries in a mostly anarchic outer space environment. Competition becomes a numbers game: those with the most capacity and equity in space are in a stronger position to set rules and norms that allow for favorable conditions when conflict arises. The greater the number of allies and partners who agree to the same set of rules and norms, the more entrenched these rules become; moreover, the more entrenched the rules are, the more legitimate response options become when those rules are broken.

U.S. Space Command and the Space Force have been forerunners in building multinational campaigns and relationships. These efforts foster the unity of effort necessary to gain strategic advantage in rules- and norms-shaping. These relationships are critical and must continue to be rapidly developed as they add strategic weight to acceptable norms of behavior as well as whole-of-government responses to aggression and hostile actions.

While multi-national, civil, and commercial relationships are formed, the roles of each of these entities within a framework of rules and norms must also be established. Ambiguity results in seams, which adversaries will exploit. Clarity in roles brings increased speed in decision-making and responses to unacceptable actions in space.

Unity of effort and the speed of decision-making are further enhanced when operational plans account for the anticipated roles of allies and civil/commercial partners and must be captured throughout the joint planning process. Multinational unity of effort is further enhanced through foreign military sales. The combination of interoperable capacity, a unified front prepared to respond to hostile actions in space, and a rapid decision-making framework set the most advantageous conditions to prevail during a conflict in space.

Shape Perceptions Through Strategic Messaging

While those who operate and defend space capabilities are intimately familiar with the importance of spacepower and the extreme risk of ceding the space high ground to adversaries, much of the public is unaware of its criticality. A framework for acceptable behavior paired with strong global partnerships is strengthened by broad public support.

When competitors or adversaries perform hostile actions in space, the United States and its allies must communicate that these actions have occurred, that they are unacceptable, why they are unacceptable, and that there will be a response. Doing so ensures the public understands why response options are warranted and aids in gaining Congressional support and funding to maintain a national spacepower advantage. Conversely, adhering to uninformed and idealistic desires for space to be kept as a purely peaceful domain, even while adversaries weaponize it, cedes strategic advantage. Thus, messaging campaigns must occur when unacceptable actions take place. Similarly, expected behaviors must be made public and frequently messaged. Classification barriers must be reduced to enable understanding and trust in the nation's, the combatant command's, and the service's actions to impose costs when hostile actions occur in space.

Deny Benefits of Hostile Actions Through Mission Resilience

Mission resilience deters an adversary's unacceptable behavior in space by denying the benefit they aim to achieve through hostile actions. Establishing a framework for acceptable space domain behavior, coupled with partnerships and communication to strengthen this framework, elevates national spacepower, but it does not make space invulnerable. The total set of activities that increase resilience and establish norms may minimize the level of degradation inflicted upon space capabilities that support joint warfighting when

conflict in space occurs, but there will still be degradation. Mission resilience is key and must be pursued in building force structure for both Space Force and terrestrial capabilities that support space superiority in the sister services. This view aligns with the Space Force's efforts to deny a first-mover advantage and the U.S. Space Command's tenet of victory to operate through a first strike.

The Space Force must continue to pursue proliferation and other means of increasing resilience that can absorb the blow when attacked in space. Proliferation and diversification must be applied to orbital regimes so that if, for example, a vast portion of LEO is made unusable due to a nuclear detonation, adequate mission capacity remains at GEO and/or MEO.

Tenaciously Defend Critical Infrastructure

Spacepower begins and ends with data networks, which enable command and control of satellites and the utilization of their delivered effects. The global nature of data networks, particularly when critically important commercial space assets are considered, results in numerous access points to disrupt large numbers of satellites asymmetrically via cyber-attack. Consequently, the Space Force has made cyber defense a core mission of its force structure. However, cyber defense tools and monitoring capabilities must expand and be constantly tested to ensure credible defense of these networks. Similarly, the Pentagon must view commercial space systems' cyber protection as critical to national security and work with commercial companies to test and validate their defenses. While protecting data networks is critical, the protection of space power projection platforms is just as critical.

The majority of U.S. spacepower is projected from government installations. Much like data networks, an asymmetric advantage is available to adversaries who can attack these installations and incur a disproportionate impact on space operations. The continued U.S. and allied reliance on space capabilities must be paired with effective, credible methods of force protection. National options and strategies for counter-UAS, missile defense, and Golden Dome must include space operations bases and installations as the highest priority for defended assets. Additionally, protection of power grids and water supplies must be incorporated into the broader strategies for both physical and cyber protection of national spacepower. A fortified spacepower infrastructure ultimately ensures both continuity of operations and the ability to conduct response options to counter hostile actions in space.

Build Credible Capability & Capacity to Execute Military Response Options

The ability to prevail in space conflict requires credible capabilities and the capacity to respond to unacceptable space behaviors by imposing costs on the adversary. The keys to deterring hostile actions consist of a clear international understanding of what constitutes hostile acts, broad concurrence and adherence to standards by partners and allies, and the ability to credibly respond with space superiority systems when standards are violated. Achieving, preserving, and restoring space superiority requires breadth and depth in capability. The Space Force must continue investment in space superiority weapon systems to disrupt and disable adversary space capabilities to ensure it possesses the breadth and depth to deliver credible and meaningful response options.

Prevailing in space conflict requires both the ability to impose costs on the adversary, defend space assets, and reconstitute space capability. Therefore, in parallel with space superiority weapon system investments, Congress must resource the Space Force to conduct dynamic space operations (DSO) that include servicing satellites, in-space logistics, and pre-positioning surge assets on orbit. DSO options complicate the adversary's hostile objectives and minimize the operational impact when their tactical objectives are achieved. Simply put, repairing, refueling, and replacing satellites minimizes the severity of an adversary's attack, and DSO investments provide that capacity.

Congress must also resource the Space Force for the ability to reconstitute capabilities when hostile acts are successful. In a peer-on-peer conflict, each side will incur damage to its on-orbit and terrestrial elements of its space architecture. The side that reconstitutes most rapidly will be in the best position to prevail. Importantly, the U.S. space launch architecture must be expanded to rapidly launch replacement satellites following attrition of on-orbit capabilities. Notably, China has five space launch complexes, while the United States has two. Space launch is the line of communication to the battlefield, and possessing greater capacity correlates to wielding greater spacepower. This does not necessarily mean China can launch more rapidly than the United States; however, it should be an area of strategic focus. A greater number of launch facilities and resources could mean more rapid replacement of forces, delivering a war-winning architecture for prolonged conflict in space. Importantly, added launch capacity is only part of the equation.

Increased national launch capacity will only provide a conflict-winning capability if the industrial base is capable of rapidly manifesting launch vehicles and satellites. The Space Force must have stable and predictable investment in the space industrial base to allow preparation of the battlespace and enable reconstitution. Similarly, procurement of ground equipment and satellite architecture must account for attrition in combat by including continuity of operations and on-orbit spares, stored replacement satellites, and the capability to rapidly produce replacements. Like any warfighting domain, the side with the best ability to effectively get resources to the fight is best positioned to prevail. The United States must make this a national spacepower objective.

Sharpen a Winning Edge Through Training & Exercises

Humanity has yet to experience high-intensity conflict in space. The Mitchell Institute conducted this workshop to better understand how conflict in space may progress and to identify the key elements required to prevail. While the Space Force and U.S. Space Command establish these key elements, the Pentagon, allies, and partners must all refine space warfighting skills and deepen their understanding of space superiority.

Ultimately, large-scale military conflict will result in some degree of degradation of space capacity. Joint operations must prepare to operate temporarily under degraded space environment conditions and while capabilities are reconstituted. Additionally, the terrestrial services must prepare to contribute to space superiority missions. Military response options will not always occur in space. The sister services will be expected to allocate resources for and execute options targeting ground stations and ground-based space superiority weapons such as direct-ascent ASATs, jammers, and directed energy weapons. Joint exercises must include these objectives to ensure prioritization of targeting is understood prior to conflict and ensure joint and coalition partners have an accurate understanding of munition inventories and demands as they pertain to evolving operational plans.

While joint operations seek to better incorporate space superiority implications, U.S. Space Command and components must hone the decision-making cycle, which incorporates the elements of hostile act criteria, response options, and reconstitution. As identified during the workshop, most participants assess that the United States is currently in a gray zone with China. While the United States works to define hostile actions and response options for gray zone activity, the resulting actions and decisions must be exercised and rehearsed to condition decision-makers and military forces to credibly respond to adversary actions.

In addition to gray zone conflict exercises, major combat operations in space must be exercised. While no Combatant Command has fought a war in space, the winning elements can be developed and put in place. The winning elements only win with decision superiority. Wargames and exercises hone these skills while identifying cracks in the armor. Additionally, while a framework of standards and norms does not yet fully exist, wargames and exercises must presume a framework is in place, along with DSO options and reconstitution capacity, so that the Pentagon is ready to execute them as those spacepower elements take shape and are fielded.

Figure 3: Virtuous cycle of recommendations to increase capability and capacity to respond to conflict in space.

Source: Mitchell Institute

Collectively, these recommendations form a virtuous cycle to create an increasingly credible combat capability, and the most likely means to deter hostile actions and escalation to conflict. The combination of clearly communicated norms and standards, allied and partnered adherence to and reinforcement of those standards, credible capacity to respond when standards are violated, mission resilience, reconstitution capacity, and routine exercising is the formula for building a space-conflict winning capacity for the United States. As more knowledge and refinement are gained on each successive iteration, the United States increases its ability to respond to and achieve victory during a conflict in space.

Conclusions

Conflict in space is not a distant or hypothetical concern. The United States, its allies, and partners currently face an increasingly contested environment characterized by coercive, deniable, and often ambiguous actions that fall below the traditional thresholds of armed conflict. Workshop participants broadly believe that the United States is operating today in a sustained gray zone in space, particularly with China. This condition favors aggressive actions short of open conflict to shape the strategic environment and could lead to unintended escalation.

Space presents a uniquely complex warfighting environment. The global and technical nature of the domain complicates the understanding of and response to hostile acts. As a result, attribution, escalation management, and credible response selection are daunting. Further, actions taken in space rarely produce isolated or localized effects; instead, they cascade across geographic combatant commands, civilian infrastructure, and global equities.

Despite these challenges and the lack of historical conflicts to build understanding on, U.S. Space Command and the Space Force must nonetheless prepare for conflict in space. By examining different elements impacting the interpretation and response to hostile acts, this workshop identified several key areas that strengthen the U.S. and allied response to aggression. These findings and recommendations largely align with existing efforts underway within the service, combatant command, and larger national security enterprise.

Improving baseline understanding of what constitutes a hostile act in space and why it matters through strategic partnerships and communication will be the essential first steps in growing a more robust space posture.

Improving baseline understanding of what constitutes a hostile act in space and why it matters through strategic partnerships and communication will be the essential first steps in growing a more robust space posture. It aligns development activities within the United States and allied nations. It also accelerates the ability to identify, interpret, and respond to hostile action. In the absence of shared definitions and understood response frameworks, adversaries can normalize progressively hostile behavior while avoiding meaningful costs. Over time, this dynamic risks conditioning the United States and its allies to tolerate levels of interference that would once have been considered unacceptable.

In a domain where actions are often invisible to the public and poorly understood outside specialized communities, the ability to rapidly attribute and clearly communicate adversary hostile or irresponsible behavior is essential. Strategic messaging shapes perception, reinforces legitimacy, aligns allies and partners, and constrains adversary narratives, particularly in the gray zone.

As identified in Space Force and U.S. Space Command documents, the ability to deny first mover advantage or operate through an attack is critical to preserving a spacepower advantage and minimizing the urgency to respond immediately. Through ongoing mission assurance initiatives, such as proliferation, diversification,

and reconstitution, the United States is building future decision space. By allowing decision-makers more time to assess the impacts and ramifications of an attack, they will be better postured to respond credibly. This does not mean an indefinite period, because a response too long delayed will lose legitimacy and meaning. Worse, it could signal acceptance of a new norm and continue to cede initiative to the adversary. At some point, a response to hostile action is required.

Beyond a shared understanding, the ability to attribute hostile actions, and the ability to operate through an initial attack, the United States and its allies must have a robust suite of credible military response options and sufficient capacity to signal a willingness to execute those options. Based on the system attacked, the effects generated, adversary intent, and the geopolitical context of a hostile act, decision-makers require a range of options. While it may not be the desired first choice, the ability to "respond in kind" adds a level of legitimacy that might best deter further aggression. However, without options for different levels of response, decision-makers may be forced to choose between inaction and disproportionate action. Either circumstance could lead to increased escalation, making a bad situation worse.

In the event of a protracted conflict in space, the side that can reconstitute lost capabilities the fastest and for the longest duration will have a decisive edge. While the United States and its allies may not want to consider a war of attrition in space, it would be foolhardy to assume friendly forces will not experience losses that must be overcome. Therefore, the ability to rapidly reconstitute will become a key element of a credible military response option.

Regardless of the force structure developed, regular and continuous training and exercises will be an indispensable method to enhance combat credibility and refine U.S. and allied shared understanding of conflict in space. Training and exercises will increase proficiency and identify shortfalls in execution, iteratively leading to better understanding, capability, and operational practices.

The virtuous cycle emerging from this workshop reduces ambiguity through clearer standards, definitions, and frameworks; accelerates decision-making; and strengthens legitimacy. Partner integration builds strategic weight and expands both capacity and options. Strategic communication shapes perceptions and reinforces norms. Mission resilience and infrastructure defenses deny adversaries the benefits they seek. Credible capability, capacity, and reconstitution enable the imposition of costs when standards are violated. Training and exercises bind all these elements together, conditioning decision-makers and fielded forces to operate decisively under uncertainty.

By embracing the findings and recommendations of this workshop and committing to their sustained implementation, the United States and its allies can increase combat credibility, deter hostile behavior, control escalation, and preserve the ability to prevail should conflict in space occur. Allowing ambiguity to persist and hostile behavior to normalize risks ceding initiative in a domain that underpins military power, economic prosperity, and national security. The path forward is clear; the challenge lies in acting with urgency, coherence, and resolve.

Endnotes

1 U.S. Space Force, *Space Force Doctrine Document 1*, SFDD-1 (The Space Force Space Training and Readiness Command (STARCOM), April 3, 2025).
2 U.S.SPACECOM, "Elements of Victory: Achieving War-Winning Advantage in Space," April 8, 2025.
3 U.S. Space Force, *Space Warfighting: A Framework for Planners* (U.S. Space Force, March 2025).
4 Workshop participants included twenty-five government and military personnel, with ranks from Sergeant to Chief and Major to Colonel. Twenty-one industry representatives, many with extensive prior military space experience also participated in the workshop. Six international officers, with equivalent ranks of Major to Colonel, rounded out the workshop participants. In total, twenty-nine participants had extensive or significant national security space experience, with five of those having doctoral degrees in related fields.
5 Sandra Erwin, "U.S. Space Force official warns of rising Chinese threats," *Space News*, December 8, 2024; and Joseph Trevithick, "U.S. Satellites Are Being Attacked Every Day According To Space Force General," *The War Zone*, November 30, 2021.
6 SFDD-1.
7 "Elements of Victory."
8 *Space Warfighting: A Framework for Planners*
9 International Committee of the Red Cross (ICRC), *The Law of Armed Conflict: Basic Knowledge* (Geneva: ICRC, June 2002); and United Nations Office for Outer Space Affairs, Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, 1966.

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