

The Role of Space in Defense Strategy

Workshop Summary

October 16-17, 2023

Center for Global Security Research
LAWRENCE LIVERMORE NATIONAL LABORATORY

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On October 16-17, 2023, the Center for Global Security Research (CGSR) at the Lawrence Livermore National Laboratory (LLNL) hosted a workshop on the role of space in U.S. defense strategy. This event brought together over 85 participants drawn across the policy, military, scientific/technical, and think-tank communities, as well as experts from the United States and a number of allied countries.

The discussion was guided by the following key questions:

1. Is U.S. space strategy well-integrated with U.S. defense strategy?
2. How can space support U.S. objectives across the conflict continuum?
3. What does and should space contribute to U.S. defense, deterrence, and peacetime competition objectives?

Key takeaways:

1. “We have come such a long way but have so far to go.” With this short phrase, one of the speakers captured the essence of two days of discussion. A great deal of progress has been made over the last 15 or so years in developing U.S. space strategy and integrating it with U.S. defense strategy. But each step forward has revealed new challenges and helped bring into better focus the next big questions needing better answers. Moreover, with rare exception, space has not been brought into the larger conversation about deterrence and defense in a way that everyone can understand.
2. Establishment of both the U.S. Space Force (USSF) and US Space Command (SPACECOM) sent a clear message to both adversaries and allies that the United States will protect its interests in space—a message that can be expected to have a stabilizing influence. As the USSF gets on with its duties to organize, train, and equip and as SPACECOM becomes more normalized as a warfighting Command, there is a growing appreciation of the similarities and

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differences with the other Services, commands, and domains. One of the chief similarities is a bureaucratic culture that stifles innovation. One of the chief differences is that no one in the space domain is at risk of dying.

3. Space is maturing as a new military domain at the same time that DoD is becoming more interested in how to better integrate operations and capabilities in all domains to redress the deteriorating security environment. But integrated deterrence remains a work in progress. Thus, we should not be surprised that space's role in integrated deterrence is not widely understood. U.S. space operations and posture can impact an adversary's deterrence calculus in various ways. A more resilient space architecture can be expected to reduce the adversary's expected benefits of attack in space. Improved means to degrade or destroy the adversary's space architecture can increase the adversary's expected costs and risks of aggression in any domain, but more importantly it may be a key enabler of U.S. intervention in a crisis via ensuring U.S. freedom of maneuver. Space may prove particularly valuable as a domain for imposing cost and risk because coercive actions there are not widely visible, meaning that leaders can save face while acquiescing to coercion. But there are also limits to the utility of space in deterrence strategy arising, for example, from the desire to conceal capabilities.
4. With China as the defense strategy's "pacing threat," its capabilities and ambitions in space are increasingly important. China's leaders view space superiority as an imperative. It is essential for both defeating U.S. power projection and projecting China's own military power. It also plays a central role in "informatized" and "intelligentized" warfare and in "the strong system of strategic deterrence" to which Xi Jinping is committed. Xi has argued that "space must be well managed, well utilized, and well protected." China's leaders also believe that they are behind the United States in the competition for space dominance. But they also see the United States as dependent on space and as vulnerable there.
5. The asymmetric vulnerabilities of the space capabilities of China and the United States have informed much of the American discourse about the role of space in a future war. The prevailing view has been that China, as the less vulnerable of the two, has more latitude to start war in space. But the asymmetry is declining as China becomes more dependent on space for various military purposes and for economic benefit. Moreover, the asymmetries may not matter much if both are vulnerable to a significant degree. At this time, neither China nor the United States can be confident of its ability to manage large-scale conflict in space.
6. With its emphasis on the full continuum of conflict (from rivalry and competition through crisis to war), the U.S. defense strategy is generating renewed discussion about how best to compete with China in space over the long term. That stimulus runs up against the fact that the U.S. enjoys many competitive advantages over China, resulting in an unhelpful complacency in some U.S. circles. That complacency undermines timely and effective implementation of policy initiatives to reshape the competition to U.S. advantage.
7. U.S. defense strategy emphasizes the role of campaigning in day-to-day activity to shape the security environment, though it has little to say about deterrence campaigns. If constructed and implemented at the national level, such campaigns have significant potential for strengthening deterrence through sustained focus, improved coordination and integration, more coherent whole-of-government approaches, and a continuous and supporting net assessment process. But existing campaign plans are balkanized across the United States government.

8. U.S. allies will play an increasingly important role in the balance of space power. So too will private sector partners. NATO's approach to space reflects this new competitive landscape. That approach has matured significantly during the course of the war in Ukraine, which has taught many lessons about the likely future roles of allies and partners in conflict. Strategic cooperation among these actors will not progress quickly with a master plan crafted by the United States government; rather, each must pursue what its interests require and then consider together how best to make the whole more than the sum of the parts. Improved collaboration will, however, require reforms to overcome over-classification and over-regulation.
9. In militarized crises, the role of space could prove significant, whether as a stabilizing or destabilizing factor. Instability might be driven by the need and temptation to deliver a debilitating first strike. Stability might be driven by the shared risks associated with bringing conflict to a domain characterized by mutual vulnerability and a strong connection to nuclear operations.
10. In war, space will be critical to both Red and Blue. Both will seek to exploit space as an enabler of success in other domains. Both will seek to deny the other such successes. Both will try to use space-based capabilities to create strategic dilemmas for the other—that is, choices between two or more courses of action, each of which may look relatively more costly or risky than desirable. Red strategies, as so far elaborated, focus on what Russia calls “regional war” and what China calls “local wars under informatized conditions.” But red is also concerned with the possibilities of unrestrained warfare and of trying to secure their interests in the context of global war. This raises uncomfortable questions about how to know when the transition point is approaching and how to reduce the risks of escalation.
11. The deterrence and defense benefits of space across the full spectrum of conflict cannot be met with offense or defense alone; both are needed. This raises sensitive questions about how much of each is enough and how much is too much. Offense involves a spectrum of capabilities, from disruptive to destructive to mass destruction, for attacking both assets in space and the supporting terrestrial infrastructures. Defense also involves a spectrum of capabilities, from target resilience to target protection to system resilience. A mix of capabilities across both spectrums is more strategically valuable than a few high-end capabilities in deterring and managing escalation. In combinations they help to generate more decision space for leaders.
12. The defense strategy also discusses the importance of risk reduction and strategic stability. It also rejects sole reliance on deterrence for these purposes, while recognizing the potential contributions of a deterrent with the proper attributes. The existing arms control regime is based on the Outer Space Treaty, which lacks clear definitions and is becoming rapidly outdated. Other forms of arms control are conceivable but unlikely. One option to mitigate the chances of unintended or accidental escalation in space would be a space version of the Incidents at Sea Agreement, or the Prevention of Dangerous Military Activities Agreement. An extension of the agreement on non-interference with national technical means in New START would also be useful. But the United States and its allies and partners are likely to have to continue to rely heavily on establishing and policing norms of responsible behavior in lieu of arms control.

13. The next innovations in space strategy and policy are unlikely to be accomplished without broader awareness among political leaders and the American public of the military challenges and opportunities in space. This requires a political strategy to keep them informed and to sustain their commitment. This in turn requires that military challenges and opportunities be put in a broader space context and in a strategy for space that advances a broad set of political, economic, and other national interests. Strong executive-legislative partnership is needed and thus also a measure of bipartisanship sufficient to long-term strategy.

Panel 1: The “Pacing Challenge:” Understanding China’s Decision-Makers

- How does space fit in their grand strategy?
- How do they think about war in space?
- What do they value (that we can put at risk)?
- How much military and political risk are they willing to accept?

China considers space superiority as imperative for their grand national strategy, but perceives the United States as enjoying asymmetric, qualitative advantages in a zero-sum technological rivalry—advantages long considered a threat to offset Beijing’s quantitative and geographic advantages, enable rising U.S. belligerence, and constrain key Chinese growth objectives. Thus, China’s mounting efforts to counter this imbalance and become a fully-fledged, world-class space power are essential to the broader China Dream of becoming a world-class political, economic, and military power. Even despite growing economic limitations and resource tradeoffs, these space ambitions remain a core national priority, motivating wide-scale investments in space-based position, navigation, and timing (PNT), intelligence, surveillance, and reconnaissance (ISR), a JADC2-equivalent network information system, and more civilian undertakings like a manned space station and moon mission. In sum, China’s space objectives are central to their national objectives, including in securing said objectives against U.S. interference.

Should this come to a head in conflict—such as one over Taiwan—Beijing perceives the United States as disproportionately dependent on space for long-distance power projection, motivating China’s decades-long buildup of diverse counterspace capabilities and the establishment of the Strategic Support Force. Early attacks on U.S. space infrastructure—communications, ISR, PNT, and any other satellites enabling over-the-horizon targeting and precision-guided munitions—are considered essential to dominating the information sphere and executing their integrated “informationized” or “intelligentized” warfare strategy. However, Beijing’s relatively risk-tolerant approach to space conflict might soften as China continues expanding its own space footprint and the asymmetry narrows. Indeed, this question of relative space dependencies—and how they are expected to evolve—framed much of the discussion on how each nation might leverage space in U.S.-China crisis and conflict contingencies. With the United States broadly reliant on satellites for joint warfighting in the Indo-Pacific, and China for projecting power beyond the second island chain, both nations might prove sufficiently vulnerable and thus unable to manage large-scale, destructive space conflict.

Lastly, wrapped up in China’s space-enabled informationization strategy is controlling the cognitive domain domestically and establishing a “cone of silence” over Taiwan in an invasion contingency—both with significant space implications. Indeed, Beijing’s political and military risk calculus is influenced by party and public support, and their projected grip on information in

an unpopular drawn-out conflict. And beyond the risks associated with endangering China's own burgeoning space economy, commercial space capabilities (seen as indistinct from national U.S. assets) on display in Ukraine pose an additional threat to China's Great Firewall, domestic social control, the "cone of silence", and intelligentized warfighting broadly. These overlapping dynamics in could dramatically shift how much risk China is willing to accept in the space domain.

Panel 2: Space and "Peacetime" Competition

- What are U.S. competitive goals in space and with space?
- What is the place of space in the strategy to build enduring strategic advantages?
- How can the private sector be unleashed toward this purpose?
- How much should the U.S. ask of its allies and how can it improve their integration?

At the highest level, the United States' competitive space goals have been widely enshrined in doctrine, emphasizing the overlapping civil, scientific, commercial, and national security implications and interests presented by space. Central to this discussion is the USSF's concept of competitive endurance, whereby building enduring strategic advantages requires avoiding operational surprise with improved domain awareness, denying first-mover advantage through resilient architectures, and responsible counterspace campaigning that sustainably bolsters deterrence. However, these strategic platitudes—while valuable—are not being met with enough implementation activity, or at the necessary speed. Careful policy planning, collaboration, and execution of space operations in a highly contested domain is urgently required, as actions undertaken in "peacetime" decide what is possible in crisis and conflict, and space will prove integral to strategic competition going forward.

Among these policy priorities is strategically shaping the role private industry could play in securing long-term competitive advantages in space—a topic of significant discussion. Broadly, the United States must construct appropriate, whole-of-government approaches that foster private space innovation, secure the space industrial base, acquire commercial capabilities at the speed of relevance, align public and private incentives, facilitate data integration and interoperability, and define and mitigate operational risks for commercial. Also important is striking a strategic balance between indigenous and commercial space infrastructure, and scaling this balance throughout the conflict spectrum—perhaps through a civil reserve air fleet (CRAF)-inspired model. Fully unleashing and harnessing the private sector would present a unique strategic advantage over rival space powers, but significant policy effort is needed towards this goal.

The prospect of allied cooperation presents a parallel opportunity for achieving space diversity, resiliency, and redundancy against mounting counterspace threats. Unlocking this potential will require enhanced information sharing and ultimately coordination on space strategy and operations, activities that have historically been inhibited by particularly burdensome classification regimes. Lessons learned from the European Union and the North Atlantic Treaty Organization (NATO)—which itself owns zero space capabilities—could inform a more integrated allied approach towards space security, building on their collective structures, planning processes, and space exercises to understand emerging space challenges and strategize accordingly. However, given budgetary constraints, the United States must be pragmatic and strategic about opportunities and expectations for allied space contribution.

Panel 3: Space and Militarized Crises

- What does space contribute to stability and instability in a complex crisis?
- What dilemmas can we present to our adversaries in and with space? And they to us?

Framing the international order as an equilibrium, this discussion was broadly structured around whether that equilibrium is particularly stable or unstable, and whether or how space activities compound or mitigate potential instability or crises. The answers to these questions vary considerably across contexts and time, as the 2007 Chinese ASAT test demonstrated the fragility of a space equilibrium previously considered relatively stable. The resulting shift towards more resilient and proliferated satellite architectures is driving the space equilibrium back towards stability, but the United States' voluntary moratorium on direct ascent, debris-producing ASAT tests could have uncertain equilibrium effects. Even in condensed timeframes—or simultaneously—space can contribute either stability or instability to the international order. Beijing's expressed fears over Starlink in the Ukraine War, a potentially stabilizing force for deterrence, were quickly upended by Elon Musk's erratic decisions on providing service to Ukraine. Entangled space systems with strategic, tactical, and now commercial applications could also have contradictory or complicating effects on stability in a militarized crisis.

Moreover, mutual vulnerability and transparency—dynamics classically thought of as contributors to stability—might not necessarily hold in space. China's weaker relative dependence on space does not categorically undermine first-strike stability, as China could still fear U.S. retaliation in another domain. Nor should complete space parity and mutual vulnerability guarantee stability, as counterspace aggression might still appear promising for securing comparative advantages. And while growing space-based ISR capabilities promote increased transparency, observation itself appears to be an insufficient deterrent for highly-motivated aggressors, both on Earth and in space.

Transparency also implicates the question of revealing or concealing U.S. and allied space capabilities, which presents uncertain implications for crisis stability. Deterrence signaling in space can be particularly potent for stability, but the United States and allies lack coherent strategy underpinning if, how, and when to message or reveal/conceal—particularly in the case of any counterspace weapon development. More broadly, presenting adversaries with dilemmas in space requires demonstrating resilience to withstand initial attacks, convincing the adversaries they incurred more risk than strategically predicted (which benefits from allied involvement), signaling the political will to respond, and exhibiting the capabilities and operational knowhow to deliver said response. Although establishing U.S. Space Command was an important first step, imposing these stabilizing dilemmas on red necessitates an expanded effort in each of these components.

Panel 4: Space and Regional Wars with Major Power Rivals

- How can Blue ops in space advance Blue objectives in regional war?
- How can Red ops in space advance its objectives?
- How dependent will Blue and Red be on space to enable terrestrial operations?
- Do some capabilities contribute more to conflict de-escalation than others?

Going forward, Blue operations in space are expected to be decisive for Blue objectives in any regional war, and particularly in the Taiwan contingency. Indeed, collecting and transporting data for communications, ISR, missile warning, PNT, and other key missions across the vast and largely maritime Indo-Pacific theater can only be accomplished through satellites. Beyond the United States, regional allies are also expanding their space posture, developing ISR and PNT capabilities that enable long-range strikes against time-sensitive targets, hypersonic glide vehicle tracking, and more robust space domain awareness for added warfighting functionality. Resolving allied integration and interoperability issues—particularly in the intelligence-sharing context, and perhaps in the model of command and control battle management capability (C2BMC)—and strategically coordinating a space division of labor would bolster the value of space in advancing terrestrial objectives. However, a significant question looms of how and if Blue counterspace capabilities would be used in a space-enabled “regional war” with Russia or “local war under informatized conditions” with China.

Regardless, as China continues expanding its own space-based ISR and PNT capabilities for long-distance power projection, and Russia maintains core elements of their military space infrastructure, Blue can expect to face space-enabled dilemmas in territorial conflict. Importantly, China has not just mirrored U.S. space architectures, but instead developed capabilities in direct support of their specific joint warfighting objectives. And beyond using space to support military operations across other domains, they would likely seek to advance objectives through attacks in space itself, posing additional threats to Blue’s strategy. Specifically, Red appears particularly concerned with ISR and PNT satellites that enable over-the-horizon targeting and precision-guided munitions—making these blue systems likely a priority set of counterspace targets for red. These realities should underscore the importance of resilient and diverse space architectures, as well as of developing offensive capabilities to deny adversaries’ hostile uses of space against the U.S. and allied joint force.

And given the various attributes and effects of different counterspace weapons, Blue would benefit from a diverse portfolio approach that broadens strategists’ and policymakers’ decision-space in multiple conflict contingencies. This should importantly include an array of ground-based weapons that can interrupt red space operations—a ripe area for allies to develop sovereign capabilities that exploit unique geographies and access. This would leave on-orbit capability to the United States, where critical decisions must be made about the role of debris-generating ASATs in Blue’s counterspace portfolio. Regardless of the scale of the current debris issue, Blue policymakers should consider the destructive and escalatory implications of wide-scale kinetic space warfare, while recognizing that Red’s perceptions of responsible space behavior might be less constraining.

Panel 5: Space in Deterrence Campaigns

- What is deterrence campaigning?
- How can deterrence campaign planners better integrate space?
- Are there specific campaigns we should consider to shape the space domain?

At the core of deterrence is frustrating an adversary’s belief in their ability to achieve their objectives at a tolerable price. To this end, deterrence campaigning can be characterized as planning and executing a series of continuously linked activities designed to influence adversary actions and frustrate that belief. Although this integrated campaigning concept exists in the

National Defense Strategy, implementation has fallen short of what is needed. In designing effective campaigns, planners should establish explicit deterrence objectives, develop an understanding of adversary decision-makers and their decision calculus, and construct a cohesive regimen of deterrence exercises, messages, actions, and means across various timeframes and contexts to influence said calculus. This process should be integrated across combatant commands, the services, the joint staff, agencies, and partners, and completed campaigns should be regularly assessed for effectiveness.

Exactly how space should be integrated into deterrence campaigns depends on the specific deterrence objectives, but given the importance of space in enabling the American way of war, campaigns must broadly signal the futility of attacking U.S. space systems. For this, campaigns that demonstrate the resiliency of space architectures or exercises showcasing warfighting continuity within a degraded space environment could broadcast to adversaries that they must fight the U.S. joint force at full strength. Specific high-priority objectives should include deterring further destructive ASAT testing, deterring attacks on U.S. space infrastructure (especially nuclear command and control and early warning), and deterring the use of nuclear weapons in space, but planners should seek opportunities for integrating these into larger deterrence campaigns.

Other considerations for maximizing campaign effectiveness could include the integration of commercial and allied partners, building off the success of the Schriever Wargame towards more holistic planning. Further leveraging the intelligence community for Red leader analyses would also help tailor campaigns to adversaries' specific deterrence calculus. However, space signals are often mediated through sensors, making counterintelligence and frequent assessment critical to ensure the messaging is received. That being said, campaign designers should remain cautious of over-revealing through messaging or exercises, given the strategic value of calculated ambiguity for stoking adversaries' uncertainty—particularly in the lead-up to crises. This double-edged sword of ambiguity also extends to the question of redlines in space, another area where more strategic thinking is needed.

Panel 6: Risk Reduction and Strategic Stability in Space

- What does and can arms control contribute to these objectives?
- What other approaches might be helpful?
- What can we learn from prior risk reduction endeavors that we can apply to space?

Across the board, the various dimensions of strategic stability appear to be eroding, as Red develops increasingly advanced counterspace capabilities while Blue appears ill-equipped to deny red hostile uses of space. While improved deterrence could bolster strategic stability, supplementing an appropriate deterrent with formal risk reduction should remain a national space priority. However, the existing space treaty regime—with the Outer Space Treaty (OST) at its foundation—suffers from critical shortcomings, with ambiguous principles, limited or non-existent verification and enforcement mechanisms, and undefined key terms. And though strengthening the OST would substantially augment strategic stability, without a system-wide shock, the leading space powers appear unlikely to broker any sweeping agreement on space arms control or responsible space behavior—particularly with Russia playing “spoiler”.

However, other more piecemeal approaches towards propagating risk-reducing norms could prove more tractable. At the most foundational level, achieving “quick wins” by concentrating on narrow areas of mutual interest—such as safety and space traffic management—could eventually expand into more security-focused efforts. These initial steps would require improved space transparency and communications, ideally through Track 1 space dialogues that are coordinated with other diplomatic efforts. Other promising avenues involve building on existing space security norms, like codifying the longstanding principle of peacetime non-interference with national technical means—to be potentially parlayed into broader non-interference norms. Commercial advancements in establishing space “rules of the road” could also snowball into bilateral, regional, or multilateral efforts, an instance of the purse leading the flag.

Prior risk reduction efforts in other domains and contexts also provide useful templates for space norm development. For example, the Incidents at Sea (INCSEA) agreement models a regime to develop principles of safe operation that could be applied to destabilizing proximity operations in space. Another precedent for managing unintended escalation is the Prevention of Dangerous Military Activities Agreement. Regardless of exact approach, the US should lead in the development of a framework for international space norms.

Panel 7: How Much Offense is Enough?

- Is reverse capability enough?
- Is offense vs. LEO enough?
- How is the scale of the problem changing?
- Is there a role for space offense in crisis bargaining?

Ongoing efforts to improve U.S. space resiliency are necessary, but insufficient. The US must also expand and accelerate the development of offensive capabilities to achieve its objectives and protect national interests, particularly as China continues closing the space support asymmetry and positions itself for increased hostile uses of space. As in the cyber domain, the ability to travel “upstream” and target attacks at their source—beyond just defensive patching—will prove instrumental for denying adversaries’ first mover advantage as well as space-enabled attacks on the U.S. joint force. While fielding robust reversible capabilities would be an excellent first step in bolstering deterrence credibility—versus debris-generating weapons that Blue might be perceived as hesitant to deploy—the United States would benefit from convincing adversaries that all options are available.

Indeed, as China’s space buildup has led it to operate over half of the world’s ISR satellites, this has changed the scale of the problem towards a target-rich environment. This problem may become more acute in the next decade if China fields its planned 10,000+ satellites across multiple orbits. Maintaining enough decision-space for blue leaders through crisis and conflict will require a diverse toolkit of space control capabilities—including less uncertain irreversible options and offense across orbits. However, planners should balance these tactical demands against legitimate concerns of fueling an escalatory, tit-for-tat arms race and stoking the perception of the United States as space aggressor, which could weaken U.S. diplomatic credibility. For this, the question of “enough” should be dictated by the specific effects of offensive capabilities in achieving national objectives, such as “enough” to hold significant

Chinese capabilities at risk. This would establish a role for space offense in crisis bargaining by presenting adversaries with strategic dilemmas in and through space, thereby affording U.S. military decision-makers the necessary operational latitude.

These questions additionally evoke recurring themes of reveal/conceal and allied integration. Over time, without overt demonstrations, risk-tolerant adversaries might become emboldened by U.S. ambiguity over its counterspace capabilities. Strategically revealing highly durable technologies through space control exercises could shore up credibility. Moreover, allied development of reversible weapons—particularly those that exploit unique geographies—could create additional dilemmas for adversaries during crises. The emerging commercial space control market might also present significant opportunities, as well as deep regulatory challenges. Regardless, fielding a robust “enough” suite of offensive capabilities will require widescale improvements in space domain awareness for finding, fixing, and tracking targets, as well as a significant system for testing and training.

Panel 8: Getting the Political Strategy Right

- What is the right public narrative?
- What needs to be done to overcome the many barriers to success?
- Who must lead?

Although space remains a surprisingly bipartisan issue in Washington, the public narrative surrounding space—and particularly its role in national security—could use considerable refinement. Now approaching the USSF’s fourth birthday, public messaging has concentrated on space as an accessible, important, but largely civilian domain, enabling weather services, point of sale transactions, and GPS navigation. On face, none of these examples invoke an immediate national security dimension, weakening the perceived relevance of USSF and USSPACECOM—both among the national security community and the public writ large.

Instead, communications should emphasize that the United States will have to *contest* the space domain in an unprecedented way, that space architectures present a single point of failure for the joint force in meeting its objectives, and that America needs ready, resilient, and combat-credible space forces. Underlying this messaging should be broad American exceptionalism in how space underpins economic competitiveness, civil society, technological innovation, and our commitments to allies. Clarifying the mission of USSF and SPACECOM will better position them to compete for coveted resources, talent, and attention.

Presenting a cohesive narrative will be complicated by the inherent complexity of the space domain, as well as the lack of coordination between defense and intelligence agencies with space-related jurisdictional overlap. Moreover, existing space expertise is spread thin between the public and private sectors, limiting the potential effectiveness of an informed messaging strategy for a national security audience—leaving space as misunderstood “fairy dust”. Burdensome classification regimes can also compound miscommunication, particularly with allies and eager commercial partners. Generally, overcoming these barriers will require diverse leadership—particularly from non-space experts and emerging leaders—who forego the constraining and

oftentimes inapplicable nuclear deterrence vocabularies. Instead, a successful messaging strategy must strike the appropriate balance between “normalizing” space and appreciating its unique implications.



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