RESPONSIVENESS IS NOT OPERATIONAL

ALIGNING STRATEGY IN THE NEWEST SERVICE

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The US Space Force is facing its greatest challenge: aligning new strategies with old. But when the new and old clash, as is actively happening in the tactically responsive space program, the difficulty in aligning acquisitions, tactics, operational readiness, and strategy becomes clear. This article highlights these challenges and offers solutions to enhance readiness in space with recommendations across all levels of war.

Formed mainly in reaction to adversaries such as China and Russia, the US Space Force has its roots in the US Air Force. Though this foundation dates back to the Cold War, it was primarily cemented between the early 1990s and when the Space Force was established in 2019, a time when US spacepower was largely uncontested. Contrary to the Air Force's beginnings in the throes of World War II, the Space Force has not yet been asked to prove itself in battle. Because of this, the service has been left to determine how to generate effects during protracted operations independent of experience.

With the lack of competition in the domain after the Cold War, US military space operations and now the US Space Force have had no need for robust spacepower theory, nor have there been experiences available upon which to base such theory. This is in contrast to the development of airpower, bathed in theory and experience and tested by adversaries competing to gain advantages provided by ever-capable aircraft with an assortment of roles.

In the early 2000s, the concept of operationally responsive space (ORS)—fast-tracking development and design to rapidly produce combat effects for the warfighter—and its later iterations were created to bridge the gap between theory and threat and to exercise the speed and capability of up-and-coming commercial partners.[1]

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1. Arthur K. Cebrowski and John W. Raymond, "Operationally Responsive Space: A New Defense Business Model," *Parameters* 35, no. 2 (2005); and Scott C. Larrimore, *Operationally Responsive Space: A New Paradigm or Another False Start?*, research report for CADRE/AR, US Air Force, rep. no. AU/AFF/NNN/2007-04 (Maxwell AFB, AL: Air Force Fellows Program, April 2007).

Yet the concept of responsiveness, as a part of nascent spacepower theory, has bled into operational language and muddied the understanding of strategy, tactics, and requirements for the Space Force. But what is responsiveness? And how does responsiveness benefit a commander?

Current space doctrine defines responsiveness as the ability to react to changing requirements and meet combatant commander needs to maintain support. It is providing the "right support in the right place at the right time" and includes the ability to swiftly meet operational needs.[2] Yet this definition fundamentally varies from doctrine to doctrine and within the service itself. This confusion surrounding the notion of responsiveness and what it means is a case study of the misappropriation of terminology, the misalignment between doctrine, strategy and acquisitions, and an ignorance of history, that highlights why the US Space Force generally misunderstands how modern armed forces operate.

A critique of the tactically responsive space (TacRS) program—the initiative to develop and launch small satellites on short notice—reveals the challenges of defining the language of the domain that leads to doctrinal deficiencies and procurement requirements at the tactical, operational, and strategic levels. By increasing the focus on requirements, Space Force leaders can improve access to space and the sustainment of effects across a protracted war. The newness of the US Space Force provides an appropriate alibi for the charge of misalignment, but the challenges need to be addressed in order for the service to compete effectively.

History of Operationally Responsive Space

China's 2007 antisatellite test was a turning point for responsiveness, and US Congress members called for something new from space professionals. At the time, Arizona Senator Jon Kyl argued, "In a world where our space assets are likely to be threatened, operationally responsive space capabilities will allow us to quickly and affordably replace assets lost to anti-satellite attacks."[3] Thus, the operationally responsive space program was born.[4]

Having the flexibility of a swift conception-to-operation process could be a massive boon to a commander. Indeed, one initial proposal of such a capability, referenced above, was written in 2005 by a future US Space Force chief of space operations. Responsive space was deemed a "new business model" that allowed for bottom-up procurement of capability.[5] This contrasted the decades-old idea of the US government as the primary customer and purchaser of satellites from contractors.

2. US Space Force (USSF), *Sustainment*, Space Doctrine Publication (SDP) 4-0 (Washington, DC: USSF, 2023), 8, https://www.starcom.spaceforce.mil/.

3. Larrimore, *Operationally Responsive Space*, 2.

4. Courtney Albon, "US Space Force Plan for Rapid Satellite Launches May Finally Take Off," C4ISR-NET, July 12, 2023, https://www.c4isrnet.com/.

5. Cebrowski and Raymond, "Operationally Responsive Space," 68.

Over the years, the new ORS office launched many satellites with high speed—construction, storage, launch capability, and launch itself—and low cost. The ORS-5 satellite, launched in 2017, was lauded for its success in speed, cost, and capability.[6] The tactically responsive space initiative, the latest generation of responsiveness, maintains that heritage today. If conditions rapidly change, the TacRS program is the contract vehicle that would allow the service to fast-track a response to the combatant commander.

Tactically Responsive Space

The mission of the TacRS program is to launch a space-based, end-to-end capability within 24 hours of notice in response to a combatant commander's needs.[7] According to program office documentation, it involves understanding the tactical need in advance, building the satellite, placing it and maintaining it in storage, and then having the space-launch capability and capacity to take it out of storage and launch it quickly.[8] The mission of TacRS encompasses many aspects of space procurement in a fully aggregated package: acquisition, space launch and access, early testing, and operations.

Yet when discussed outside of the main program office, the clarity of the capability is diluted. The US Space Command commander has asserted that TacRS capability to "replenish" satellites will be critical to deterring China.[9] Congress has said the ability to "rapidly reconstitute degraded systems" is crucial.[10] Such comments run counter to the idea that the program will launch an end-to-end capability.

TacRS is a very small program—its budget in fiscal year 2023 was $50 million out of a total US Space Force budget of $26.3 billion.[11] Relative to its size, the program regularly features in conversations at the highest levels of civil and military space, including a recent mention in a Center for Strategic and International Studies conversation with the chief of space operations when discussing his theory of success, and in an opinion piece from the former administrator of the National Aeronautics and Space

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6. SMC [Space and Missile Systems Center] Public Affairs Office, "SMC Sets New Standard of Success for Acquisition and Operations of SensorSat," press release, Air Force Space Command, October 9, 2019, https://www.afspc.af.mil/.

7. Sandra Erwin, "Launch On Demand: If Satellites Are Shot Down, Will Space Force Be Ready to Restock?," *SpaceNews*, October 10, 2022, https://spacenews.com/.

8. AFWERX Challenge, "Tactically Responsive Space Overview," May 2023, 2, https://afwerxchallenge.com/.

9. Sandra Erwin, "USSPACECOM Supports Use of Responsive Launch to Deter China and Russia," *SpaceNews*, November 29, 2022, https://spacenews.com/.

10. Sandra Erwin, "Lawmakers Ask House Appropriators to Add $50 Million for DoD 'Tactically Responsive Launch,'" *SpaceNews*, January 21, 2022, https://spacenews.com/.

11. Marcia Smith, "Appropriators Boost FY 2023 Space Force Funding," SpacePolicyOnline, December 22, 2022, https://spacepolicyonline.com/.

Administration, Jim Bridenstine.[12] Yet the program's operational concept and the language used to support it show an immaturity within space warfighting.

The use of such terms as replenish and reconstitute by top commanders and civilian leaders discussing TacRS does not align with the program's stated goals; the word responsive, which differs in important ways from replenish and reconstitute, is part of the name of the program itself.[13] Yet, typically, these words are used when advocates discuss TacRS program capabilities, usage, or financing. In fact, these terms have a doctrinal definition that can completely change the nature of the capability depending on use. Such a disconnect is apparent across the service. While this article references TacRS in particular as a case study, its analysis can be applied to problems with terminology that are common across the Space Force, its programs, and its weapon systems.

Doctrinally Divergent?

The problem is not that senior leaders are using this terminology, but rather that the doctrine provides little clarity of communication on the purpose of a given mission. This clarity and nuance should help define alternative and differentiated mission sets for the Space Force if required. For example, a responsive program is different from a replenishment program. An augmentation of capability is different from a reconstitution effort. Each of these could be their own program. Yet each of these is not well defined for the space domain specifically. The misappropriation of terminology also highlights how US Space Force terminology differs from the broader Joint terminology, as revealed by areas of divergence between the space domain and its terrestrial counterparts.

The terms listed in table 1 are commonly used by the program office, senior leaders, Congress, and others to describe the space domain. Their definitions come from a variety of sources, and not just space doctrine. Their interplay highlights a deficiency in the understanding of space capability.

Just like every other warfighting domain, space struggles with unique needs and domain-specific challenges. The cost of attaining and changing orbits is extraordinarily expensive in both dollars and fuel. The cost of launch drove satellite design that required complete independence from terrestrial support mechanisms.[14] With no ability to refuel or upgrade hardware systems, the Space Force takes what it is given and operates within the constraints. The specific characteristics of the domain and

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12. Center for Strategic and International Studies (CSIS), "Theory of Success: A Conversation with General Saltzman," CSIS, February 22, 2023, https://www.csis.org/; and Jim Bridenstine, "Tactically Responsive Space Strengthens America," *SpaceNews*, September 18, 2023, https://spacenews.com/.

13. *Hearings on the National Defense Authorization Act for Fiscal Year 2023 and Oversight of Previously Authorized Programs*, 117th Cong. 64 (2022) (statements from Rep. Michael Waltz [R-FL] and General James H. Dickinson, commander, US Space Command), March 1, 2022; and "Keynote: Lt. Gen. Michael Guetlein," interview by Nathan Strout, C4ISRNET, April 20, 2022, video, 33:14, https://www.militarytimes.com/.

14. Thomas D. Taverney, "Resilient, Disaggregated, and Mixed Constellations," Space Review, August 29, 2011, https://www.thespacereview.com/.

corresponding architecture choices make it difficult for Guardians to directly apply Joint terminology, but not for lack of effort.

Table 1. 'Re'wording the US Space Force: The 'Re'apportionment of Definitions for the Domain

Responsive	The ability to react to changing requirements and meet the needs to maintain support. It is providing the right support in the right place at the right time. It includes the ability to meet operational needs rapidly.[15]
Reconstitute	Action to restore units to a desired level of combat effectiveness commensurate with mission requirements and available resources. It transcends normal day-to-day force sustainment actions. Yet it uses existing systems and units to do so. No resources exist to solely perform reconstitution.[16]
Replenishment	Generally defined across multiple instances as operations required to transfer personnel, supplies, or fuel.[17]
Resiliency	The ability to withstand, fight through, and recover quickly from disruption.[18]
Readiness	The ability of the military forces to fight and meet the demands of assigned missions.[19]
Reserve Satellite (new)	Spacecraft that have been accumulated in excess of immediate needs for active spacecraft and are retained in the inventory against possible future needs.[20]

Initial attempts at Space Force doctrine have either wholesale applied doctrine from the Air Force or combined terms that further muddle the issue. For example, in the capstone Space Force doctrine publication *Spacepower*, space launch is associated with both space mobility and space logistics. The publication makes no delineation between the two terms, paired together under the acronym SML.[21] The newest Space Force doctrine, *Operations*, Space Doctrine Publication (SDP) 3-0, references the capstone document's definition but reformulates the acronym to SAML with the addition of space access.

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15. USSF, *Sustainment*, 8.

16. Headquarters, Department of the Army (HQDA), *Reconstitution*, Field Manual 100-9 (Washington, DC: HQDA, January 13, 1992) (no longer active); and John M. Menter, "The Fallacy and Myth of Reconstitution," US Army (website), March 28, 2019, https://www.army.mil/.

17. Chairman of the Joint Chiefs of Staff (CJCS), *Joint Logistics*, Joint Publication (JP) 4-0, (Washington, DC: CJCS, July 20, 2023).

18. Department of Defense (DoD), *2022 National Defense Strategy of the United States of America* (Washington, DC: DoD, October 2022), 16, https://media.defense.gov/; and Frank Kendall, *Comprehensive Strategy of the Air Force* (Washington, DC: Department of the Air Force [DAF], August 15, 2023), https://www.spaceforce.mil/.

19. CJCS, *DoD Dictionary of Military and Associated Terms*, JP 1-02 (Washington, DC: CJCS, 2007), 451, https://dcsg9.army.mil/.

20. Author's definition; see CJCS, *DOD Dictionary*, s. v. "reserve satellite," 464.

21. USSF, *Spacepower*, Space Capstone Publication (Washington, DC: USSF, 2020), 37, https://media.defense.gov/.

SDP 3-0 does define the terms separately. Mobility is parenthetically defined as movement and maneuver and "includes post-launch transport of space vehicles between orbits, within orbits, and augmented maneuvering to enhance mission effectiveness or maneuvering related to reconstitution, operational degradation or loss, and end-of-life actions." Logistics "may include spacecraft servicing, disposition, debris management capabilities, refueling, and in-space component installation." Yet space launch continues to remain associated with both.[22]

Traditionally, the Department of Defense acquires weapon systems, not logistics programs. Setting requirements and developing programs for logistics is putting the cart before the horse. Other domains have initial logistics requirements, such as ports in the maritime domain or troop transport for the Army. Likewise, assets such as cargo aircraft provide key logistics and mobility capabilities. If the TacRS program is an attempt to operationalize space launch, it seems to be missing the focus of the mission. If instead space launch is more of a mobility capability, such as a C-17, then it needs to be operationalized like a weapon system with the requirements and US Space Force ownership to match. But mobility and access are not the only victims of reinvention.

Responsiveness made its way into Joint Publication (JP) 3-14, *Space Operations*, an operational doctrine, as well as SDP 4-0, a sustainment doctrine.[23] Space doctrine has more correctly placed responsiveness as one of the nine "principles of sustainment."[24] This doctrine mimics the language in JP 4-0, *Joint Logistics*, which states "responsiveness is providing the right capability when and where it is needed" but changes the definition. Space responsiveness reacts "to changing requirements"; Joint responsiveness simply provides "the right capability."[25]

While the intent is similar, the definitions are fundamentally different. Between 2020 and 2023, Joint space doctrine replaced responsiveness with agility. In 2020, responsiveness was defined assuch: "Space operations provide the ability to surge some types of capabilities, such as communications or ISR, on much faster timescales than ground-based or airborne capabilities. As priorities change, some space resources can be rapidly reallocated to the areas where they are needed most."[26] In 2023, agility is defined as such: "Space operations enhance joint capabilities, such as communications or ISR, with greater speed, reach, and persistence compared to ground-based or airborne modalities. As priorities change, some space capabilities can be reallocated to the areas where they are needed." [27]

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22. USSF, *Operations*, SDP 3-0 (Washington, DC: USSF, 2023), 52, 36, https://www.starcom.spaceforce.mil/; and see Theresa Hitchens, "Enhancing 'Lethality': First Space Force 'Operations' Doctrine Cements Role within Joint Force," Breaking Defense, August 3, 2023, https://breakingdefense.com/.

23. CJCS, *Space Operations*, JP 3-14 (Washington, DC: CJCS, 2020), I-4, https://www.jcs.mil/.

24. USSF, *Sustainment*, 8.

25. USSF; and CJCS, *Joint Logistics*, x.

26. CJCS, *Space Operations*, I-4.

27. CJCS, *Joint Space Operations*, JP 3-14 (Washington, DC: CJCS, 2023), I-5–I-6.

The tension here is that responsiveness can be defined multiple ways. One way is mission related: troops in contact prefer higher responsiveness from close air support missions. A highly responsive space capability is likely one already on orbit and the timeliness is derived from a satellite's persistence relative to another domain. The other definition is the responsiveness of acquisition and logistics. A military without knowledge of the threat, or in a war of attrition, prefers responsiveness from acquisitions and logistics. The TacRS conversation seems to drift between the two.

Language used by TacRS supporters such as reconstitution and replenishment are other examples of this confusion. Both terms have foundations in logistics and a history to match. The Joint logistics enterprise—the network of key global logistics providers that support the Joint Force's needs—has an operating framework that clearly outlines logistical objectives at the three classic levels of war. Within the 176-page Joint doctrine document, reconstitution is not a guiding principle and is rarely mentioned.[28] In space doctrine, reconstitution is specifically defined as "the restoration of functionality to an acceptable level for a particular mission, operation, or contingency after severe degradation" and includes both space- and ground-based equipment and personnel.[29]

Replenishment, on the other hand, is mentioned but specifically aligned with the transfer of fuel, food, supplies, and personnel between ships.[30] A replenishment satellite to a Sailor may be more akin to an "oiler satellite" that refuels others instead of an end-to-end responsive capability. In space doctrine, replenishment is casually referenced similarly to that of ships in terms of consumables and expendables on spacecraft. But the tepidness of the definition as part of a larger discussion on sustainment trivializes the difficulty of on-orbit refueling. An authoritative push for on-orbit replenishment of satellites would go a long way to providing clarity of meaning.

Misalignment with Joint doctrine can cause difficulty in advocating for the proper requirements at all levels and when integrating across services. Differences between Joint- and service-level doctrine is not unheard of. Yet the uniqueness of the Space Force should drive some reflection upon whether reinventing the wheel is a good idea. Indeed, this reflection should come now, before finalizing doctrine. How these divergences play out at the tactical, operational, and strategic levels must be explored.

Tactical Deficiencies

The name of the TacRS program, Tactically Responsive, implies a timing and tempo that would assist with a tactical timeline. But whose tactical timeline? Though the logic behind the name of the program is missing, the importance of understanding tactical timelines for space is not. In the span of 24 hours, the currently reported mission timeline, many tactical operations could occur. In low Earth orbit, satellites

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28. CJCS, *Joint Logistics*.
29. USSF, *Sustainment*, 16.
30. CJCS, *Joint Logistics*.

encircle the Earth upwards of 15 times per day. Depending on the orbit, that could mean multiple daily targeting opportunities for the adversary.[31]

If US Space Command is supporting terrestrial missions with a now-defeated satellite, the responsiveness of 24 hours may be well past a tactical commander's needs, depending on the capability provided. On the other hand, the timeline may be sufficient for a Space Command mission alone. To that end, even industry believes this logic, pushing the Space Force to "strengthen the concept of operations."[32] Industry experts seem to understand they are being asked for 24-hour launches, yet do not understand how the Space Force intends to use the capability. For a domain that largely supports terrestrial forces, the nuances in language matter.

Misunderstanding tactical timelines is not the only tactical deficiency highlighted by the TacRS program. An analysis of the program also reveals the force's deficient tactical capability. Inherent in the desire for responsiveness is the implication that the current satellites in orbit are insufficient for the United States to survive a significant attack.

As discussed above, today's Space Force satellites were developed in an era of US hegemonic spacepower with no adversary. As a result, defensive capability is likely deficient. Yet setting responsiveness as a goal not only is a tacit acknowledgement of the deficiency, but also points to an insidious undercurrent that elevates defeat instead of success. The new comprehensive strategy for the Space Force seems to get this right by separating resiliency and responsive sustainment into two implications for the Space Force.[33] The focus on defensiveness would lessen the requirement for responsiveness. A level of responsiveness has always been required across all domains. But if defensive capabilities are required from the initial design, less reactive responsiveness is required at the operational level.

Operational Responsiveness

Operationally, the underlying assumption of responsiveness is the need to adapt to new or changing combatant commander requirements. At the early outset of the program, the threat situation in the space domain was new and unknown. Why spend dollars on a big budget space program if the threat is unknown? That has changed since 2007; the threat is now known and the principles of winning on orbit are demonstrated three times per year at the services' Space Flag exercise. Organizationally, the new service exists to help define and advocate for the requirements that have emerged since the changes in the domain since 2007.

Though the responsiveness of a commander is critical, typically, operational responsiveness has not been the domain of military procurement. Responsiveness

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31. US Defense Intelligence Agency (DIA), *2022 Challenges to Security in Space: Space Reliance in an Era of Competition and Expansion* (Washington, DC: DIA, 2022), https://www.dia.mil/.

32. Sandra Erwin, "Space Force Lays Out Timeline for 2023 Rapid Response Launch Experiment," *SpaceNews*, November 6, 2022, https://spacenews.com/.

33. Kendall, *Comprehensive Strategy*, 6.

instead has been built historically through tactical and operational readiness.[34] Responsiveness is created by ensuring the combat capability can achieve the desired effect and is ready to execute operations on a specified timeline.

For example, a Special Forces unit with high readiness is typically able to deploy faster than a larger Army combat unit, therefore achieving high responsiveness. Speed and time are the components: a fixed-wing close air support aircraft may be able to support troops in contact faster than a rotary-wing aircraft covering the same distance, yet if the rotary-wing aircraft is nearby, it takes the objective. To an earlier point, a force already in the area typically provides the fastest response.[35]

The desired effect provides different opportunities for readiness objectives for the Space Force. Instead of an end-to-end solution from launch to orbital operations, what if the requirement was an ability to match any orbit within 24 hours? The same effect could be achieved at the satellite level and would promote changes to maneuver and fuel capabilities, both of which could drive increases in satellite capability across the force. Likewise, an inability to achieve the 24-hour timeline would factor into a readiness calculation by a commander. If the commander's requirement is purely responsiveness, defining what responsiveness looks like in terms of readiness may achieve a better outcome.

Likewise, the earlier confusion of reconstitution highlights more deficiencies at the operational level. When the Army used reconstitution, it implied available forces to reconstitute with, either from combining broken units or bringing forward reserve forces. For example, World War II and the Korean War both saw Army reconstitution with "divisions and regimental combat teams rotated off of the front lines to absorb and train replacements."[36] The practice was largely enabled by the draft and an "impressive industrial supply complex capable of producing any required military equipment."[37]

While SDP 4-0 covers reconstitution, the requirements for such highlight the complexities of the task. Reconstitution requires "planning and lead-up operations to build, integrate, and deliver a payload or payloads to orbit."[38] That is effectively the entire design cycle for a satellite minus operations and end-of-life. Is TacRS operationalizing acquisitions? The TacRS program does seem to meet the doctrinal intent with the reserve satellite on the ground, but that drives the discussion toward the physical placement of reserve forces.

While the elements may translate to Space Force satellites, a more similar analogy would be that of a ship or an aircraft. Neither of these platforms use reconstitution; they use reallocation instead. As a thought experiment, how does a new ship or aircraft

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34. Stacie L. Pettyjohn, *The Demand for Responsiveness in Past U.S. Military Operations* (Santa Monica, CA: RAND Corporation, 2021), https://www.rand.org/.
35. Pettyjohn.
36. Menter, *Fallacy and Myth*.
37. Menter.
38. USSF, *Sustainment*, 16.

arrive in theater if one is destroyed in combat? Simply, the service reallocates forces from either reserve forces or forces in another theater. Is TacRS then reallocating satellites from a terrestrial theater to the heavenly theater with space launch as the mobility mechanism? If yes, is not then Earth the "port" of a satellite since it cannot operate in that domain? Given a satellite does not operate terrestrially, a bird in orbit is worth two in the bush.

Unfortunately, reallocation within the domain is not any easier. If all satellites in orbit are already in the area of responsibility for the combatant command, confusion mounts as to who owns and has control of the satellite: the service or the combatant command. Force ratios, allocation, and design are not fully formulated within the space domain and deserve further consideration and development. TacRS just happens to be the contract vehicle that highlights this deficiency. The operational challenges for the most junior service continue to pile up.

Strategic Focus

At the strategic level, TacRS highlights a lack of focus between strategy, combatant commander requirements, and a space-industrial base output. Chief of Space Operations General B. Chance Saltzman's theory of success, referred to as Competitive Endurance, offers an early strategic direction that provides the required focus. The main tenets of this theory include avoiding operational surprise, denying first-mover advantage, and counterspace campaigning.[39] The first two of these, while defensive in nature, are inherently proactive. Operational surprise in the domain is prevented through space domain awareness, or intelligence of the activities in and through the domain. Denial of first-mover advantage focuses on resilience to win through either active or passive defense. Responsiveness and reconstitution focus on reactive defense after deterrence has failed—counterspace campaigning.

The defensive bent from TacRS is a responsive model that strives for dominance via an anti-attrition style of war and overwhelming logistics. In attrition warfare, the objective is to outlast the enemy through the sequential destruction of their forces and to prevent the same from happening to one's own forces. Maneuver warfare, attrition warfare's opposite, uses initiative and rapid movement of forces for success.[40]

While there are more styles of war, with the TacRS program and other new programs from the Rapid Capabilities Office and Space Development Agency, the Space Force is attempting to build toward surviving an attrition war through resilience. Yet within the first Space capstone document, maneuver warfare is the focus of discussion.[41] The doctrinal focus on maneuver is unsurprising; most modern and democratic militaries have focused on maneuver warfare for decades. But the efforts mentioned above seem to focus on outlasting the enemy through overwhelming logistical superiority.

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39. See CSIS, "Theory of Success."

40. Brent L. Peterson, "The Factors That Influence Air Strategy: How Do Leaders Choose Air Strategy?" (master's thesis, School of Advanced Air and Space Studies, Air University, June 2019), https://apps.dtic.mil/.

41. USSF, *Spacepower.*

If the service is leaning toward resiliency as the focus, the Space capstone document may already be out-of-date. If the service still desires maneuver warfare-based weapon systems, programs with a maneuver focus have yet to be publicized. Doctrine provides the "foundational and authoritative purpose and identity of a military force."[42] The service needs both the ability to survive the onslaught of the enemy and a force able to fight and win.

The problem of permanence on orbit further plagues the issue. The combined assumptions of resiliency, responsiveness, and reconstitution run counter to the problem of space debris. The theory of success touches on the problem from the side of the offense in that "space superiority must not create hazardous debris that jeopardizes the Joint Force's access to vital space capabilities."[43] But resiliency could create that exact debris problem on defense without ever giving the United States the offensive opportunity in the first place. Space-debris permanence creates a tug-of-war between offense and defense in space that still lacks resolution.

Overwhelming logistics helped the United States win two world wars, so the pursuit is worthy. Unfortunately, as it stands right now, the state of the space industrial base and supply chain may not support a simple wartime effort. Over the past 25 years, the Department of Defense has launched about 75 missions, or about three per year.[44] The commercial side is not significantly different. Assuming a wartime effort includes both commercial and government resources, production may support six satellites per year. Is that enough to overwhelm the adversary? Likely not. In fact, that recognition drove changes to procurement and the Space Development Agency's plan in 2023 to launch a thousand microsatellites for resiliency purposes.[45]

This highlights another potential issue facing the newly formed service: TacRS highlights a lack of clarity regarding combatant commander requirements. The TacRS program is a "broader effort by the US Space Force to accelerate the timeline for deploying payloads to orbit."[46] In a picture-perfect world, the combatant commander would understand the adversary, the tactical skill of friendly forces, force ratios and allocation, and the state of the space industrial base. Based on this, they would ask for precisely what is needed to win the war effort.

In reality, fundamental analyses of requirements based on strategic outcomes could drive satellite production goals. A broader effort of accelerated timelines should not be the focus of a single program but instead the result of greater demand signaled

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42. Kenneth Grosselin, "A Culture of Military Spacepower," *Air and Space Power Journal* 34, no. 1 (March 23, 2020): 79.

43. CSIS, "Theory of Success."

44. Eric Berger, "With Reusable Rockets on the Rise, Air Force Changes EELV Program Name," Ars Technica, March 4, 2019, https://arstechnica.com/.

45. Ramin Skibba, "The Space Force Is Launching Its Own Swarm of Tiny Satellites," Wired, August 14, 2023, https://www.wired.com/.

46. Sandra Erwin, "Firefly, Millennium Space Selected for U.S. Space Force Rapid-Launch Demonstration," *SpaceNews*, October 1, 2022, https://spacenews.com/.

collectively by the needs of combatant commands. Even still, accelerated timelines are not without merit.

Recommendations

A Place in the New US Space Force Mission

The first recommendation may solve the strategic confusion. The Space Force recently published a new mission for the service: "Secure our Nation's interests in, from, and to space." This gives a TacRS-like capability a new opportunity for mission relevance. Per the previous discussion, responsiveness should not be the program's ultimate goal. Instead, the program should focus on the interest of having access to space. This means divorcing access to space from the goal of tactical responsiveness. In order to receive capability in and from space, the nation must first get to space. Focusing the program on one objective could provide a long-term competitive advantage.

Saltzman's first note to Guardians after assuming his role as chief of space operations includes a line that could provide nuance: "The Space Force must field combat-ready forces prepared to outcompete rivals, deter aggressors, and defeat enemies."[47] A responsive capability may help outcompete rivals, but not necessarily deter or defeat others. To extend the maritime analogy mentioned earlier: access to the sea is strategically important, but the capability it provides is the interest behind such access.

Prioritize War-Winning Effects

The second recommendation is one of strategic and industrial base requirements. From a strategic perspective, the Space Force needs to focus its efforts on war-winning effects first, then the supply chain as support next. Proposing the idea of rapidly launching replenishment satellites is deciding that the logistics arm of the Space Force should be developed first. Likewise, resilient and defenseless satellites are built for sacrifice instead of winning.

To ensure operational effectiveness, the development of combat capabilities should take precedence over supply-chain establishment, analogous to the prioritization of fighter and bomber equivalents over a tanker. US Space Command should advocate for requirements that drive toward decisive victory conditions within the area of operations, reinforcing an uncompromising operational posture.

This requires a newfound focus on understanding the mission, then using the mission to drive the requirement through the Joint requirements process. This means identifying the need, codifying it in bureaucracy, and potentially establishing a new program. While that may not be responsive, the process exists to tie missions to tasks to requirements.

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47. B. Chance Saltzman, "LOE 1 - Fielding Combat Ready Forces," January 18, 2023, https://www.spaceforce.mil/.

Focus on Operational Readiness

The third recommendation tightens the loop between capability development and operational readiness consideration. Though the theme of connecting operations and procurement is discussed at length in strategic documents, the specifics on what that looks like are typically inadequate.[48] The Space Force needs to develop requirements that win all levels of war.

Tactically, satellites should be able to defend themselves through any known defensive options. Operationally, force ratios need to be understood, put into requirements, and driven toward capability and force design. Changing the thinking to focus on operations and readiness could enhance the space industrial base at a level that could support a 24-hour launch. In other words, the Space Force should seek to buy highly capable and readied satellites first, then conduct launches that get them to orbit, not combine the two missions into one.

Operationally responsive space was viewed at the time as a bridge model that would create demand for small and nontailored satellite capabilities owned by operational and tactical commanders. While the bridge still has value, delineation between acquisitions and tactical responsiveness is critical. And if the goal is tactical timeliness, a clear readiness posture should be a requirement. In practice, it may be more effective to understand the domain and its readiness requirements and put a satellite into space ahead of need.

Understand the Battlespace Holistically

A fourth recommendation combines operational and tactical needs focused on understanding the battlespace. Air-refueling capability requirements can be traced back to operations: How many air refuelers and how much fuel does the nation need to cross the Pacific and win a war? The analogy is used to drive home the understanding that the battlespace was understood before the requirement was developed. The US Space Force and Space Command need similar metrics for either space launch or satellites.

Not only are the metrics based in logistics at the operational level, but understanding the cost of delta-v at the tactical level, requirements of maneuver, and potential loss rates could inform this recommendation. Likewise, the service needs to retain assets for test, training, and reserve purposes. Retaining assets increases the service's ability to provide responsiveness via reallocation to the combatant commander.

Transform Space Access and Sustainment

As a fifth and final recommendation, the Space Force should radically change its space access and sustainment approach. The recognition and study of the vast literature on mobility and logistics is a logical place to start. Additionally, this involves taking that knowledge and not just holistically transitioning it to the space domain

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48. DAF, *U.S. Air Force 2030 Science and Technology Strategy* (Washington, DC: USAF, April 2019), https://www.af.mil/.

but leveraging it to create novel applications of the knowledge within the domain. Seemingly radical ideas such as using cislunar space as a satellite reserve location places satellites out of current threat regions while maintaining a higher readiness than a terrestrial launched option.[49]

While the Space Force has begun to publish doctrine, committing to the wrong doctrine is worse than committing to no doctrine at all. The authoritative nature of doctrine makes it a primary source of knowledge and needs to rapidly iterate along with the newest service.

The combination of these recommendations could provide a new model for acquiring the appropriate weapon systems. Airframes or ships combine to create a lethal force through the specialization of weapon systems and knowledge of the domain. Fighters, bombers, and air refuelers work together to combine effects from the air. One without the other creates opportunity for an adversary.

Conclusion

TacRS is an impressive capability, and many great Americans work on the programs. And yet, the challenges discussed in this article require solutions. The analysis underscores the imperative for the US Space Force to address key strategic and operational challenges to effectively prevail in future space conflicts. The service needs to redefine its mission to prioritize winning through war-winning effects, tighten the loop between capability development and operations, comprehensively understand the battlespace, and embrace transformative approaches to space access and sustainment. These five recommendations, grounded in military theory and strategic insights, provide a framework for enhancing the Space Force's readiness.

As we navigate the complexities of the space domain, implementing these recommendations will be crucial in ensuring the service will meet future challenges head on and emerge triumphant. Responsiveness still has its place in acquisitions to be faster and more agile to the changing character of war. For the US Space Force to win the first war in space, it first needs the capabilities to do so. The question the Space Force needs to ask is, Is our goal to win or to be responsive to failure? **Æ**

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49. Alexander Urban, "Development of Minimum Delta-V Trajectories to Service Geo Assets from Cislunar Space" (master's thesis, Air Force Institute of Technology, March 2022), https://scholar.afit.edu/.