

# Go Tactical to Succeed

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## For Your Consideration

**Operating in contested environments requires special land and space systems. Proposed: An Army tactical space program for multi-domain battle.**

- Can the U.S. Army's space architecture support land forces in a multi-domain battle?
- Should Army space forces become members of the combined arms team?
- Would creating resilient Army space capabilities deter our adversaries?

The multi-domain battle concept is driving change across the Army; it is impacting current doctrine, future organizations and the systems we procure. The multi-domain battle concept encompasses a mounting problem known for many years. Adversaries are capable of attacking across all domains (land, maritime, air, space and cyberspace) to degrade U.S. technological advantages and fracture the highly integrated joint force.<sup>1</sup>

Since September 2001, the Army has operated against violent extremists and non-peer adversaries in a benign space environment. This has left little justification for widespread procurement of new ground combat systems and even less justification to modernize the space capabilities to support them.<sup>2</sup> The emergence of new adversary capabilities combined with a pause in modernization has led to a dangerous situation: The Army may not be able to fight effectively in a war with multiple contested domains.

It is time to fundamentally change the space capabilities the Army provides for unified land operations. To accomplish this change, the Army should create a tactical space program and equip Army space forces with new capabilities to conduct unified land operations in a multi-domain battle.

### Why an Army Tactical Space Program?

An Army tactical space program would allow the service to refresh its space dependencies in a context of the threats posed by the current Anti-Access Area-Denial (A2AD) challenge and the emerging operating environment. It would equip Army space forces so that they can properly contest peer adversaries in the space domain and enable land combat functions in the multi-domain battle environment.

The Army's development of the Multi-Domain Task Force (MDTF) pilot formation is the beginning of a new structure to leverage tactical space integration.<sup>3</sup> The functions of the MDTF would likely require substantial support from systems in the space domain. An Army tactical space program could help meet these emerging needs.

An Army tactical space program would provide a mechanism to develop integrated solutions to land domain capability gaps. By using the Army's program office construct and leveraging expertise in system of systems integration, the benefits of space enhancement could be extended to many existing Army programs.

An Army tactical space program could work closely with select program offices to develop improved space linkages to mission command systems, expand reconnaissance capability for maneuver units, improve the resilience of unmanned aerial systems (UASs), bolster tactical communications and assist fires systems with targeting.

By working within the confines of land force needs, excessive system requirements can be avoided; the primary engineering focus would be interoperability with land force combat systems. When the requirements of a space system are scoped to a small number of specific needs there is more flexibility for creative and less-expensive material solutions. Additionally, engineering tactical space systems in unison with the ground combat systems that will use them will allow for entirely new methods of land-space integration to develop.

This stands in contrast to the current model where large space systems provide user services designed to meet a broad set of requirements which often conflict. For these reasons, a well-scoped Army tactical space program would serve as the best vehicle to realize improved space capabilities for land domain forces.

In addition to supporting the MDTF, an Army tactical space program could develop space systems to dramatically enhance other land force formations to fill the capability gaps the Army has identified. This same program also could develop training equipment to replicate space-denied environments for land forces at training centers and exercise locations. This would extend the reach of the Army space training strategy and support realistic threat replication for units in training.

The specific functions performed by tactical space systems would need to be developed through concepts and experimentation, but there are many potential starting points. Army space forces equipped with tactical space systems could provide maneuver forces with timely space-based imagery and full-motion video to support targeting and fires observation in areas where UASs cannot fly.

Tactical space systems could enhance small UAS platforms by extracting data and passing commands from low Earth orbit, enabling them to operate deep into enemy areas without constant line of site radio links. Tactical space systems in low earth orbit could provide electromagnetic spectrum reconnaissance data directly to ground users, unhindered by excessive security barriers.

The Army also could use small communication satellites to balance the threat of enemy electronic warfare systems by communicating across the battlefield in multiple bands with distinctive temporal geometries above ground forces. The potential applications of tactical space systems for the Army are truly numerous.

### **Defining an Army Tactical Space Program**

Before discussing the justification for an Army Tactical space program, it is necessary to describe the activities it would perform and define its characteristics. An Army tactical space program would develop, acquire, field and sustain space and select land systems for employment by the Army's space forces. It would focus on meeting the capability gaps of land domain forces in a multi-domain battle characterized by A2AD threats and a Contested, Degraded and Operationally limited (CDO) environment. It would not seek to meet national or strategic requirements, complement national systems or serve as a test-bed for large strategic systems.

An Army tactical space program would have two major lines of effort:

- 1) Leverage the benefits of the space domain to enable decentralized land force operations in support of the Army's mission command philosophy
- 2) Deliver synchronized capabilities from, through and into the space domain in direct support of land domain forces.

This program would meet the space-related requirements of maneuver units and the emerging MDTF while operating within the confines of Army mission command systems. Tactical space systems from this program would help maneuver units to see, move and

communicate, while projecting force across the depth of the battlefield. They would link units and systems in the theater of combat, minimize the amount of data processing and reduce the latency of information. In short, an Army tactical space program would be satellites for soldiers.

The primary goal of an Army tactical space program should be to equip Army space forces so they can evolve into a crucial member of the combined arms team. Achieving this goal will enable Army space forces to project power and create windows of advantage for land domain forces.

The secondary goal should be to develop space-based systems to support warfighting functions. Land domain reconnaissance, fires and protection systems could derive significant benefits from augmentation by specialized tactical space systems. In this way, Army tactical space systems could support flexible and resilient capabilities across multiple domains and the electromagnetic spectrum.

### **The Problem**

The multi-domain battle concept was created by U.S. Army Training and Doctrine Command in 2016 in response to the military developments of emerging peer adversaries.<sup>4</sup> It is predicated on adversaries' reaction to the success of U.S. forces in the 1991 Gulf War and U.S. military actions throughout the 1990s.<sup>5</sup>

U.S. forces in the Gulf War were the first combat forces to leverage the benefits of space on a wide scale and did so with tremendous success.<sup>6</sup> The results of Operation Desert Storm sent a clear message to the world: A high-tech land force, supported by a modern Air Force, could attack with greater power than the conventional force ratio would dictate.

The Chinese People's Liberation Army in particular reacted by developing numerous electronic warfare capabilities and modernizing its military doctrine.<sup>7</sup> Other near-peer adversaries studied the strengths and weaknesses of the joint force and adopted deliberate strategies to degrade capabilities across all domains. These adversary actions are meant to challenge U.S. premises of domain superiority and deter us from responding to their aggression.<sup>8</sup>

Taken as a whole, the multi-domain battle concept describes the emerging threat environment and prescribes a solution to counter the threats facing the Army and Marine Corps. The threat environment of multi-domain battle encompasses other familiar concepts: the CDO environment, A2AD threats and the Denied, Degraded and Disrupted Environment.

All of these concepts can be grouped into a general notion that adversaries will contest the U.S. military across all domains while employing long-range precision strike capabilities from areas with highly integrated air and maritime defense systems. They will do this to enable their ground forces to seize the initiative and operate more freely from joint force standoff attacks.<sup>9</sup>

The general problem of multi-domain battle is easy to understand but hard to solve. In a Joint Army and Marine Corps white paper published in February 2017, implications of the multi-domain operating environment are summed up succinctly:

“Over the last 25 years, assumptions of air, land, maritime, space, and cyberspace domain superiority drove the doctrine, equipment, and posture of U.S. forces. These assumptions are proving to be invalid in light of recent changes to adversary capabilities, capacities, and approaches. Potential adversaries now possess capabilities that allow them to contest both the deployment and employment of U.S. forces in greatly expanded areas of operation, interest, and influence. U.S. forces are not organized, trained, equipped, and postured to properly contest emerging and potential threats. As a result, the freedom of action required to support U.S. policy, by deterring, and if necessary, defeating potential enemies is at risk.”<sup>10</sup>

It is critical for Army space professionals to understand these implications. Since the Gulf War, the satellite architecture used by ground forces has evolved on a linear trend. User equipment has become smaller and more capable, but taken as a whole, there have been few pioneering advances in the satellite architecture that supports ground combat.

This linear evolution has resulted in an Army that seems to be at a pinnacle of space integration. Vehicles and soldiers are equipped with GPS navigation on a wide scale, satellite communication terminals are abundant in brigades and space-based intelligence helps decision-making down to the company level.

Under closer examination, however, the hard truth emerges. GPS is vulnerable to jamming and exploitation; tactical SATCOM bandwidth, particularly UHF, is limited; and space-derived intelligence is highly classified and slow to arrive at forward elements.

The willingness of adversaries to attack the vulnerabilities of U.S. space systems is not the only problem in multi-domain battle. Many of our most prized battlefield technologies are vulnerable to attack or negation across multiple domains (cyber and land-based infrastructure), including the electromagnetic spectrum. Enemy forces will synchronize their attacks across all domains to create numerous dilemmas for the joint force.<sup>11</sup>

In such a scenario, U.S. forces cannot rely on fixed communications that are detectable and targetable with kinetic weapons. The battlefield will have high levels of jamming and interference, making communication difficult. Unmanned aerial systems will be vulnerable to enhanced air-defense threats and electronic attack. Battlefield sensors and intelligence, surveillance and reconnaissance (ISR) assets will require direct networking to ground forces to preserve situational awareness as enemy forces attempt to seize the initiative. The ability to interdict enemy precision strike capabilities will be essential to protecting forces. Preserving the ability to navigate and employ precision weapons will be equally important.

By understanding the operating environment of multi-domain battle, the problem facing the Army becomes apparent. Our current space architecture is not postured to support tactical land forces in a multi-domain battle characterized by contested domains and A2AD threats.

The Army is beginning to recognize this in its broader study of current and emerging capability gaps. Recently, the Army G-3/5/7 conducted a comprehensive review of regional scenarios and studies that evaluated land forces in a CDO environment with A2AD threats. It found common capability gaps across every scenario and compiled them into a single prioritized list of shortfalls and gaps called the “Oklahoma Chart.”<sup>12</sup> In this list, each capability gap is linked by function to a prioritized list of challenges facing the Army. Nearly every capability gap identified is the direct result of enemy threat systems found in an A2AD and CDO environment. Many of the gaps identified are related to the design limitations of current space systems, and several of the gaps have the potential to be filled by tactical space systems.

The problem of filling these gaps is complicated, but the multi-domain battle white paper proposes an elegant solution synopsis for land forces:

“Combined Arms for the 21st century requires ready and resilient Army and Marine Corps combat forces capable of outmaneuvering adversaries physically and cognitively through the extension of combined arms across all domains. Through credible forward presence and resilient battle formations, future Army and Marine Corps forces integrate and synchronize capabilities as part of a joint team to create temporary windows of superiority across multiple domains and throughout the depth of the battlefield in order to seize, retain, and exploit the initiative; defeat enemies; and achieve military objectives.”<sup>13</sup>

There are two key points in this statement. Army space forces must be able to operate as part of a combined arms team with a credible forward presence, and they must be able to integrate capabilities from the space domain throughout the depth of the battlefield. In these respects, we must recognize that the task is to leverage the benefits of the space domain for land forces to open windows of superiority, seize the initiative and defeat enemies.

### **Understanding the Army's Functions**

When arguing the need for an Army tactical space program, it is necessary to understand the basis of the Army's space functions. DoD Directive 5100.01, *Functions of the Department of Defense and its Major Components*, is the definitive document in this matter. It establishes the functions of each military service from a basis of U.S. law (Title 10 United States Code) and national-level guidance. This document identifies Army authorities for military space functions in two categories: those which are common to all military services (Army, Navy/Marine Corps and Air Force) and those which are specific to the Army.<sup>14</sup> The functions related to the space domain and space systems are summarized as follows:

#### Common Military Service Functions

- 1) Organize, train, equip and provide space forces
- 2) Organize, train and equip forces to provide ISR to joint force commanders across all domains, including space
- 3) Operate organic spacecraft or space systems

#### Army Service Specific Functions

- 1) Interdict enemy space power through operations on or from the land
- 2) Provide support for space operations to enhance joint campaigns
- 3) Conduct reconnaissance, surveillance and target acquisition

From this list, it is clear that the Army is expected to perform a broad array of space functions. Ultimately these functions are the basis to fill space-related capability gaps for multi-domain battle as we see fit.

### **The Barriers: Changing Paradigms**

Some stakeholders throughout the DoD and U.S. Government space community might oppose an Army tactical space program. Many in the Army also would oppose such a program under the guise that building and operating space systems should not be an Army function. Critics could cite the expertise of the Air Force in this matter and the challenging fiscal environment the United States faces. These points represent rational concerns; however, examining each argument with a critical lens can expose gaps that the Army should fill.

The Army functions outlined in DoD Directive 5100.01 provide a strong mission area basis for an Army tactical space program, but this does not address the argument that other services could perform such functions on behalf of the Army. The U.S. Air Force has an indisputable leadership role in the space domain, but the responsibilities that come with this domain are vast. The Air Force simply does not have the resources to engineer all of the space dependencies across every component and function of the joint force, nor should it be expected to meet every service's unique requirements.

The capability gaps of the Army are best filled by the Army, and allowing the Army to engineer tactical space systems within its existing program office construct will ensure maximum ground system interoperability. It would allow the Army to develop networks with profound land-to-space integration, create more resilience in multiple layers of ISR and balance the threat of electronic warfare systems across multiple domains.

The perceived high cost of space systems seems a formidable barrier to realization of an Army tactical space program. The truth is that space systems are no more expensive than anything else the Army acquires; the Kestrel Eye Block II satellite has a target production cost of less than \$2 million.<sup>15</sup> At this production cost, the Army could field substantial constellations of Kestrel Eye satellites at flexible price points ranging from \$30 million to \$100 million depending on needs. By comparison, the Army's procurement spending for small tactical UAS platforms (RQ-7 and RQ-11) was \$87.2 million in fiscal year 2016 and \$320.6 million in FY 17,<sup>16</sup> a substantial cost when considering the electronic warfare vulnerabilities of these systems.

The lack of tactical level space integration also may be costing the Army in terms of significant waste. A prudent example of this is evidenced by the failure of the Warfighter Information Network-Tactical (WIN-T) program. The Army's recent decision to stop the purchase of WIN-T terminals after spending \$6 billion was guided in part by its vulnerable satellite links.<sup>17</sup> In addition, the Army recognized that its fixed communications terminals are susceptible to electronic warfare and kinetic targeting, and did not move rapidly on the battlefield.<sup>18</sup>

The \$6 billion question is, would designing WIN-T in parallel with a tailored space architecture have prevented this failure? I maintain that an Army tactical space program would be able to mitigate such issues by extending flexible space domain solutions to ground systems like these.

### **Win in a Complex World**

Potential adversaries have developed a wide range of capabilities to attack the premises of domain superiority, particularly in space and through the electromagnetic spectrum. They seek to defeat the United States' will to fight by degrading our ability to deploy and employ land forces to confront them. Modernizing the Army's space capabilities will posture the United States to confront this threat and deter aggressive actions.

The creation of an Army tactical space program will equip Army space forces to become a key contributor on the combined arms team and posture for the multi-domain battle. We must create concepts that drive the way and means to fill the capability gaps the Army has identified. Experimentation with SMDC-ONE, SNaP and Kestrel Eye represents the first step in an important evolution of space capabilities. An Army tactical space program can leverage this progress and posture the Army to win in a complex world.

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<sup>1</sup> U.S. Army Training and Doctrine Command, *Multi-Domain Battle: Combined Arms for the 20th Century*, Feb. 24, 2017, [http://www.tradoc.army.mil/multidomainbattle/docs/MDB\\_WhitePaper.pdf](http://www.tradoc.army.mil/multidomainbattle/docs/MDB_WhitePaper.pdf).

<sup>2</sup> Ibid.

<sup>3</sup> David G. Perkins, "Multi-Domain Battle, the Advent of Twenty-First Century Warfare," *Military Review*, November 2017, <http://www.armyupress.army.mil/Portals/7/military-review/archives/ENGLISH/November-December-2017-English-book.pdf>.

<sup>4</sup> Ibid.

<sup>5</sup> Ibid.

<sup>6</sup> U.S. Space Command, *Operations Desert Shield and Desert Storm Assessment*, January 1992, George Washington University National Security Archive, <http://nsarchive2.gwu.edu/NSAEBB/NSAEBB39/document10.pdf>.

<sup>7</sup> Department of Defense, "PLA Modernizes Its Military Training Program," information report, June 23, 1995, <https://nsarchive2.gwu.edu/NSAEBB/NSAEBB39/document13.pdf>.

<sup>8</sup> U.S. Army TRADOC.

<sup>9</sup> Ibid.

<sup>10</sup> Ibid.

<sup>11</sup> Ibid.

<sup>12</sup> The chart is so named because its highlighted priority list resembles the shape of the state of Oklahoma. The chart is an Unclassified-FOUO document.

<sup>13</sup> U.S. Army TRADOC.

<sup>14</sup> Department of Defense, *Functions of the Department of Defense and Its Major Components*, Department of Defense Directive 5100.01, Dec. 21, 2010, <http://www.esd.whs.mil/Portals/54/Documents/DD/issuances/dodd/510001p.pdf>.

<sup>15</sup> U.S. Army Space and Missile Defense Command/Army Forces Strategic Command, “Kestrel Eye,” fact sheet, <https://www.smdc.army.mil/FactSheets/KESTRELEYE.pdf>.

<sup>16</sup> Office of the Under Secretary of Defense (Comptroller)/Chief Financial Officer, *Program Acquisition Cost by Weapon System*, May 2017, [http://comptroller.defense.gov/Portals/45/Documents/defbudget/fy2018/fy2018\\_Weapons.pdf](http://comptroller.defense.gov/Portals/45/Documents/defbudget/fy2018/fy2018_Weapons.pdf), pg. 1-5.

<sup>17</sup> Sandra Erwin, “Army Seeks Fixes to Vulnerable Satellite Communications,” *Space News*, Sept. 28, 2017, <http://spacenews.com/army-seeks-fixes-to-vulnerable-satellite-communications>.

<sup>18</sup> Colin Clark and Sydney J. Freedberg Jr., “Army Plans to Halt WIN-T Buy; Shuffle Network \$\$,” *Breaking Defense*, Sept. 27, 2017, [http:// https://breakingdefense.com/2017/09/army-plans-to-halt-win-t-buy-shuffle-network](http://https://breakingdefense.com/2017/09/army-plans-to-halt-win-t-buy-shuffle-network).