Space Combat Capability . . . Do We Have It?

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Space is a foundational capability for all military operations, yet we don't really plan for anything but success.

—Gen William Shelton
Commander, Air Force Space Command
Atlantic Council, July 2014

When General Welsh took the reins as the USAF chief of staff, he acknowledged the nation's dependence upon the space domain as it relates to our national security. In an interview published in *Strategic Studies Quarterly*, he highlights several asymmetric advantages: "Only the Air Force gives our decision makers the capability and capacity they need for air superiority, nuclear and global strike forces, ISR [intelligence, surveillance, and reconnaissance], rapid global mobility, and command and control operations, all enabled by space and cyber forces. I truly believe that . . . those are the areas where we must continue to focus." He adds, "I believe the air, space, and cyber domains are likely to be those most contested in the future."[1]

It is difficult to ascertain with certainty that the DOD and Air Force are postured for tomorrow's fight in the space domain. A comprehensive, coherent plan to deter adversary action and protect our space assets remains elusive. The 2011 *National Security Space Strategy* states,

"Space capabilities provide the United States and our allies unprecedented advantages in national decision-making, military operations, and homeland security. . . . Space systems allow people and governments around the world to see with clarity, communicate with certainty, navigate with accuracy, and operate with assurance. . . . Maintaining the benefits afforded to the United States by [our operational capabilities in] space is central to our national security."[2] The 2010 *National Security Strategy* asserts that maintaining these benefits means "ensuring the U.S. military continues to have the necessary capabilities across all domains."[3] Are the nation's space assets postured for tomorrow's fight? Does the United States have a comprehensive, coherent plan to deter adversary action and protect our space assets in place or in development? As for many difficult questions, the answer is yes and no. We need to rebalance and invest in space war-fighting expertise and capabilities or risk lengthy/costly conflicts that will undermine US sovereign options and freedom to act on a global stage. This article identifies areas where opportunities for improvement exist and provides recommendations to enhance the nation's unhindered access and utilization of the domain. It provides a brief analysis of the problem along with a recommendation that can be accomplished through increased active space ISR, real-time ISR to the space war fighter, force development, and coordinated command and control (C2). It does not recommend specific acquisition reforms, champion new space policy, or address operational decision criteria.

Context

Over the last several decades, the distance of military operations required near-instantaneous secure communications and ISR as well as precise timing and navigation in support of national security objectives. The demand for these services has multiplied exponentially and is likely to continue. As a nation, we eagerly sought and exploited the inherent advantages space offered. These capabilities now enhance our operational effectiveness in almost every facet and across the

range of military operations. Space operations have improved our ability to find, fix, track, target, engage, and assess (F2T2EA) as well as to maneuver and communicate across all domains on a global scale. The following vignettes illustrate the breadth of these applications and our reliance on space capabilities.

F2T2EA: Ground forces posturing for a capture/kill mission receive battlespace awareness and real-time ISR from space assets and are commanded and controlled through a common special operations center within an area of responsibility (AOR). These space assets provide critical data and intelligence to synchronize the sensor with the shooter.

Maneuver: Naval carrier strike groups around the world rely on space support for ship movement through the use of military-grade Global Positioning System (GPS) signals and ISR assets providing battlespace awareness of possible threats through various choke points. This supports and enables "strategic positioning of capabilities that bring potential airpower to bear within striking distance of potential or actual adversaries."[4]

Communicate: When establishing "no-fly zone" operations, fighter aircraft circle the desert sky performing vital combat air patrol (CAP) missions to defend US personnel, systems, and interests. Meanwhile, an E-3 Airborne Warning and Control System (AWACS) provides airspace awareness of inbound enemy aircraft and relays data throughout the force. At times, many of these aircraft are relying on satellite communications (SATCOM) to ensure message delivery to the war fighter.

In the scenarios above, a recurring pattern emerges: integrated ISR and C2 are vital prior to, during, and postoperations to ensure mission success and assessment. As integration of space capabilities has permeated military operations, the speed, range, and accuracy advantages provided offer a fundamental competitive edge over any adversary.

During Operations Iraqi Freedom (OIF) and Enduring Freedom (OEF), Air Force Space Command (AFSPC) provided extensive space-based support to USCENTCOM through the areas of communications; positioning, navigation, and timing (GPS); meteorology; and warning.

As adversaries have seen our success, they have begun to develop ways to deny and mitigate our clear advantage and increase the costs of military operations that provide these benefits of speed, range, and accuracy. These efforts to undermine our operational advantage must be carefully considered and defeated though active defensive capabilities. To protect space capabilities, AFSPC began developing multiple defensive space control (DSC) systems in the early 2000s.[5] These systems were designed to monitor high-priority SATCOM to detect, characterize, and geolocate interference or jamming. But has our capability to defend our space assets kept pace with the technological developments of our potential adversaries? Recently addressing this topic, Former AFSPC Commander General Shelton pointed out "the growing threats in space, anything from jamming, which is very easy to do, all the way up through laser activity, to kinetic ASAT activity" and that "things are moving much faster than we would like and certainly they had predicted."[6] To this day, the DOD has yet to field a DSC program of record, and it terminated the most current system design—the Rapid Attack Identification, Detection, and Reporting System (RAIDRS) Block 10.[7]

More than a decade later, recent experience in Red Flag exercises and real-world operations make it difficult to affirm with a high degree of confidence that our capability to defend our space assets has kept up with adversarial technologies. Tasking orders have moved from machine-ingestible products to Word documents. Changes to taskings of space assets lack the structure inherent in typical air operations, such as dynamic targeting. Users of space resources and space defenders have no common operational picture, and the community has yet to adopt the brevity common throughout the joint community to standardize communications and improve interoperability.

We have fallen short in developing our ability to find, fix, and finish adversary counterspace. The lack of active ISR and a C2 posture to detect, characterize, and neutralize threats to these assets is alarming. In short, we have been *too slow* to develop an architecture optimized to detect and attribute interference and protect our space assets.

The concepts of continuous, persistent, and active ISR and C2 allow commanders to prepare for and defend against enemy threats at a moment's notice and have become synonymous with decisive, time-sensitive combat operations. While the DOD is well postured in the air, land, and sea domains, space remains ill-equipped to provide continued combat support operations when the domain becomes truly contested.

A "Known" Problem?

Current space ISR and space control operations focus on providing effects and protection to land, maritime, and airborne forces.[8] Using the example discussed earlier, if additional RC-135 and E-8 platforms provide real-time updates on adversaries that pose a threat to friendly forces, then the AWACS can immediately vector appropriate assets to neutralize those threats, the F-15 engages, and the same intelligence platforms assess the results. Though aircraft continue to advance, the reliance on space support and capabilities to F2T2EA does not change. Who performs each of the vital roles for space assets at risk? Where is the purpose-built space architecture to F2T2EA in a dynamic, contested domain? Simply, this architecture does not exist today.

Threats ranging from SATCOM jammers, sensor blinding lasers, and other antisatellite weaponry pose a threat to numerous high-value US assets and their capabilities. In 2012 Gil Klinger, deputy assistant secretary of defense for space and intelligence, remarked, "Every day we have visible signs that the importance of space to U.S. national security and national economic security continues to increase, making space capabilities not only an asymmetric strength and advantage, but also a potential vulnerability."[9] In a 2014 House subcommittee hearing, it was stated that "recent advancements in China's counterspace program, coupled with America's reliance on vulnerable space assets, poses a serious risk to national security."[10] Furthermore, various state and nonstate actors have developed, or are developing, capabilities to counter, attack, and defeat US space systems.[11] The DOD needs to focus

efforts within the space domain in an attempt to achieve and maintain space superiority against emerging threats.

Awareness of the problem is not enough. In 2013 the DOD experienced 200-plus reported SATCOM electromagnetic interference (EMI) events.[12] This number represents only those events conveyed through the proper chain of command and does not account for numerous events that either cleared before reports were generated or went undetected for a large period of time. The posture driven by the gap in current space ISR and C2 forces a reactionary approach to defense, preventing us from proactively mitigating these threats. If we are to compete in a contested space environment, we need solutions that allow space systems to identify, locate, move, block, and neutralize these new threats and a flexible infrastructure that enables rapid communication and reconfiguration.

Recommendations

The DOD and Air Force must invest resources and personnel to enable AFSPC to meet current and future space threats on the following four fronts:

1. Build situational awareness (SA).
2. Exploit what we know (through force enhancement).
3. Defend our capabilities.
4. Attack to defend our national interests (if required).

Increasing proactive ISR in the space domain delivers a more comprehensive and continuous picture, allowing war fighters to digest small changes rather than a flood of new information. Increasing real-time ISR and providing SA to the space war fighter enables predictive posturing executed by properly trained Airmen.

Establishing the proper force-development pipeline of personnel and equipment structures optimizes capabilities and expertise in line with

or ahead of the adversary development cycle. Building upon the current space C2 model to provide active space ISR capabilities for real-time threat reaction and mission defense puts action behind all the awareness, posturing, and expertise developed above.

For this solution to remain viable, there must be a fundamental difference between space asset utility (force enhancement) and combat capability.[13] As stated in the 2011 US *National Military Strategy* (*NMS*), the United States "must grow capabilities to enable operations when a common domain [space] is unusable or inaccessible."[14] In this instance, the *NMS* is referring to the United States' ability to fight through a contested, degraded environment to continue delivering effects in support of commanders and terrestrial forces (i.e., communication and information services). What the *NMS* does not address is the need to actively defend US space assets against threats in the first place, thus avoiding the need to operate in a degraded environment (i.e., combat capability).

The past strategy of focusing space assets solely as support entities to terrestrial forces (as seen in Operation Desert Storm, OIF, and OEF) has left the DOD's defensive space posture narrow in scope and has hindered advancements in active space ISR and coordinated C2. To ensure continuity of operations, future *NMS*s should outline a plan for operating space forces to protect space assets and engage threats (state and nonstate actors). Developing this concept will require a new lens not often considered if space is viewed simply as force enhancement—that of tooth versus tail. Tooth-versus-tail comparisons arise when the military seeks to maximize war-fighting capacity by converting tail (sustainment and force enhancement) to tooth. Adding teeth to the protection of our space forces is a necessary step in moving from force enhancement to combat capability. One inhibitor to this argument is the misinterpretation of outdated international space treaties. While the weaponing of space is prohibited, this does not preclude the United States from taking defensive action against hostile kinetic or nonkinetic attacks. Maj Gen James Armor, former director of the

Defense Department's National Security Space Office, expressed that the "DOD balances the need for improved space situational awareness [SSA] and protection of critical space assets with ensuring that the United States has the ability to deny an adversary access to space capabilities that can be used for hostile purposes contrary to U.S. national interests."[15] In this context, the United States can and should take action within space to ensure continued use and protection of space assets.

Increased Active Space ISR

Air Force ISR has largely been conducted these past 20-plus years in a permissive environment. We must plan for and invest in the future of the Air Force's incredible ISR contributions to our nation's defense. It's critically important that those contributions be possible in all scenarios, to include operations in contested battlespace.

—Gen Mark Welsh, USAF Chief of Staff

Lt Col William Danskine's article "Aggressive ISR in the War on Terrorism" contends that a vital aspect of modern warfare is relentless ISR from every possible avenue and explains that the "United States is searching for a proactive strategy for countering threats before they arrive upon its own shores."[16] In the case of the war on terrorism, the Air Force increased and improved airborne ISR within the AOR. The same concept should be applied to the space domain. According to Air Force core doctrine, tailorable products enable strategic, operational, and tactical effects with a better understanding of the operational environment (systematically, spatially, and temporally)[,] allowing decision-makers and warfighters to better orient themselves to the current and predicted situation and enable decisive action. [17] By this definition, ISR assets should be aggressively focused on providing these capabilities specifically to space operations as they integrate with terrestrial operations. Solely committing ISR to other domains fundamentally overlooks the freedom of action that aggressive ISR provides within the space domain.

To truly understand the space environment, we must increase and improve active space ISR for the purpose of threat indications and warning. The United States' heavy reliance on military and commercial space assets exposes a significant vulnerability for adversary exploitation. Those vulnerabilities can be mitigated; however, any lack of current SSA increases the difficulty of those mitigation actions. As space operations become more congested and contested, it will become more difficult to track foreign and possible threat space systems orbiting the earth. Since the launch of Sputnik 1 in 1954, nearly 4,000 rockets have delivered more than 6,000 payloads into Earth's orbit—some of which have either collided or broken apart to create more clutter in the operational environment.[18] This space debris makes active ISR very difficult and increases the requirement for additional observations, analyses, and communications to ensure mission success. If not tackled head-on, the United States may never have an adequate picture of what space threats exist today or in the future.

A key component of active space ISR is understanding the functions, purpose, and activity of adversary capabilities—both space-based and terrestrial. The DOD must establish a fleet of assets, or repurpose current ISR assets, to provide active space ISR that defensively postures space resources to proactively employ their combat capability. These ISR assets need to perform multiple functions: monitor space activity through radio frequency signal activity; visually identify satellite kinetic and nonkinetic space-based threats; and identify/characterize, track/find, fix, and target terrestrial nonkinetic threats to US military and commercially purchased/leased space assets. This fleet of assets would form the equivalent of ISR CAPs for each orbital regime (low, medium, high, and highly elliptical) and the accompanying infrastructure—a distributed common ground system for space.

Real-Time ISR to the Space War Fighter

Once an active space ISR fleet is established, data generated must be readily available to the space war fighter in a useable form. Air Force

core doctrine states that "as an essential element of all Air Force operations, global integrated ISR linked personnel should be fully aware of mission goals and objectives and be integrated into the operational environment at all levels," disseminating integrated, accurate, relevant, timely, accessible, and secure information."[19] Employing adequate active ISR for space threat indications and warning requires an architecture that meets these six requirements.

Space ISR assets, as configured today, are doctrinally divided into "military, nonmilitary, and national systems."[20] This division of assets has proven to work well in supporting traditional ISR collection for terrestrial threat warning and indications. However, it lacks dedicated capacity, priority, and focus to adequately employ the same systems to deliver integrated, accurate, relevant, timely, accessible, and secure data to those operating space systems.

Current space defensive measures are much more reactive rather than proactive. Consider a "typical" communications interference scenario: the first action taken to resolve interference requires the user to report a problem to a communication center.[21] The communications center troubleshoots or relays to C2, C2 may ask for space assistance through an additional process called joint spectrum interference resolution, and—if the interference remains active—the space system may be able to locate and/or attribute the interference to a user misconfiguration or a hostile actor. The process can take days or longer. While this chain of events may be adequate for responding to unintentional EMI, it in no way actively defends SATCOM against a hostile adversary. At this point, the adversary has accomplished its mission to disrupt or deny communications, and the DOD is unable to take defensive actions to stop that from happening in the first place. Mr. Douglas Loverro, deputy assistant secretary of defense for space policy, conveys that the DOD's space protection needs to consist of "defensive operations to provide warning of and interruption to an adversary's attack."[22] Countering Mr. Loverro's testimony, the 2013 DOD *Electromagnetic Spectrum Strategy*

does not address engaging or defeating a threat but only a need to outperform it.[23]

Unfortunately, once an event has occurred, the effects could be irreversible or, in some cases, the adversary's objective may have been achieved with even a short-duration denial of space capabilities at key times. Further, space operations are different from air, land, or sea platforms from the standpoint that an effect on one space asset may cause effects to multiple assets across different domains. A hypothetical kinetic attack on a military communications satellite could severely impact a national asset by creating a massive debris field within an already highly regulated and congested orbit. Enemy satellite jamming on a military satellite could easily spill over and affect numerous nonmilitary/commercial satellites.

Various space ISR assets exist today—some terrestrial, military-based defensive systems monitoring thousands of SATCOM signals and some space-based national systems. However, no common architecture is in place to provide real-time indications and warning to space system operators. Also lacking is a multiplatform data-link or common operating picture, and interoperability of systems is typically an afterthought upon system acceptance. Within the 16th Space Control Squadron, four separate systems—built to monitor priority SATCOM and to detect, characterize, and geolocate sources of interference—were designed by different contractors to operate on three different networks.[24] This problem compounds when communications and C2 must occur across squadrons, space wings, and joint mission partners. Who's holding the stick on data exposure and interoperability? Who suffers more when a degraded space capability affects ALL other joint war fighters?

To F2T2EA, maneuver, and communicate, our space forces need to know who to target, what to avoid when maneuvering, and how to communicate broadly, quickly, and clearly. Real-time, active ISR provides the starting point from which these branch plans arise.

Force Development

To effectively employ the recommended solution of increasing active ISR for space and providing real-time ISR for space war fighters, the DOD must also invest in building the proper force development pipeline for personnel and equipment to engage in a space-based contested and degraded operational environment. In 2001 the US Space Commission released a report concluding that "the DoD is not yet on course to develop the space cadre the nation needs."[25] While the DOD has come a long way in building a large and well-trained cadre of space operators and leaders, a deficiency of professionals dedicated to the active defense of US space assets remains.

The typical space operators in today's Air Force, Army, Marines, and/or Navy do not have the opportunity to sufficiently master one single space system. Instead, they are often moved to two or three different systems before taking a command/leadership role in one of the systems they previously operated. In some cases, Air Force space operators may take a command/leadership role within a mission area they have never operated. Within other Air Force flying specialties, members of that career field will spend years becoming experts in their weapons system. The Air Force does not place a tanker pilot into a fighter squadron or a remotely piloted aircraft pilot into an airlift unit, so why should it accept anything different within space operations? To effectively man and operate advanced space control, ISR, and C2 forces, AFSPC must develop space professionals capable of engaging adversary space actions while operating in a contested and degraded environment. Fortunately, the Fourteenth Air Force has taken initial steps with a proposal that targets increasing mission area expertise, cultivating manpower through prioritized assignments, and improving recruiting and retention. These efforts, however, are largely focused on platforms and may not sufficiently address development of tactical C2; additional steps are needed to capture service-level support and action.[26]

With a cadre of elite space control, ISR, and C2 war fighters, AFSPC can effectively employ and grow personnel to counter current and future space threats. Various reports and national-level hearings have historically shown that adversary capabilities continue to expand every year, and the United States continues to recognize a need for internal expansion in similar technology to counter those threats.[27] The Air Force and DOD need a process in which AFSPC can rapidly develop and employ space control and ISR systems operated by highly trained tactical operators. The desired end state is a force operating iterations of systems developed to outpace modern threats, with acquisition decisions based after delivered performance rather than on projected performance. These operators must develop effective tactics, techniques, and procedures for this new fleet of interoperable capabilities, creating the force structure that counters threats through real-time ISR, experienced/tactical space C2, and active defensive space systems.

Coordinated C2

The Joint Space Operations Center (JSpOC) commands and controls space assets. C2 of space assets today, along with the JSpOC Mission System (JMS) coming online in the future, centers primarily on spacecraft mission utility, space surveillance, and space control operations. The Air Force should expand the current space C2 model to provide collection of active space ISR capabilities for real-time threat reaction and mission defense. General Shelton touched on this topic in a recent address, saying that "we don't have a way to fuse all this data. We're operating right now on a kind of 1994 software package and a 1980s computer package at the Joint Space Operations Center out at Vandenberg–SPADOC, Space Defense Operations Center."[28] The Joint Functional Component Command for Space (JFCC Space) must be able to expand the operational C2 provided by the JSpOC to fuse ISR and space combat capabilities. Current C2 tools look at the operational control of a single domain (space) without concurrent visualization of space effects

across other domains and the protection of those effects against real-time threats. To defend space assets, ISR across all domains must be integrated through a common C2 node to identify real-time and future space threats and provide tactical C2 to employ space combat capabilities.

The current space C2 model and future JMS are designed to provide C2 of tactical space assets for payload operations and overall satellite health and orbital station keeping. This extremely important mission must remain in place. However, to implement real-time ISR for the space war fighter, a C2 node must intake, discriminate, decide, and disseminate data rapidly. In other words, posturing space assets to F2T2EA as well as maneuver and communicate in a contested and degraded environment requires a faster, more robust architecture to provide tactical C2. Similar to the airborne C2 model—comparable to that of the AWACS—the space domain needs to invest in personnel and resources that feed a common operating picture into a central, agile C2 node and then disseminate threat indications and warnings to tactical units for real-time reaction and protection. This C2 node must develop procedural controls for a mix of terrestrial- and space-based assets that provide high fidelity and shared battlespace awareness. So equipped, space professionals must bring air and joint tactical C2 constructs together to ensure integrated and complementary operations with assets in the other domains. Ultimately, tactical C2 needs to tell a space platform where to maneuver, how to distinguish between friendly forces and adversaries (i.e., deconflict orbits and then access satellite payload data), how the threat will not find the relocated space asset or be aware of the maneuver, and how the asset will reconstitute operations once in place. Enabling space combat capabilities to F2T2EA, maneuver, and communicate ensures remaining space assets survive to enable successful operations in the other war-fighting domains.

Conclusion

Space operations are more integrated today into combat operations than ever before, but that integration falls short when it comes to pro-

tecting critical space capabilities. The former AFSPC commander, General Shelton, recently commented that "space has really become a utility. You plug in, take it for granted, and don't even think about where the services came from."[29] Overlooking the source of these capabilities or how to properly protect them proves a fundamental flaw with the DOD's position. Any lapse in US capacity to ensure unhindered freedom to F2T2EA, maneuver, and communicate threatens the loss of the same air, land, and maritime capabilities. We must be aware of adversary actions to neutralize our competitive edge and use this awareness to posture our space assets. Then our cadre of professional space operators supported by a robust architecture will be fully capable of accomplishing the space mission with a more integrated battlespace consciousness than ever before. If we cannot achieve these goals, as noted by the 2014 SATCOM EMI Working Group, "with what we have today, we must be prepared to lose any serious conflict in the future."[30] ✪

Notes

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12. JFCC Space SATCOM EMI Working Group Conference, "Summary of Findings: Issues / Unanswered Questions / Recommendations" (Vandenberg AFB, CA, 17–21 March 2014).

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14. Michael G. Mullen, *The National Military Strategy of the United States of America 2011: Redefining America's Military Leadership (*Washington, DC: Joint Chiefs of Staff, 2011), 9.

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