Developing Tomorrow's Space War Fighter

The Argument for Contracting Out Satellite Operations

Maj Sean C. Temple, USAF

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> *So when any environment comes under threat, what we have to do is we have to figure out how to fight through that threat and continue to provide operational capability, and that's the fundamental first priority of our command today.*
>
> —Gen John E. Hyten
> 2015 National Space Symposium

To date, space has been a fairly unchallenged environment to work in. The threat, however, is growing. As General Hyten stated, the priority of Air Force Space Command (AFSPC) is to continue to provide operational capability, even in a threatened environment. As the chance of a war in space intensifies, developing AFSPC personnel who are equipped to "win tomorrow's fight" will be increasingly necessary. Tomorrow's space war fighter will need to possess a broad range of skills to deal with potential threats to our space systems. As we move forward, our focus needs to move from operating satellites in an uncontested setting to ensuring that satellite effects are available even in a congested, contested, and competitive space environment.[1] *To develop space war fighters who are educated, experienced, and prepared to win tomorrow's fight, AFSPC should contract out day-to-day satellite command and control and shift the space operator's focus to defending our nation's space assets.*

War in Space

> *War in space would destroy the intrinsic trust and cooperation necessary to maintain these systems, and combat itself in space would produce debris that would destroy the satellites, seriously ending the possibility of using space for peaceful purposes.*
>
> —Helen Caldicott and Craig Eisendrath
> *War in Heaven: The Arms Race in Outer Space*

The United States has made it clear in policy that it has no wish to fight a war in space. According to the 2011 *National Security Space Strategy*, "We seek a secure space environment in which responsible nations have access to space and the benefits of space operations without need to exercise their inherent right of self-defense."[2] The launch of an antisatellite weapon by China in 2007, however, highlighted that there is a need for countries to be able to defend themselves.[3] It also highlighted the devastating effects that a war in space could produce. This single event created more than 3,000 pieces of debris in low Earth orbit that will take an estimated 100 years to dissipate.[4] Each piece of debris, travelling at speeds of more than 17,000 miles per hour, has the potential to physically destroy a satellite on impact.[5] Imagine several of these antisatellites being used simultaneously in different orbits; the effects to the space environment would be catastrophic, both militarily and commercially.

Additionally, there are many nonkinetic threats that can be used to interfere with space capabilities. While nonkinetic effects are usually reversible (i.e., causing no permanent damage to the satellite), they have the ability to take our space systems out of the fight in a conflict. Jammers, laser dazzling, spoofing, and cyber attack are but a few of the methods that can prevent a satellite from delivering operational capability. This is the type of environment that tomorrow's war fighter needs to be prepared to fight in and through.

Defending space systems is not a simple task. As a 2008 Council on Foreign Relations special report states, "Satellites' predictable orbits make them vulnerable to a variety of offensive counterspace technologies that are growing more sophisticated and capable over time. In space, offense has a major advantage over defense."[6] The United States arguably has the most to lose in a war in space, which puts it in the difficult position of having to defend our space systems. As adversary offensive counterspace technologies continue to evolve and become increasingly effective, it is imperative that we educate our space war fighters on their capabilities and potential ways to counter them.

Developing Tomorrow's Space War Fighter

> *We will improve the ability of U.S. military and intelligence agencies to operate in a denied or degraded space environment through focused education, training, and exercises and through new doctrine and tactics, techniques, and procedures.*
>
> —2011 *National Security Space Strategy*

To be ready for the challenges of tomorrow, space war fighters must have a better understanding of the art and science of war in space and must have the systems to support them. Now is the time to develop doctrine and train space professionals for tomorrow's conflict. This education needs to occur early and often in the careers of our space professionals. Now is the time to start developing systems with advanced defensive capability. We should begin preparing tomorrow's space cadre by focusing

education in areas that will make them better space war fighters instead of just better space operators.

The Space War Fighter Needs to Have a Solid Understanding of Threats That Are Out There, Both Kinetic and Nonkinetic

Anything that can degrade, disrupt, deny, or destroy our operational space capability should be known and understood by the space war fighter. Space war fighters need to have the appropriate clearance level and access to classified information to stay current on threats. This includes space war fighters who develop requirements and acquire space systems.

The Space War Fighter Needs to Be Educated on Ways to Counter the Enemy Threat

It is not enough to know the threat; space war fighters need to be well versed on defensive tactics. They should have a technical understanding of defensive counterspace operations and how to implement them. As they work with specific weapons systems, they should learn which defensive tactics can be applied to their weapons system and which ones can't because of operational or technical limitations. War fighters should have potential threats to their system at the forefront of their minds, constantly thinking about new ways to counter them or operate through them.

The Space War Fighter Needs to Have a Solid Understanding of Our Space Systems and Their Capabilities

All space professionals should know, in general, what space systems are out there and what mission they perform. As personnel work with specific weapons systems, they should learn the specific capabilities provided by the system and why it is vital to the war-fighting effort. They should develop tactics, techniques, and procedures to ensure that the capability is available in a denied or degraded space environment, even if the capability no longer comes from space. War fighters should practice counterspace capabilities on their system so they are ready when called upon.

The Space War Fighter Needs to Have a Solid Understanding of the Space Environment

From orbital mechanics to the electromagnetic spectrum, understanding how space works and how it is different than the terrestrial environment is key to developing war fighters who can defend our systems in space. According to Simon Worden, "It is more important that all space professionals be versed in orbital dynamics mathematics than being able to recite the elements of total quality management."[7] While a technical degree may not be necessary for today's space operator, it will become increasingly important that we recruit technically minded individuals who can understand the complexities of space.

The Space War Fighter Needs to Have a Solid Understanding of Space Policy and Direction

War fighters need to understand what our country defines as acceptable behavior in space. War fighters need to understand the impact that counterspace actions could

have on the larger picture. For instance, maneuvering several Global Positioning System (GPS) satellites to avoid a questionable space object could affect GPS accuracies that civilians depend on. Along with an understanding of policy, space war fighters need to have a clear chain of command and control. They need to be empowered to take action to defend our satellites within well-defined boundaries.

The Space War Fighter Needs to Have the Experience and Knowledge to Develop Quality Space Systems

As space professionals progress in their careers, they will likely be involved in developing the next generation of space systems. The experience they gain as space war fighters will aid them in developing good requirements. Such development must take into account the potential vulnerabilities of the system and attempt to minimize those vulnerabilities using the space war fighter's knowledge of defensive counterspace options. Space war fighters must also be intimately involved in the acquisition of more robust, capable, and survivable space systems. The space war fighter cadre should include acquisition personnel who will spend their careers acquiring for space.

The Space War Fighter Needs to Be Integrated

Defending space will be a team effort that will involve contributions of the intelligence community, commercial partners, and allied countries to the common defense. Tomorrow's war fighter needs to understand the risks and benefits of partnering with other organizations and utilize them to the maximum extent practicable.

The Space War Fighter Needs to Focus on Space as a Contested Environment

Space war fighters must focus on counterspace operations to ensure that our nation's space assets are available when needed. They need to be prepared to help defend our allies and commercial assets from potential threats. Simulations and exercises need to be done frequently and with realism. Space war fighters need to have the resources available to accurately simulate possible threats and to test and validate tactics, techniques, and procedures.

Contracting Out Satellite Operations

> *We will build a more diverse and balanced workforce among military, civilian, and contractor components. These professionals must be educated, experienced, and trained in the best practices of their field—whether it is planning, programming, acquisition, manufacturing, operations, or analysis.*
>
> —2011 *National Security Space Strategy*

Developing tomorrow's space war fighter will take time, training, and a refocus toward space as a war-fighting domain. Where does one find the time to do this when all of his or her energy is spent training, certifying, evaluating, and operating

satellites? One answer is to contract out day-to-day satellite operations and remove the myriad of requirements that satellite operations bring with them. Having military personnel perform satellite operations is both inefficient and unnecessary.

Because AFSPC falls under the United States Air Force, it is natural that one would expect space operators to "fly" satellites in the same way that a pilot flies a plane. The actual process of maintaining a satellite on orbit is much different. A satellite is repositioned, reconfigured, and updated by sending commands through a data link from the ground to the satellite. Every command sent to a satellite needs to be carefully developed, thoroughly reviewed, and appropriately tested to ensure that there are no adverse effects on the satellite. A bad command sent at the wrong time could cause a catastrophic loss of a multi-billion-dollar system. To develop and/or modify these commands, many satellite programs depend on contractor expertise. Often, the contractor that built the satellite is the only one with the knowledge and technical ability to create commands. Once the satellite is built, these commands are then passed to the military operator, who uploads them to the satellite at the appropriate time.

Having Military Personnel Operate Satellites Is Inefficient

Military space operators must go through months of generalized training on how to operate a satellite, how to use command and control software, how to run checklists, and so forth. Once this training is finished, the military operator gets more specialized training on his or her specific systems. All of this training takes time, facilities, and a cadre of experienced instructors. Additionally, because of the sensitive nature of the job (commands are sent to very expensive satellites), the operators must be constantly evaluated on their proficiency, certified, and medically cleared for operations. Even with all of this training, most operators have far less knowledge of how the system works than their support contractor, who has been doing the job for years. We spend a lot of time and money developing technical orders and checklists to make operations more manageable for military operators and to reduce the chance of an error. Finally, after our military personnel are fully qualified and have some experience operating their satellite, we move them to a different job. Whether it's moving to a back shop of the squadron (such as the scheduling section), to an evaluator/instructor position, or to a new satellite system entirely, operators are rarely in place long enough to take advantage of all the training they have received.

A primary cause of the inefficiencies in our current system is the constant turnover of military personnel. By having contractors take over operations, we can eliminate much of this turnover. Contractors would still have to go through a rigorous initial training process prior to taking over satellite operations; however, they would have to do this training only one time and only for the system they operate. Because turnover would be much reduced, contract operators wouldn't require an army of instructors/evaluators that changes every few months. A few highly trained contractor personnel could train newcomers and ensure the proficiency of existing operators. The 24/7 engineering support currently provided to military operations personnel could also be much reduced. A contract operator with continuity

and detailed technical understanding of the system should rarely need to rely on on-call support.

Further efficiencies can be gained by adding interoperability and automation as well as by streamlining processes for our Air Force's satellite command and control systems.[8] According to a 2013 Government Accountability Office (GAO) report, "While commercial companies use computer programs to perform routine tasks, the Air Force typically uses human operators. Increasing automation for routine control functions could reduce Air Force personnel costs, and the potential for human errors."[9] The contractor should have sufficient incentive to develop systems and/or processes, with government oversight and approval, that optimize satellite commanding. One operator can do the job of many if the processes are mostly automated. In fact, some commercial companies have gotten to the point where they can control up to 15 satellites with just one operator at a time.[10]

Having Military Personnel Operate Satellites Is Unnecessary

On the one hand, many of our Air Force pilots are required to operate their aircraft where the threat of losing their lives is quite possible. Other military operators are in control of weaponry that can have lethal and devastating effects. Space operators, on the other hand, are under no direct threat. Most of our satellite operations are performed from within US borders. Additionally, while the operational effects from space are critical to the military and civilian population alike, there are no direct lethal effects delivered from satellites. Ultimately, there is no military necessity for satellite operators to be military personnel. Commercial satellite operators provide very similar command and control services for commercial satellites every day, and, returning to the first point, they do so far more efficiently. Again, the 2013 GAO report summarizes the situation well: "While commercial satellites and Air Force satellites can greatly differ in their missions, and to some extent may differ in their need for information security, basic satellite control operations functions of most of these satellites are generally the same, allowing trusted practices from the commercial sector to be applicable to many Air Force satellite programs."[11]

Transitioning to Contracted Operations Is Not without Its Risks

Contract operators should be mainly focused on performing day-to-day operations and meeting the requirements of their contract while military personnel should be focused on overseeing the contractor and developing defensive tactics to keep their satellite available. If both are to do their jobs well, a high degree of integration must exist between the military and the contractor. The space war fighter must work with the contractor to define what the satellite's defensive triggers are, what defensive options can be executed, and under what constraints. The military needs to be able to integrate defensive counterspace into the command and control processes of the contractor so that options can be implemented quickly in a crisis. All systems will require competent government oversight and approval to ensure that systems are being operated in the best interests of the government.

Summary

Tomorrow's space war fighter needs to be educated, experienced, and prepared to win tomorrow's fight in space. Performing daily satellite command and control operations does not prepare our forces for that fight. To start the transition from space operators to space war fighters, we should take the following steps:

1. Start transitioning to contractor satellite operations where feasible.
2. Transition space operators to a contractor oversight role, and shift their focus to defensive counterspace operations.
3. Reinvigorate space education to focus on the skills that tomorrow's space war fighter will need (see "Developing Tomorrow's Space War Fighter," above).
4. Enhance training/simulation/exercises to develop space war fighters' thinking and to test space-war-fighting capabilities.
5. Utilize the development of space war fighters' expertise to define and acquire the next generation of defensible space systems.

In these fiscally and manpower-constrained times, finding more efficient ways to operate is critical. It already takes an army of on-site and factory engineers to do the analysis and develop the commands that our military space operators rely on. In fact, many of our systems could not be operated without contractor expertise. Removing the military as the middleman in satellite operations is one area where we can generate huge gains in efficiency. By contracting out satellite operations, we can free up time for our military personnel to focus on learning about the threats to our space systems and planning for their defense. ✪

Notes

1. Department of Defense and Office of the Director of National Intelligence, *National Security Space Strategy: Unclassified Summary* (Washington, DC: Department of Defense and Office of the Director of National Intelligence, January 2011), 1, http://www.dni.gov/files/documents/Newsroom/Reports%20and%20Pubs/2011_nationalsecurityspacestrategy.pdf.
2. Ibid., 4.
3. Bruce W. MacDonald, *China, Space Weapons, and U.S. Security*, Council Special Report no. 38 (New York: Council on Foreign Relations, September 2008), 5, http://i.cfr.org/content/publications/attachments/China_Space_CSR38.pdf.
4. Department of Defense and Office of the Director of National Intelligence, *National Security Space Strategy*, 2; and MacDonald, *China, Space Weapons, and U.S. Security*, 6.
5. MacDonald, *China, Space Weapons, and U.S. Security*, 5.
6. Ibid., 32.
7. Simon P. Worden, "Future Strategy and Professional Development: A Roadmap," in *Toward a Theory of Spacepower: Selected Essays*, ed. Charles D. Lutes and Peter L. Hays (Fort Lesley J. McNair, Washington, DC: Institute for National Strategic Studies, National Defense University, 2011), [580], http://www.dtic.mil/dtic/tr/fulltext/u2/a546585.pdf.
8. US Government Accountability Office, *Satellite Control: Long-Term Planning and Adoption of Commercial Practices Could Improve DOD's Operations* (Washington, DC: US Government Accountability Office, April 2013), 19, http://www.gao.gov/assets/660/654011.pdf.

9. Ibid., 20.
10. Ibid., 18–19.
11. Ibid., 19.

Maj Sean C. Temple, USAF

A graduate of the US Air Force Academy and Auburn University–Montgomery, Major Temple is the chief of space control and space situational awareness programs at Headquarters Air Force Space Command. Career highlights include 4th Space Operations Squadron engineering flight commander, flight commander / instructor at the Air and Space Basic Course, and multiple program management positions at the Space and Missiles Systems Center.

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