Chapter 1

United States Military Uses of Space: Issues and Challenges

Peter L. Hays[*]

Abstract

This paper examines U.S. military space issues and challenges by reviewing U.S. national space policies and doctrines, overviewing U.S. military space mission areas and programs, and considering specific approaches to deal with these concerns more effectively. The United States currently categorizes its military space activities into five mission areas: Space Situational Awareness (SSA), Space Force Enhancement, Space Support, Space Control, and Space Force Application. SSA is fundamental to conducting all space operations and is essential for Space Control. Space Force Enhancement operations increase joint force effectiveness by increasing combat potential, enhancing operational awareness, and providing critical joint force support. Space Force Enhancement is composed of Intelligence, Surveillance, and Reconnaissance (ISR); Missile Warning; Environmental Monitoring; Satellite Communications (SATCOM); and Positioning, Navigation, and Timing (PNT). The Space Support mission area includes the essential capabilities, functions, activities, and tasks necessary to operate and sustain all elements of space forces throughout the range of military operations and involves Spacelift, Satellite Operations, and Reconstitution of Space Forces. The Space Control mission area supports freedom of action in space for friendly forces, and when necessary, defeats adversary efforts that interfere with or attack U.S. or partner space systems and negates adversary space capabilities. The Space Control mission area consists of Offensive Space Control (OSC) and Defensive Space Control (DSC). Finally Space Force Application is combat operations in, through, and from space to influence the course and outcome of conflict by holding terrestrial targets at risk.

U.S. Policy and Strategy for Space Security

For decades space capabilities have delivered important asymmetric advantages to the United States. These advantages have provided foundational elements of America's strength in the information age but are now being

undermined by factors including the rise of China as a peer competitor with significant space and counterspace capabilities and continuing work by Russia to develop a range of counterspace weapons.[1] Meanwhile, the United States has too often wavered and devoted insufficient resources toward advancing a viable and sustainable strategy to develop and employ capabilities needed to address these mounting challenges. The trajectory of U.S. spacepower development has reached an inflection point where current lines of attack will no longer improve or even maintain U.S. advantages—a point where the United States must implement different approaches or face diminishing returns from space investments and erosion of overall military power. To become more agile and adaptive in developing spacepower the United States needs to improve its strategic-level management and organizational structures for implementing goals from the National Security Strategy, National Space Policy (NSP), and especially the National Security Space Strategy (NSSS). The United States should craft a deliberate, comprehensive, long-term, and consistent strategy that assures effective and efficient development and employment of resilient space and counterspace capabilities. This strategy should draw on all instruments of power from all levels of government, foster unity of effort and effect in national security space (NSS) activities, develop improved space control capabilities, increase the competitiveness of the U.S. space industrial base, and, in particular, find better ways to leverage state-of-the-world commercial and international space capabilities in resilient architectures. Many of today's problems with NSS stem from inappropriate or underdeveloped policies and top-level management structures. Consequently, improvements are most needed in these areas rather than at the tactical- and operational-levels where most NSS activity has been more successful and created a highly effective yet fragile reconnaissance-strike complex. This paper addresses these issues and strategic challenges by reviewing U.S. national space policies and doctrines, overviewing U.S. military space mission areas and programs, and considering specific approaches to deal with current issues and challenges more effectively.

The Obama Administration's National Security Strategy, released in February 2015, reiterated the importance of space security and added new emphasis on deterring and defeating attacks on space systems and developing

[1] A helpful annual overview of developments related to space security is provided by the *Space Security Index* located at http://spacesecurityindex.org/

resilient space capabilities:

> Space systems allow the world to navigate and communicate with confidence to save lives, conduct commerce, and better understand the human race, our planet, and the depths of the universe. As countries increasingly derive benefits from space, we must join together to deal with threats posed by those who may wish to deny the peaceful use of outer space. We are expanding our international space cooperation activities in all sectors, promoting transparency and confidence-building measures such as an International Code of Conduct on Outer Space Activities, and expanding partnerships with the private sector in support of missions and capabilities previously claimed by governments alone. We will also develop technologies and tactics to deter and defeat efforts to attack our space systems; enable indications, warning, and attributions of such attacks; and enhance the resiliency of critical U.S. space capabilities.[2]

This emphasis on countering attacks on space systems and developing resilient space capabilities is consistent with a general trend for recent Presidents to devote increasing attention and resources to national security and foreign policy during their tenure. The shift in tone on space security between the beginning and end of the Obama Administration is significant and moves national policy a considerable distance away from the tone in its first National Security Strategy and its NSP, both released in 2010, toward the tone of the 2011 NSSS.

The June 2010 NSP emphasized broad continuity between its major objectives and the overarching themes of U.S. space policy, originally developed by the Eisenhower Administration, such as encouraging responsible use of space and strengthening stability in space. Other goals evolved directly from original U.S. space policy objectives including expanding international cooperation, nurturing U.S. space industry, and increasing assurance and resilience of mission-essential functions enabled by commercial, civil, scientific, and national security spacecraft and supporting infrastructure. In particular, the NSP indicated the United States will "ensure cost-effective survivability of

---

[2] Barack Obama, *National Security Strategy* (Washington, DC: The White House, February 2015), p. 13.

space capabilities" and "develop and implement plans, procedures, techniques, and capabilities" necessary for mission assurance including "rapid restoration of space assets and leveraging allied, foreign, and/or commercial space and nonspace capabilities to help perform the mission."[3] The 2010 NSP also contained some areas of new or changed emphasis such as the more enthusiastic approach towards transparency- and confidence-building measures (TCBMs) including "concepts for space arms control if they are equitable, effectively verifiable, and enhance the national security of the United States and its allies."[4] The Obama Administration's position on pursuing TCBMs and considering space arms control was similar to the Reagan Administration's considerations for space arms control and replaced the Bush Administration's 2006 NSP language about opposing "development of new legal regimes or other restrictions that seek to prohibit or limit U.S. access to or use of space."[5]

Unfortunately, it has grown increasingly clear that the 2010 NSP fell short of appropriately and comprehensively addressing many of the most important NSS challenges the United States faces. While more stress on cooperation and responsible behavior in space is useful, the 2010 NSP eschews any discussion of U.S. space leadership and overcorrects the competitive tone in the 2006 NSP by emphasizing just the cooperative dimensions of space, avoiding the reality that space is inherently a domain of both cooperation *and* competition as states and other actors pursue their economic and security interests. Moreover, the Obama NSP does not provide sufficient guidance or criteria for determining what constitutes responsible behavior in space. For example, it did not even specifically address the January 2007 Chinese anti-satellite (ASAT) test, a dangerously irresponsible act that reawakened global concerns about space as a militarily contested domain and created a persistent debris cloud that initially contained more than 25 percent of all catalogued objects in Low-Earth Orbit (LEO).[6] Another troubling part of the 2010 NSP calls out space stability and

---

3 Barack Obama, *National Space Policy of the United States of America* (Washington, DC: The White House, 28 June 2010), p. 13.

4 Ibid., p. 7.

5 George W. Bush, *U.S. National Space Policy* (Washington, DC: The White House, Office of Science and Technology Policy, 14 October 2006), p. 2.

6 "Fengyun 1-C Debris: Two Years Later," *Orbital Debris Quarterly News*, Vol. 13, No. 1 (January 2009), p. 2. As a result of the 11 January 2007 Chinese ASAT test, the U.S. Space Surveillance Network catalogued 2378 pieces of debris with diameters greater than five centimeters and estimates the test created more than 150,000 pieces of debris larger than one square centimeter. Unfortunately, due to the

sustainability as vital national interests. The United States does have a strong interest in developing and maintaining space activities in stable and sustainable ways but it should not call out these particular objectives as vital national interests. The United States has traditionally reserved this term of art for its most important interests as a clear signal it will use military force if needed to defend them. Labeling space stability and sustainability as vital national interests inappropriately links these nebulous objectives to the use of military force, implies the United States has the military and other means needed to maintain space stability and sustainability, and erodes the meaning of the term vital national interests. Finally, and probably most importantly, the NSP provides insufficient guidance on implementation issues such as how the United States will refine top-level management and organizational structures, provide clear lines of authority and responsibility, and ensure they have the durability needed to improve the effectiveness and efficiency of NSS capability employment in an increasingly contested strategic space environment. These implementation gaps are particularly troubling given the fact that structural deficiencies have been a consistent theme of almost every commission studying NSS issues and candidate Obama's pledge to reestablish a space council at the White House.

As the strategic environment of space has grown increasingly complex and hostile, it is critical that the United States has now promulgated its first comprehensive NSSS, a document signed by the Secretary of Defense and Director of National Intelligence and released on 4 February 2011.[7] Details revealed by the NSSS substantiate how space has become increasingly congested, contested, and competitive: currently the Department of Defense (DoD) tracks over 22,000 man-made objects in space (including 1,100 active satellites), there are hundreds of thousands of additional debris pieces too small to track with current sensors but that could still damage satellites in orbit, and there is also increasing congestion in the radiofrequency spectrum due to satellite operations by more than 60 states and consortia and as many as 9000

---

high altitude of the test, only a small percentage of this debris has reentered the atmosphere thus far and it is estimated that many pieces will remain in orbit for decades and some for more than a century.

7 Secretary of Defense and Director of National Intelligence, *National Security Space Strategy: Unclassified Summary* (Washington, DC: Office of the Secretary of Defense and Office of the Director of National Intelligence, January 2011).

satellite communications transponders expected to be in orbit by 2015.[8] In addition Space is increasingly *contested* in all orbits. Today space systems and their supporting infrastructure face a range of man-made threats that may deny, degrade, deceive, disrupt, or destroy assets. Potential adversaries are seeking to exploit perceived space vulnerabilities. As more nations and non-state actors develop counterspace capabilities over the next decade, threats to U.S. space systems and challenges to the stability and security of the space environment will increase. Irresponsible acts against space systems could have implications beyond the space domain, disrupting worldwide services upon which the civil and commercial sectors depend.[9]

And with respect to increasing competition, while the United States "maintains an overall edge in space capabilities," its "competitive advantage has decreased as market-entry barriers have lowered;" and its "technological lead is eroding in several areas."[10] "U.S. suppliers, especially those in the second and third tiers, are at risk due to inconsistent acquisition and production rates, long development cycles, consolidation of suppliers under first-tier prime contractors, and a more competitive foreign market;" and the U.S. share of world satellite manufacturing revenue has dropped from an average of more than 60 percent during the 1990s to 40 percent or less during the 2000s.[11]

To address these challenges, the NSSS seeks three strategic objectives: strengthening safety, stability, and security in space; maintaining and enhancing the strategic national security advantages afforded to the United States by space; and energizing the space industrial base that supports U.S. national security.[12] The strategy advocates five strategic approaches to pursue these objectives: promoting responsible, peaceful, and safe use of space; providing improved U.S. space capabilities; partnering with responsible nations, international organizations, and commercial firms; preventing and deterring aggression against space infrastructure that supports U.S. National Security; and preparing to defeat attacks and to operate in a degraded environment.[13] Effectively and efficiently implementing these strategic objectives and approaches will be difficult but the NSSS correctly assesses the most significant

---

8 Ibid., pp. 1-2.
9 Ibid., p. 3.
10 Ibid.
11 Ibid.
12 Ibid., p. 4.
13 Ibid., pp. 5-11.

changes in the space strategic environment and presents a comprehensive and responsible way to address these changes.

Concepts and Doctrine for Space Security

In the monograph, *On Space Warfare*, David Lupton presents an important analytical framework for considering the utility and rationale for four schools of thought about space activity: sanctuary, survivability, control, and high ground. [14] As shown in Slide 1,
this paper refines and extends Lupton's analysis by adding characteristics and employment strategies, combat missions, and appropriate military organizations for operations and advocacy.

[14] Lieutenant Colonel David E. Lupton, USAF, (Ret.) introduced his approach in "Space Doctrines," *Strategic Review*, Vol. 11 (Fall 1983), pp. 36-47; and provided a book-length treatment in *On Space Warfare: A Space Power Doctrine* (Maxwell AFB, AL: Air University Press, June 1988).

Slide 1. Attributes of Military Space Doctrines

	Primary Value and Functions of Military Space Forces	**Space System Characteristics and Employment Strategies**	**Conflict Missions of Space Forces**	**Appropriate Military Organization for Operations and Advocacy**
Sanctuary	• Enhance Strategic Stability • Facilitate Arms Control	• Limited Numbers • Fragile Systems • Vulnerable Orbits • Optimize for NTMV	• Limited	NRO
Survivability	Above functions, plus; • Force Enhancement	• Terrestrial Backups • Distributed Architectures • Autonomous Control • Hardening • Redundancy • On-Orbit Spares • Crosslinks • Maneuver • Less Vulnerable Orbits • Stealth • Attack Warning Sensors • 5 Ds; Deception, Disruption, Denial, Degradation, Destruction • Reconstitution Capability • Defense • Convoy	• Force Enhancement • Degrade Gracefully	Major Command or Unified Command
Control	• Control Space • Significant Force Enhancement		• Control Space • Significant Force Enhancement • Surveillance, Offensive, and Defensive Counterspace	Unified Command or Space Force
High Ground	Above functions, plus; • Decisive Impact on Terrestrial Conflict • BMD		Above functions, plans: • Decisive Space-to-Space and Space-to-Earth Force Application • BMD	Space Force

The *sanctuary* school of thought posits that the most useful military applications of space are for systems that enhance strategic stability and facilitate strategic arms control. Intelligence, Surveillance, and Reconnaissance (ISR) satellites perform both of these critical functions by monitoring the strategic forces of potential enemies and providing national technical means of verification (NTMV) for arms control agreements. Missile warning satellites, such as the U.S. Space-Based Infrared System (SBIRS), also strengthen strategic stability by providing worldwide surveillance of ballistic missile launches that enhances the survivability of and control over retaliatory strategic forces. Other military space systems, particularly communications satellites for command and control over nuclear forces, also make essential contributions to strategic stability. The sanctuary school clearly fits very closely with the mutual assured destruction (MAD) paradigm for strategic deterrence. Because of the

critical importance of the stabilizing functions performed by spacecraft, proponents of the sanctuary school believe that space must be kept free of weapons and they are especially concerned with prohibiting ASAT weapons that threaten spacecraft performing these vital functions.[15] Critics of this school charge that it attempts to ignore the reality of dedicated ASAT systems and residual ASAT capabilities and that it fosters a space environment conducive to the development of very threatening and destabilizing space systems.[16]

The *survivability* school is in some ways the least well defined of the four schools of thought about the military utility of space. It is clearly related to the sanctuary school in that it also sees the ability of spacecraft to enhance stability as their most important function. However, the survivability school represents an evolution away from the sanctuary school because it argues that technological developments indicate that space can no longer be maintained as a sanctuary and, moreover, recognizes that space systems deployed to promote stability also have significant potential for enhancing the military effectiveness of terrestrial forces. This school also emphasizes and derives its name from the idea that space systems are inherently less reliable, supportable, and survivable than are terrestrial forces and must therefore specifically be designed to enhance their survivability. The survivability school can thus be seen as a type of conceptual half-way house between the sanctuary and control schools that

---

[15] For a detailed discussion of the concepts behind the sanctuary school, see Lupton, *On Space Warfare*, chapter four. Lupton describes the basic tenet of this school as "space surveillance systems make nuclear wars less likely," p. 52.

[16] Difficulties in distinguishing between stabilizing and destabilizing space systems present major conceptual challenges for the sanctuary school and for space security analysis more generally. When considering the attributes of space, space systems, and space operations, most analysts conclude that it is an offense-dominant environment and that it is very hard to distinguish between an offensive and a defensive space posture. Robert Jervis finds that these conditions are "doubly dangerous" and the most difficult situation for states to reach cooperative outcomes under the security dilemma. See Robert Jervis, "Cooperation Under the Security Dilemma," *World Politics*, Vol. 30, No. 2 (January 1978), pp. 167-214. Now-Secretary of Defense Ashton Carter identified this conceptual problem decades ago and discussed the inverse relationship between ASATs and threatening spacecraft as "the basic paradox of ASAT arms control: to the extent that ASAT development is suppressed and the vulnerability of spacecraft masked, the superpowers will be more and more tempted to deploy threatening spacecraft. And to the extent that they do so, pressures will in turn build to set aside the treaty and deploy ASATs." See Ashton B. Carter, "Satellites and Anti-Satellites: The Limits of the Possible," *International Security*, Vol. 10, No. 4 (Spring 1986), p. 68.

cautions against relying too heavily upon inherently vulnerable space assets for either stabilizing functions or terrestrial force enhancement in conflict scenarios. Critics of the survivability school question whether space systems are inherently more vulnerable than other types of military systems and oppose the restrained approach to military space advocated by this school.[17]

The third major school of thought on space holds that space should be considered in a manner similar to other military theaters of operation and that the primary initial military objective in space should be to attempt to gain *control* over the space environment. In this regard, analogies are often drawn from the concepts of sea control or air superiority to discuss the space control school. The space control school also posits that both offensive and defensive operations are likely to be conducted in space but provides less focus on defining what specific purpose(s) are served through space control. Thus, while space control can be considered independently, this concept is often linked with its role in helping to accomplish military missions from space such as reconnaissance, force enhancement, and force application or could also be linked with non-military functions such as exploration and commercial exploitation of space. Critics of the space control approach charge that this school encourages an expensive and unnecessary arms race in space that they believe would not enhance security on Earth.[18]

The final major school of thought on the military utility of space holds that space clearly has the potential to be the decisive theater of combat operations. Reasoning by historical analogy, the *high ground* school posits that just as holding the high ground is often the decisive factor in a land battle or as airpower often predominates over land and sea forces, in the future, space forces will predominate over terrestrial forces. Lupton, along with most other analysts in the 1980s, linked the high ground school directly with President

---

[17] The concepts behind the survivability school as well as the vulnerabilities of satellites to various types of weapons are discussed in detail in Lupton, *On Space Warfare*, chapter five. Lupton finds that this school overstates the case for the vulnerability of space systems. Another contemporaneous discussion of the range of threats to military space systems that emphasizes the limits of survivability is found in Robert B. Giffen, *US Space System Survivability: Strategic Alternatives for the 1990s* (Washington, DC: National Defense University Press, 1982).

[18] See Lupton, *On Space Warfare*, chapters seven and eight for more detail on the space control school. Lupton's primary purpose in his book is to advance the space control school as the most appropriate space strategy for the United States. In so doing, however, his discussion of the basic tenets and broad critiques of the space

Reagan's 23 March 1983 strategic defense initiative (SDI) or "star wars" speech and the concept of space-based ballistic missile defense (BMD). Accordingly, the high ground school is also clearly linked with the concepts of warfighting and defense for strategic deterrence and diametrically opposed to the sanctuary school and the MAD deterrence paradigm. Conceptually, however, the high ground school is broader than strategic debates in the 1980s and envisions force application missions from space for more than just BMD. As the widespread debate over SDI indicated, many oppose these high ground concepts for several reasons including: the destructive impact on MAD (the putative basis for strategic stability); the alleged extreme expense and technological barriers involved; and the likelihood of stimulating a wide-open arms race in space.[19]

Space Mission Areas and Capabilities

In Joint Publication 3-14, "Space Operations," the United States currently divides military space activities into five mission areas: space situational awareness (SSA), space force enhancement, space support, space control, and space force application.[20]

Space Situational Awareness. SSA is a broad and foundational set of activities that provide essential knowledge to improve the effectiveness of activities in the other space mission areas. In recognition of its growing importance, SSA was first called out as a separate mission area in the 2013 version of Joint Publication 3-14.

> SSA involves characterizing, as completely as necessary, the space capabilities operating within the terrestrial environment and the space domain. SSA is dependent on integrating space surveillance, collection, and processing; environmental monitoring, processing and analysis; status of US and cooperative satellite systems; collection of US and multinational space readiness; and analysis of the space domain. It also incorporates the use of intelligence sources to provide insight into adversary use of space capabilities and their threats to our space capabilities while in turn contributing to the JFC's [joint force

control school is even more limited than for the other schools.

19 See Lupton, *On Space Warfare*, chapter six for more on the high ground school.

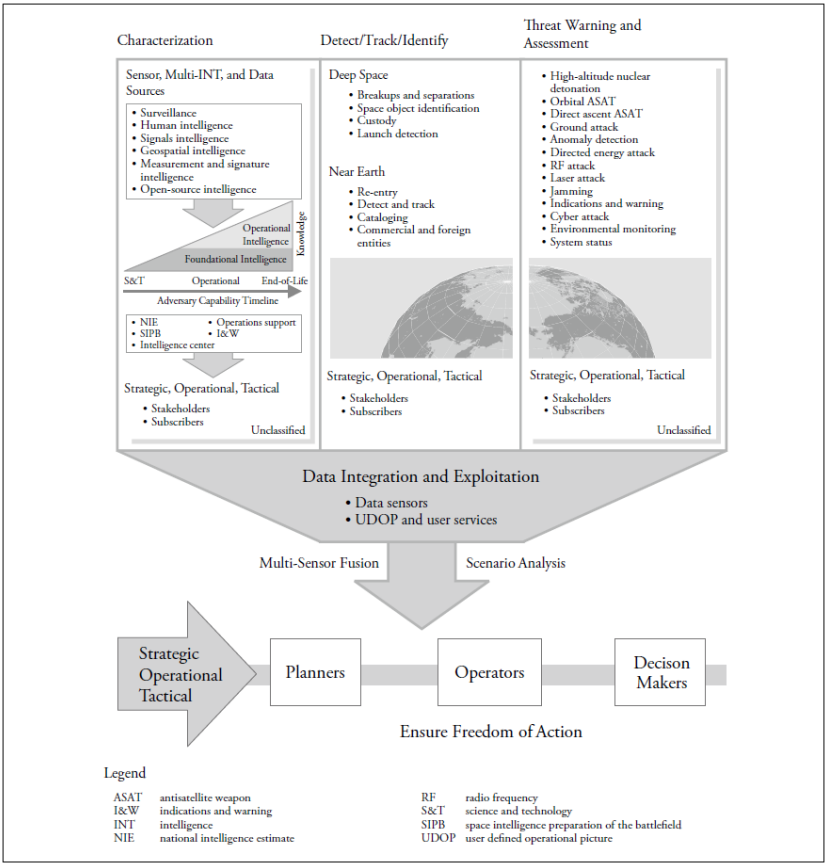
20 Joint Publication 3-14, "Space Operations," (Washington, DC: Joint Staff, Department of Defense, 29 May 2013).

commander's] ability to understand adversary intent.[21]

SSA is divided into four functional capabilities as shown in Figure 1 below: Detect/Track/Identify (D/T/ID), Threat Warning and Assessment (TW&A), Characterization, and Data Integration and Exploitation (DI&E).[22] D/T/ID is the ability to search, discover, track, maintain custody of space objects and events, distinguish objects from others, and recognize classes of objects. The primary roles of D/T/ID are to support safety of flight, offensive space control (OSC), and defensive space control (DSC), as well as providing data needed for creation of a common operational picture (COP). TW&A is the ability to predict and differentiate between potential or actual attacks, space weather environment effects, and space system anomalies, as well as provide timely friendly force status; its primary role is in direct support of OSC and DSC. Characterization is further divided into Foundational Intelligence and Operational Intelligence; it is the ability to determine strategy, tactics, intent, and activity, including characteristics and operating parameters of all space capabilities (ground, link, space) and threats posed by those capabilities. Finally, DI&E is the ability to fuse, correlate and integrate multi-source data into a tailorable COP and enable decision making for the entire set of space operations missions.

[21] Ibid., p. x.
[22] Ibid., II-2 through II-4.

Figure 1. Space Situational Awareness Functional Capabilities



More than any other space mission area, SSA requires continuing and seamless integration between DoD and the Intelligence Community (IC). Performance of the TW&A and Characterization missions is primarily an IC responsibility and performance of the D/T/ID and DI&E missions is primarily a DoD responsibility.

Space Force Enhancement. Space Force Enhancement operations improve joint force effectiveness by increasing combat potential, enhancing operational awareness, and providing joint force support. This mission area is composed of ISR, Missile Warning, PNT, SATCOM, and Environmental Monitoring.

Together, these capabilities deliver critical asymmetrical advantages for U.S. forces, allow access to denied areas, and provide persistence in ways not enabled by comparable air, land, or maritime capabilities. Space-based ISR helps provide situational awareness, warning of attack, and information on adversary location, disposition, and intent; aids in tracking, targeting, and engaging the adversary; and provides a means to assess these actions through tactical battle damage assessment and operational combat assessment. Space-based ISR is especially valuable in providing information on activities deep in adversary-controlled areas. The Missile Warning mission area is supported by the launch detection and missile tracking functions; space-based systems provide essential contributions in detection, tracking, and communications on potentially hostile missile events. Space-based PNT is a mission-essential element and foundational capability for effective operation of virtually every modern weapon system. PNT allows joint forces to more effectively plan, train, coordinate, synchronize, and execute operations; enables communications capabilities such as frequency hopping, as well as network and cryptological synchronization, to improve communications effectiveness and security; and enables precision attack from stand-off distances, thereby reducing collateral damage and allowing friendly forces to avoid threat areas. SATCOM provides U.S. forces with worldwide command and control capabilities, even in regions that lack telecommunications infrastructure; transmits critical intelligence, enables reach-back capabilities that reduce the U.S. foot-print in forward deployed locations, and ties sensors and shooters together in a single network. Finally, Environmental Monitoring capabilities provide data on meteorological, oceanographic, and space environmental factors that might affect military operations.[23] Space Force Enhancement mission areas, primary orbits, and systems are shown on Slide 2 below.[24]

[23] Ibid., II-4 through II-6.

[24] Space systems above the dashed line at the bottom of each column are currently deployed. Systems below the dashed line are programs of record to be deployed in the future; systems in *italic* are programs that have been cancelled.

Slide 2. Force Enhancement Missions, Primary Orbits, Major Systems

Environmental Monitoring	**Satellite Communications**	**Positioning, Navigation, and Timing (PNT)**	**Missile Warning**	**Intelligence, Surveillance, and Reconnaissance (ISR)**
Polar Low-Earth Orbit (LEO)	Geostationary Orbit (GEO) and LEO	Semi-synchronous Orbit	Various	Various
Defense Meteorological Satellite Program (DMSP) ---------- *National Polar-Orbiting Operational Environmental Satellite System (NPOESS), Defense Weather Satellite System (DWSS)*	Defense Satellite Communications System (DSCS) II, DSCS III, Ultra-High Frequency Follow-on (UFO), Milstar, Global Broadcast System (GBS), Iridium, Commercial Systems, Advanced Externally High Frequency (AEHF), Wideband Global System (WGS), Mobile User Objective System (MUOS) ---------- *Transformational Communications System (TSAT)*, Enhanced Polar System	Global Positioning System (GPS) GPS II GPS IIR GPS IIR-M GPS IIF ---------- GPS III	Defense Support Program (DSP), GPS, Space-Based Infra-Red System (SBIRS), Space Tracking and Surveillance System (STSS) ---------- *Precision Tracking Space System (PTSS)*	Geospatial Intelligence (GEOINT) Satellites, Signals Intelligence (SIGINT) Satellites, Overhead Persistent Infrared (OPIR), commercial systems ---------- *Future Imagery Architecture (FIA)*, Integrated Overhead SIGINIT Architecture (IOSA), *Space Radar*

Space Support. The space support mission area includes the essential capabilities, functions, activities, and tasks necessary to operate and sustain all elements of space forces throughout the range of military operations and consists of spacelift, satellite operations, and reconstitution of space forces. Spacelift is the ability to deliver satellites, payloads, and material into space, including via commercial launch services when advantageous to DoD. Assured access to space includes spacelift operations and range operations. Satellite operations include network activities to maneuver, configure, operate, and sustain on-orbit assets in order to conduct spacecraft and payload operations. Spacecraft operations include telemetry, tracking, and commanding, maneuvering, monitoring state-of-health, and maintenance sub-functions; while payload operations include monitoring and commanding of the satellite payload to collect data or provide capability to users. In addition, satellite operations includes specific processes known as rendezvous and proximity operations that

bring two or more space objects into close proximity to enable activities such as docking and on-orbit servicing. Reconstitution of space forces refers to plans and operations for replenishing lost or diminished space capabilities and includes repositioning, reconfiguring unaffected and surviving assets, augmenting capabilities with civil and commercial capabilities, and replacing lost assets.[25]

Space Control. Space control supports freedom of action in space for friendly forces, and when necessary, defeats adversary efforts that interfere with or attack U.S. or allied space systems and negates adversary space capabilities. Space control consists of OSC and DSC operations that change in nature and intensity as the type of military operations change. OSC actions are designed to prevent an adversary's hostile use of U.S. or third-party space capabilities or offensive operations to negate an adversary's space capabilities used to interfere with or attack U.S. or allied space systems. OSC can create temporary and reversible effects or permanent effects and entails the negation of adversary space capabilities through deception, disruption, denial, degradation, or destruction (5Ds) actions. OSC also includes prevention activities such as diplomatic, informational, military, and economic measures designed to preclude an adversary's hostile use of adversary, U.S., or third-party space systems or services to support their operations. Specific measures supporting the 5Ds include:

- Deception: misleading an adversary by manipulation, distortion, or falsification of evidence to induce the adversary to act against their interests;
- Disruption: temporarily impairing specific targeted nodes of an adversary system, usually without physical damage to the space system;
- Degradation: permanently impairing (either partially or totally) the utility of targeted adversary systems, usually with physical damage;
- Denial: temporarily eliminating the utility of targeted adversary systems, usually without physical damage; and

Destruction: permanently eliminating the utility of targeted adversary systems.

DSC operations are conducted to preserve U.S. access to, and use of, space

[25] Joint Publication 3-14, "Space Operations," II-6 through II-8.

and space capabilities using active and passive means, while protecting friendly space capabilities from attack, interference, or unintentional hazards. DSC includes operations that protect U.S. or third-party space capabilities from adversaries' attack, interference, or unintentional hazards. Although focused on responding to man-made threats that can affect either terrestrial or space-based systems such as GPS and SATCOM jammers, DSC actions may also safeguard assets from unintentional hazards such as space debris, radiofrequency interference, and other naturally occurring phenomena such as radiation and weather. In addition, DSC contributes to space deterrence by employing a variety of measures that help assure the use of space, and consistent with the inherent right of self-defense, deter others from interference and attack, defend U.S. space systems and contribute to the defense of allied space systems, and if deterrence fails, defeat efforts to attack them.[26]

Space Force Application. The space force application mission area consists of combat operations in, through, and from space to influence the course and outcome of conflict by holding terrestrial targets at risk. The space force application mission area includes ballistic missile defense and force projection capabilities such as intercontinental ballistic missiles.[27]

Current Issues and Challenges for Space Security

Unfortunately, in the nine years since China's 11 January 2007 successful test of its direct-ascent LEO ASAT, both the Chinese, and increasingly the Russians, have continued and even accelerated development and testing of their robust and multi-dimensional counterspace capabilities. These counterspace capabilities include multiple direct-ascent and co-orbital kinetic energy ASATs systems (some of which can reach all the way to GEO) and can be deployed from a variety of platforms; literally thousands of increasingly powerful and sophisticated jamming and spoofing systems, including on-orbit jammers, coherent jammers, and capabilities that combine and synergize dangerous jamming, spoofing, poisoning, and cyber abilities; and multiple megawatt-class and a larger number of less powerful counterspace lasers deployed at fixed sites and on mobile platforms.

Increasing U.S. concerns and focus on these destabilizing Chinese and Russian counterspace improvements were powerful motivations for the USG to complete a comprehensive Strategic Portfolio Review (SPR) for Space during

---

[26] Ibid., II-8 through II-9.

2014.[28] Main drivers behind the SPR have been Ashton Carter, both as Deputy Secretary of Defense and Secretary of Defense, and Robert Work, the current Deputy Secretary of Defense.[29]

The SPR found that the United States must focus and work diligently on both OSC and DSC capabilities to become better prepared for a war that may extend into space and strongly reaffirmed the NSSS finding that the strategic space environment has become increasingly contested. The SPR has also led to significant additional funding for DoD and IC space and counterspace capabilities as well as several major organizational and management changes designed to improve the effectiveness and resilience of U.S. space capabilities.

Severely limited resources and increasing threats remain the most pressing issue for NSS, and DoD in general, because Congress has provided only sequestration-level DoD funding since the 2011 Budget Control Act. In a clear reflection of serious and growing concerns, Deputy Secretary Work and others have indicated that requested funding for space and counterspace capabilities will be increased by over $5 billion during the next five years. Figures as high as $8 billion in new funding for space have been publically discussed, and defense officials have cited three unclassified programs that would be part of the new funding, totaling approximately $2 billion.[30] In addition, following this year's budget compromise and passage of the fiscal year (FY) 2016 National Defense Authorization Act (NDAA), expectations are high that DoD finally will again receive funding close to requested levels in its FY16 appropriation.

Major management and organizational changes resulting from the SPR include creation of a Joint Space Doctrine and Tactics Forum (JSDTF), [31] Joint

---

[27] Ibid., II-9 through II-10.

[28] The SPR was mentioned by Ashton Carter in his confirmation hearing on 4 February 2015 and discussed by Deke Weatherington in his testimony before the House Committee on Armed Forced, Strategic Forces Subcommittee on 25 March 2015.

[29] It is instructive to note the evolution of Ashton Carter's thinking on space security from the 1980s to today. When he worked for Congress at the Office of Technology Assessment during the Reagan Administration, it was hard to find military space or Strategic Defense Initiative programs he strongly supported; now it is difficult to find strategic space programs he does not strongly support. Deputy Secretary Work has taken the lead in publically announcing many SPR-related developments including the JICSpOC and the PDSA.

[30] Colin Clark, "US Commits $5B In NEW $$ To Countering Space Threats; HASC Protects It," *Breaking Defense*, 22 April 2015; and Mike Gruss, "Hyten: Continuing resolution would delay space protection efforts," *SpaceNews*, 17 September 2015.

[31] Colin Clark, "Work Unveils First Space Ops Center For Intel Community And

Interagency Combined Space Operations Center (JICSpOC),[32] and Principal DoD Space Advisor (PDSA). In January 2015, United States Strategic Command (USSTRATCOM) and the National Reconnaissance Office (NRO) established the JSDTF, a senior warfighter forum designed to improve collaboration and coordination between DoD and IC on space operations and advance integrated doctrine and tactics for the increasingly contested strategic space environment. Deputy Secretary Work announced creation of the JICSpOC at the June 2015 Geospatial Intelligence Symposium. The JICSpOC is located in Colorado Springs, is initially designed to experiment and simulate strategic-level space scenarios and advance conceptual work from the JSDTF, and as these concepts mature they could be incorporated into operational procedures for the Joint Space Operations Center and elsewhere.[33] The most recent and sweeping management and organizational change thus far came in the 5 October 2015 memorandum from Deputy Secretary Work designating the Secretary of the Air Force as the Principal DoD Space Advisor (PDSA).[34] The PDSA memo is designed to enhance governance of the DoD space enterprise by sharpening space portfolio authorities and responsibilities. The PDSA will act as the primary advisor for all senior-level planning, programming, and acquisition processes (the Deputy's Management Action Group, the Joint Requirements Oversight Council, and the Defense Acquisition Board), as well as to all senior-level DoD officials including the Secretary and Deputy Secretary of Defense, the Office of the Secretary of Defense Principal Staff Assistants, and the Chairman and Vice Chairman of the Joint Chiefs of Staff. The PDSA will oversee all departmental space matters, including policies, strategies, plans, programming, and architecture assessment across the DoD Space Enterprise. In addition, the PDSA will fulfill the requirement for a Principal DoD Space Control Advisor from the FY16 NDAA, Chair the Defense Space Council, oversee the Space Security and Defense

---

Military," *Breaking Defense*, 23 June 2015; and U.S. Strategic Command Public Affairs. "Defense, Intelligence communities collaborate for space resiliency," U.S. Strategic Command, 2 September 2015.

[32] Department of Defense Press Release, "New Joint Interagency Combined Space Operations Center to be established," (Washington, DC: Department of Defense, 11 September 2015).

[33] Mike Gruss, "DoD, intelligence agencies invest $16M in JICSpOC," *SpaceNews,* 11 September 2015.

[34] Robert Work, "Designation of the Principal DoD Space Advisor," (Washington, DC: Department of Defense, 5 October 2015).

Program, and conduct an annual space SPR of the budget submissions of every entity with responsibilities for space capability development and assess their compliance with the National Security Council-approved Implementation Plans and departmental policy and programmatic guidance.

The Obama Administration has clearly moved toward a more forceful approach to space security in its policy, doctrine, funding, organization, and management of NSS. These comprehensive changes are a response to the security implications of the eroding strategic space environment. Effectively implementing these changes and others will require focused and sustained effort if the United States is to back away from the current inflection point. Challenges will undoubtedly come in maintaining funding and achieving unity of effort and effect. Of course, these challenges will be exacerbated by the very limited time remaining in this administration, senior-level personnel changes, and priorities of the next administration.