



***U.S. Army Space Capabilities:
Enabling the Force of Decisive Action***





14 May 2012

At its core, the Army is people. Soldiers are our strength and the centerpiece of our formations. That said, the United States Army uses technology to augment its Soldiers and core strengths and overcome battlefield challenges. Within the history of the Army, the space era is a relatively new one; however, it is just as important as past technological eras. Like the machine gun, the truck and the helicopter, space-based capabilities are now indispensable to the force. The precise, lethal and discriminate application of military force is what the Army does; it can do so in the modern era because space capabilities mitigate the constraints of terrain, distance and time.

A cadre of professional Soldiers provides the Army’s space capabilities that form the technological backbone of global operations. This space cadre is distributed across all components and sustains expertise throughout the total force. The space-based enablers they provide enhance each of the Army’s six warfighting functions to improve operational performance at every echelon. The Army is continually looking for new ideas and materiel solutions for the complex technical problems associated with its space mission. Building, maintaining and upgrading the Army’s space assets and retaining its space forces will be imperative for the future force. The Army of 2020 will need more space access at lower cost—a worthy and difficult challenge that must be met to support our warfighters.

In this latest installment of AUSA’s signature Torchbearer series, we discuss how Army space-based capabilities fit within landpower. A discussion on warfighting integration, force structure, training and materiel development provides a snapshot of where Army space is now and where it must go in the future. We hope you find this report a useful and informative resource and that you will continue to look to AUSA for insightful and credible analysis of contemporary national security issues.


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Executive Summary

Space capabilities are now integrated and inextricably bound up in the “nervous system” of U.S. military forces and intelligence capabilities; users of U.S. national security space capabilities are both numerous and diverse in their requirements.

Mr. Gil Klinger, Deputy Assistant Secretary of Defense for Space and Intelligence, in his statement to the House Armed Services Subcommittee on Strategic Forces, 8 March 2012

The U.S. Army conducts unified land operations in a number of challenging locations around the world. Future missions will span a variety of terrains and populations and will contend with adaptable state and nonstate adversaries. As the Department of Defense’s new strategic guidance highlights, the Army will be part of a joint force that is smaller and leaner but more agile, flexible and technologically enabled. To mitigate complex operational risks and assure landpower dominance now and in the future, the Army relies on a technological backbone built on space-based capabilities and force structure. Preserving and expanding these capabilities will be required to keep the Army the force of decisive action.

To guide the preservation and expansion of space enablers into the future, the Army has composed both a space policy and a strategic space plan. It has also drafted a white paper to describe space operations through the year 2030 and how current operations fit into the six Army warfighting functions. The six warfighting functions—mission command, movement and maneuver, intelligence, fires, sustainment and protection—describe the major physical activities on the battlefield. Each has a blend of unique and common space requirements. Satellite communications, position, navigation and timing data and high-resolution imagery enable Army formations to move precisely about the battlefield and communicate effectively across echelons. Space-based friendly force and materiel tracking allows commanders to understand the disposition of forces and equipment as they move about theaters. Persistent overhead multispectral observation capability provides information on adversary activity, threats and missile launches. Together, these space capabilities augment all aspects of Army operations and allow the discriminate and timely application of lethal force.

Delivering the space capabilities is a professional force of trained and ready Soldiers—the tactical space force. The force consists of the 1st Space Brigade and organic Space Support Elements (SSEs) at echelons above brigade headquarters. The 1st Space Brigade is a multicomponent brigade that is responsible for providing continuous, worldwide space support to the Army. Two of the subordinate battalions, the 1st Space Battalion and the 117th Space Battalion (Colorado Army National Guard) control the Army Space Support Teams (ARSSTs) and Commercial Imagery Teams (CITs). ARSSTs contribute assessment of space capabilities and threats, positioning data and imagery support to tactical headquarters; more than 70 teams have deployed to Afghanistan and Iraq since 2001. CITs work with government and commercial vendors to access significant amounts of near real-time, high-resolution imagery and pass it on to commanders at all echelons including combatant commands. Elements of the 1st Space Battalion also provide theater-level missile warning through dedicated, forward-deployed systems in three of the five geographic combatant commands. The 53d Signal Battalion operates five Wideband Satellite Communications Operations Centers and performs payload and transmissions control on the Wideband Global Satellite Communications and Defense Satellite Communications Systems. This ensures global communications are available at any time for the President, combatant commanders and the diplomatic corps.

Complementing the 1st Space Brigade’s forces are the SSEs, teams of functional-area qualified officers organic to theater army, corps and division headquarters. In addition to expertise on space systems and capabilities, SSEs build interoperability through theater security cooperation exercises with joint and multinational partners. These elements lead the joint friendly force tracking efforts and have contributed to operational solutions targeting improvised explosive devices and unmanned aerial vehicle threats. The Army is investing in a modernization plan for its



tactical space force to ensure that communications, imaging and detection capabilities remain sufficient for current and future joint force operations.

The Army's space cadre is made up of Soldiers and civilians who conduct the daily missions of the space force. The cadre comprises two categories of experts: space professionals and space enablers. Space professionals are career specialists whose principal duties are directly related to space; space enablers are personnel—in positions such as air defense, signal, military intelligence or engineering—whose primary career field is not space but who perform space-related duties. More than 400 of the 2,595 members of the space cadre are Space Operations Officers with the Functional Area 40 (FA40) designation. These FA40 officers provide in-depth expertise on space systems to tactical commanders, form the backbone of the space cadre and exist in both active and reserve component formations.

Bringing together all elements of space operations, U.S. Army Space and Missile Defense Command/Army Forces Strategic Command (USASMDC/ARSTRAT) is the Army proponent for all space- and missile-related personnel, doctrine, organization, materiel and integration. The command is multicomponent and split-based at Huntsville, Alabama, and Colorado Springs, Colorado. Functionally, USASMDC/ARSTRAT has three core tasks: to provide trained and ready space and missile defense forces (capabilities for today); to build future space and missile defense forces (capabilities for tomorrow); and to research, test and integrate space, missile defense, cyber, directed energy and related technologies (capabilities for the day after tomorrow). Essential to the first two tasks is education. USASMDC/ARSTRAT oversees the training and professional development of its space cadre while also providing mobile training opportunities to integrate space concepts into other career fields. Collection and distribution of lessons learned from deployments and operations augment the joint force's space-knowledge base and collective expertise.

An additional role for the command is advancing cost-effective technologies and solutions that are required to maintain space capabilities in the face of growing demands. Delivering beyond-line-of-sight data and voice communications capability to combat formations is an enduring challenge. **Linear battlefields are gone; today's warfighters need on-the-move communications unaffected by terrain or distance.** A potential solution to this challenge is using constellations of nanosatellites. These constellations will use small, replaceable satellites to provide right-sized, tailorable capability for specific regions or missions. Key to this concept is overcoming the complexities and costs of space launch. Current space launches are few, and competition for space is intense. Further, the physical limitations on multiple payload destinations restrict flexibility. USASMDC/ARSTRAT, in partnership with other governmental and nongovernmental organizations, is undertaking several efforts designed to tackle the challenges involved with satellite constellations and low-cost launch systems such as the SMDC Nanosatellite Program and the Soldier–Warfighter Operational Deployer for Space programs.

Space is the ultimate high ground and all functions of the Army depend on space-based capability. To preserve the force's combat edge, a cadre of trained and ready space professionals supported by appropriate resources and commensurate force structure is needed. The Department of Defense must invest in long-term research and development focused on space and missile defense; provide the Army with the necessary resources to sustain space-enabler force structure; maintain an active role in developing responsive concepts; continue to advocate for the development of new technologies and launch capabilities; and prioritize Army efforts in satellite communications, global positioning and missile launch warning. Congress must provide timely and predictable resources that allow for technology maturation, and it must craft legislation that encourages and rewards cross-sector cooperation in space-capability improvement.

Army space enablers touch each aspect of the “prevent, shape and win” strategy through strategic flexibility, connectivity and precision lethality. Space technologies underwrite U.S. Army land dominance and must be preserved, expanded and enhanced. The Army is the nation's force of decisive action, and space is the nation's decisive enabler.



U.S. Army Space Capabilities: Enabling the Force of Decisive Action

If joint forces want to fight in domains without geographic boundaries, they will need space and missile defense.

Lieutenant General Richard P. Formica,
Commander, U.S. Army Space and Missile Defense Command/Army Forces Strategic Command,
Air, Space and Missile Defense Association Annual Membership Luncheon, 26 January 2012

Introduction

The U.S. Army's worldwide mission takes place in an increasingly complex and uncertain strategic environment. Although the Army is transitioning from conflicts in Iraq and Afghanistan, it will play a key role in the Department of Defense's (DoD's) new global strategy, "Sustaining U.S. Global Leadership: Priorities for 21st Century Defense." The Army will be part of a "joint force for the future that will be smaller and leaner but will be agile, flexible, ready and technologically advanced."¹ Unified land operations across a range of terrains, locations and populations will be the norm. With increased mission diversity and complexity, however, come increased risks. To mitigate those risks, the Army relies on a technological backbone to provide its Soldiers informational and situational dominance. Global positioning, high-resolution imagery, satellite communications and missile defense are critical force multipliers that sharpen the Army's combat edge. **The Army is inextricably linked to space-based capabilities.**

Space capabilities are involved with all aspects of the prevent, shape and win framework that guides the Army, both in current conflicts and in its future vision. The Army of 2020 will require space-based assets to quickly link distributed forces and missile defenses to mitigate anti-access/area-denial techniques designed to degrade American power projection. As the Army's space proponent, United States Army Space and Missile Defense Command/Army Forces Strategic Command (USASMDC/ARSTRAT) provides trained and ready space and missile defense forces and enablers to combatant commanders. The unique capabilities associated with space will be in high demand as the Army



continues to use technology to overcome the significant challenges of the operational environment and remain the force of decisive action.

Moving Army Space Forward

Army Space Policy and Strategic Space Plan

The current *Army Space Policy*, published in 2009, focuses on the operational and tactical needs of land forces. It follows implemented DoD space policies and procedures, reestablishes objectives for Army space and sustains the Army Space Council—an advisory committee that provides advice on space issues to the Vice Chief of Staff. The *Army Space Policy* outlines four broad space-related objectives:

- maximize the effectiveness of current space capabilities in support of operational and tactical land warfighting needs;
- influence the design, development, acquisition and concepts of operation of future space systems that enable and enhance current and future land forces;

¹ U.S. Department of Defense, "Sustaining U.S. Global Leadership: Priorities for 21st Century Defense," 3 January 2012, p. v, http://www.defense.gov/news/Defense_Strategic_Guidance.pdf.



- advance the development and effective use of responsive, timely and assured joint interoperable space capabilities; and
- seamlessly integrate relevant space capabilities into the operating force.

In 2011 the Army published the *Army Strategic Space Plan*. This document was shaped by national-level guidance, including the *National Space Policy* (June 2010) and the *National Security Space Strategy* (January 2011). The plan, in coordination with the aforementioned *Army Space Policy*, outlines the Army's path for strategic space planning, programming and resourcing and shapes how the Army responds to space needs. The essence of the space strategy is to assure access to resilient and relevant space capabilities that aid Army forces in unified land operations.² The space strategy rests on three principles that link Army strategic space planning and programming to the guidance in national and DoD space policy and strategy:

- enable the Army's enduring mission by providing requisite space-enabled capabilities to support current operations and future transformation efforts;
- leverage existing DoD, national, civil, commercial and international space-based capabilities; and
- pursue cross-domain solutions to create a resilient architecture to mitigate threats and vulnerabilities and to assure access to critical capabilities needed to sustain land force operations.

² For more information on unified land operations and Army doctrine, see AUSA's Torchbearer National Security Report "U.S. Army Training for Unified Land Operations," September 2011, http://www.ausa.org/publications/ilw/documents/TB_Full-Spectrum_web.pdf.

As part of the implementation plan for the space strategy, the Army has drafted a white paper that describes Army space operations through 2030 and identifies Army space requirements across the six warfighting functions for that time period. The white paper will serve as a foundational document to inform the planning, programming, budgeting and execution process and to address the DoD Directive 5101.2 requirement directing heads of DoD components to submit space requirements to the DoD executive agent for space.

Space systems bring the power of joint capabilities to the Army's warfighting functions. As the Army continues with the *Army Space Strategic Plan* implementation efforts, it will address the challenges of the operating environment and determine the space capabilities essential to the successful conduct of unified land operations. The Army will continue to examine how space capabilities will drive informed development plans in support of the six warfighting functions.

Integrating Space into the Army's Six Warfighting Functions

As America's principal land force, the Army must be organized, trained and equipped to conduct responsive and sustained unified land operations to achieve national objectives. It must fight as part of a joint team and respond, as directed, to crises at home and overseas. To guide the force conceptually, the Army publishes strategic guidance—collectively called the Army Concept Framework (ACF)—to develop the capabilities required to support modernization. ACF explains how the Army will integrate and use its core abilities. Six core ability areas, known as Army functional concepts, correspond with six Army warfighting functions (WfFs) that describe the major physical activities on the battlefield. The warfighting functions are: mission command, movement and maneuver, intelligence, fires, sustainment and protection.

Army space capabilities are combat multipliers that span all six WfFs. The Army is integrating space capabilities with each Center of Excellence to maximize understanding of how space capabilities enable unified land operations. Space as an operational function



Space Capabilities in Army Functional Concepts

Mission Command

- Satellite Communications
 - Inter- and Intra-theater
- Space Control
 - Offensive, Defensive and Space Situational Awareness
- Position, Navigation and Timing
 - Friendly Force Tracking
 - Common Operating Picture

Movement and Maneuver

- Position, Navigation and Timing
 - Situational Awareness
 - Friendly Force Tracking
- Satellite Communications
- Space Control
 - Planning, Coordination and Execution

Intelligence

- Imagery, Signals, Measurements and Signature Intelligence
 - National Technical Means
 - Commercial
- Geospatial Support
- Satellite Communications
- Weather, Terrain and Environmental Monitoring

Fires

- Position, Navigation and Timing
 - Precision Strike Support
 - Situational Awareness
- Theater Missile Defense
 - Targeting
- Satellite Communications

Sustainment

- Satellite Communications
 - Military and Commercial
 - Inter- and Intra-theater
- Position, Navigation and Timing
 - Commodities Tracking
 - Situational Awareness

Protection

- Missile Warning
 - Precision Strike Support
- Intelligence, Surveillance and Reconnaissance
 - Battlefield Characterization
 - Change Detection
- Satellite Communications

Source: U.S. Army Space and Missile Defense Command/Army Forces Strategic Command

is aligned with mission command; however, each WfF has a unique space capability need as well as several shared needs.

The Mission Command Warfighting Function is the exercise of authority and direction by a commander using mission orders to enable disciplined initiative within stated intent to empower agile and adaptive leaders conducting unified land operations. Mission command requires timely, accurate information flow between commanders and subordinates to ensure that decisions are based on battlefield realities. Space enablers support this information flow in two ways: satellite communications (SATCOM) and position, navigation and timing data (PNT). SATCOM—through platforms owned by the military or capabilities

contracted via civilian assets—is the critical enabler. Protected satellite communication provides narrow-band and wideband transport of voice and data to all levels of command, from theater headquarters to company teams. SATCOM capabilities allow expanded areas of operation, larger span of control and better situational awareness for every echelon.

PNT information is provided by U.S. Global Positioning System (GPS) satellites. Precise position location information combined with geospatial products is the technological foundation that allows friendly force tracking, which forms the basis of situational awareness and the force's common operational picture. As the space environment continues to grow more congested, contested and competitive, space control capability



integration within mission command—using situational awareness of space, protecting space systems, preventing adversary use of U.S./ally space systems and negating enemy use of their own space systems—will become more important. U.S. commanders will have to make decisions in fast-paced environments against well-informed, adaptable opponents who are also enabled by their own space-based assets.

The Movement and Maneuver Warfighting Function moves and employs forces to achieve a position of relative advantage over the enemy and other threats; direct fire and close combat are inherent in maneuver. Like the mission command function, the movement and maneuver function relies on position location for friendly force tracking, situational awareness and the common operational picture, but it also requires PNT for navigation, positioning of weapon systems (including unmanned aerial systems) and precision munitions use. Due to their dependence on space capabilities, maneuver forces must have a basic understanding of the limitations and vulnerabilities of space assets. The Army is working to ensure space enablers are integrated in concepts, experiments and future capabilities across branches and knowledge bases.

The Intelligence Warfighting Function facilitates understanding of the enemy, terrain and any civil considerations within operations. It includes the synchronization of collection requirements with the execution of tactical intelligence, surveillance and reconnaissance (ISR) operations. Space-based ISR sensors are one part of the multitiered collection capability. National and commercial space-based sensors provide imagery, measurement, signature intelligence, overhead persistent infrared sensing and electronic warfare support. ISR capabilities are critical in supporting commanders' information requirements and updating the common operational picture.

As in the mission command function, SATCOM underpins the entire space-based ISR infrastructure. SATCOM and high-altitude capabilities enable real-time, extended range beyond-line-of-sight communications relay for the mass amounts of raw and processed ISR products disseminated across national and tactical networks.

The Fires Warfighting Function provides collective and coordinated use of Army indirect fires, air and

missile defense and joint fires through a deliberate targeting process. Army forces require persistent (on-station for long periods of time) space-based capabilities, which include missile warning sensors such as the Defense Support Program and the Space-Based Infrared System (SBIRS). Space-based missile warning sensors are the first line of defense in multitiered theater missile warning defense architecture. These sensors can be cross-queued with ISR assets (space, air and ground) to support target acquisition and targeting processes. Other capabilities relevant to the fires function are GPS, geospatial support and weather and environmental sensors. These space capabilities all play a role in enabling lethal/nonlethal fires and effects through enhanced situational awareness, accurate weather forecasts for planning, intelligence collection, navigation assistance, timing, battle damage assessment and battlefield characterization. PNT data support timely and accurate fires by allowing units to determine precise physical location related to three aspects: weapons, target and precision munitions capability.

The Sustainment Warfighting Function provides support and services that ensure freedom of action, extend the reach of operational forces and prolong their endurance. The sustainment function relies primarily on commercial SATCOM and GPS services to monitor and track inter- and intra-theater sustainment operations, including movement of commodities from factories, depots and logistics support bases into mission theaters around the world. With GPS capabilities, sustainment forces can also monitor in-transit shipments, conduct precision air drops and provide accurate situational awareness of the sustainment operational picture. Sustainment forces are routinely spread across vast distances and continue to operate on leased commercial SATCOM networks. Protecting access to these networks, or migrating to military assets, creates a unique challenge that must be addressed in future capability planning.

The Protection Warfighting Function preserves the force so a commander can apply maximum combat power to accomplish a mission. Preserving the force includes protecting personnel (friendly combatants and noncombatants) and the physical assets of the U.S./host nation/multinational military and its civilian partners. Space-based ISR and missile warning sensors



contribute significantly to the Army's ability to protect the force. Using reachback exploitation assets to analyze hyperspectral and multispectral imagery, battlefield characterization and change detection analysis allow the force to identify chemical and biological agent locations. Additionally, overhead persistent infrared capabilities continue to mature and are providing data to detect heat sources from missile, rocket and artillery launches.

Space capabilities are key enablers for unified land operations and provide essential support to each of the Army's six warfighting functions. **Simply put, space capabilities are elements critical to the Army's ability to shoot, move and communicate.** As the Army's dependence on space capabilities continues to grow, DoD's space capabilities and architectures must become more robust and resilient against attacks and disruptions. The Army must preserve its space capabilities by exploring new and innovative ways to exploit technological capabilities beyond their intended uses.

The Army's Tactical Space Force

Dedicated Space Expertise

The reality of integrating space capabilities across the force falls to the Army's tactical space force that executes the daily mission of space operations. The tactical space force consists of two groups of personnel: the 1st Space Brigade and the organic Space Support Elements (SSEs) with theater army, corps and division headquarters.

The 1st Space Brigade, a multicomponent brigade headquartered at Peterson Air Force Base, Colorado, is responsible for conducting continuous global space support, space control and space force enhancement operations worldwide. The brigade, which provides Army space capabilities to U.S. Strategic Command (USSTRATCOM) and the geographic combatant commanders, contains three battalions:

- The 1st Space Battalion provides assured access for theater ballistic missile early warning, Army Space Support Teams (ARSSTs), space control operations and the Commercial Imagery Teams (CITs).
- The 117th Space Battalion (Colorado Army National Guard) mirrors the Space Support Team and Commercial Imagery Team support provided

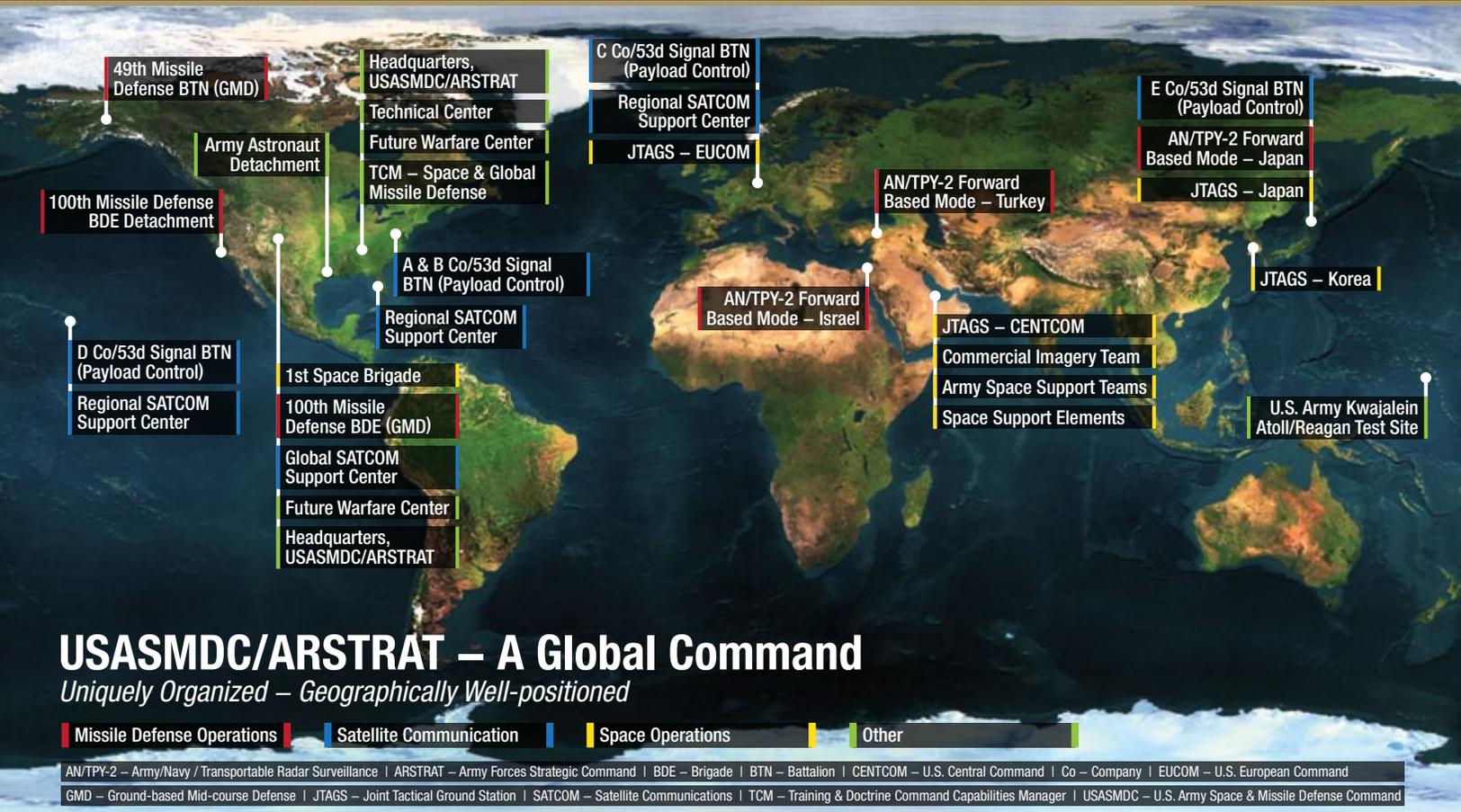


by the active component 1st Space Battalion and plays a key role in providing continuous support to U.S. Central Command (USCENTCOM).

- The 53d Signal Battalion performs payload and transmissions control on the Wideband Global SATCOM and the Defense Satellite Communications Systems.

The 1st Space Brigade's ARSSTs and CITs are key contributors to the force. ARSSTs provide access to Army, joint and national space capabilities for warfighting headquarters. The teams are detached from 1st Space Brigade and attached to units as required; more than 70 teams have deployed to Afghanistan and Iraq since 2001. Teams have also deployed to Kuwait, Oman, Bahrain and South Korea. Space support teams have deployed within the United States to provide satellite imagery and satellite communications support to civil authorities for disaster relief and consequence management operations. In the USCENTCOM area of responsibility, ARSSTs provide vulnerability assessments on space threats in addition to global positioning data to support precision maneuver and fires. Initially, coalition-based operations created information-classification challenges regarding distribution of imagery and other sensitive space-related information to multinational partners. However, ARSSTs adapted and capitalized on the availability of commercial space platforms. The rapid growth of commercially procured imagery of the USCENTCOM area of operations allowed ARSSTs to employ a direct space support CIT concept that focused solely on unclassified commercial space imagery.

CITs are a conceptual modification of the U.S. Air Force Eagle Vision program. Eagle Vision is based on hardware suites that interface directly with international,



USASMDC/ARSTRAT – A Global Command

Uniquely Organized – Geographically Well-positioned

Missile Defense Operations | Satellite Communication | Space Operations | Other

AN/TPY-2 – Army/Navy / Transportable Radar Surveillance | ARSTRAT – Army Forces Strategic Command | BDE – Brigade | BTN – Battalion | CENTCOM – U.S. Central Command | Co – Company | EUCOM – U.S. European Command | GMD – Ground-based Mid-course Defense | JTACS – Joint Tactical Ground Station | SATCOM – Satellite Communications | TCM – Training & Doctrine Command Capabilities Manager | USASMDC – U.S. Army Space & Missile Defense Command

Source: U.S. Army Space and Missile Defense Command/Army Forces Strategic Command

commercially owned satellites to download imagery in real time but at the expense of availability—a downlink is available only for short durations given the satellites’ orbital mechanics. CITs instead have access to commercial vendors’ full image libraries and archives, providing more imagery over a broader timeframe to include near-real time. The first team deployed to support operations in 2004; today, the teams interface daily with the National Geospatial Intelligence Agency (NGA), the USCENTCOM collection manager and deployed units to fulfill commercial imagery requirements. Each CIT is a combatant command-level asset and is able to support the entire USCENTCOM area of operations.

Enduring Space Support to the Theater

The 1st Space Brigade’s SATCOM and missile warning forces maintain a 24-hour watch to ensure communications and missile warnings are provided to USSTRATCOM and combatant commanders. The 1st Space Brigade’s 53d Signal Battalion, headquartered in Colorado Springs, Colorado, operates five

DoD Wideband Satellite Communications Operations Centers (WSOCs). The centers, operated by Soldier satellite operator/maintainers, provide payload and transmissions assurance for the DoD wideband satellite constellations. This capability ensures that critical SATCOM is available for the President, combatant commanders and the diplomatic corps around the world. WSOCs are responsible for executing and monitoring the communications link engineering plans put forth by regional SATCOM support centers. Additionally, members of the 1st Space Brigade’s 1st Space Battalion provide 24-hour theater missile warning for the combatant commanders through the Joint Tactical Ground Station (JTACS). These systems are forward-stationed in support of USCENTCOM, U.S. Pacific Command (USPACOM) and U.S. European Command (USEUCOM) operations. JTACS receives data about missile launch detection from overhead persistent infrared satellites.

Space forces supporting combat operations have shifted between Afghanistan and Iraq as mission



requirements dictated. In both theaters ARSSTs supported regional commands, and at least one ARSST has been deployed since the beginning of Operation Enduring Freedom in 2001. To sustain the constant rotation of forces into the USCENTCOM area of operations, the 1st Space Brigade adopted the same Army Forces Generation (ARFORGEN) model used for deploying brigade combat teams (BCTs). Because of the multicomponent nature of the brigade, the lengths of the ARFORGEN cycle vary by component. However, ARSSTs from all components use the division Mission Rehearsal Exercise (MRX) as the capstone event in their ARFORGEN cycle. The intent is for each ARSST to deploy to theater with the general-purpose force unit supported during its MRX. Today, the Army maintains the capability to deploy five ARSSTs at a time; there are currently three ARSSTs and one CIT deployed in support of overseas operations. The teams can be drawn from the active component, Army National Guard or Army Reserve, but the majority of the total 26 ARSSTs and five CITs reside within reserve component force structure.

Space Support Elements

The backbone of the rotationally deployed Army space forces is the Space Support Elements (SSEs), which support operations in each of the geographic combatant commands. Small teams of specifically trained, space functional-area qualified officers at the theater army, corps and division headquarters levels work to provide space expertise for planning and conduct of operations. When an ARSST is attached, it “plugs in” to the organic SSE within a theater army, corps or division headquarters to ensure continuity of effort and reachback support for the team. The SSEs bring tailored space products and capabilities that meet critical theater needs to ground commanders.

An important mission for the theater army-based SSEs is to support theater security cooperation efforts. In 2011 the U.S. Army Pacific (USARPAC) SSE participated in the multinational training exercise Talisman Saber 11 with Australia.³ The exercise emphasized space-based capabilities, and the USARPAC SSE was augmented with space planners from the 1st Space



Brigade and USASMDC/ARSTRAT. These Army space forces joined with U.S. Air Force space forces to reinforce the Australian Joint Space Operations Cell, which was formed in 2010. U.S. Army space forces built new operational relationships with Australian space cadre, exercised Title 10 responsibilities in an operational scenario and developed the techniques and procedures for expanded space integration within the USARPAC Main Command Post.

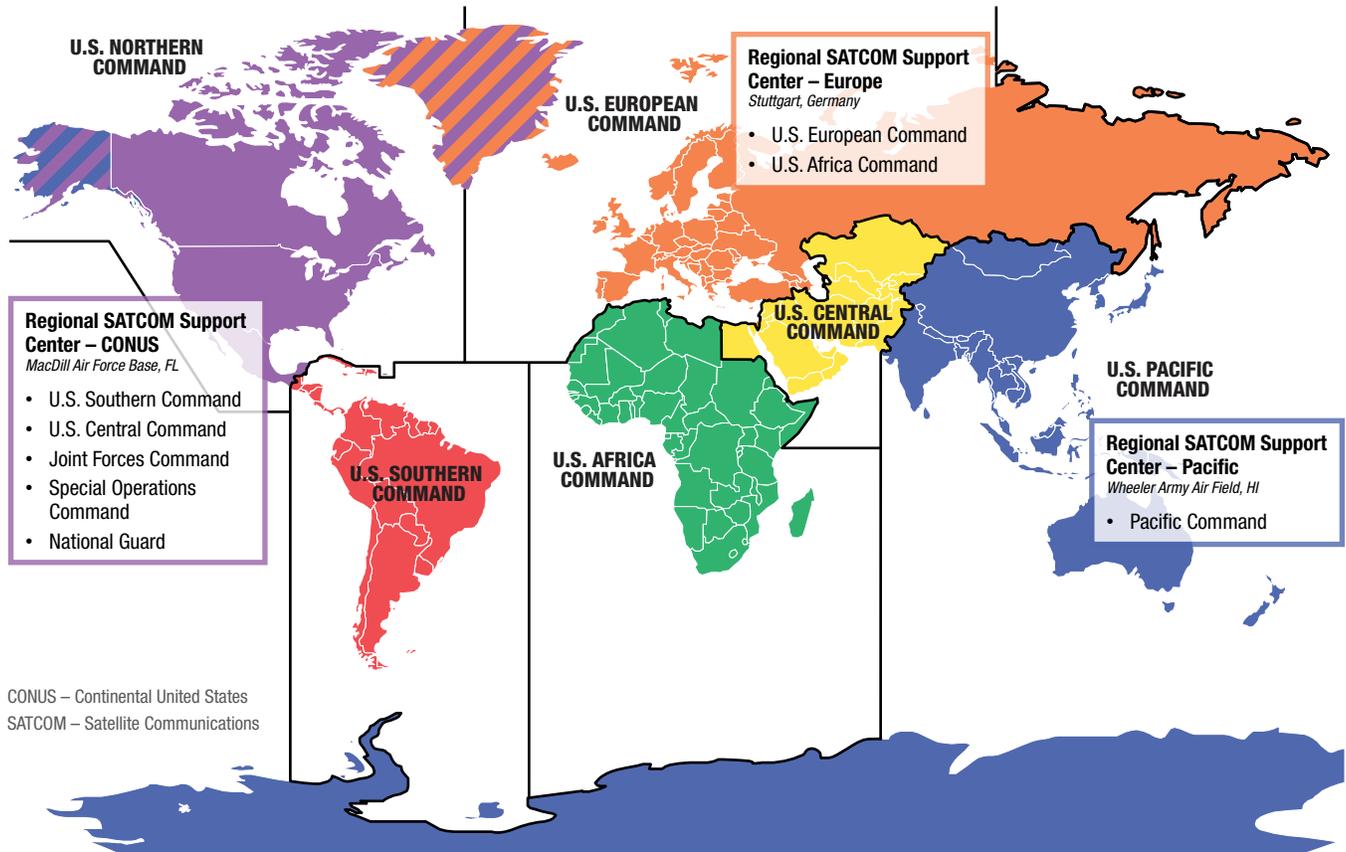
Third U.S. Army/U.S. Army Central’s (ARCENT’s) organic SSEs conduct split-based operations for the Combined Force Land Component commander at the ARCENT Main Command Post located at Shaw Air Force Base, South Carolina, and at the Operational Command Post located at Camp Arifjan, Kuwait. This team of space professionals integrates space capabilities throughout the ARCENT staff; the integration includes providing a current space operational picture to the commanding general, monitoring special programs in the U.S. Army Central Command joint security area, protecting critical infrastructure and communications architecture with space-based systems and incorporating technical capabilities to provide warfighting solutions to all operational levels.

The ARCENT SSE spearheaded the acquisition, implementation and execution of several capabilities that assisted in protecting coalition forces from improvised explosive devices and countering unmanned aerial vehicles within the USCENTCOM theater. The space element also maintains a close working

³ For more information on U.S. Army Pacific, see AUSA’s Torchbearer National Security Report “Transforming U.S. Army Pacific,” June 2009, <http://www.ausa.org/publications/torchbearercampaign/tnsr/documents/TBNR-Pacific.pdf>.



Regional Satellite Communication Support Centers



Source: U.S. Army Space and Missile Defense Command/Army Forces Strategic Command

relationship with U.S. Air Forces Central’s director of Space Forces, thereby ensuring the most effective joint space coverage for the theater. It is also the theater lead for joint blue-force situational awareness; in this capacity it ensures sufficient coverage and capability for friendly force tracking technologies in the region. Last, with a constant presence in theater, the ARCENT SSE is able to assist all Army space professionals deploying to theater with reception, staging, onward-movement and integration requirements.

Modernizing the Force

Over the past decade, the Army has upgraded the equipment for both ARSSTs and CITs. ARSSTs are currently upgrading to the Distributed Common Ground System–Army for their computing/assessment requirements. This will be the first time that ARSSTs have had program-of-record equipment supporting their operations. Options for Internet-based connectivity, which would disseminate products more effectively and to a

wider audience, are also under evaluation. The Army is assessing how best to meet the continuing demand for commercial imagery for tactical forces including coalition, partner and homeland security interagency teams with cooperation from its Geospatial Center and the Army G-2.

WSOCs are being upgraded to be compatible with the expanding fleet of new Wideband Global SATCOM (WGS) satellites fielded by the U.S. Air Force. Additionally, Australian military personnel are performing wideband SATCOM integrated engineering, planning and control through a partnership of embedded personnel in WSOCs, the Regional SATCOM Support Center–Pacific and the Army G-6.

JTAGS will also require an operational upgrade to be fully compatible with the new Space-Based Infrared System. As SBIRS gains full constellation capability, Program Executive Office (PEO) Missiles and Space will modernize JTAGS to ensure it continues providing



assured missile warning to the geographic combatant commanders. The enhanced capabilities provided by the SBIRS constellation will also allow JTAGS to provide improved information in support of operational environment awareness for tactical commanders.

Space Cadre Force Structure

The Army's future force will be adaptable and lethal because of greater leveraging of the capabilities of the ultimate high ground. The nature of warfighting is changing rapidly and the Army's strategic role in space is evolving continuously, requiring specific emphasis on developing and maintaining a cadre of space experts.

The Army space cadre is made up of the Soldiers and civilians who execute the daily planning, operations, procurement and integration of space resources across the four space mission areas: space support, space force enhancement, space control and space force application. **The space cadre is composed of two categories of experts: space professionals and space enablers.** Space professionals are career space specialists (military and civilian) whose principal duties include planning, developing, resourcing, acquiring, integrating or operating space forces, concepts, applications and capabilities. Space enablers are personnel—in positions such as air defense, signal, military intelligence or engineering—whose primary career field is not space but who perform space-related duties.

Today the Army's space cadre consists of more than 2,595 Soldier and civilian billets across all components of the Army. More than 400 of the cadre members are professionally trained Space Operations Officers. These officers have the Functional Area 40 (FA40) identifier, which indicates their ability to provide in-depth space expertise and leverage space assets; they provide the core of the Army's space cadre. The active component has space officer billets in Army Service Component Commands, corps, divisions, fires brigades and the 1st Space Brigade, plus additional positions within the Department of the Army, Office of the Secretary of Defense and joint/combatant commands. Army National Guard and Army Reserve FA40s serve in a wide variety of organizations. In addition to all components being represented in the 1st Space Brigade, National Guard FA40s serve at the division level and within fires brigades while Army Reserve FA40s



are assigned to U.S. Strategic Command. FA40s follow a defined career development model and have a multitude of broadening opportunities, including advanced civil schooling up to PhD, training with industry and fellowship/scholarship opportunities.

Non-FA40 Soldiers serving in space cadre billets may be identified with an additional skill identifier of 3Y (Space Enabler) and earn the space badge based on their training/education and time served in a cadre billet. The Army, to date, has awarded space badges to more than 1,600 Soldiers and FA40 space operations officers. The Army does not have a space military occupational specialty designation; however, it does track space-related personnel through the Army Space Personnel Development Office (ASPDO). The Army also does not have a space career field for civilians; however, those serving in designated space cadre billets have the opportunity to attend space training courses that support their professional development. ASPDO conducts an annual Space Cadre Symposium—open to all members of the space cadre—to advance professional education, capture lessons learned and discuss operational space issues that affect the Army and space community.

As part of the implementation of the *Army Strategic Space Plan*, ASPDO is leading the assessment of space cadre development and distribution. This assessment will ensure the Army space cadre is trained and distributed throughout the Army and DoD to fully leverage current space capabilities. As the Army undertakes the task of assessing its current space cadre disposition, it must focus not only on current operations and requirements but also on forecasting and anticipating those of the future.



Organizing for a Broad, Continuous Mission

Yesterday

United States Army Space and Missile Defense Command/Army Forces Strategic Command is the Army's proponent for space and global missile defense-related personnel, doctrine, organization and materiel integration and development. USASMDC/ARSTRAT traces its lineage back to the early Cold War and the advent of nuclear-armed ballistic missiles. The Army recognized a need to counter the new weapons and in 1957 established the Redstone Anti-Missile Missile Systems Office at Redstone Arsenal, Alabama. Through the years, the Army's anti-ballistic missile effort belonged to many different commands and offices as the related technology, organization and strategies matured. In 1985 the Army consolidated its ballistic missile defense capability under the U.S. Army Strategic Defense Command. At the same time, the Army recognized the growing importance of space as an operational theater. The Army Space Planning Group was established in 1985 at Colorado Springs, Colorado, and then evolved into the Army Space Agency, which served as the service component command to U.S. Space Command. The Army Space Agency's role was expanded in 1987 to include operational control of several space-support centers and was reflagged as U.S. Army Space Command (ARSPACE).

The 1991 Gulf War illustrated how dependent the force had become on space-based enablers. In 1992, to address the importance of space in operational planning, U.S. Army Strategic Defense Command was redesignated U.S. Army Space and Strategic Defense Command (USASSDC), which included ARSPACE as a subordinate element. ARSPACE's primary mission was to manage, plan and control the Army's communication satellites and the attending ground stations. ARSPACE's mission continued to grow as communications, weather, terrain analysis, three-dimensional visualizations and mapping functions became more important to ground commanders. In response to the demand for these enablers, USASSDC was elevated to Major Army Command status and redesignated as U.S. Army Space and Missile Defense Command. In 2002 the Department of Defense's new Unified Command Plan⁴ merged U.S. Space Command and U.S. Strategic Command (retaining the identifier of U.S. Strategic Command); USASMDC became the Army Service Component Command to U.S. Strategic Command and assumed the role of Army Forces Strategic Command, which yields the organization's full title of USASMDC/ARSTRAT.

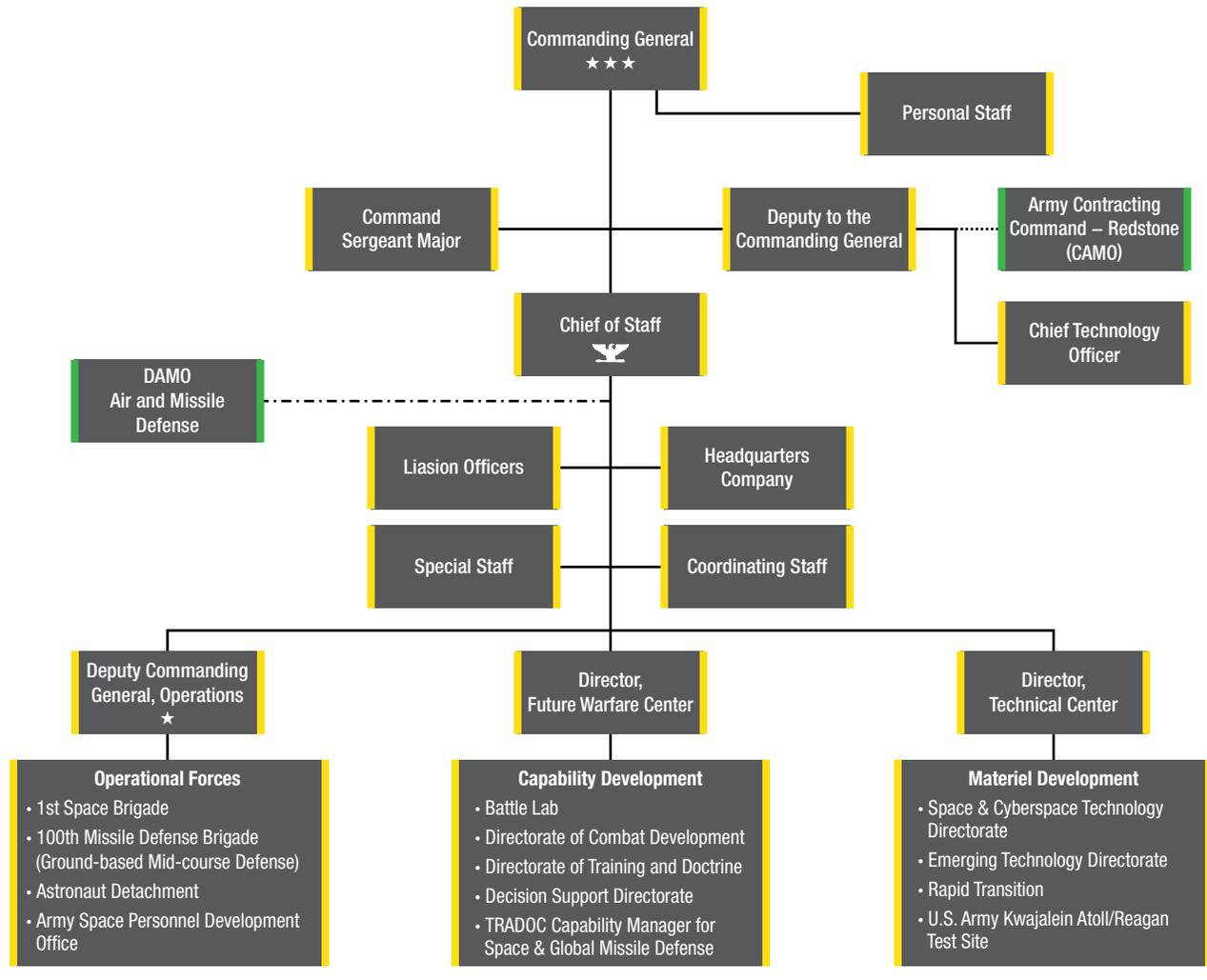
Today

USASMDC/ARSTRAT is a complex and global command with a split-based headquarters in Huntsville (Redstone Arsenal), Alabama, and Colorado Springs (Peterson Air Force Base), Colorado. The split reflects the organization's dual roles and its history as a proponent for missile defense and space-based enablers and its attendant interagency/interprogram partnerships. In Huntsville the command is colocated with elements from the Missile Defense Agency (MDA), Army Materiel Command, PEO Missiles and Space, PEO Aviation, the Missile and Space Intelligence Center and NASA. In Colorado Springs it is located with MDA, U.S. Northern Command, U.S. Air Force Space Command and Joint Functional Component Command-Integrated Missile Defense. The command is also multicomponent, including active Army, Army National Guard, Army Reserve and civilian positions.

⁴ For more information on the 2002 Department of Defense Unified Command Plan, see AUSA's National Security Watch "The 2002 Unified Command Plan: Changes and Implications," February 2003, http://www.ausa.org/publications/ilw/ilw_pubs/nationalsecuritywatch/documents/nsw03-2.pdf.



U.S. Army Space and Missile Defense Command and Army Forces Strategic Command Organization



ARSTRAT – Army Forces Strategic Command
 CAMO – Contracting and Acquisition Management Office
 DAMO – Department of the Army, Military Operations
 SMDC – Space and Missile Defense Command
 TRADOC – U.S. Army Training and Doctrine Command

SMDC/ARSTRAT (Yellow box)
Army Unit (Green box)

— Assigned
 - - - Coordinating
 Supporting

Source: U.S. Army Space and Missile Defense Command/Army Forces Strategic Command

Functionally, USASMDC/ARSTRAT has three core tasks:

- **Provide trained and ready space and missile defense forces for the nation (capabilities for today).** This is the operational mission; at any given time there are more than 850 Soldiers supporting space and missile defense operations at continental-based, forward-stationed or deployed

locations. The command provides missile-defense crews on a continual basis at Fort Greely, Alaska, and Schriever Air Force Base, Colorado, and delivers theater-level missile defense warning to combatant commands. USASMDC/ARSTRAT also provides the Army astronaut detachment in support of NASA; there are currently three Army astronauts.



- **Build future space and missile defense forces (capabilities for tomorrow).** This core task is a function of developing the doctrine, force structure and training methods that will sustain space integration across the Army's warfighting functions. Part of this building process is training and educating space professionals—military and civilian. USASMDC/ARSTRAT conducts courses at the U.S. Military Academy, the Command and General Staff College and the various Centers of Excellence while also operating mobile training teams to increase reach into the force. The command is currently developing a high-altitude capabilities requirement document to inform the Army's investment in future space-related platform procurement.
- **Research, test and integrate space, missile defense, cyber, directed energy and related technologies (capabilities for the day after tomorrow).** This materiel development function identifies and fills gaps in warfighter capability. For example, to fill gaps in regional satellite communications coverage, USASMDC/ARSTRAT is developing nanosatellites and constellation-based networks—larger numbers of smaller, replaceable satellites can provide more tailorable coverage and easier upgrade than large, conventional platforms. To enhance warfighter force protection, the command is pursuing counter-rocket, artillery and mortar technologies based on solid-state lasers. The use of energy weapons to interdict indirect munitions as well as improvised explosive devices is an ongoing effort at the command's Technical Center. The Ronald Reagan Ballistic Missile Defense Test Site (RTS) at Kwajalein Atoll provides operational and developmental range testing of both theater- and strategic-level missile defense systems. RTS is the hub of missile defense testing and is integrated with other agencies' space-related missions, such as those from DoD, MDA and Defense Advanced Research Projects Agency. Currently RTS is undergoing a transformation from a locally operated range to a globally operated one; in the near future operations and test capability will be controlled from the command's headquarters in Huntsville, reducing travel and infrastructure costs.

Space Training for the Army— Developing the Force

Premier Space Education

Sustaining a trained and ready space cadre requires an effective system to educate and prepare space experts for operational missions. The education and training mission falls to USASMDC/ARSTRAT and its Directorate of Training and Doctrine (DOTD). DOTD's role is to ensure the effectiveness of Armywide space and missile defense training, education, activities and products to Soldiers of all ranks and to the civilian workforce. USASMDC/ARSTRAT's institutional training began in 2001 with one course: the FA40 Space Operations Officer Qualification Course (SOOQC), which graduated 14 students that year. Since then, 22 classes have graduated 486 students, including Army FA40, U.S. Air Force, U.S. Marine Corps and reserve component officers, warrant officers and noncommissioned officer students. DOTD has 14 core space courses; by the end of 2012 it expects to have trained 1,800 USASMDC space cadre students in residence at Colorado Springs and via mobile training teams at Huntsville and other locations. Under the Armywide Space Knowledge initiative, DOTD also anticipates training almost 5,000 more Army (non-USASMDC) and other service/agency personnel on space concepts.

Current Courses

SOOQC, initially a seven-week course in 2001, has expanded to an 11-week course, adding the National Security Space Institute's Space 200 course and other training that meets the requirements of unified land operations in the current mission environment. SOOQC develops the FA40 officers, who provide commanders a specialized capability for planning, developing, training and integrating space capabilities into tactical, operational and joint military missions. SOOQC staff also has partnerships with several universities around the country to allow FA40 graduates to receive course credit toward the completion of an advanced degree program. Currently the 11-week course is offered twice a year and trains 50 new FA40s annually. In Fiscal Year 2012 DOTD will conduct the first SOOQC for Army National Guard and Army Reserve FA40s. This course will be conducted over a two-year period to meet the reserve component training requirements and civilian job responsibilities. DOTD also conducts JTGS missile



warning training and Army Space Cadre Basic Course (ASCBC) training at its Colorado Springs location. ASCBC is the preeminent 80-hour space fundamentals course for the Army space cadre and is part of the requirement for Soldiers to earn the Army space badge.

To meet the demands for space forces and accommodate varied deployment cycles and personnel rotations, the Army offers mobile training teams (MTTs) to deliver tailored space knowledge and leader development training packages to existing career development schools to build space professionals and enablers. DOTD currently provides MTTs at the following locations:

- **Army Space Cadre Basic Course MTT.** This is the same 80-hour space fundamentals course but designed for Army Soldiers in space cadre billets at worldwide locations where it is more practical to take the training to the Soldiers.
- **U.S. Army Fires Center of Excellence, Fort Sill, Oklahoma.** Space knowledge is embedded in the Joint Operational Fires and Effects Course, Fire Support Coordinator's Course, Army Operations Electronic Warfare Course, Electronic Warfare Officer's Qualification Course, Electronic Warfare Warrant Officer's Course and the Electronic Warfare Enlisted Course.
- **U.S. Army Intelligence Center of Excellence, Fort Huachuca, Arizona.** There is a two-hour tailored space knowledge and leader development class on the capabilities and limitations of space-based systems as related to intelligence mission areas. Space knowledge is also incorporated in the Imagery Intelligence Course, Signals Intelligence Course, Strategic Intelligence Course, Captains Career Course and the Pre-Command Course.
- **U.S. Army Warrant Officer Career College, Fort Rucker, Alabama.** DOTD recently started a partnership with the Warrant Officer Career College to include space and missile defense training topics and guest lectures in the Warrant Officer Staff Course and Warrant Officer Senior Staff Course.
- **Command and General Staff College (CGSC), Fort Leavenworth, Kansas, and Intermediate-Level Education.** A resident DOTD civilian space professional assigned to CGSC provides daily



space education to the Combined Arms Center and CGSC schools in support of two space electives within the college's Intermediate-Level Education.

Ultimately, space-based capabilities affect every branch in the Army. Accordingly, in 2011 the Army Space Council directed USASMDC/ARSTRAT to execute an Armywide initiative to incorporate space knowledge and leader development training into all Army schools. DOTD is leading this effort with support from Training and Doctrine Command (TRADOC) and is researching and identifying gaps in space knowledge training at the Centers of Excellence and associated schools. Once completed, the analytical results will help define the appropriate depth and breadth of space knowledge training and then facilitate integration into existing lessons and school curricula. With institutional space knowledge training and leader development established at Army schools, the reinforcing strategy to train as the Army fights is to then incorporate realistic impacts of using space-based capabilities through all operating environments, including degradation, disruption or denial of those capabilities. Incorporating these concepts into unit-level training venues at Centers of Excellence and Combat Training Centers will help to give Soldiers and leaders a better understanding of the Army's reliance on space to move, shoot and communicate.

DOTD's Doctrine, Collective Training and Lessons Division is responsible for writing all Army space and missile defense doctrine as well as coordinating on all service, joint and coalition doctrine products. The Collective Training arm oversees the doctrinal and training publications for the 1st Space Brigade and



100th Missile Defense Brigade. The Lessons Learned Analysis program is focused on codifying lessons learned. All Army space forces and, where available, other services/joint space forces are prepared prior to rotation with information needs, tracked for the duration of deployment and then interviewed post-rotation. The findings are analyzed and disseminated to course managers within the command to ensure the contemporary operational environment is taught to the services and joint communities. The information is also posted within internal command knowledge sites and to the Center for Army Lessons Learned.

The Army also conducts an annual Army Space Cadre Symposium, hosted by USASMDC/ARSTRAT, to enhance the professional development and operational expertise of the Army space cadre and provide a forum to discuss space cadre-related issues. This forum provides continuing education and professional development in support of Army space cadre members (military and civilian) and supports the core task of providing trained and ready space and missile defense capabilities to combatant commanders. Finally, the Army collaborates with other services on the training education initiatives and processes to identify and track space cadre in pursuit of a world-class space force that meets the nation's needs.

Going forward, space-related training must remain flexible to meet the needs of the active component, reserve component and civilians. The reliance on space-based capabilities will only grow; the educational model and opportunities must grow in accordance.

Mobile training teams, joint educational opportunities, distance learning and civilian career management are just a few of the requirements to maintain a robust and effective space cadre. The ability to train, track, leverage and retain the Army's space cadre, both military and civilian, is essential for the future joint force.

Materiel Development: Enabling the Decisive Force through Adaptive and Affordable Space Capabilities

Addressing Battlefield Challenges

The Army's ability to project and sustain forces in any location is the essence of strategic flexibility. The new defense guidance notes that "modern armed forces cannot conduct high-tempo, effective operations without reliable information and communication networks and assured access to cyberspace and space. Today space systems and their supporting infrastructure face a range of threats that may degrade, disrupt or destroy assets."⁵ USASMDC/ARSTRAT's research and development initiatives are focused on evolving space-based capabilities that will be less expensive, less complex and more responsive to tactical warfighters.

The challenge for space-based assets, platforms and capabilities is to provide for the ever-increasing demands from BCTs. As the Army's tactical warfighting organization, the BCT is expected to conduct unified land operations across noncontiguous operating areas and engage complex adversaries employing diverse, asymmetric tactics. Geographic characteristics of these operating areas range from dense urban population centers to vast, austere and sparsely populated remote areas. Although enabled by networked systems, mission command is continually challenged by limited beyond-line-of-sight (BLOS) communications capabilities. To facilitate operations on distributed battlefields, the Army must address this BLOS gap and bring broadband communications, data and intelligence to all elements of a BCT regardless of geographic location.

The old concept of a linear communications zone robustly extended by various echelons' line-of-sight nodes is gone. The terrain and distances of modern battlefields have rendered the concept unsustainable in terms of personnel, force structure and equipment.

⁵ DoD, "Sustaining U.S. Global Leadership," p. 5.



Orders of Magnitude

Nanosatellites are at the very small end of the MilSat spectrum.



SBIRS – \$1.5B
Missile Warning Satellite
10,000 lbs.



GPS III – \$250M
Position/Navigation Satellite
2,500 lbs.



TacSat-3 – \$88M
Multispectral Imagery Satellite
1,000 lbs.



Kestrel Eye – \$1M
Visible Imagery Satellite
30 lbs.



SMDC-ONE – \$350K
Communications Relay Satellite
9 lbs.

Satellites not drawn to scale

Source: U.S. Army Space and Missile Defense Command/Army Forces Strategic Command

Ultimately, the Army will need to utilize space capabilities more efficiently and effectively to mitigate terrain effects and connect all tactical elements when line-of-sight systems are not practical. Army study teams returning from theater consistently highlight the need for improved BLOS capabilities within the BCT footprint.⁶ This need is addressed in the Army space white paper, which includes a discussion about the relationship between space and the mission command and movement and maneuver warfighting functions.

Potential Materiel Solutions

USASMDC/ARSTRAT is responsible for the development and demonstration of microsatellite capabilities and for the assessment of their military utility. Tactical forces, especially those dismounted from their vehicles, often do not have timely access to or the means to utilize strategic ISR resources to support their missions. The continuing evolution of technology—especially trends in the miniaturization of electronics—provides an opportunity to develop low-cost yet effective system solutions that enable persistent data communications and ISR capabilities that enhance situational awareness for users.

Small, nanosatellite-class satellites in low-earth orbit can provide relevant military utility in the form of low data-rate communications, data exfiltration from

unattended ground sensors and regionally persistent surveillance/reconnaissance functions. Space-based capabilities are enhanced by placement and density of in-orbit spacecraft systems; persistent capability, such as GPS, requires a sufficiently dense constellation of satellites. Low-cost constellations of single-purpose nanosatellites can provide the required performances while also conforming to a “right-sized” deployment model. Right-sizing is tailoring in-space assets to a specific mission, as opposed to the current mode of single, large satellites that support (at varying levels of effectiveness) all current missions at once. A key component to the constellation concept is cost-effective refreshing of in-orbit satellites; an intrinsic aspect of constellations will be life-cycle management of component satellites.

Deploying Satellites—Solving the Launch Challenge

Critical to successful execution of a constellation strategy is the ability to ensure specific launch schedules supporting that strategy. Current small satellite launch operations are conducted almost exclusively as secondary payloads on launch vehicles designed to lift major DoD and commercial space platforms. This model ensures that launch costs remain high because of low launch frequency rates. Further, the orbital placement of secondary payloads remains inflexible because of the priority given to the primary payload

⁶ E.g., then-Major General Keith C. Walker’s Army study team’s “Trip Report, Evaluation of the Afghan Mission Network,” 12–15 January 2011.



position requirements and the simple fact that competition for secondary payload positions is intense and globally driven.

The Army Strategic Planning Guidance calls for investing in enhanced capabilities for Soldiers at all levels and in all formations. To enable densities of space capabilities sufficient to support the 33 BCTs, the Army's vision as discussed in the draft Army space white paper is for lower-cost, lower-weight satellites

that can be launched individually or in small numbers on commensurately lower-cost, less complex launch vehicles. Increasing the launch frequency while constraining the total payload mass to specific maximums will lower launch vehicle costs and make space missions more affordable. **To simplify and lower the cost of small satellite development, the aim is to use commercially available, mature technologies wherever possible and rapidly advance those technologies with significant military potential.** There is an emerging industrial base for components suitable for integration. Demand for these components in academia, government and even foreign small satellite program efforts is driving costs down while increasing the component availability, reliability and technological readiness.

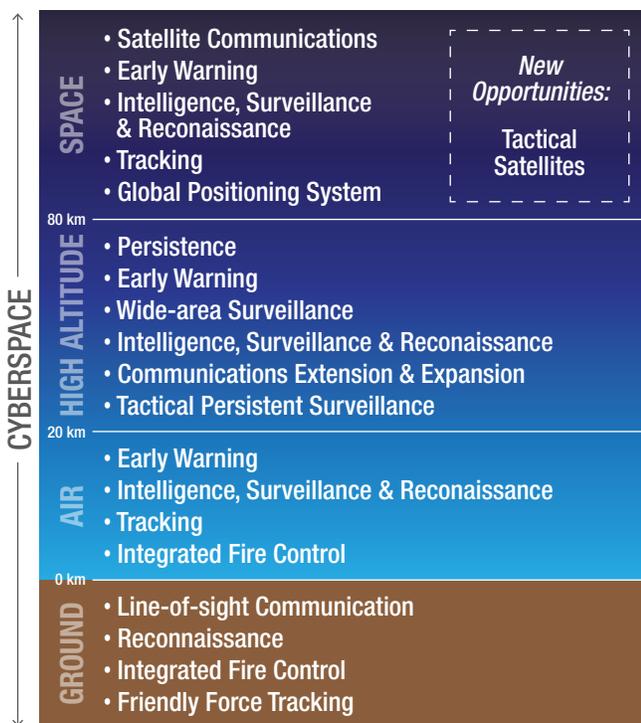
Advancing Materiel Solutions

The USASMDC/ARSTRAT science and technology focus is on exploring small satellite solutions that address gaps in current capabilities. The command's current small satellite demonstration programs, kicked off with the successful 2010 technology demonstration of the SMDC ONE nanosatellite, include the SMDC Nanosatellite Program (SNaP), which supports data exfiltration and low data rate communications, and the Kestrel Eye program for tactical echelon ISR and real-time image support. These demonstrations are focused on validating the military utility of constellations of small satellites.

The command is also working toward a demonstration for a low-cost launch vehicle dedicated to small satellites through its Soldier-Warfighter Operational Deployer for Space (SWORDS) project. The SWORDS plans include deliberate follow-on demonstrations with upgraded communications payloads and more advanced sensor capabilities tied directly to tactical warfighters. USASMDC/ARSTRAT is partnering with a variety of government and nongovernment organizations to enable these advanced technology demonstrations and determine the military utility of these technologies.

The volume, quality and variety of information required by warfighters in modern conflict are increasing. The Army's Soldiers require persistent, timely and relevant BLOS communications, surveillance and reconnaissance capabilities in all operating environments. These capabilities need to be available to the Soldier without the increased burden of additional

Multi-domain Solutions



Source: U.S. Army Space and Missile Defense Command/Army Forces Strategic Command



force structure and commercial infrastructure. Space capabilities by their very nature reduce the tactical footprint in the operating area. Microsatellite and nanosatellite technology can help fill these urgent needs responsively and at a relatively low cost. These small satellite constellation capabilities do not exist today but are achievable with current technology. Success in these demonstrations will serve as the catalyst for the fundamental paradigm shift in space-based capabilities and spacecraft employment necessary to achieve BLOS data communications and ISR capabilities across the tactical battlespace.

What is Needed

The Army of 2020 depends on assured access to space capabilities to enable the land force to shoot, move and communicate. The Army relies, to an ever-increasing degree, on space-based assets to deliver the precision location, targeting, warning, imagery and force tracking capabilities that make it so dominant on the battlefield. The Army's focus for a long-term, sustainable space strategy is to support the land component's operational requirements, which includes providing experienced personnel to enable assured access to space capabilities and develop, evaluate and integrate new space-related technologies.

Accordingly, the Army should take a more influential role within the national security, commercial and international space communities to ensure that current, planned and future space capabilities are developed, interoperable and leveraged to support decisive action across the range of military operations. It should also develop and maintain DoD, national security, interagency and international partnerships to shape, provide and exploit space enablers across the range of military operations in support of land forces. In addition, the Army needs to function as a full space partner by funding, developing and fielding organic Army space capabilities and enhancements that augment DoD and national space capabilities. This includes developing an Army space and space-related architecture that supports TRA-DOC-validated needs, requirements and approved operational plans across the range of doctrine, organization, training, materiel, leadership, personnel and facilities.

The continual identification and professional development of space cadre experts are critical for the Army to maintain a share in joint programs. Additionally,



space professionals should continue to be integrated into combatant commands and other regional-level commands to ensure ground commanders have the best enabling capabilities and are making decisions based on the most accurate and relevant information about space capabilities. Working space-related curriculum into the force at large will highlight the Army's space requirements and dependencies while exposing future leaders to the broader picture of space enablers as a strategic, operational and tactical force multiplier. Adequate retention and career opportunities are imperatives for the Army to build and maintain an expert space cadre and keep relevant knowledge inside the force. Accordingly, Army space formations and proponents require proper resourcing, staffing and support.

Above all, space-based capabilities are technology-centric endeavors. Efforts to advance space capabilities span both military and civilian research and development programs. Smaller satellites, less-expensive launch technologies, more accurate sensors and larger bandwidth capacities will be required for the United States to maintain its combat advantage and protect forward-deployed forces and the homeland from missile attack. These advancements will come from military, civilian, public and private development efforts. The Army and USASMDC/ARSTRAT must have the flexibility, authority, funding and initiative to reach out to all space-related organizations and harness the concurrent efforts being made toward space capability enhancement.

What Must Be Done

It is an imperative that the executive and legislative branches of government recognize the linkage between



the domain of space and landpower and resource them both accordingly. Congress and the Department of Defense must commit to leveraging the capabilities space provides to land forces. For its part, **the Army must continue to:**

- assess its space dependencies and mitigate threats through improved knowledge, doctrine, training and capabilities to provide assured access to space for unified land operations;
- develop and maintain the capability to deny or disrupt threat access to space-based capabilities and degrade the ability of enemies to employ such capabilities against friendly land forces;
- develop leaders and organizations who understand the capabilities, limitations, products and enhancements that space systems and forces provide to sustain access to the space capabilities needed to support unified land operations;
- provide trained, equipped and ready Army space forces to execute assigned missions by recruiting, training and effectively employing an Army space cadre. In addition, it must expand and normalize space education and development in Army schools and leader development activities including acquisition instruction;
- provide career development opportunities and appropriate recruiting and retention benefits to space cadre members;
- ensure that Army space capability requirements and operating concepts are addressed in joint planning, acquisition and resourcing processes and are integrated across the national security space enterprise to inform joint and national space capability development efforts;
- expand joint-service projects and missions to increase collaboration and shared capabilities among services in missions that affect the joint force; and
- allocate adequate force structure to preserve Army integration in space programs.

Beyond the Army, **DoD must:**

- invest in long-term research and development programs focused on space technologies (AUSA Resolution 12-17);

- fund current space acquisition programs—primarily SATCOM (Wideband Global SATCOM and Mobile User Objective System), SBIRS and Global Positioning System III—to include space, ground and user segments (AUSA Resolution 12-17); and
- maintain an active role in developing responsive space concepts and continue to advocate for the development of new technologies and launch capabilities (AUSA Resolution 12-17).

Congress must:

- authorize and appropriate timely and predictable funding for space programs (AUSA Resolution 12-7); and
- craft legislation that encourages and rewards innovation and cross-sector cooperation in improving space capabilities (AUSA Resolution 12-14).

The U.S. Army is a technologically enabled force; it will be more so in the future. Space-based capabilities—such as threat monitoring, imagery, communications and force tracking—support the Army’s missions to prevent, shape and win. These capabilities *prevent* conflict by providing strategic and operational flexibility to ground commanders and policymakers, *shape* the battlefield by linking forces and agencies together around the world and enable the force to *win* through precise, lethal and discriminate action. Current space-based assets and force structure are adequate; however, growth in data requirements, communications needs, targeting missions and dynamic threats will require more collaborative leveraging of joint space capabilities as well as new investments in affordable, tailorable technologies. Professional education and careers in space functions must be competitive with other functional areas and specialties to preserve expertise within the force. Future battlefields will see U.S. forces engaged with a wide variety of adversaries, populations and terrains. Warfighters require capabilities that mitigate the challenges of geography and distance; space-based solutions will meet that requirement. Space is the ultimate high ground—its technologies, platforms and Soldiers underwrite U.S. force-of-arms supremacy, agility and lethality. **The Army is the nation’s force of decisive action, and space is the nation’s decisive enabler.**



Torchbearer Message

As a critical part of the Department of Defense's new strategic guidance, the Army of 2020 will be part of a joint force that harnesses technology to gain agility and flexibility in exchange for absolute size. The Army, as a technologically enabled force, relies on space-based capabilities to preserve its landpower dominance and will continue to do so in the future. Global positioning, high-resolution imagery, satellite communications and missile defense are critical enablers that sharpen the Army's combat edge. The conduct of unified land operations around the world requires the preservation and enhancement of space-related capabilities and assets to provide the information necessary for the precise, discriminate application of force.

Space capabilities augment all six of the Army warfighting functions—mission command, movement and maneuver, intelligence, fires, sustainment and protection. These battlefield activities are enhanced by the suite of space-based capabilities that mitigate the limitations of terrain and distance. **Fundamentally, the Army's ability to shoot, move and communicate relies on space-based capabilities.** The precision communications, surveillance and reconnaissance capabilities must be available to Soldiers without the increased burden of additional force structure or commercial infrastructure. Developing, integrating and advancing new technologies from a variety of cross-domain sources are requirements for retaining the space edge the United States enjoys over current and potential adversaries.

The Army's space capabilities are provided by a professional cadre of space experts. The space professionals of the 1st Space Brigade and Space Support Elements bring expertise to operations and planning at echelons ranging from division to combatant command; the space cadre has been continually involved with global combat operations since 2001 as well as with enduring operations in other theaters and with assistance to civil authorities in the United States during disaster relief and consequence management missions. The cadre is multicomponent and also works with U.S. partner nations to build multinational space capability through theater security cooperation missions.

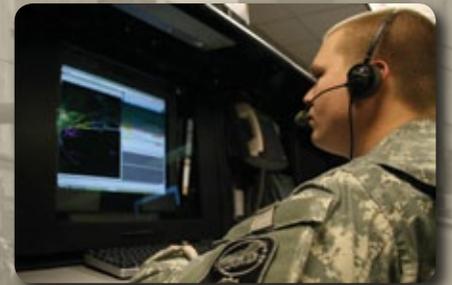
U.S. Army Space and Missile Defense Command/Army Forces Strategic Command (USASMDC/ARSTRAT) is the Army proponent for space and missile defense capabilities and the professional space force. The command has three core tasks: to provide trained and ready space forces for the nation; to build future space and missile defense forces; and to research, test and integrate new space and missile defense technologies. USASMDC/ARSTRAT not only trains the tactical space force but also integrates space-related concepts into other career field curricula to broaden the force's professional development and understanding about how space enables unified land operations. Retaining and developing the space cadre is essential for maintaining the level of technical knowledge required for the future joint force.

The Army is addressing the materiel challenges associated with space operations as well. The high costs of and competition for launch space combined with the technical challenges associated with current space launch processes limit the Army's ability to quickly and efficiently update and expand its space assets. The Army is working toward technology demonstrations of low-cost small satellites and launch vehicles that can be used to supply tailorable coverage for specific forces and missions at lower cost than traditional methods. Such solutions must leverage mature technologies where possible and develop enduring and innovative partnerships with civilian, private and commercial partners to advance emerging technologies.

Space enablers are combat multipliers for America's forces around the world. To sustain these multipliers, timely and predictable funding is required to support the extended development times associated with complex and technical space-related projects. Proper force structure and space advocacy are needed to maintain the level of space expertise within the force and to manage the space assets on which warfighters rely. Space capabilities reduce operational footprints while mitigating the constraints of time, distance and terrain. **Space is the ultimate high ground and provides commanders the strategic flexibility, interoperability and precision required to execute the Army's "prevent, shape and win" strategy.** The Army is the nation's force of decisive action, and space is the nation's decisive enabler.

Space and cyber capabilities provide the U.S., our allies, and our partners with unprecedented advantages in national decision-making and military operations, in homeland security, in economic strength, and in scientific discovery.

General C. Robert Kehler,
Commander, U.S. Strategic Command,
U.S. Strategic Command Cyber and Space Symposium, 15 November 2011



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