

Space Support: Enabler of the Unit of Employment

**A Monograph
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ABSTRACT

SPACE SUPPORT: ENABLER OF THE UNIT OF EMPLOYMENT by MAJ Edward J. O'Neill, USA, 68 pages.

This monograph addresses the concept of how space support provides the enabling functions to facilitate the Unit of Employment's attainment of full spectrum dominance from the operational to tactical battlefield. It demonstrates the relevance of the space operations essential tasks to enable the Unit of Employment (UE) Concept. There are five Space Operations Essential Tasks: Support increased deployability and reduced theater footprint; achieve situational understanding "Off the Ramp" during entry operations; support precision maneuver, fires, sustainment, and information; enable continuous information and decision superiority; and protect the force during all phases of the operation. The integration of these five tasks, their capabilities and functions and the denial of these benefits to adversarial forces are crucial to the UE concept of operations.

Space operations enables the objective force to achieve the characteristics envisioned for it by Army's Transformation Plan. This support resides in three key areas: C4ISR, space control, and force protection. Space support seamlessly integrates into all land force operations and remains a vital component of the Objective Force. The theater commander can directly access responsive and reliable space-based support across the entire spectrum of conflict. The United States' ability to control space ensures the uninterrupted use of space-based assets to facilitate command and control and the protection of the force.

Space systems and products significantly reduce the fog, friction, and uncertainty of warfare. The integration of space capabilities enables Units of Employment to exploit the operational environment and enhance the commander's overall operational design. The results are expeditious strategic response, improved situational understanding, global communications, accurate surveillance, precision attacks on multiple targets, and enhanced sustainment, all while protecting the force from home station to area of operation, enabling Objective Force commanders to dominate their battlespace. The successful transformation of the U.S. Army will, to a very large degree, depend on how it leverages joint space capabilities to enable the transformational concepts of the Objective Force. The conclusions prove that Units of Employment will be a space-enabled force reliant on continuous overhead constellation of communications, navigation, ISR and imagery, weather, and missile warning satellites that will integrate seamlessly land, air, and space operations to ensure operational and tactical dominance.

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CHAPTER ONE

WHY SPACE SUPERIORITY IS CRITICAL TO THE OBJECTIVE FORCE

The Army must possess the capability to defeat enemy land forces and to seize, occupy, and defend land areas. Additionally, we must be capable of conducting air and missile defense, space and space control operations, and joint amphibious and airborne operations . . . Information superiority is essential to decisive Army operations. Technological advances will continue to enhance the common operational picture and situational understanding, the precision of fires and maneuver, and virtually every other aspect of Army operations. Through interoperable ground-, air-, and space-based capabilities, Army forces can now conduct information operations that affect an adversary's will to resist and enable decisive superiority for joint and multinational forces. – FM 1¹

The 21st century battlespace extends beyond the physical dimensions of land, sea, and air-based operations, and now includes both space and cyberspace. As the U.S. Army transforms to the Objective Force, space is the “high ground” that will support global land force operations. Information dominance requires the exploitation of space to ensure full-spectrum operations per the Army’s Capstone Concept. Current and future operations demand space-based capabilities as an integral part of land dominance. Full-spectrum operations requires land forces to have unmatched capabilities in Communications, Reconnaissance, Intelligence, Surveillance and Target Acquisition (RISTA), Weather, Terrain, and Environmental Monitoring, Positioning, Navigation and Timing, Force Protection and Battlespace Control. Space forces are critical combat multiplier because of their “high ground” position and are often the first “eyes on” for a deploying force. This chapter explains why space superiority is critical for Objective Force battlefield success.

¹ Department of the Army, *Field Manual 1 The Army*, Washington, DC: GPO, 14 June 2001, p. 2.

The strategic environment foresees an explosion of space related activities in both the commercial and military realms. Space based products and capabilities are sought by a myriad of government, civil, commercial and private systems, all competing for positions, bandwidth and profit.² Many nations have, are developing, or require space programs that enable them to maximize the advantages space offers in the areas of communications, intelligence, surveillance, and reporting (ISR) and threat warning. The Information Revolution has placed increasing demands on nations to seek space systems able to transfer large volumes of information and data quickly in order to remain globally and economically interconnected. Space technology advancement provides a diverse variety of readily available space products for commercial and military exploitation.

This burgeoning requirement for national and transnational space capabilities poses a significant threat to the United States' ability to achieve space and information dominance. Adversarial forces will seize opportunities to exploit space capabilities to the United States' detriment. They will "threaten our freedom of navigation to, through, and in space and by the interruption of our use of vital space capabilities."³ They will utilize asymmetric means to disrupt our space capabilities through cyber warfare, terrorism, WMD, the employment of hostile space systems and anti-satellite capabilities, and /or deny access to operate within the space environment by attacking ground stations, launch facilities, or industry.

² Department of the Army, *Space Support to the Army Transformation Force, Organizational and Operational Concept*, (Arlington, VA: United States Army Space and Missile Defense Command, Washington DC, Feb 2001), pg. 2.

³ Department of the Army, *TRADOC Pamphlet 525-60, Space Support to Land Force Operations*, (Fort Monroe, VA: United States Army Training and Doctrine Command, November 1994), p. 3.

Due to increased number of satellites launched in the coming decade, adversarial forces will exploit new methods of communications, imagery, intelligence collection, and targeting capabilities. Via the Internet, readily available imagery, down to .5-meter resolution, exists today for any transnational or national actor to obtain for military purposes such as targeting. One can assume that adversarial forces will have limited access through various governmental and commercial space systems imagery, observation and communication capabilities that will impact future Army operations. State and non-state entities⁴ with proven space capabilities will continue to exploit their advantages to gain information superiority, collect intelligence, and attempt to deny our access to space. Adversarial forces will attempt to undermine national resolve through information technology and telecommunications. They will use mass media to alter alliance systems and disrupt coalition forces by influencing national populace against our operations. Since we rely so heavily on information, adversarial forces will attack, through jamming, monitoring, or direct action, our technological superiority and disrupt our ability to maintain information dominance. Adversarial forces, especially those with space capabilities, remain a threat to U.S. use of space. “Adversaries may alter the space environment and affect spacecraft, communications links, ground stations, terminals, or the associated information infrastructure.”⁵ Developing anti-satellite technologies and the means to deliver them are evolving so quickly that our ability to protect critical satellites becomes even more crucial to assure space, informational and land dominance. The variety of threats to assured access to space and our reliance on space-based

⁴ State and non-state entities are defined as legitimate national governments, terrorist organizations, transnational actors that have space capabilities or access to those capabilities.

⁵ Ibid., p. 5.

capabilities demand that our army take measures to deny adversaries space-based capabilities while protecting our technological superiority for the Objective Force.

There remains an increasing requirement for space-based capability to ensure dominance across the full spectrum of operations. Adversarial forces will seek to deny, disrupt, or destroy our ability to exploit this technological superiority while attempting to attain an informational advantage to augment their own capabilities. The Objective Force must take advantage of evolving space technologies to create seamless “mud to space” information architecture.⁶ According to the Draft Unit of Employment Organizational and Operational Concept, dated 01 November 2001, the UE will incorporate advanced C4ISR, future combat systems of system, integrated sensors, robotics, attack/reconnaissance helicopters, and expanded capabilities for maneuver, stand-off precision fires and sustainment. Units of Employment will conduct simultaneous operations synchronized with other joint elements to destroy key capabilities in a distributed, non-linear battlespace.⁷ The Unit of Employment is a knowledge-based force organized and designed to operate within the network-centric environment of the future. Army space operations will make possible and take advantage of evolving ISR technological capabilities to remain dominant on the 21st century battlefield.

METHODOLOGY

Using a combination of the historical method and descriptive comparison, this work intends to answer how space support provides the enabling functions to facilitate the Unit of Employment’s attainment of full spectrum dominance from the operational to

⁶ Department of the Army, *TRADOC Pamphlet 525-66, Battle Command Concept (Draft)*, (Fort Monroe, VA: United States Training and Doctrine Command, July 2001), p. 11.

tactical battlefield and to demonstrate the relevance of the space operations tasks to enable the Unit of Employment (UE) Concept. There are five Space Operations Essential Tasks: Support increased deployability and reduced theater footprint; achieve situational understanding “Off the Ramp” during entry operations; support precision maneuver, fires, sustainment, and information; enable continuous information and decision superiority; and protect the force during all phases of the operation. The integration of these five tasks, their capabilities and functions, and the denial of these benefits to adversarial forces are crucial to the UE concept of operations.

The overall research strategy requires an assessment of current and future space architectures that enable situational understanding, ability to execute precision networked fires, and conduct of operational maneuver throughout a theater commander’s area of operation: essentially how space systems will enhance the UE’s ability to shoot, move, and communicate. The criteria chosen to meet these three attributes represent the Objective Force quality of firsts, see *first, understand first, act first and finish decisively*.⁸ The standards applied to the criteria must address the ability and importance of the five space operations essential tasks to enable the UE to achieve strategic responsiveness, situational understanding, global communications, accurate surveillance, precision attacks on targets, and enhanced sustainment. These standards may be modified as evidence and data prove or refute the capabilities space support provides to the UE.

By analyzing the Army’s space operations essential tasks and conceptual framework for the UE, this monograph demonstrates that the use of space based systems

⁷ Department of the Army, *TRADOC Pamphlet 525-3-100, Organizational and Operational Concept of Units of Employment*, (Fort Monroe, VA: United States Army Training and Doctrine Command, July 2001), p. 5.

and products are a necessary component to the conduct of full spectrum objective force operations. An examination of the space operations essential tasks may demonstrate shortfalls in capability and provide recommendations to mitigate them. The analysis should identify critical vulnerabilities and provide potential recommendations to address them. This will answer the question of what space-based capabilities are required and their impact on evolving UE requirements.

The Objective Force Capstone Concept defines the requirements that the Objective Force must possess to dominate and how space based capabilities provide the means to execute the myriad of UE missions across the spectrum of operations. Army space operations exploit the advantages of space and space systems, integrating space support into land force operations and supporting joint space operations to dominate the fourth dimension of warfare: space. Space-based operations will support all forces from strategic to tactical level; however this monograph focuses on the operational level, specifically an examination of the Unit of Employment.

Finally, an analysis of evolving capabilities, technologies and requirements is necessary to demonstrate how space-based systems facilitate the seamless integration of space and land forces. This assessment demonstrates technological effectiveness to determine critical components necessary to assure space support to the UE. The analysis identifies the critical vulnerabilities and provide potential recommendations to address vulnerability.

⁸ Department of the Army, *TRADOC Pamphlet 525-3-0, Objective Force Concept*, (Fort Monroe, VA: U.S. Army Training and Doctrine Command, 19 August 2002), pp. 30-32.

STRUCTURE

The monograph is divided into five chapters. The introduction chapter provides a basic structure of the work and relays the significance the subject has to the overall project. It answers why space support is required and what significant impacts space operations essential tasks have on UE operations. This chapter lays the foundation to address the remaining elements of the monograph.

The review chapter examines current and evolving space doctrine and policy as it relates to the legacy force and what changes may be required in relation to the UE. The review will include a brief historical framework of Army Space Support operations, their impacts on major operations specifically Operation Desert Storm, and ongoing operations impacted by space support. Finally, this chapter briefly addresses Army space theory and how it meshes with the space operational essential tasks.

The third chapter provides an overview of the Objective Force concept of operation (CONOPS) and the evolving design of the Unit of Employment. A discussion is necessary to facilitate understanding of what the Unit of Employment is required to perform, its' unique capabilities and expectations as an Air-Ground-Space task force. The Unit of Employment examined focuses on the Corps Task Force concept.

The analysis chapter codifies the bulk of discovery. It examines the Objective Force conceptual framework to identify the requirements that space support must provide in relation to the "quality of firsts". This will address the UE space operations essential tasks and how space support mitigates vulnerabilities. Additionally, the analysis addresses evolving space capabilities and their potential benefits to meet UE

requirements; specifically, how evolving force enhancement and space control capabilities increase a theater commander's dominance over his Area of Operations. Lastly, this chapter examines how space support integrates into the Objective Force architecture and provides integration of space and land forces.

The final chapter, Recommendations and Conclusions, finalizes the results of the project. The conclusions should address the general research question: Can space support provide the enabling functions to facilitate the Unit of Employment's attainment of full spectrum dominance from the operational to tactical battlefield? Do the space operations essential tasks and associated functions enable the UE to become a space-empowered force and achieve full-spectrum objective force operations? Any recommendations for further research and potential changes to existing space doctrine and space operations essential tasks for the Unit of Employment are summarized at the conclusion of this work.

CHAPTER TWO

DOCTRINAL, HISTORICAL, AND THEORETICAL REVIEW

For communications and command and control, for intelligence and navigation, we need to be in space, and we need a variety of space systems. - General Colin Powell⁹

An assessment is necessary of the current body of literature in regards to Army space operations and the Unit of Employment concept of operations. The difficulty in such assessment is the evolving nature of the Objective Force and its' force operational concepts. Although most of the major Army commands have a voice in the Objective Force Concept, there are two specific players developing Objective Force concepts encapsulated mainly by briefings from the Objective Force Task Force (OFTF) and United States Army Training and Doctrine Command (TRADOC). Current doctrinal and force operational thought on Army space operations resonate from the Force Development and Integration Center (FDIC), United States Army Space and Missile Defense Command (USASMDC) in Washington, D.C. Supporting these organizations' efforts is a host of researchers, doctrinal experts, research and development analysts, military concepts developers, and scientific and technical industries. Their combined efforts have led to the current Objective Force Concept and Concept for Space Support to the Objective Force. The following analysis articulates the doctrinal foundations that govern Army space operations, how space has proven its value in previous operations, and provide a general theory of space support for future operations.

⁹ United States Combined Arms Center, Center for Army Lessons Learned (CALL), "CALL Newsletter Number 91-3, The Ultimate High Ground!" (Fort Leavenworth, Kansas, October 1991), p. i.

DOCTRINE

Army space operations doctrine was codified for the first time in 1995 by a single doctrinal publication, *Field Manual 100-18, Space Support to Army Operations*. It established doctrine for the Army's use of space, enumerated space system capabilities, and provided for the use and application of space capabilities to support Army operations.¹⁰ In conjunction with 1993 version of *Field Manual 100-5, Operations*, it laid the foundation for the use of space capabilities during all facets of Army operations. It provided Army and joint communities with a framework on how the Army functions with space based systems and what capabilities could be exploited to enhance the conduct of operations.

FM 100-18 is an incomplete doctrinal guide for army space operations. It is an outgrowth of Operation Desert Storm and AirLand Battle doctrine. What the manual lacks are doctrinal "how to" procedures to obtain space based capabilities and incorporate them into planning and execution. There are no tactics, techniques or procedures (TTPs) for operational and tactical level staffs to use to exploit space capabilities. The evolution of space capabilities and force projection CONOPS necessitates a revision of Army space doctrine to more closely parallel joint space doctrine, embodied in *Joint Publication 3-14, Joint Space Operations*. It needs to incorporate a space planning process aligned with *FM 5-0, Army Planning Process*, a revised Annex N (Space Operations), and Space Operations officer TTPs to reflect the evolving space capabilities of the Objective Force.

¹⁰ Department of the Army, *Field Manual 100-18, Space Support to Army Operations*, (Washington, DC: GPO, 20 July 1995), p. ii.

Although further clarification and recommendations are put forth in Chapter Five, several examples of doctrinal changes provide evidence of new doctrinal challenges. The current manual lacks specificity of space tasks needed to execute the myriad of operations across the spectrum of conflict. It does not address integration of information superiority to include all Army and joint sensors and ISR assets by space-based, aerial and terrestrial systems into space surveillance and space control networks that have become important components of joint operations. It fails to accommodate the role space platforms play in early planning, rehearsal, execution and rapid battle assessment of force projection operations. Multi-spectral imagery, long-haul, digital and voice communications, focused surveillance, navigation, precision fires and engagement, and tactical missile warning are aspects prevalent in force projection operations in Bosnia, Kosovo, and Afghanistan. They illuminate the use of space systems as a critical component of Army operations and demonstrate that continuing evolution of space capabilities is necessary to meet Joint Force Commander (JFC) requirements. Each aspect plays a critical role in integrating simultaneous operations within a theater of operation. The evolution of joint operations since Desert Storm and Kosovo dictate changes are required in Army Space support doctrine and the Objective Force concept will drive doctrine developers to incorporate the challenges space operations entail for the Objective Force. Doctrinal work has already met many of the challenges of *FM 100-18* and has made their way into *Joint Publication 3-14, Joint Doctrine for Space Operations*.

Since space operations are inherently joint in nature, both in how they support military operations and to whom they support, it was necessary to formalize an overarching space doctrine to bring together the disparate doctrinal efforts of each

service. The lack of a unifying source for joint space doctrine resulted in the services each developing respective doctrine without the necessary joint guidance.¹¹ *JP 3-14*, finally published in 2002, was seventeen years in the making and required the space operational challenges of Desert Storm, Somalia, Kosovo, and Afghanistan to formalize a joint doctrinal concept for space operations. *JP 3-14* describes in great detail the foundation of military space operations specifically highlighting operational considerations for space and space planners. It describes United States space organization and missions, including the duties and responsibilities of United States Space Command, integrated into United States Strategic Command as of 01 October 2002, service component operations, and theater space support to warfighting combatant commanders in the form of joint and component space support teams. It describes the command and control of space forces and outlines military space operations mission areas. Finally, and most importantly, *JP 3-14* outlines support to space planning. It defines the role of commanders, staffs and space support teams in deliberate and crisis action planning, integrating space forces into theater, and exploiting space capabilities for the JFC. *JP 3-14* captures the evolving nature of transforming forces and can be considered the basis for achieving Objective Force space operations essential tasks.

HISTORY

The Army's role in space dates back to the post World War II era when Army leadership decided to exploit space as a military domain. Army rocket development and early space exploration first received impetus when Dr. Wernher von Braun and other German scientists joined the Army's missile effort in 1945. In the following years, the

¹¹ Colonel Avery V. Allison, Jr. "The State of the US Army and Space Operations," (USAWC Strategy

Army engineered the first U.S. space rockets and led the development of space technology.¹² After the creation of the National Aeronautics and Space Administration (NASA), the Army's role in space began to diminish. The U.S. Army Satellite Communications Agency was established in 1961 to research, develop, and produce strategic and tactical satellite communications ground terminals used by all services. The Army was the lead proponent for national missile defense and tactical exploitation of national capabilities (TENCAP).¹³ With the establishment of United States Space Command in 1985 and the development of the Army's new AirLand Battle concept, the Army explored means to exploit space systems to support Army operations. The result was an operational concept for space operations, space architecture, and the establishment of U.S. Army Space Command, a component of U.S. Space Command.¹⁴ The evolution in the Army's space role culminated in force structure changes, doctrinal development, operational planning and organization, and technological exploitation resulting in what is often termed as America's first "space war."¹⁵

Operation Desert Storm (ODS) was a watershed event for Army space operations. It showed the importance of space-based systems for command and control, intelligence collection, and navigation throughout the vastness of the Saudi desert. The Allies' overwhelming military success especially the opening air campaign and subsequent ground operations, was premised heavily on having sole possession of space-borne communications, reconnaissance, weather, missile warning and detection and intelligence

Research Project, U.S. Army War College, Carlisle Barracks, Pennsylvania, May 1998), p. 13.

¹² Department of the Army, *Field Manual 100-18, Space Support to Army Operations*, p. iii.

¹³ *Ibid.*, p. iii-iv.

¹⁴ *Ibid.*, p. iv.

¹⁵ Roger Handberg, *Seeking New World Vistas: The Militarization of Space*, (Praeger: Westport, Connecticut, 2000), p. 3.

systems along with global positioning (GPS) capabilities.¹⁶ Coupled with other military technologies, ODS demonstrated the potential effectiveness of space-based systems and capabilities.

Space assets enabled detailed target identification and battle damage assessment in order to enhance efficiency of target selection and minimize undue risk to Allied pilots from Iraqi ground fire. During the preparation of the initial air campaign, satellite imagery was extremely useful to correlate other intelligence sources to develop a complete picture of Iraqi defensive dispositions along the Saudi border and build relevant target packages. Unfortunately, satellite imagery and intelligence was extremely slow in processing, analyzing, and disseminating to intelligence officers back in Saudi Arabia. For tactical purposes, overhead imagery was not useful and often arrived too late to assist analysts and tactical commanders in determining enemy targets. They had to rely on other aerial and ground reconnaissance platforms to confirm moving Iraqi formations.¹⁷

Certainly the most promising technological usage from space came from an operational necessity to move large ground formations across open desert terrain with limited terrain features to guide them.¹⁸ GPS decreased the incidence of friendly fire by accurately pinpointing locations of small and large unit formations. The enormous “left hook” executed across hundreds of kilometers while maintaining divisional boundaries and destroying fleeing Iraqis was made possible by the overhead constellation of GPS satellites. GPS enabled United States Central Command (USCENTCOM) commanders to precisely track division unit locations thereby enhancing situational awareness, direct

¹⁶ Ibid., p. 87.

¹⁷ Ibid., pp. 94-98.

¹⁸ United States Combined Arms Center, Center for Army Lessons Learned (CALL), “CALL Newsletter Number 91-3, The Ultimate High Ground!” (Fort Leavenworth, Kansas, October 1991), p. 8.

targeting, and to move mountains of logistics. The challenge commanders faced during the Gulf war was the number of navigational receivers. Commercial receivers were purchased hastily to equip front line units in order to navigate across the desert. DOD, realizing the accuracy dilemma of commercial receivers, removed the selective availability filter imposed on commercial receivers, facilitating pinpoint accuracy for system targeting and navigation.¹⁹ After the Gulf War, DOD established a priority to acquire new GPS receivers for all fielded forces.

The ability to command and control distant forces, across an enormous battlespace, was a significant advantage for Allied commanders during the Gulf War. Over 1,500 satellite communication terminals, mostly single-channel man-portable systems, deployed to theater to provide intra- and inter-theater communication due to lack of communication infrastructure within Saudi Arabia and beyond.²⁰ Satellite communications provided a near instantaneous link between President George Bush and Secretary of Defense Dick Cheney and CENTCOM commander, General Norman Schwarzkopf. Allied units exploited this technological advantage from the strategic to tactical level, facilitating preparation and execution of actions to maximize performance. Space based communications raised expectations for military commanders to extend the effectiveness and range of combat formations.²¹ The success of satellite communication (SATCOM) during Desert Storm has had programmatic and procurement implications for

¹⁹ Ibid., p. 100. See also Michael R. Gordon and General Bernard Trainor, *The General's War*, a discussion by Lieutenant General Walt Boomer, I MEF Commander during ODS, on navigational problems USMC forces encountered due to dense oil fire smoke on 24 February 1991, p. 371.

²⁰ Center for Army Lessons Learned (CALL), "CALL Newsletter Number 91-3, The Ultimate High Ground!," pp. 15-16.

²¹ Handberg, *Seeking New World Vistas*, pp. 101-102.

DOD and has increased demand for SATCOM capability down to battalion and brigade echelons.

By far one of the most visible symbols of military space activity relates to theater missile defense. Obtaining accurate and timely warning was critical to alert coalition forces in order to execute defensive measures. Defense Support Program (DSP) constellation provided alert warning of Iraqi SCUD launches to theater forces; however, the process was slow and impact areas inaccurate. DSP warning was linked through U.S. Space Command in Colorado Springs, through inter-theater Control and Reporting Center (CRC), to Patriot batteries.²² Although the relay system worked well, there were times when tactical units failed to receive alert notification until the Patriot radar cued for engagement during a SCUD's terminal approach.²³ Satellite detection and alert notification were crucial to keeping Israel out of the Gulf War and enabled Allied forces to take responsive defensive measures.

Defense Meteorological Satellite Program (DMSP) satellites integrated with National Oceanic and Atmospheric (NOAA) satellites to provide operational planners detailed forecasts with which to launch attacks between rapidly moving weather fronts.²⁴ DMSP enabled USCENTCOM to assess the best opportunity to commence the ground offensive by providing photo surveillance of impending weather patterns. DMSP imagery has a resolution of .6 kilometers allowing identification of smaller scale weather

²² Ibid., pp. 102-103.

²³ Center for Army Lessons Learned (CALL), "CALL Newsletter Number 91-3, The Ultimate High Ground!," p. 14.

²⁴ Handberg, *Seeking New World Vistas*, pp. 98-99.

phenomena, such as sandstorms and fog.²⁵ This ensured all military capability was brought to bear, especially rotor and fixed winged attack aviation.

Desert Storm was not without its space challenges. During the Iran-Iraq war, U.S. intelligence shared vital imagery of Iranian troop movements and assembly areas. Though unable to retain the imagery, Iraqi leadership recalled how clear the quality was and realized to counter that capability required a change in operational movements. Knowing that US satellites passed overhead once or twice a day, the Iraqis used this to shift forces south into Kuwait and to reposition units along the Saudi Arabian border. On 29 January 1991, the Iraqis launched a three-division attack against northern coalition observation posts in Saudi Arabia. Their initial penetration and subsequent follow-on attack to the city of Khafji was masked during night movements while satellite coverage was unavailable. They exploited a gap in intelligence coverage and turned their weakness into strength.²⁶

Although prevalent throughout the theater, SATCOM demands were greater than the system was designed or could accommodate. CENTCOM forces, especially command and control facilities, military intelligence, and special forces, used enormous amounts of satellite communication time and bandwidth to conduct operations. This could over time impede operations especially during critical times of the campaign. To offset these challenges, CENTCOM and DOD purchased additional satellite capability from commercial industry and Allied nations while reallocating critical high-level SATCOM requirements onto INTELSAT systems. Needless to say throughout the

²⁵ Center for Army Lessons Learned (CALL), "CALL Newsletter Number 91-3, The Ultimate High Ground!," p. 5.

1990s, US military forces have become dependent on SATCOM to provide instant long-range communications to enable operational doctrine changes of a force projection Army conducting non-linear operations. SATCOM demand will not change and probably will increase in the future as we move to the Objective Force.

THEORY

There are a couple of prevailing theories on space utilization that have become accepted tenets for space application. Lieutenant Colonel Michael R. Mantz's report, *The New Sword: A Theory of Space Combat Power*, lists the following axioms of space combat power:

1. Space strike systems can be decisive by striking earth forces.
2. Space strike systems can be decisive when an enemy's essential means for waging war are vulnerable to space attack.
3. Space strike systems can be decisive by striking enemy decision-making structures.
4. Space strike systems can deter hostile actions by holding the enemy at risk.
5. Space denial systems can be decisive by denying enemy access to space-derived data.
6. Space denial systems can be decisive by physically denying enemy access to space.
7. Space protection systems can assure friendly access to space.
8. Total space control is neither achievable nor necessary.
9. Space combat power must be centrally and independently controlled.
10. Space power is not intrinsically linked to air power.²⁷

Although this seems to be a lengthy list of requirements for a space theory, Mantz does illuminate the preconditions to control the sea, air, or land from space. Major Robert D. Newberry uses Mantz's theory and defines four supporting conjectures to categorize space theory. He believes space power must enhance war-fighting capabilities, target

²⁶ Michael R. Gordon and General Bernard E. Trainor, *The General's War*, (Boston: Little, Brown and Company, 1995), p. 271. Comments made by General Joseph P. Hoar, CENTCOM Commander after the Gulf War to the United States Marine Historical Center, Washington, DC, 1991.

²⁷ Lieutenant Colonel Michael R. Mantz, *The New Sword: A Theory of Space Combat Power*, (Maxwell AFB, AL: Air University Press, May 1995), p. 74.

enemy sea, land and air forces, gain a decisive advantage, and protect space power.²⁸

Mantz and Newberry qualify their theories to assured space remains a dominant factor in military application of power. Each theory embraces the four space mission areas, Space Support, Force Enhancement, Force Application, and Space Control²⁹ and encompasses the tenets of their theory to assure space power remains vitally important to national security.

Another theory worth examining defines four key principals on which all space operations are based. Major Arnold H. Streland states that space theory must help commanders and operators understand the effects of space, the limitations of those effects and how these effects can be maximized for successful military operations. His principals are 1) Control of Space Means Controlling the Effects of Space, 2) Access to Space is Everything, 3) The Primary Users of Space are not Space Operators, and 4) Space is a National Center of Gravity for the U.S. and its Enemies.³⁰ His theory is well-grounded in the attributes of services' space initiatives to conform to United States Space Command's vision to dominate the space medium and integrate space power through

²⁸ Robert D. Newberry, Major, *Space Doctrine for the Twenty-First Century*, (Maxwell AFB, AL: Air University Press, October 1998), pp. 22-23.

²⁹ Briefly summarized definitions of space mission areas: Space Support operations consist of operations that launch, deploy, augment, maintain, sustain, replenish, deorbit, and recover space forces, including the C2 network configuration for space operations; Force Enhancement operations multiply joint force effectiveness by enhancing battlespace awareness and providing needed warfighter support. It includes communications, navigation, position, timing, weather, terrain, environmental monitoring, missile warning and ISR support; Force Application consists of attacks against terrestrial-based targets carried out by military weapons systems operating in or through space, including ballistic missile defense and force projection; and Space Control operations provide freedom of action in space for friendly forces while, denying it to an adversary. It includes space surveillance, protection, prevention and negation functions. See *Joint Publication 3-14, Joint Space Operations*, Washington, DC: GPO, 9 August 2002, pp. IV-5 – IV-10.

³⁰ Major Arnold H. Streland, *Clausewitz on Space: Developing Military Space Theory Through a Comparative Analysis*, (Maxwell AFB, AL: Air Command and Staff College, April 1999), p. 31. Major Streland compares Julian Corbett's naval theories for command of the seas and lines of communications to propose an applicable theory that maintains control of space as vital to assured access.

military operations. The critical elements of each theory are embodied in current joint and component doctrinal publications and lay the foundation for space dominance.

The Army views space as a vertical extension of the battlefield, in, from, to and through which land force operations are conducted.³¹ The closest statement of an articulated space theory within the Army is summed by the SMDC motto, “Secure the High Ground!” In effect, this articulates the Army’s space position and has focused its efforts to operationalize, normalize and institutionalize space in the Objective Force to exploit the nature of space and its’ attributes for the warfighter. The move toward an agile, versatile force that is more strategically responsive will be highly dependent upon assured access to adequate orbital and ground-based space assets and seamless integration with complementary capabilities.³² Though a theory is not specifically stated, the Army Space Master Plan presents the Army Space vision that links space capabilities and products to Army Transformation initiatives to enable strategic responsiveness, deployability, agility, versatility, lethality, survivability and sustainability. The essential tenets of the Objective Force embed space-based capabilities to achieve dominance and information superiority across the full spectrum of operations.

These theories provide the framework to transform USSPACECOM’s operational concepts: Control of Space, Global Engagement, Full Force Integration, and Global Partnerships into specific space capabilities to exploit the medium of space.³³ Combined with the Army’s Transformation Vision and Plan, they lay the foundation for the Objective Force concepts to *See First, Understand First, Act First and Finish Decisively*

³¹ Department of the Army, *TRADOC Pam 525-60, Space Operations* (Final Draft), (Fort Monroe, VA: United States Training and Doctrine Command, 3 May 2000), p. 1.

³² Department of the Army, *United States Army Space Master Plan*, (Washington, DC: GPO, 2000), p. ES-3.

at all levels of warfare. The next chapter will discuss the evolving Objective Force concepts and provide a basic understanding of the Unit of Employment and how space doctrine, history, and theory have played a part in its development.

³³ Ibid., p. ES-8.

CHAPTER THREE

OBJECTIVE FORCE AND UNIT OF EMPLOYMENT CONCEPTS

Today's battlefield is multi-dimensional, dispersed, continuous, and noncontiguous in nature. Operations take place on land, sea, in air, space and cyberspace. Adversaries are evolving, sophisticated and adaptive with asymmetric capabilities. The Objective Force was designed to provide innovative capabilities to cope with the new operational environment relying on leaders and soldiers to out think and dominate our adversaries with superior speed of command and decisive action. The Objective Force is organized, manned, equipped, and trained to be more strategically responsive, deployable, agile, versatile, lethal, survivable, and sustainable across the full spectrum of military operations. The Objective Force is comprised of modular, scalable, flexible organizations for prompt and sustained land operations. – The Objective Force in 2015 White Paper.³⁴

THE OBJECTIVE FORCE

To understand how space is a key enabler of the Unit of Employment, it is important to describe what the Objective Force concepts are and the current work being conducted. As of this writing the Objective Force concept is a work in progress with the most recent concept coordinating draft elaborated in November 2002. The concept is the embodiment of a decade worth of technological demonstrations, laboratory studies, joint and Army exercises, experiments, and assessments representing a continuous learning process to capture the requirements for a Transformed Army to meet strategic mandates.³⁵ The overarching concepts are structured to meet the requirements of the Quadrennial Defense Review (QDR) transformational goals of assured access to remote theaters of operation, improved strategic responsiveness, and an adaptive future operating environment. The following pages provide a synopsis of the Objective Force concept to

³⁴ Department of the Army, *The Objective Force in 2015 White Paper*, (Arlington, VA: Objective Force Task Force, 08 December 2002), p. i.

present an understanding of what the Objective Force and Unit of Employment (UE) frameworks require, leading to an understanding why space support is important to the Objective Force.

The Objective Force idea is to create a strategically responsive and dominant force at every point across the spectrum of operations. “It contributes to decisive joint operations by conducting simultaneous, distributed and continuous, combined arms air-ground operations, in all terrain environments and weather conditions throughout the battlespace to establish land force dominance, wrest the initiative from the enemy, force him onto the defensive, and defeat him in detail.”³⁶ Objective Force units operate at a tempo that affords the enemy no rest or relief and no means of responding effectively. They develop situations in and out of contact in order to maneuver to positional advantage, shape enemy forces within the battlespace with precision fires well beyond enemy forces’ weapon ranges, and destroy them with fire and maneuver and by tactical assault, both vertically and horizontally, when and where Objective Force units desire.³⁷ The intent is to provide soldiers and leaders revolutionary increases in operational capability enabled through advanced technologies against evolving, sophisticated adversaries.

Objective Force units attain these effects through a quality of firsts: Objective Force formations must *see first, understand first, act first and finish decisively*. Objective Force units *see first* by detecting, identifying, and tracking the individual components of

³⁵ Department of the Army, *TRADOC Pamphlet 525-3-92, Objective Force: Unit of Employment Concept*, (Fort Monroe, VA: U.S. Army Training and Doctrine Command, 08 November 2002), pp. 4-5.

³⁶ Department of the Army, *TRADOC Pamphlet 525-3-0, Objective Force Concept*, (Fort Monroe, VA: U.S. Army Training and Doctrine Command, 19 August 2002), p. 30.

³⁷ *Ibid.*, p. 30.

enemy systems, infrastructure, and combat formations. Advanced technologies that lead to unprecedented intelligence, surveillance, and reconnaissance capabilities coupled with ground, air, and space sensors networked into a common integrated operational picture enable Objective Force units to visualize the enemy as a complex, adaptive organization. The enablers for seeing first include combat identification systems, organic sensors that are robotic, multi-spectral, and disposable, unmanned aerial vehicles (UAVs), embedded C4ISR, SOF, LRSD, air and ground reconnaissance and space based platforms. Data fusion systems, global information grids, and leader training will enable decision makers with a synthesized, common picture of the battlefield.³⁸ The ability to see first enables the Objective Force to gain an informational advantage over an adversary and affords decision superiority to commanders.

Objective Force units must *understand first* through exploitation of a common operational picture of the battlespace facilitating leaders' and soldiers' situational understanding of an adversary's operations while anticipating future intentions. Objective Force leaders and staffs simultaneously analyze and share intelligence and operational assessments through terrestrial and space-based command and control systems that leverage the intellect, experience, and tactical intuition of leaders at multiple levels in order to identify operational and tactical centers of gravity and conceptualize solutions to complex problems. Objective Force units reap additional time and space through the effective use of advanced information technologies and systems to seize and retain the initiative and build impetus for decisive victories. The key enablers for

³⁸ Ibid., p. 30.

understanding first include a knowledge-based Battle Command system, mentally agile, intuitive and adaptive leaders, and an execution-centric C2 system.³⁹

Seeing and understanding first enables Objective Force units to *act first* by virtue of superior situational awareness that allows them to decisively engage adversaries in a manner and a time of their own choosing. Robust command and control systems, coupled with broad access to a common operational picture, facilitate widespread dissemination of commander's intent to provide unparalleled opportunities for subordinate initiative to exploit enemy vulnerabilities. Information dominance is crucial for Objective Force units to act first while maintaining the capability to maneuver, engage, and retarget, if necessary, far quicker than an adversary. Objective Force formations will have target acquisition systems that will observe farther than the enemy in all weather conditions and terrain environments. They will exploit various options rapidly, act first by understanding when and where they must transition between actions, and maintain fully synchronous fires throughout the violence of execution. The Objective Force creates a high operational tempo, achieved through continuous operations with no significant pauses, to overwhelm an adversary's ability to respond effectively. Objective Force units will be enabled by systems that link and clear line-of-sight and beyond-line-of-sight fires through advanced weapons control systems and man-in-the-loop decision-making.⁴⁰ Robust sensor-to-shooter links provide responsive and lethal effects onto a confused enemy while protecting critical vulnerabilities from enemy activities.

³⁹ Ibid., p. 31.

⁴⁰ Ibid., p. 31.

Objective Force units *finish decisively* by destroying the enemy's ability to continue the fight and achieving moral dominance over him. It will do this by building momentum and rapidly transitioning to assault and exploitation operations without allowing the enemy time and opportunity to regroup and continue the fight. They will maneuver by both ground and air to assume tactical and operational positions of advantage through which they will dominate the enemy and pursue subsequent campaign objectives. Objective Force units will exploit the initiative until they have broken the enemy morally and/or physically, thus achieving decisive victory.⁴¹ The quality of firsts enables the Objective Force to dominate an adversary in all aspects of land combat while simultaneously preparing for follow-on campaigns and operations. While the above provided a brief overview of the Objective Force concept, the focus of this chapter is on the Unit of Employment and its' capability to conduct operational campaigns and tactical battles. The remainder of this chapter applies the Objective Force concepts to the broad activities the Unit of Employment must conduct successfully in order to fight and win.

The Objective Force concepts base its organizational framework on Units of Purpose and their unique characteristics and capabilities by echelon of command and control. "The Units of Purpose comprise an organizational framework developed to help the Army explore the complex questions of echelonment, task, purpose, command and control, and mission tailoring of the future force. The framework prescribes two basic groups of echelons – the Units of Action (UA) and Units of Employment (UE)."⁴² For the purpose of this monograph, the discussion is limited to Units of Employment, more specifically to the Corps Task Force. This is done because current thought indicates that

⁴¹ Ibid., pp. 31-32.

division air –ground task force may not be the best-suited echelon for the Unit of Employment due to limited command and control capabilities. This work focuses on the effort centered around the Corps Task Force as the UE of choice.

THE UNIT OF EMPLOYMENT

Units of Employment (UE) are highly tailorable, higher-level echelon that integrates and synchronizes Army forces for full spectrum operations at the higher tactical and operational levels of war. They focus on major operations and decisive land campaigns in support of joint strategic and operational objectives. They participate in all phases of joint operations from initial entry to conflict termination in any form of conflict and operating environment. The UE is capable of commanding and controlling all Army, joint, and multinational forces. It will be organized, designed and equipped to fulfill command and control functions as the Army Forces (ARFOR) component, Joint Forces Land Component Command (JFLCC), or the Joint Task Force (JTF). The UE will also have inherent capacity to interact effectively with multinational forces as well as interagency, non-governmental organizations, and private volunteer organizations. The UE is envisioned to consist of a multinational HQ nucleus with embedded joint staff elements and linkages for joint interoperability, plus a standard base of subordinate communications, sustainment, and ISR organizations. This small organic organizational base facilitates rapid deployment for immediate response to contingencies while facilitating augmentation. Force tailoring enables expansion into a larger formation for each contingency. Subordinate units of action tailored into the UE for contingency or

⁴² Department of the Army, *TRADOC Pamphlet 525-3-92, Objective Force: Unit of Employment Concept*, p. 6.

ongoing stability operations will include maneuver, fires/effects, ISR, maneuver support, force protection and maneuver sustainment commands.⁴³

The Corps Task Force (UE) provides time, space, and purpose to subordinate units (UAs) for their operations while conducting simultaneous, integrated operations and battles, resulting in accomplishment of operational and campaign objectives. UEs assigns purposes and allocates combat enablers and multipliers such as fires and effects, aviation, ISR, maneuver support and maneuver sustainment forces to subordinate UAs in order to influence current operations while preparing for follow-on operations. The UE uses its unique tailored structure to apply forces and effects to protect deployed forces from enemy capabilities, shapes the battlespace with fires to isolate enemy formations and critical capabilities, and interdicts enemy reinforcement and resynchronization. Lengthy campaigns and major operations may require the UE to rotate UAs to maintain overwhelming tempo, synchronize sustainment activities, and minimizes unplanned operational pauses. The Corps Task Force (UE) conducts simultaneous planning of future operations while orchestrating the current fight. The UE synchronizes and balances efforts to position its own forces and logistics, coordinate commitment of joint, interagency, multinational, and theater assets, and prepares for transition from one operation to the next, potentially in another area of operation, with efforts aimed at setting conditions with respect to the enemy's ability to anticipate, prepare, or respond to the changing situation.⁴⁴

The Unit of Employment operational concept posits eight requirements that enable the core attributes of the overall Objective Force concept. Units of Employment

⁴³ Ibid., p. 6.

⁴⁴ Department of the Army, *TRADOC Pamphlet 525-3-0, Objective Force Concept*, p. 45.

must prepare and posture prior to deployment, be strategically responsive, conduct entry and shaping operations, conduct decisive operations, gain information superiority, maintain commander- and execution-centric battle command, protect the force, and sustain it throughout operational campaigns and major operations while simultaneously posturing for future contingencies. UEs constantly prepare and posture forces for future contingencies through extensive activities such as: home-station training and preparation for deployment; force tailoring from corps force pools such as air and missile defense forces, fires/effects force, aviation forces, and maneuver support and sustainment forces; augmenting the force if required, to facilitate additional command and control obligations as a JTF or JFLCC; conduct initial deployment and campaign planning collaboratively with joint, interagency and multinational C2 echelons; establish C2 linkages with JTF headquarters and forward deployed forces while posturing the C4ISR network to support operations and enable rapid, strategic response.⁴⁵

Strategic responsiveness is a core tenet of the Objective Force concept providing theater commanders with flexible options for initial entry operations and rapid transition to decisive operations. The UE's unique capability to rapidly deploy key enablers such as theater air and missile defense, C4ISR, joint precision fires, lethal and versatile conventional and special operations forces to deny enemy access with overwhelming force, strengthens theater commanders' ability to deter conflicts, limit escalation and/or preclude early enemy success while providing immediate combat power.⁴⁶ Units of employment will conduct operational maneuver from strategic distances to expeditiously

⁴⁵ Department of the Army, *TRADOC Pamphlet 525-3-92, Objective Force: Unit of Employment Concept*, p. 19.

⁴⁶ *Ibid.*, pp. 19-20.

deploy forces into undeveloped and austere theaters immediately prepared to fight directly onto operational objectives with or without the use of intermediate staging bases (ISB).

Units of Employment must conduct entry and shaping operations to gain access into a theater of operations. This requires an ability to overcome enemy anti-access capabilities, seizure of critical enemy terrain and infrastructure while conducting information operations to circumvent the enemy's decision cycle and maintain friendly information superiority. Entry operations will emplace forces via multiple platforms to multiple entry points in order to overwhelm an adversary's ability to respond. The entry force must be tailored with appropriate maneuver support and sustainment capability. UEs continuously shape operations with joint fires and effects to develop situations in and out of contact, destroy critical enemy capabilities, enable subordinate maneuver, and potentially conclude engagements and operations without decisive close combat.⁴⁷

Units of Employment conduct decisive operations through simultaneous engagement and distributed operations, by direct attack of enemy decisive points and centers of gravity, and maintaining continuous operations with overwhelming operational tempo that the enemy can not match. The Unit of Employment's critical function is to conduct close tactical combat, seize and control key terrain, and close with and destroy enemy forces. By exploiting a redundant constellation of advanced sensors, target acquisition and C2 enablers, and maneuver units of action, Units of Employment will actuate the quality of firsts.⁴⁸ The Unit of Employment is tailored to exploit the capabilities of operational maneuver, vertical maneuver, mobile strike, and reach

⁴⁷ Ibid., pp. 21-22.

⁴⁸ Ibid., pp. 23-24.

operations with various habitual forces and structured augmentation to support land force operations.

In order to exploit shaping and decisive operations, the UE must be a knowledge-based force organized and designed to operate within the network-centric and collaborative information environment of the future.⁴⁹ Advanced C4ISR capabilities form the nervous system that facilitates execution of the operational concepts discussed previously. The C4ISR structure will reap the benefits of collaborative databases, overhead space platforms, terrestrial suite of sensors, unmanned and manned aerial and ground reconnaissance systems and national and theater means to accelerate the commander's decision-action cycle. The C4ISR network facilitates situational understanding from theater commander to engaged soldiers at the tip of the spear. A common operational picture provides near real time operational assessment to enhance command and control. Information superiority takes advantage of unique capabilities of space platforms for a variety of purposes discussed in greater detail later in this chapter. UEs will orchestrate the three facets of information superiority by conducting robust integrated information operations while assuring its own information fidelity and protect vital linkages through information assurance. The Unit of Employment must synthesize the vast quantities of information into actionable knowledge ultimately leading to situational understanding and a common operational picture throughout the force.⁵⁰

The nature of the future operating environment and the conduct of simultaneous, non-contiguous and distributed operations require UE leadership and staff to exercise a

⁴⁹ Ibid., p. 30.

⁵⁰ Ibid., p. 32.

higher level of operational art and master the scientific intricacies of command. They must understand the complexities of the operating environment along with integrated joint, interagency, and multinational qualities brought to joint operational areas (JOA). Information technologies will replace antiquated staff-centric planning with commander driven decision-action cycle. Battle command drives the operational process while exerting efficient control and maximizing subordinate initiative, through networked collaboration between theater, operational, and tactical commanders and staffs. “The Objective Force Battle Command concept focuses on commander driven purpose-oriented knowledge-based mission orders, battle command anywhere at anytime, fully integrated from strategic to tactical level, through one battle command system using ultra-reliable information networks, collaborating throughout distributed operations especially during execution, and be modular, scalable and tailorable to meet multiple C2 obligations. Battle command structure must reduce the footprint of past corps and division command posts using a combination of technology and reachback capability while maintaining 24-hour continuous command and control and integrating interagency and multinational commands.”⁵¹ The Battle Command concept embeds advanced technological C2 systems to increase the responsive time for the commander’s decision-action cycle. This allocates precious time for subordinate commanders to plan and prepare while creating confusion for enemy command and control systems.

Force protection is the responsibility of every commander; however, the unique nature of the future operating environment presents significant challenges to Objective Force commanders because of the complex, multi-dimensional, conventional and

⁵¹ Ibid., pp. 34-36.

unconventional threats that stretch from home-station to operational objectives. UE commanders must use active and passive measures, deception operations, and asymmetric responses to adversarial threats to operations. The Unit of Employment will tailor and employ maneuver support, maneuver sustainment and combat forces to enhance the force protection capability inherent within the organizational structure. The theater commander must struggle against an adaptive, capable threat that devises new methods and approaches to disrupt, deny, or destroy UE force capability.⁵²

The final Objective Force requirement that the Unit of Employment must possess is the ability to sustain itself over strategic distances, in austere environments, while conducting distributive operations across the theater commander's battlespace. Sustainment requires multiple lines of communications that exploit national and theater lift platforms to maintain continuous logistical provisioning of deployed forces. Objective Force design will exploit technologies to decrease sustainment demand simultaneously reducing footprint and creating more efficient operations. Several supporting concepts to enhance sustainment capability include "split-based operations, distribution-based sustainment, increased air-delivered sustainment stockage, sustainment and operations integration (key to every operational success), new maintenance concepts, medical treatment on the move, focused sustainment protection, and improved teaming between active and reserve components."⁵³ Sustainment drives operations and in future operating environments, the UE will exploit rapidly transforming CSS operations to sustain land dominance over any potential adversary.

⁵² Ibid., pp. 36-37.

⁵³ Ibid., pp. 37-39.

The execution of the UE operational concept is fully dependent on the development and incorporation of a variety of advanced capabilities. The Unit of Employment relies on six families of capabilities that are particularly important to the Objective Force operational concept. These capabilities demand inclusion to stress the required capabilities of the UE:

“First, *advanced C4ISR* capabilities will form the backbone of the Objective Force. The UE will rely on a knowledge-based C4ISR network of networks, vertically and horizontally integrated from operational to tactical level. The network will provide the means for forces at all levels to: achieve situational understanding; establish, maintain, and distribute a common operational picture; create an execution-centric C2 environment; and operate within a noncontiguous battlefield framework. The C4ISR network will sharply enhance lethality, survivability, agility, and versatility of the force, enabling more effective and timely application of the elements of combat power. Conversely, shortfalls in the achievement of these capabilities will adversely affect nearly all the operational themes within the UE concept.

Second, *CSS Transformation* enables the continuing revolution in military logistics so vitally essential for the UE to operate in austere theaters without the establishment of the kind of heavy logistical structure that has characterized past operations. Sustainment demands must be reduced through higher fuel efficiencies, new power sources, higher level of reliability, and improvements in maintainability, and smaller, more effective munitions.

Third, the UE is dependent on the development of a suite of new strategic and operational lift capabilities to achieve higher levels of strategic responsiveness and operational agility for the UE. *Strategic and Operational Lift*, coupled with other enablers that ensure connectivity and knowledge-building during movement, provide the UE the capability to respond quickly to potential conflict locations for immediate resolution.

Fourth, UE operations are also highly dependent on pervasive use of *precision munitions and advanced fire control* at all echelons to exploit superior knowledge, more effectively apply both lethal and non-lethal effects, integrate joint capabilities, and accelerate the pace of destruction of enemy forces and capabilities, leading thereby to more rapid conclusion of engagements, enabling rapid transitions, and diminishing the requirement for close combat assault for decision. Precision fire capabilities must be optimized within a more effective joint fire control system that reduces latency and expands engagement options at all levels.

Fifth, the *future combat system of systems* will provide improved capabilities in lethality, mobility, agility, and versatility required to achieve rapid tactical decision inherent within the UE concept, while also improving strategic responsiveness and deployability of the force overall as a result of its weight advantages over current systems.

Finally, it must be emphasized that the development of the unit of employment is intertwined with and dependent on successful *joint transformation*. Successful achievement of the UE concept can only occur in concert with the parallel development of joint concepts, capabilities, and joint enablers, many of which have been previously cited: space capabilities, advanced C4ISR enablers, strategic and operational lift platforms, integrated joint force protection; and integrated shooter and sensor network.⁵⁴

The failure to develop these critical joint capabilities will inevitably create a severe impediment to Objective Force operations and limit the degree to which strategic responsiveness, simultaneous engagement, distributed operations, and operational maneuver can be achieved or improved. The Army will continue to synchronize its developmental activities with joint experimentation and the joint requirements process to ensure that the creation of the Objective Force and the UE are fully nested within and supported by future joint organizations and capabilities.

The UE will be a space-empowered force exploiting the overhead constellation of military and civilian space platforms for intelligence, focused surveillance, area reconnaissance, long haul communications, early warning, positioning, timing, and navigation, missile defense, weather/terrain/environmental monitoring (WTEM), and access to the global information grid.⁵⁵ Space platforms provide the UE improved capabilities and redundancy to develop situational understanding at all levels. They will assist commanders and staffs resolve complex operational challenges such as fleeting target engagement or limits on range and mobility of terrestrial communications, while facilitating the commander's exploitation of layered C4ISR systems that support his operations. More responsive and comprehensive target acquisition will result from capability developments to integrate intelligence and non-intelligence space platforms to create the common operational picture. "Space support will extend from national to

⁵⁴ Ibid., pp. 45-46.

tactical level or space to mud and prove indispensable in immature theaters where existing communications infrastructure may be insufficient or unreliable. Space based capabilities are critical enablers for implementation for the fundamental principles of the UE concept, especially with respect to achieving information superiority, creating situational understanding, and operating within high tempo, non-contiguous, simultaneous framework of distributed operations.”⁵⁶ The ‘high ground’ is the unique characteristic that is explored in greater detail in the next chapter. The final analysis will demonstrate the significance of space support to enable many of the concepts of the Unit of Employment and Objective Force.

The Unit of Employment operational concept is still evolving and will become finalized in the summer of 2003 with the results of the efforts of the Integrated Concept Team (ICT) on the Unit of Employment. The Unit of Employment will provide theater commanders with flexible options to exploit opportunity and respond to uncertainty across the joint battlespace. Through the conduct of multiple decisive tactical actions, executed at high tempo, UE operations will lead quickly toward the enemy’s operational disintegration and the successful achievement of campaign objectives. Critically important is the UE’s ability to close with and destroy enemy forces.⁵⁷ With these operational and organizational concepts in mind, the next chapter will focus on how space support concepts and space operations essential tasks empower the UE and exploit the technological capabilities of space platforms.

⁵⁵ Ibid., p. 31.

⁵⁶ Ibid., p. 31.

⁵⁷ Ibid., p. 47.

CHAPTER FOUR

THE SPACE OPERATIONS ESSENTIAL TASKS

Today, in all our military operations, we rely even more heavily on Space-based systems to provide the situational understanding and communication needed to succeed at all points along the spectrum of operations. – Lieutenant General Joseph M. Cosumano, Jr., Commanding General, United States Army Space and Missile Defense Command⁵⁸

THE CAPSTONE WARFIGHTING CONCEPT

What are the space-based capabilities and how do they impact on the Objective Force and Units of Employment? The Capstone Warfighting Concept envisions space operations that support the flexibility and agility of full spectrum operations.

“The Capstone Concept calls for a seamless, vertical continuum for exploiting a ‘system of systems’ of space-based and aerial capabilities fully responsive to the ground force commander. It goes on to address operationalizing space capabilities, describing imagery, early warning, and other intelligence assets in space, seamlessly linked directly to the critical echelons of command without requiring undue authorizations from higher headquarters. The concept also underscores the importance of space-based communications and position location/navigation assets, and summarizes that the future will be postured to exploit space-based capability, while at the same time avoiding dependency upon it.”⁵⁹

The Capstone Concept defines the requirements that the Objective Force must have to dominate and how space capabilities provide the means to execute the myriad of Objective Force missions across the spectrum of operations. Army space operations exploit the advantages of space and space systems, integrating space support into land force operations and supporting joint space operations to dominate the dimension of

⁵⁸ Lieutenant General Joseph M. Cosumano, Jr., “Space – A Continually Growing Mission Area”, *Army Space Journal*, (Arlington, VA: United States Army Space and Missile Defense Command, Fall 2002), p. 2.

⁵⁹ Department of the Army, *TRADOC Pamphlet 525-60: Concept for Space Support to Land Operations*, (Fort Monroe, VA: United States Army Training and Doctrine Command, 01 November 1994), p. 6.

space.⁶⁰ Space-based operations will support all forces from strategic to tactical level. Space-based ISR supports commanders to achieve common operational picture, to *see first* enemy activities, and conduct necessary reconnaissance to develop situational understanding. Many nations rely on our extensive GPS network to locate and navigate across diverse terrain. Commanders will have the ability to deny GPS access within their area of operations. Space-based platforms will support attack operations against ground targets especially time sensitive targets like ballistic and tactical missile launchers as well as provide missile attack early warning to the whole force. US forces today require satellite communications (SATCOM) for reach-back sustainment and support operations, operational level attack and dispersed command and control. SATCOM is the primary means to attain long-haul communications across a theater of operations along lines of communication and to the continental United States. The Objective Force will exploit these capabilities and requirements using advanced technologies and space systems to assure informational and land dominance.

The Objective Force remains the desired end state of the Army's Transformation effort. It will take advantage of a multitude of advanced technologies including space to operate and dominate anywhere on the spectrum of operations with the ability to rapidly transition mission requirements without loss of impetus. "Objective Force operations will be characterized by developing situations out of contact; maneuvering to positions of advantage; engaging enemy forces beyond the range of their weapons; destroying them with precision fires and when necessary, by tactical assault at times and places of our choosing. Commanders will accomplish this by maneuvering dispersed tactical formations of Future Combat Systems units linked together by robust C4ISR capabilities

⁶⁰ Ibid., p. 9.

for common situational dominance.’⁶¹ It is the intent of the Objective Force to *see first, understand first, act first, and finish decisively*. A common operational picture provides the Objective Force the means to understand what the enemy is doing and anticipate his actions. Space-based systems allow the Objective Force to *see first* “by detecting, identifying and tracking the individual components of enemy units. Space systems can remove battlefield uncertainties of weather, terrain, and enemy that are inherent in air and ground based systems. Advanced technologies that lead to unprecedented intelligence, surveillance, and reconnaissance capabilities coupled with other ground, air, and space sensors are networked to provide a common integrated operational picture....’⁶² Space support to the Objective Force focuses on the four space mission areas, Force Enhancement, Force Application, Space Support, and Space Control. Each area defines space tasks that allow the Objective Force to attain informational, land, and space dominance and provide US forces overmatching capabilities against any adversary.

There remains an increasing requirement for space-based capability to ensure dominance across the full spectrum of operations. Adversarial forces will seek to deny, disrupt, or destroy our ability to exploit this technological superiority while attempting to attain an informational advantage to augment own capabilities. The Objective Force must take advantage of evolving space technologies to capitalize on our superiority to create a seamless integration of land and space capability. Army space operations will make possible and take advantage of these technological capabilities in order to remain dominant on the 21st century battlefield.

⁶¹ Department of the Army, *TRADOC Pamphlet 525-3-90, Objective Force, Tactical Operational and Organizational Concept for Maneuver Units of Action*, (Fort Monroe, VA: United States Army Training and Doctrine and Command, 2001), p. 6.

⁶² *Ibid.*, p. 7.

METHODOLOGY AND CRITERIA

To review the methodology and criteria for evaluation of the five Space operations essential tasks, this work intends to answer how space support provides the enabling functions to facilitate the Unit of Employment's attainment of full spectrum dominance from the operational to tactical battlefield and to demonstrate the relevance of the space operations essential tasks to enable the Unit of Employment (UE) Concept. The standards applied to the criteria, *see first, understand first, act first and finish decisively*, must address the ability and importance of the five space operations essential tasks to enable the UE to achieve strategic responsiveness, situational understanding, global communications, accurate surveillance, precision attacks on targets, and enhanced sustainment. By analyzing the Army's space operations essential tasks and the UE conceptual framework, my intention is to demonstrate that the use of space-based systems and products are a necessary component to the conduct of full spectrum objective force operations. An analysis of evolving capabilities, technologies and requirements is necessary to demonstrate how space-based systems enable the seamless integration of space and land forces. This assessment may demonstrate technological effectiveness to determine critical components necessary to assure space support to the UE. This examination should illuminate potential shortfalls in capability and provide recommendations for mitigation. The analysis should identify critical vulnerabilities and provide potential recommendations to address them. The results will answer the question of what space-based capabilities are required and their impact on evolving UE concepts.

SPACE OPERATIONS ESSENTIAL TASKS

There are five Space Operations Essential Tasks: Support increased deployability and reduced in-theater footprint; enable situational understanding “Off the Ramp” during entry operations; support precision maneuver, fires, sustainment and information; enable information and decision superiority; and protect the force during all phases of the operation. The integration of these five tasks, their capabilities and functions, and the denial of these benefits to adversarial forces are crucial to the UE concept of operations.

Support Increased Deployability and Reduced In-Theater Footprint

The United States’ global reach and military dominance rests heavily on its unimpeded and unmatched access to organic and commercial space-based command and control, communications, computers, intelligence, reconnaissance, and surveillance (C4ISR) capabilities. Objective Forces face several challenges with regards to rapid deployment into a theater of operation while maintaining the correct balance of force structure committed. It will be mainly a power-projected force from either Continental United States (CONUS), prepositioned locations, or forward-based presence. This creates a global reach challenge of operational maneuver from strategic distances. Theater commanders must tailor force deployment with finite strategic lift assets. It becomes paramount to lessen the infrastructure requirements of the deployed force. Simultaneously, deploying UEs require significant information on the adversarial forces, operational geography and infrastructure, as well as multinational allies and their potential capabilities. Objective Force requirements demand capabilities that ensure theater commanders retain command and control access across his battlespace with reachback to home-station operation centers and support nodes. He must have at his

disposal space-based communications and ISR platforms that enable him to *see and understand first* prior to deployment of forces. More importantly, it facilitates the forces' strategic responsiveness allowing UEs to become the knowledge-based force envisioned.

Applying the first two criteria, *see and understand first*, to the above space task, it is necessary to examine current ISR and imagery space systems and capabilities. Current ISR satellites are controlled by the National Reconnaissance Office and their status and specific capabilities are classified. However, through the Army Space Program Office (ASPO) using Tactical Exploitation of National Capabilities (TENCAP) and associated ground based processing systems such as Eagle Vision II and Multi-Mission Mobile Processor (M3P), theater commanders have access to imagery intelligence (IMINT), signals intelligence (SIGINT), and measurements and signals intelligence (MASINT) that provide optical and radar imagery enabling them to develop initial situational understanding. There are several limitations to current technological capabilities. These capabilities are limited by only a near-real time target detection, identification, and location using a combination of overhead satellites, JSTARS airborne platforms, SOF and other ground forces, and infrequent revisit times of overhead space platforms and lack of in-theater retasking to conduct commander directed battlefield visualization.⁶³ There is an over reliance of imagery databases which are confined to specific geographic locations with highest priority such as the Middle East or Korean Peninsula. Imagery databases do not provide the resolution down to one meter demanded by battlefield commanders. Retasking of satellites and imagery surveillance can take days to weeks to process. Future conflict areas may have inadequate imagery for immediate use by theater

⁶³ Department of the Army, *United States Army Space Master Plan*, (Arlington, VA: GPO, 2000), pp. D-14-16.

commanders. Additionally, current ISR capability does not provide 24-hour, all-weather, target-sensing capability. A final shortfall is the limited data transfer rates from existing systems to ground processing system is too slow to accommodate commander's expeditious requirements for immediate imagery. Adversaries will exploit this shortfall to maneuver ground and sustainment forces in an attempt to gain positional advantage and wrest initiative away from US forces.

The third and fourth criteria, *act first and finish decisively*, highlight the demands and limitations for exact position, navigation, and timing (PNT) to move forces across strategic distances and over all terrain environments. First, there are no airborne or terrestrial systems that perform these functions to the degree of accuracy required by Legacy and Objective forces. Secondly, current PNT satellites do not have anti-jam or anti-spoof resistance nor does the current generation of ground receivers like the Precision Lightweight GPS Receiver (PLGR) or Cargo Utility GPS Receiver Embedded System (CUGAR). These systems are easily interrupted and distorted by low technology inexpensive jammers. Adversarial forces could hamper local area navigation and precision fires with these jammers.⁶⁴ Accuracy is a matter of significant concern for battlefield systems especially field artillery and air defense artillery systems as well as smart munitions employment. Existing systems boast only ten meter accuracy but the need for precision fires and effects, maneuver, and sustainment require accuracy far greater than present capabilities. Current generation of satellites and receivers has limited signal power and reception in complex terrain such as within buildings of urban areas and in dense jungle areas. Finally, not all units or personnel have GPS receivers. Although the majority of combat arms and combat support units retain the advantage of

GPS capability, most combat service support equipment do not possess embedded GPS receivers. This hampers sustainment operations and has significant impact on operational maneuver.

Applying the third criteria, *act first*, to the above task, examination of current military satellite systems is essential to demonstrate the need for assured communications for Objective Forces.⁶⁵ US forces rely on five types of satellite communications (SATCOM) with varying capabilities from fully protected multi-channel communications Mobile Subscriber Equipment (MSE) range extension on the MILSTAR constellations, to strategic multi-channel reachback on Defense Satellite Communications Systems (DSCS), to battlefield awareness video and data broadcasts on Global Broadcast systems, to mobile warfighter command and control voice nets and intelligence dissemination on UHF Follow-on birds, through administrative and logistics C2 and surge supplemental on commercial satellites. Current satellite communications provide beyond line-of-sight (BLOS) communications intra- and inter-theater. Limitations these systems possess range from poor foliage and weather penetration, limited capacity, power limits for multiple users, deployability of transportable terminals, limited frequency ranges, and competing demands across governmental agencies and multinational users.

Current SATCOM does not allow for C2 on the move nor do we possess assured access. During contingency operations and major regional conflicts, surge capacity is required from commercial satellite systems. It is not always guaranteed US forces will have access to these systems and they are very expensive to lease. The final limitation to existing SATCOM infrastructure revolves around ground terminals. Many are large,

⁶⁴ Department of the Army, *United States Army Space Master Plan*, pp. D-27-32.

cumbersome, truck-mounted systems that make deployment very difficult and require apportionment of strategic lift to move into theater.

Taken together, current satellite systems expose several significant shortfalls and limitations in near-term capability. Objective Force units will require additional capacity and interoperability to link Units of Employment with Units of Action conducting operations in non-linear environments. Most SATCOM systems are not protected from jamming or spoofing, denying this critical capability to battlefield commanders. There is a limited number of ground terminals, mainly residing in echelons brigade and above and special operations forces, that exploit continuous global coverage and assured access to available information networks. These critical shortfalls and limitations provide a real challenge to the Objective Force and especially to the Unit of Employment as the primary higher echelon C2 headquarters (ARFOR, JFLCC, or JTF).

To support increased deployability and reduced in-theater footprint, Space Operations Essential Task #1, to execute operational maneuver from strategic distances, Units of Employment require ISR, imagery, PNT, and communications satellites to evolve in order to support burgeoning Objective Force demands. Units of Employment will need global 24 hour assured communications to retain command and control. It will require jam resistant positioning, navigation, and timing (PNT) along with combat identification to develop a common operational picture to maintain situational understanding and track enroute forces and sustainment in and out of theaters. It needs enroute and in-theater weather as well as detailed terrain products using multispectral and hyperspectral imagery to develop reliable and actionable situational templates and

⁶⁵ Colonel Glen C. Collins, Jr., "The Army's Mission in Space," Briefing to Command and General Staff Course Students, April 2002, slide 47.

identify enemy forces and activities. Space-based systems must evolve in order to achieve strategic responsiveness and situational understanding.

Future space system concepts and developments planned fill the gaps in current capability for Units of Employment to exploit. The Space Based Radar (SBR) will provide detailed Synthetic Aperture Radar (SAR), Ground Moving Target Indicator (GMTI) radar and mapping capability to DTED-level 5 (less than one meter resolution) directly down linked to UEs and UAs to develop situational understanding in order to *see and understand first*. Linked with ground sensors and aerial platforms such as UAVs and U-2s, SBR can provide battlefield clarity and mitigate uncertainty. Space-based Mapping will enhance current databases with on-demand terrain imagery of up to 10,000 square kilometers within ten minutes of request.⁶⁶ Developing Tactical Exploitation Systems will enable on-demand dynamic retasking of satellites to collect imagery necessary to develop battlefield situations in response to UE commander's requests. Blue Force Tracking devices such as Grenadier Brat and Movement Tracking Systems (MTS) will provide in-transit visibility and track sustainment missions to afford full battlespace visualization for the UE commander.

Potential increases in PNT capability will offset inaccuracy of field systems. Units of Employment need one meter accuracy to achieve the effects desired, maneuver in all terrain, and ensure unimpeded sustainment. One meter accuracy will expedite weapon system emplacement and decrease time required to establish fire solutions. Units of Employment systems will need embedded GPS receivers to exploit Blue Force tracking of friendly units. It will require GPS capabilities in complex terrain even within

⁶⁶ Department of the Army, *United States Army Space Master Plan*, pp. D-14-15.

buildings and in subterranean locations.⁶⁷ This capability must be jam proof and on-demand.

Future SATCOM improvements will provide beyond-line-of-sight command and control on the move (C2OTM) and access in restricted, urban and subterranean area. Fielding plans call for the deployment of a system of Wideband Gapfiller and improved Global Broadcast Satellites (GBS) to provide protected, anti-jam, low probability of interception (LPI) and low probability of detection (LPD) capabilities. It will possess the ability to broadcast large volumes of secure data, voice, imagery, and video information throughout a commander's battlespace.⁶⁸ This capability is essential for entry operations and in austere areas to facilitate operational and tactical C2OTM. Planned future systems, coupled with assured access to commercial systems, will provide the necessary communications backbone to facilitate the high volume of data available anywhere, anytime, and on the move, all of which is required for the UE to succeed.

These future capabilities will support Space Operations Essential Task #1: Increased deployability and reduced in-theater footprint and enable Units of Employment to develop contingency operations with fewer systems. It will increase situational awareness and facilitate development of Time Phased Force Deployment Data (TPFDD) to tailor land forces appropriately and more efficiently. Overhead resources linked to aerial and ground sensors will afford complete coverage during contingency operations for UEs. They will offset current shortfalls and limitations and exploit the unique medium of space.

⁶⁷ Colonel Glen C. Collins, Jr., "The Army's Mission in Space," slide 47.

⁶⁸ Ibid., slide 130.

Support Situational Understanding “Off the Ramp”

This space operations essential task has many of the same challenges of the previous space task with regards to ISR and communications. Enemy forces will prepare to counter US interventions by leveraging terrain, weather, infrastructure, obstacles and use of weapons of mass destruction (WMD) which may alter theater commanders initial plans as Units of Employment are enroute to mission objectives. Enemy forces can exploit complex and urban terrain to deny US technological and informational superiority.⁶⁹ Units of Employment will deploy globally and with little notice. They will demand an enroute mission capability to plan and rehearse operational plans or changes as necessary. Strategically deployed forces will require situational updates with the latest intelligence and imagery to mitigate any potential challenges entry forces may encounter. Initial terrain data may be inaccessible or unavailable due to contingency operations located in low priority areas. UEs will require an interdependent and joint ISR capability to link ground-air-space resources to enable force dominance. Objective Forces require continuous battlespace situational understanding to counter the enemy’s advantage of owning the terrain. Updated information must be relevant and in real-time that is actionable and tailorable to meet commanders’ needs while retaining information superiority.⁷⁰ A quick review of current space systems and means will demonstrate shortfalls that will be mitigated for Objective Forces with future space-based systems.

⁶⁹ Department of the Army, “TRADOC 525-3-14: Concept for Space Operations in Support of the Objective Force,” Briefing to the Chief of Staff, United States Army, (Fort Monroe, VA: United States Training and Doctrine Command, 22 January 2003), slide R-22.

⁷⁰ Department of the Army, *TRADOC 525-3-14: Concept for Space Operations in Support of the Objective Force*, United States Army, (Fort Monroe, VA: United States Training and Doctrine Command, 23 January 2003), p. 16.

Using the *see and understand first* criteria, current ISR and imagery challenges of lack of direct down-link to ground forces, slow data transfer rates, limited area databases, and infrequent satellite revisit times presented in the previous space task exist in the second task. The difference between the two tasks is the changing nature of the information and the ability to get it quickly to enroute UE commanders and staffs so they can take necessary actions to mitigate. Commanders do not have dynamic retasking authority of satellites to gather specific area imagery and information. A further challenge of visualization posed is that of environmental monitoring and the effects of weather on operations. Current Defense Meteorological Satellite Program (DMSP) with geosynchronous and polar orbiting satellites provides global weather coverage. The challenge faced is weather data that is outdated by up to twelve hours. Commanders receive weather forecasting through U.S. Air Force elements via the Integrated Meteorological System (IMETS) attached to echelons brigade and above. Existing weather forecasting lacks rapid high-resolution weather information to create three-dimensional battlespace visualization actionable by commanders and staffs. This deficiency prevents contemporary contingency forces from receiving the most accurate and complete information.

Again the previous space operations essential task accounts for the challenges associated with *acting first and finishing decisively*. PNT issues remain relevant in relation to present capabilities to gain situational understanding; however, to develop complete situational understanding, the additional space capability of missile warning alerts forces in theater and enroute to potential hazards of WMD or weapons of mass effects (WME) attack. Present Defense Support Program (DSP) satellites downlink

launch information and relay predicted impact locations and times to Joint Tactical Ground Station (JTAG) deployed in-theater to alert forces. Launch information is disseminated to contingency forces but is not received directly but relayed to enroute airborne forces. This is a crucial deficiency of force protection for deploying forces due to shortened timelines and Battle Management Command, Control, Computers, and Communications (BMC4) interface challenges with aerial platforms.

Applying the second criteria, *understand first*, the unique challenge presently facing contingency forces' situational understanding "Off the Ramp" is lack of Battle Command On The Move (BCOTM). Space and Missile Defense Battle Lab has experimented with the Enroute Mission Planning and Rehearsal System (EMPRS) during Joint Contingency Force – Advanced Warfighting Experiment (JCF-AWE) 2000 at using an airborne task force from the 82nd Airborne Division and assault task force from the 10th Mountain Division. The results were promising but raised several issues regarding connectivity that hampered change of mission planning and dissemination between aircraft.⁷¹ Together these challenges provide unique opportunities for future space-based systems to overcome to enable Objective Forces.

To provide situational understanding "Off the Ramp", Units of Employment require several space capabilities to afford UE commanders to retain situational understanding. The UE must have the ability to receive direct downlink of ISR products like hyperspectral imagery, BCOTM, Blue Force Tracking, enroute mission planning and reachback to shared knowledge databases. The intent is to recognize enemy patterns, movements, and activities in order to mitigate them before Objective Forces arrive.

⁷¹ Lieutenant Colonel Brad Baehr, Space and Missile Defense Battle Lab, "Overview Brief," Briefing to Command and General Staff Course students, 14 March 2002, slide 46.

Enemy target sets are isolated, precisely located, and under constant surveillance. This allows UE commanders to adjust their concept of operations enroute, exploiting enemy vulnerabilities at precise decisive points. Combined with existing and forecasted weather conditions, UE staffs can finalize the complete operational and tactical situation. Enroute capabilities enable the UE to anticipate the enemy's intentions and adjust their scheme of maneuver to counter enemy actions.

Evolving space systems for the Objective Force will make enroute mission planning and Battle Command On The Move a reality. Units of Employment will exploit Theater Exploitation Systems (TES) to receive updated down linked imagery and information to pinpoint enemy locations in all terrain. SBR will provide not only spectral imaging and terrain mapping but a Ground Moving Target Indicators (GMTI) capability to enhance situational understanding, improve target development, and confirm situational templates. Wideband Gapfiller and GBS satellites will provide dedicated digital SATCOM channels for Objective Forces to enable BCOTM with real-time data, voice, video and imaging capabilities at an extremely high transfer rate.⁷² Future missile warning satellites such as the Space Based Infrared Systems (SBIRS) – High will increase timeliness of alert warning through SATCOM data links and assist in cueing of ground-based interceptors to protect deployed forces. Upgraded weather satellites like the National Polar Orbiting Environmental Satellite System (NPOES) to provide real-time imagery for onboard databases with one kilometer resolution in a single hour for detection, analysis, processing and dissemination to improved IMETS terminals embedded in the UE and UA. Objective Forces will receive faxed weather information

⁷² Colonel Glen C. Collins, Jr., "The Army's Mission in Space," slide 130.

and downloadable forecasts to include in situational assessments and impacts on operations.

These future capabilities will support Space Operations Essential Task #2: Situational Understanding "Off the Ramp." It will increase situational understanding and facilitate Battle Command and enroute mission planning. It will sustain global communications and exploit the joint interoperability of space systems linked to terrestrial components to Units of Employment in order to achieve situational dominance before, enroute, and during operations.

Support Information and Decision Superiority

The third space operations essential task combines the capabilities and aspects of the previous two space tasks to create a synergistic effect to achieve information and decision superiority. ISR, imagery, weather, missile warning, communications and PNT develop an infosphere that Objective Forces will dominate across a global battlespace, however, they must overcome several challenges. Information networks, including terrestrial, airborne, and space-based, are vulnerable to attack through asymmetric means against space assets and direct action against ground terminals. Enemy forces will obtain their own ground, air, and space ISR capabilities that will significantly enhance their information and decision cycles. They will exploit commercially available ISR, communications, imagery, and PNT abilities from other governments and entities willing to sell technological advantages to those with monetary means. Assessment of existing space control and space support functions will identify shortfalls that Objective Forces must account as part of its transformation.

Space control defines the ability to ensure uninterrupted access to space for US forces and the freedom of operations within the space medium while simultaneously denying adversaries the use of space. To accomplish this goal, US forces must surveil space, protect the ability to use space, prevent adversaries from exploiting US and Allied space services, and negate adversaries' ability to use their space forces.⁷³ Existing space control measures include offensive, defensive, and passive measures to retain control of space access. Space control is divided into four areas: Protection, Negation, Surveillance, and Prevention. Applying the *see first* criteria, two space control areas of negation and surveillance have the most significant impact to future UE operations. The Army is a partner with the USAF and other Allied nations to monitor, detect, identify, track, assess, verify and categorize overhead space objects that may impact on critical space constellations. Due to the vastness of space and the increasing number of space objects, both man-made and natural, existing capabilities do not allow for continuous global space surveillance. This limitation prevents US forces from ascertaining potential threats from adversarial forces simultaneously allowing the enemy to attain information superiority.

Negation requires army space forces to deny, destroy, degrade, disrupt and deceive enemy space capabilities to prevent their use of own space assets. Current negation capability does not provide for on-orbit protection and negation embedded on US constellations against enemy satellites. Due to the classified nature of space negation capabilities, only a single Army initiative can be discussed. The Space Electronic Warfare Detachment (SEWD) remains the single terrestrial based negation capability the

⁷³ Department of the Army, *TRADOC Pamphlet 525-60: Concept for Space Support to Land Operations*, p. 9.

Army possesses. This limits when and where Army forces can apply negation capability against enemy ground elements to prevent their access to space products.

Examining space support from a “quality of firsts” perspective highlight shortfalls in space support surge capacity. Space support defines operations that deploy, augment, sustain and replenish space forces, including configurations of C2 structures for space operations. Activities of space support include spacelift, satellite operations, deorbiting and recovering space vehicles.⁷⁴ It takes tremendous amount of inertia and monies to rapidly replace loss satellites. Due to their immense cost, on the shelf satellites are kept to a minimum. Additionally, building and maintaining on-demand launch platforms is also cost prohibitive and time consuming. It takes 8-19 months to build, mate, and launch a new satellite to replace aging or enemy destroyed space segments. These shortfalls in present space support measures prevent our ability to surge, replenish and regenerate space forces. It is critical for theater commanders to maximize space capabilities for ISR, communications, imagery, PNT and WTEM. Units of Employment will require space control and space support capabilities to maintain information decision superiority.

US forces currently hold a tentative technological advantage but in time this will degrade due to enemy technological advancements and acquisition of space systems and/or US space and ground segment losses to enemy action. Retaining information and decision superiority requires transformation of space control and space support functions embedded in Objective Forces. Units of Employment must have a space control capability that denies enemy forces from use of space assets and attaining information

⁷⁴ Ibid., p. 6.

superiority. The Army is currently developing capabilities that Units of Employment could use against potential threats. Directed energy (DE), in the form of both chemical and solid-state lasers, has the potential to give UEs the ability to degrade or destroy enemy satellites. In addition, kinetic energy anti-satellite (KE-ASAT) missiles will enable US Strategic Command to quickly destroy enemy space segments preventing their use against US forces and retaining UEs information superiority. A network of ISR and SATCOM satellites will conduct BMC4 integrated with DE and KE-ASAT systems to blind or destroy enemy ISR, SATCOM and UAV capabilities.⁷⁵ These measures will assure US access to space-based products and capabilities, enable friendly space assets to operate freely in support of Objective Force operations.

Superior situational understanding, based on advanced C4ISR capabilities will enable UE commanders the ability to operate at a time and place of their choosing.⁷⁶ The network of SATCOM, ISR, PNT, DPS constellations will enable UE to project combat power anywhere and defeat enemy anti-access strategies and reduce enemy targeting effectiveness. Combining space control and space support with global reach communications and robust space- and terrestrial-based ISR, Units of Employment will enjoy information and decision superiority.

Support Precision Maneuver, Fires, Sustainment, and Information

Objective Forces will face an adaptive thinking enemy who will utilize developing technological advancements against US forces conducting entry and decisive operations. The enemy retains operational and tactical advantages on their own soil and

⁷⁵ Colonel Glen C. Collins, Jr., "The Army's Mission in Space, slide 131.

⁷⁶ Department of the Army, *TRADOC 525-3-14: Concept for Space Operations in Support of the Objective Force*, United States Army, (Fort Monroe, VA: United States Training and Doctrine Command, 23 January 2003), p. 17.

will exploit it by dispersing their operations and using asymmetric means to degrade US operational strengths. They will maximize the use of complex terrain and weather to disrupt command and control of US forces and diminish Objective Force standoff situational understanding.⁷⁷ Units of Employment requirements demand capabilities that ensure theater commanders are able to employ precision engagement and maneuver against enemy forces in non-contiguous environments. He must have at his disposal space-based PNT and ISR platforms that enable him to *act first and finish decisively* by conducting precision attacks on target and increase sustainment functions. By assessing current space capabilities to support precision maneuver, fires, sustainment and information will determine existing shortfalls that UEs must overcome to maintain land dominance.

Critical to precision maneuver and fires is exploiting timely and continuous PNT. It is the key to target acquisition and accuracy to targets. The third criteria of *act first* highlight PNT demands for target acquisition and precision engagement. As discussed in previously in Space Task 1, current PNT satellites do not have anti-jam or anti-spoof resistance nor does the current generation of ground receiver. Enemy forces can hamper operational maneuver and precision strikes with low technology jammers that degrade or block GPS signals. This limits our ability to conduct precision engagement from standoff distances with incredible accuracy. Enemy forces that can jam GPS signals will slow sustainment operations which have significant impact on operational maneuver.

Existing ISR capability does not enable the precision required for Objective Forces. As noted in assessing the first and second space operations essential tasks above, see and understand first are key criteria to assess ISR capability. Present systems possess

⁷⁷ Ibid., p. 18.

two major shortfalls: the lack of ground moving target indicators and over reliance of databases of high priority areas only limit our ability to locate and isolate enemy forces in any geographic locality, identify combatants in complex terrain, and bring to bear precision munitions to defeat and destroy enemy forces. Limitations on ISR and imagery prevent full exploitation of the synergistic effects of precision maneuver and fires.

Units of Employment will rely on extremely accurate PNT and real-time high resolution ISR and imagery to reap the advantages of precision maneuver and fires. Units of Employment will conduct simultaneous engagement across a distributed battlespace that focuses its effects on enemy decisive points and centers of gravity. This requires that UEs are embedded with an advanced C4ISR and jam resistant PNT capability to retain the freedom of action to shoot, move and reengage enemy forces while denying that ability to the enemy. The culminating effect is to destroy enemy forces in detail using the combined effects of land, air and space synchronized and integrated to increase the lethality afforded by linked space systems.⁷⁸

UEs will demand jam resistant PNT that facilitates precision strikes and aerial delivery of an array of precision munitions. UEs will track all friendly forces using PNT space systems and Blue Force tracking systems to develop a common operational picture. Combined with advanced C4ISR imagery from the Space Based Radar, UEs will enjoy three-dimensional terrain mapping that enable UEs and UAs to examine objective areas depicted with located enemy formations and covered positioned in order to facilitate precision maneuver and standoff fires. The integration of air, ground, and space sensors linked to all shooter systems provide for responsive, accurate precision strikes on

⁷⁸ Department of the Army, *TRADOC Pamphlet 525-3-92: Objective Force: Unit of Employment Concept*, (Fort Monroe, VA: United States Army Training and Doctrine Command, 08 November 2002), pp. 23-24.

multiple targets while minimizing the risks inherent in decisive close combat. This enables UEs to perform operational maneuver, vertical envelopment, and mobile strike operations throughout a noncontiguous battlespace.

UEs will require situational development out of contact. Space based ISR integrated with UAVs, JSTARS, and ground sensors will provide a comprehensive common operational picture from which a UE commander can focus maneuver and fires to destroy enemy forces as well as track and move crucial sustainment stocks around a dispersed battlefield without an operational pause or cessation of tempo. The intent is to maintain constant pressure on enemy forces so they are unable to regenerate combat power and effectively destroy their will to resist. These future capabilities will support precision maneuver, fires, sustainment and information superiority to enable Units of Employment to exploit precision engagement and strike targets with incredible lethality.

Protect the Force During All Phases of the Operation

Objective Force operations will face many challenges protecting critical capabilities within force projection operations over strategic distances. Possession of home-court advantage and the ability to exploit dispersed operations in and around complex terrain and employ asymmetric approaches give adversaries inherent benefits to counter against US superiority. They will exploit commercially available space capabilities for GPS, imagery, communications and weather. They will employ long range tactical ballistic missiles (TBM) as part of an anti-access strategy to deny US entry operations, disrupt sustainment missions, and degrade national will.⁷⁹

⁷⁹ Department of the Army, *TRADOC Pamphlet 525-3-14: Concept of Space Operations in Support of the Objective Force*, p. 18.

The assessment of the final space operations essential task possesses almost all of the previously discussed shortfalls of current space capability with regards to the quality of firsts. Not addressed previously is the potential problems associated with counter-RISTA and counter-SATCOM operations Units of Employment may face on dispersed and distributed battlefields. Current space control means to surveil and negate enemy space capabilities have been already addressed (global space surveillance, terrestrial-based negation, and attacks on enemy C4ISR ground control stations) but they are most profound as a force protection issue because of our reliance on information and decisional superiority. The shortfalls hamper present-day forces from denying enemy use of ISR and communication systems to synchronize their offensive operations. Denying this enemy capability ensures Objective Forces retain land dominance by protecting critical capabilities and shielding vulnerabilities against enemy attack. Potential shortfalls in timely alert warning of TBM attack place current operational forces at risk to devastating WMD effects. DSP satellites and JTAGS ground station continue to play a critical role in early warning. Cueing information to attack systems is a crucial shortfall that Objective Forces must overcome to enhance force protection.⁸⁰ These space-based challenges represent focal points for integration into Objective Forces and the capability must be embedded into Units of Employment

Force protection is an inherent responsibility to all force commanders. Units of Employments will be configured with robust, inherent force protection and survivability capabilities to provide redundant abilities against any array of threat means to degrade

⁸⁰ Ibid., p. 37.

Objective Force capability.⁸¹ Units of Employment will require space control capabilities that deny space-based ISR to blind enemy forces during all phases of an operation. It will require the ability to deny space communications to desynchronize enemy efforts to command and control their dispersed forces and prevent them from massing. Kinetic and directed energy weapons are essential to enable UEs to have robust layered response to enemy space-based abilities. UEs must conduct electronic attack against enemy satellite control stations and if necessary complete their destruction through standoff precision fires. Additionally, UEs will demand timely warning of TBM launches that determine launch locations for time-sensitive targeting, impact location to alert only that portion of the battlefield in order to maintain operational tempo, and an assessment of warhead type to prepare the force against the potential WMD/WME effects. They will protect information networks so vital to the success of the Objective Force concept by countering enemy RISTA and SATCOM operations and deny enemy attempts to disrupt information and decision superiority. Future space system developments such as the Space Based Radar, SBIRS-High, terrestrial-based negation weapon systems will enable Units of Employment to protect the force during all phases of operations.

Analysis of the five space operations essential tasks has shown many challenges and shortfalls our current force structure must mitigate and the risks inherent to evolving Objective Forces. By examining each task and the development of evolving space technologies and capabilities demonstrates the importance of space-based capabilities to ensure Units of Employment dominate land force operations. Space operations and systems provide the essential foundations for a robust C4ISR infrastructure required to

⁸¹ Department of the Army, *TRADOC Pamphlet 525-3-92: Objective Force: Unit of Employment Concept*, p. 36.

seamlessly integrate air, ground and space operations. “Space support will extend from national to tactical level, from space to mud, and prove indispensable in immature theaters where existing communications infrastructure may be insufficient or unreliable. Space based capabilities are critical enablers for implementation of the fundamental principles of the UE concept, particularly with respect to achieving information superiority, creating situational understanding, and operating within the high tempo, non-contiguous, simultaneous framework of distributed operations.”⁸² From this analysis several requirements have been addressed that will enable Units of Employment to fully integrate space and land operations. The next chapter summarizes these recommendations and present conclusions for a space-empowered Unit of Employment.

⁸² Ibid, p. 31.

CHAPTER FIVE

RECOMMENDATIONS AND CONCLUSIONS

RECOMMENDATIONS

It is clear as the Army transforms to the Objective Force, space and space-based systems and products play an integral part of that process. Units of Employment will be a knowledge-based force capitalizing on information superiority to execute simultaneous and distributed operations. Army space operations will exploit joint capabilities to assure access to space and seamlessly integrate land and space operations to ensure dominance over any adversary. The analysis presented indicates several recommendations the Army should address as it determines the operational and organizational structure of the Unit of Employment.

1) The Air Force, in conjunction with the other services, must continue to develop constellations that will fulfill the Army's requirements for service transformation. Each service relies on space support to visualize operational battlespace, to apply precision maneuver and fires to gain positional advantage over adversaries, and to communicate with dispersed forces over land, sea, and air. The next generation of satellites, Wideband Gapfiller, Space Based Radar, SBIRS- High, GPS Block II, and NPOES, must enable the knowledge-based information requirements of the Objective Force. Space architecture replacement and upgrade, both space and ground segments, must become a national priority in order to retain information and decision superiority. A potential cost savings initiative may be to combine space capabilities on multifunctional satellites integrating subsets of communications, missile warning, ISR, PNT, and WTEM; however, this may prove too difficult to achieve.

2) There are potential technology demonstrations that the Army could invest in to offset reliance on expensive overhead constellations. The use of aerosats or high-altitude airships fitted with sensor packages is one method to fulfill near and mid-term requirements for the Objective Force. Sensor platforms attached to the airships or aerostats could provide much needed capability for moving target indicators, networked engagement operations, multi- and hyper-spectral imagery, missile alert warning and cueing for attack operations, and networked-centric battle command over parts or entire theater of operations. Additionally, inexpensive, expendable Low Earth Orbiting satellites could provide mid-term solutions to evolving Objective Force and space concepts. This would enhance theater commanders' ability for dynamic retasking without shifting orbits of current satellites.

3) Space control systems must be an integral part of the Objective Force and an embedded capability within Units of Employment. Kinetic missiles and directed energy systems will provide immediate denial, destruction, degradation, and disruption of enemy space assets. Integrated with a system of alert and cueing platforms, space control measures employed by Units of Employment will allow for freedom of action and assure access to space-based products and services.

4) The Army needs to revise and publish its current space doctrinal manual, *FM 100-18, Space Support to Army Operations*, to reflect the evolving mid-and far-term space capabilities of the Objective Force. Since the medium of space has joint implications, the new Army space doctrine must be integrated with the new *Joint Publication 3-14, Joint Space Operations* as well as other service space doctrine. The new manual should outline a space planning process that integrates with *Field Manual 5-*

0, Army Planning Process and *JP 5-0, Joint Planning Process*. The new manual needs to incorporate Space Operations Officer tactics, techniques, and procedures so any soldier can leverage space capabilities. A revision to Annex N (Space) is also required to reflect changes in Objective Force concepts and planning.

5) The single most important component of Army Transformation process is its soldiers. They must possess multifunctional skills to exploit difficult technological challenges of space based systems and able to support UE commanders and execute contingency operations. Units of Employment need a specialized staff element with space expertise to integrate space operations into military operations across the full spectrum of conflict. This element will maximize space-based capabilities to work for the commander. The Army currently has Army Space Support teams, but is moving to organic space support elements in Objective Force organizational structures. Augmentation from Army Space Support Teams provides linkages to space capabilities that are not normally available in theater. This rapidly deployable team with access to commercial imagery and reachback to Army and joint capabilities can provide three dimensional terrain maps, space intelligence preparation of the battlefield, battlefield visualization, and capitalize the numerous other space products and capabilities.

CONCLUSIONS

Space operations enables the Objective Force to achieve the characteristics envisioned for it by the Army's Transformation Plan. This support resides in three key areas: C4ISR, space control, and force protection. Space support seamlessly integrates into all land force operations and remains a vital component of the Objective Force. The theater commander can directly access responsive and reliable space-based support across

the entire spectrum of conflict. The United States' ability to control space ensures the uninterrupted use of space-based assets to facilitate command and control and the protection of the force.

Objective Forces conduct sustained combined arms air-space-ground operations within the joint campaign to establish land-force dominance, wrest the initiative from the enemy, force him to the defensive, and defeat him in detail. Objective Force units achieve their dominance through the ability to *see first, understand first, act first, and finish decisively*, at the strategic, operational and tactical levels of war. Units of Employment conduct continuous operations at overwhelming operational tempo, closing with and destroying the enemy in simultaneous engagements to collapse the enemy's ability to continue any form of resistance.

Operational maneuver from strategic distance to areas, with limited forward-deployed forces or in situations where an adversary has achieved some success in denying access to US and coalition forces, may require forced entry operations, followed by a transition to decisive operations without unplanned operational pause. Objective Force capabilities to conduct forcible entry operations by dismounted and mounted forces simultaneously in multiple locations demands real-time battlespace awareness and assured communications as well as capabilities to counter specific adversary anti-access capabilities. Internetworked, overhead (high altitude and space) communications and ISR capabilities and the means to protect them are critical to provide the essential communications, precision fires and effects, simultaneous maneuver throughout the theater, timely and accurate surveillance, and enroute mission planning and rehearsal

capabilities for deploying forces.⁸³ Space negation capabilities are essential to counter adversary anti-access strategies and to deny adversary access to space-based ISR capabilities.

Once decisive operations have begun, UE commanders will depend on space systems, integrated with other sensors, to provide unequaled situational awareness of the battlespace. This situational awareness is severely degraded with the absence of space-based capabilities. Space-based sensors provide the deep look for operational maneuver, while other air, sea, and ground systems provide in-theater information. Satellites provide views into deeply compartmented and urban terrain that are difficult to equal with other platforms.

Advanced C4ISR capabilities will form the backbone of the Objective Force, introducing potentially the most revolutionary advances in force effectiveness and enhancing the optimized application of all other capabilities to execute the operational concepts described previously.⁸⁴ Superior situational understanding, based on advanced C4ISR capabilities at all levels, enables ground commanders to operate on their terms, at a time and place, and with the method of their choosing. Reliable, redundant, networked, jam-resistant, high-bandwidth communications; user-friendly information displays; and advanced tactical decision aids are vital to the ability to *see and understand first*.⁸⁵ Near-real-time knowledge sharing by internetted platforms of friendly and enemy locations and movements will enable precise synchronized maneuver and fires.

⁸³ Department of the Army, *TRADOC Pamphlet 525-3-14: Concept for Space Operations in Support of the Objective Force*, (Fort Monroe, VA: United States Army Training and Doctrine Command, 23 January 2003), p. 22.

⁸⁴ Department of the Army, *TRADOC Pamphlet 525-3-92: Objective Force Unit of Employment Concept*, (Fort Monroe, VA: United States Army Training and Doctrine Command, 8 November 2002), p. 30.

⁸⁵ Department of the Army, *TRADOC Pamphlet 525-3-14: Concept for Space Operations in Support of the Objective Force*, p. 22.

Commanders will rely on space-based communications and intelligence capabilities as they move from CONUS installations to the theater of operations. During the movement, employment of counter-reconnaissance capabilities will be critical to ensure friendly forces are free from observation by threat forces during the deployment process. In addition, space assets will provide global communications; real-time and accurate intelligence, surveillance and reconnaissance; enroute mission planning and rehearsal capabilities; early warning; and inter-theater reachback capabilities. This will enable Objective Forces to arrive fully synchronized with other elements of the joint force and ready to fight. Improved satellite communications provide the UE commander responsive, in-theater communications, on the move, and enable information superiority. These bind military forces together and facilitate reachback to and from supporting forces stationed around the world. Planned future systems, coupled with assured access to commercial systems, will provide the necessary communications backbone to facilitate the high volume of data available anywhere, anytime, and on the move, all of which is required for the UE to succeed.

Space systems and products significantly reduce the fog, friction, and uncertainty of warfare.⁸⁶ The integration of space capabilities enables Units of Employment to exploit the operational environment and enhance the commander's overall operational design. The results are expeditious strategic response, improved situational understanding, global communications, accurate surveillance, precision attacks on multiple targets, and enhanced sustainment all while protecting the force from home station to area of operation enabling Objective Force commanders to dominate their battlespace. The successful transformation of the Army will, to a very large degree,

depend on how we leverage joint space capabilities to enable the transformational concepts of the Objective Force. The conclusions prove that Units of Employment will be a space-enabled force reliant on continuous overhead constellation of communications, navigation, ISR and imagery, weather, and missile warning satellites that will integrate seamlessly land, air and space operations to ensure operational and tactical dominance.

⁸⁶ Ibid., p. 17.

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