TRADOC Pamphlet 525-7-4

The United States Army's
Concept Capability Plan
(CCP)

SPACE OPERATIONS

2015 - 2024

Version 1.0

15 November 2006

The United States Army Space Operations Concept Capability Plan
Foreword

From the Director
U.S. Army Capabilities Integration Center

Emerging joint and Army concepts highlight the fact that the future Modular Force battlefield now extends vertically into space. Additionally, the complexity of joint and combined arms operations described in our joint and Army concepts place high demands on future Modular Force commanders and organizations. The global explosion in military and commercial space-based information technologies present an opportunity to integrate space throughout the force enabling the type of warfare envisioned in our future Force concepts. Within this context the Army has a responsibility to influence and shape the design and development of the space related requirements of the future Modular Force.

The U.S. Army Space Operations Concept Capability Plan (CCP) identifies the space-enabled capabilities required to execute Army operations in the 2015 - 2024 timeframe. The CCP describes how Army forces leverage the power of national, civil and commercial space-based assets on the future battlefield. The capabilities identified in this CCP provide a coherent way ahead for the further examination of potential doctrine, organization, training, materiel, leadership and education, personnel and facilities (DOTMLPF) solutions. As such, this CCP will serve as a start point for a comprehensive capabilities based assessment involving many different proponents.

In examining Army's future space-enabled capabilities, the CCP describes the environment of space, the emerging threat from our adversaries use of space for hostile purposes, and the joint interdependence of all space operations. The CCP describes how the Army will evolve from a position of simply exploiting strategic space-based capabilities to a position where the Army is fully integrated into the planning, execution, and use of theater focused operational and tactical space applications. The realization of these capabilities is essential to achieving the Army's Capstone Concept objective of becoming a strategically responsive, campaign quality force.

As with all concepts, concept capability plans are in continuous evolution. This CCP will be refined and updated as new learning emerges from research, joint and Army wargaming, experimentation and combat development. Many of the space-enabled capability requirements introduced in this CCP will be further developed in other proponent capability documents. Because this CCP crosses so many joint and Army functional areas, I strongly encourage its use in our interaction with other proponents, Services and joint organizations.

Lieutenant General, U.S. Army
Director, Army Capabilities
Integration Center

Executive Summary

The future Modular Force battlefield extends vertically into the region of space and this concept capability plan (CCP) concentrates on the growing importance and dependence of Army operations on space-based systems and space-enabled functions, processes and information. The Army Space Operations CCP is intended to focus the Army's efforts to exploit the ultimate high ground of space and describe the required space-enabled capabilities needed to realize the objectives of our joint and Army concepts. The CCP presents capabilities that enable the effective application of space-based assets and capabilities across the full spectrum of conflict in an interdependent, joint, and multinational environment. It describes how Army forces integrate the power of national, civil, and commercial space-based assets. The CCP is not an end unto itself but rather the foundation for change and will likely result in one or more capability based assessment. The reference timeframe for this CCP is 2015–2024.

U.S. space operations are inherently joint and interagency in nature. The CCP recognizes the fact that joint interdependence is essential for the conduct of all Army space operations. This interdependence and complexity extends beyond the traditional Department of Defense (DOD) capabilities to include national agencies such as: the National Aeronautics and Space Administration (NASA), the National Reconnaissance Office, the National Oceanic & Atmospheric Administration, National Geospatial Intelligence Agency, National Security Agency and others. It is critical that the subject matter expertise, roles and unique capabilities each Service and agency provides be leveraged in the conduct of future Modular Force operations.

The CCP is designed to achieve four imperatives:

- Facilitate the integration of space capabilities across the full spectrum of Army and joint operations.
- Improve the Army's ability to exploit existing space capabilities.
- Deliver space capabilities that address Army needs (capability requirements) and priorities by influencing the design of space-based systems and payloads.
- Systematically and deliberately evolve Army space support operations over time to provide dedicated, responsive theater focused support to operational and tactical commanders.

Central to achieving these imperatives, the concept describes the need for a layered infrastructure involving specific space enablers at the strategic, operational and tactical levels. This infrastructure consists of facilities, personnel, organizations and equipment that extend space-based enablers to the "last tactical mile." Using an operational level vignette, and the Army capstone concept's seven key operational ideas (shape and entry operations, operational maneuver from strategic distances, intratheater operational maneuver, decisive maneuver, concurrently and subsequent stability operations, distributed support, and network-enabled battle command) the CCP illustrates the integration and contribution of space-enabled capabilities in a future Modular Force operational setting.

The Army Space Operations CCP draws its key ideas and required capability statements directly from the text of the joint and Army concepts. The CCP refines these broad capability statements

into space-enabled capability statements and provides a detailed description of the capabilities required by the future Modular Force. Additionally, the CCP identifies the space-based or supporting infrastructure in the current, mid- and far-terms. Although many of these capabilities are yet to be realized, they represent the bridge between the current modular force and the future Modular Force. This listing of required capabilities should be interpreted as optimum capabilities for the 2015-2024 timeframe.

As the Army moves forward in its transformation, and achieves future Modular Force qualities, we must, in all our mission areas, recognize that our concepts and concept capability plans are the basis for the development of future Modular Force capabilities. The holistic approach of this CCP should support any number of future capability based assessments. The power and capabilities we generate from and within space are integral components of the future Modular Force's success.

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Military Operations

Army Space Operations Concept Capability Plan

Summary. This concept capability plan (CCP) provides a capability plan for integrating Army space operations capabilities and will result in a space operations focused capabilities based assessment (CBA). The Army space operations CBA will identify doctrine, organization, training, materiel, leadership and education, personnel, and facilities (DOTMLPF) solutions or solution sets for space operations capability gaps in the 2015-2024 timeframe. The Army Space Operations concept focuses on the strategic, operational and tactical application of integrated space operations capabilities across the spectrum of conflict. This concept draws from approved and draft documents addressing the Army's modular forces to include the division, corps, and Army service component commands in addition to the Army's Future Combat System (FCS) Operational and Organizational (O&O) Plan, and emerging joint and Army concepts relevant to Department of Defense (DOD) and Army Transformation. This CCP is version 1.0.

Applicability. This CCP applies to all U.S. Army Training and Doctrine Command (TRADOC), non-TRADOC Army proponents, and Department of the Army (DA) activities that identify and develop DOTMLPF solutions to field required space operations capabilities. Active Army, Army National Guard, Army Reserve operating forces, and Army Materiel Command may use this pamphlet to identify future space operations trends in the Army. This pamphlet may also serve as a reference document to agencies within the joint Community that are planning or are concerned with Army space operations and initiatives.

Supplementation. Do not supplement this CCP without prior approval from Director, TRADOC Army Capabilities Integration Center (ARCIC) (ATFC-ED), 33 Ingalls Road, Fort Monroe, VA 23651-1061.

Suggested Improvements. The proponent of this CCP is the TRADOC Army Capabilities Integration Center. Send comments and suggested improvements on DA Form 2028 (Recommended Changes to Publications and Blank Forms) through channels to Director, TRADOC Army Capabilities Integration Center (ATFC-ED), 33 Ingalls Road, Fort Monroe, VA 23651-1061. Suggested improvements may also be submitted using DA Form 1045 (Army Ideas for Excellence Program (AIEP) Proposal).

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Chapter 1
Introduction

1-1. Purpose. The Purpose of this Concept Capability Plan (CCP) is to identify required space-enabled capabilities based on a detailed analysis of the nine Army concepts.

a. The identification of these capabilities will provide a coherent way ahead for the further examination of potential DOTMLPF solutions. These potential solutions will enable Army operations at all echelons across the spectrum of conflict. Army space operations are not the exclusive domain of the Army Space and Missile Defense Command or any single branch or functional proponent. The space domain, and the systems and enablers using this domain, is central to achieving the future Modular Force envisioned in the joint and Army concepts.

b. This CCP provides for the integration of Army space operations for the future Modular Force and will result in an Army space operations focused CBA involving many different proponents. The CCP presents technical and non-technical capabilities, used by a wide range of proponents, that enable the effective application of space-based assets and capabilities in an interdependent, joint, and multinational environment. It describes how Army forces integrate the power of national, civil, and commercial space-based assets.

c. The plan discusses the application of existing and emerging joint and Army thought and identifies capabilities required for the optimum use of the space domain in support of future Modular Force operations. The Army space operations CBA will identify DOTMLPF solutions or solution sets for Army space operations capability gaps in the 2015–2024 timeframe. Experiments, tests and exercises are needed to mitigate the risk inherent in developing and fielding these ideas.

d. Finally, this plan will serve as a dynamic living document and replaces TRADOC Pamphlet 525-3-14 *Concept for Space Operations in Support of the Future Force*, 11 April 2003.

1-2. Functional Area. The Army Space Operations CCP identifies capabilities required to execute Army operations in the 2015–2024 timeframe. This plan reaches across the Joint Functional Areas of Battlespace Awareness, Command and Control, Force Application, Focused Logistics, and Sustainment. Additionally, this plan is fully nested in the Army concept strategy documents from the Capstone Concept, The Army in Joint Operations, and through the six Army functional concepts.

1-3. Scope. The scope of Army space operations as depicted in this CCP is consistent with current joint and Army concepts, and focuses on the time frame 2015–2024. The primary basis for analysis are the *Capstone Concept for Joint Operations*, joint operating concepts (JOC) of *Major Combat Operations, Homeland Defense and Civil Support Operations, Stability and Support Operations, and Deterrence Operations*, the Army's Future Force capstone concept, *The Army in Joint Operations 2015–2024*, and the Army Operational Maneuver and Tactical Maneuver concepts.

1-4. Relation to the Family of Army Functional Concepts and Role of the Army in Space.

a. TRADOC Pamphlet 525-3-0, *The Army in Joint Operations: The Army's Future Force Capstone Concept*, reinforces the fact that Army forces will conduct operations as an integrated component of a joint force and will depend on the capabilities from other Services to maximize effectiveness. It is within this context that the campaign is linked firmly to theater strategy and the operations must establish early, sustained control of the air, land, sea, space, and information domains. The capstone concept lays out seven key operational ideas across the spectrum of conflict to achieve full spectrum dominance. Space-based systems and capabilities are contributing enablers to each of the seven operational ideas and an integral component of network-enabled battle command. The concept describes the future Modular Force as a "…space-empowered force…" that will "…routinely exploit the constellation of military and civilian space platforms for persistent surveillance, reconnaissance, communications, early warning, positioning, timing, navigation, weather, environmental monitoring, missile defense, and access to the global information grid."[1]

b. TRADOC Pamphlet 525-3-1, *The U.S. Army Operating Concept for Operational Maneuver*, addresses the operational level of war and focuses on the ways and means by which future Modular Force commanders link a broad array of tactical actions to achieve a joint force commander's campaign objectives. The concept presents a detailed discussion of the seven key operational ideas identified in the Army capstone concept and how they are applied at the operational level of war. The concept reinforces the idea that the Army is a space-empowered force and recognizes the threat's access to a wide array of space-based capabilities and the dependence of Army forces on space enablers. In its discussion of space, the concept goes beyond the traditional space force enhancement capabilities to describe a, "…layered redundancy and improved capabilities to help resolve many current operational challenges (such as, fleeting target engagement or limits on range and mobility of terrestrial communications)."[2] The concept characterizes space-enabled capabilities as "critical enablers for implementation of the fundamental principles of the operational maneuver concept, particularly with respect to achieving information superiority, creating situational understanding, and operating within the high tempo, non-contiguous simultaneous framework of distributed operations." [3]

c. TRADOC Pamphlet 525-3-2, *The U.S. Army Operating Concept for Tactical Maneuver*, describes the future Modular Force within the framework of tactical operations—battles and engagements. The concept presents a detailed discussion of five key ideas as defining the most important vectors of change in tactical operations. Underpinning these five key ideas is the need to develop and maintain a deep understanding of the increasingly complex tactical environment.[4] The key ideas are:

- Simultaneous and continuous operations.
- Decisive maneuver—new tactical paradigm.
- Routine employment of joint capabilities at tactical level.

[1] TP 525-3-0, The Army in Joint Operations, 7 April 2005, pg. 34.
[2] TP 525-3-1, Operating Concept for Operational Maneuver, 2 October 2006, pg. 42l
[3] Ibid, pg 42l
[4] TP 525-3-2, Operating Concept for Tactical Maneuver, 2 October 2006, pgs 21-30l

- Self-synchronizing and cooperative engagement.
- The quality of firsts.

d. To achieve this level of situational understanding, the concept describes space-enabled capabilities such as near real-time, digitized terrain updates, and precision position, navigation and timing data as becoming increasingly more important to the new tactical paradigm.

e. The final concept documents describing the Army's role in the future Modular Force are the six Army functional concepts: *Battle Command, See, Move, Strike, Protect and Sustain*. The functional concepts describe the Army capabilities needed to conduct successful operational and tactical maneuver. The following paragraphs address each Army functional concept and identify capabilities enabled by space-based systems.

(1) Battle Command. The Battle Command functional concept provides a visualization of how Army future Modular Force commanders will exercise command and control of Army operations in a joint, interagency, and multinational environment. The battle command function is a blend of the cognitive and the technical. It is achieved by combining the art of well prepared leaders with the enabling science and technical systems of the future Modular Force. Many of the key ideas within the Battle Command functional concept relate to or are enabled by space-based systems.[5] These include:

- Collaborative planning; accelerated military decision making process (MDMP).
- Information and decision superiority.
- A single, integrated Army battle command system.
- Interagency and multinational interoperability and integration.
- Horizontal and vertical fusion.

(2) See. The See functional concept describes how the future Modular Force will acquire and generate knowledge of itself, its opponent and the operational environment. The function of seeing and creating knowledge of the operational environment is the essential element of transforming to a knowledge-based, net-enabled force capable of seeing first, understanding first, acting first and finishing decisively. Every aspect of future Modular Force operations derives increased effectiveness through the ability to see and know, and from that, the ability to anticipate. Space-based systems and enablers are critical to the main ideas put forward in this concept.[6] The ideas that may be supported by space enablers include:

- Acquisition of data from organic and non-organic sources including joint and interagency. This includes the subordinate functions of gathering, collecting and fusing.
- Transforming data through the rapid and continuous fusion of data and analysis of information to produce knowledge, across all domains and disciplines to develop relevant knowledge.
- The provision of timely, precise and tailored knowledge input to the command for decision-making, force application, movement, protection and sustainment.

[5] TP 525-3-3 Battle Command Functional Concept 2015-2024, Coordinating Draft, 15 August 2005, pgs. 8-15.
[6] TP 525-2-1 See Functional Concept 2015-2024, Coordinating Draft 5 August 2005, pg 1 and pgs 14-16.

(3) Move. The Move functional concept focuses on strategic force projection and operational agility in support of joint campaign objectives. The Army's approach to this requirement for strategic responsiveness is through a "…prompt and sustained framework."[7] The prompt response concept depends on space-based enablers to support:

- Establishment of information superiority and situational understanding.
- Global command and control, communications, and intelligence-surveillance-reconnaissance.
- Precision navigation and targeting aids.
- Integrated missile warning network.
- En route knowledge-building and continuous connectivity.
- Similarly, sustained response and operational agility depend on space-based enablers to support: joint and blue force tracking (BFT) and in-transit visibility.

(4) Strike. The Strike functional concept addresses joint and future Modular Force fires at the strategic, operational, and tactical levels. Strike includes fires routinely integrated with information operations (IO) and three IO-related military activities; public affairs (PA), civil military operations (CMO), and defense support to public diplomacy (DSPD).

(a) It reflects future Modular Force elements that will have fully integrated capabilities to employ direct and long-range, precision, highly responsive, reliable, sustainable, readily available and easily deployable fires coordinated with IO-related military activities that can support future Modular Force and applicable joint operations.

(b) Future Modular Force strike, in conjunction with joint fires, will create interdependent future Modular Force strike and joint fires networks that mutually enhance strike and joint fires capabilities for Army and joint forces in a joint, interagency, and multinational environment. The future Modular Force strike network will capitalize on joint command and control (JC2) and joint intelligence, surveillance and reconnaissance networks, using the collaborative information environment and the common operating picture (COP) to gain the near real-time situational awareness (SA) required to effectively employ strike in support of future Modular Force operations.

(c) Strike will help shape the operational environment, seize and maintain the initiative, maintain continuous pressure, disintegrate, disorient, or destroy the enemy, support stability operations, and protect friendly forces conducting full spectrum operations across the full spectrum of operations in support of joint force commander objectives. The Strike functional is built around the following key ideas, each of which is supported by space-based enablers:

- Provide continuous integration and employment of networked strike from tactical to strategic distances. Enabled by:

[7] TP 525-3-6, Move Functional Concept 2015-2024, Coordinating Draft, 12 August 2005, pg 13.

- Collaborative, dynamic planning and employment across all levels of command.
- Continuous access to the global information grid (GIG).
- Seamless and transparent communications and computer interface.
- Routine exploitation of available joint, allied, and coalition fires.

- Execute seamless employment of strike by lethal or non-lethal means.
  - Routine integration of fires with IO and related capabilities.
- Prosecute elusive and fleeting surface targets.
  - Achieve near-real time SA for strike employment.
  - Eliminate response gaps between organic and other available strike capabilities.
  - Deliver immediate, precision or sustained fires.
- Establish and maintain routine access to space at all levels.

(5) Protect. The Protect functional concept lays out a set of enabling tasks and capabilities by which the future Modular Force protects people, physical assets and information against the full spectrum of threats. The function of protect will take place on land, in the air, on the seas, in space and the electronic domains.[8] Space-based systems and enablers play a role in accomplishing each of the seven enabling tasks: detect, assess, warn, prevent, deter, defend, and respond. These tasks are interconnected and represent the processes of a full dimensional protection environment. Additionally, the concept includes two other broad missions that operate across the spectrum of conflict and enable the future Modular Force: force health protection support and space operations. The discussion of space operations includes a discussion of space control which it describes as, "active and passive means to protect friendly assets and retain the space capabilities they need while, when appropriate, denying those capabilities to adversaries." [9] The Protect functional concept also states that, "Space systems provide communication, surveillance, and reconnaissance systems which are essential to protect situational awareness in identifying adversary locations, capabilities, weather, terrain, and missile information that warns those under direct missile attack, cues missile defense systems, and provides the launch data necessary for counterattack operations."[10]

(6) Sustain. The Sustain functional concept establishes the overarching framework for logistics support to the future Modular Force. At the strategic and operational level, future Modular Force support is envisioned as a single joint system that senses and interprets the operational environment and responds through networked capabilities and advanced distribution platforms with precision, from the source of support to the point of effect.[11] Future Modular Force support operations include supply and field services, medical support, maintenance, transportation, force health protection, Soldier services, and aviation logistics support. Space-based systems form much of the enabling backbone of this single, coherent joint system needed to support future Modular Force sustainment operations by enabling:

- Sustainment command and control.

[8] TP 525-3-5 Protect Functional Concept 2015-2024, Coordinating Draft 5 August 2005, pgs. 13-14.
[9] TP 525-3-5 Protect Functional Concept 2015-2024, Coordinating Draft 5 August 2005, pg 14.
[10] Ibid pg 14.
[11] TP 525-4-1 Sustain Functional Concept 2015-2024, Coordinating Draft, 5 August 2005, pg 14.

- Force situational awareness and understanding.
- Data links for sustainment operations.
- In-transit visibility.

f. While the joint and Army concepts provide word pictures of the capabilities required for future Modular Force operations in the 2015–2024 timeframe, the vignettes in Chapter 2 put these concept capabilities into an operational setting.

1-5. References. Appendix A.

1-6. Explanation of Abbreviations and Terms. Appendix B.

Chapter 2.
Concept Capability Plan

2-1 Introduction.

a. Why this CCP is needed. There is no current Army concept or plan that takes a holistic view of the Army's needs from a space perspective. This CCP describes the Army's collective dependence on space-enabled capabilities and the capability requirements of the Army's future Modular Force. It provides a basis for the systematic, integrated, and prioritized development of the space capabilities needed to enable the future Modular Force.

b Problem statement. The desired conceptual capabilities of the future Modular Force significantly increase the Army's reliance on space-based systems and space-enabled capabilities. Future Modular Force capabilities such as: a pervasive inter- and intra-theater communications infrastructure enabling global communications to Soldier or platform level; integrated sensor networks enabling the collection, processing, fusion, and simultaneous exchange of information from multiple non-contiguous locations; and precision fire and maneuver are fundamental, space-enabled conditions for effective future operations. In order to achieve these space-enabled conditions, the Army has a responsibility to influence and shape the design, development, and employment of the future Modular Force space-enabled capabilities.

c. Traditional Role of Space. The traditional role of space support to land component forces concentrated on the global strategic mission. Operational and tactical applications were piggy-backed on strategic and national assets and the services developed means to exploit on-orbit capabilities. Proponents worked with other services, national and joint agencies to develop and leverage the power of space; however, there was no real effort to take an integrated approach.

d. Future Role of Space. The complexity of joint and combined arms operations envisioned in the 2015–2024 timeframe will place high demands on future Modular Force commanders and organizations. The global explosion in both military and commercial space-based information technologies presents an opportunity to integrate space throughout the echelons of command and across the spectrum of conflict. This global explosion in space technologies also highlights the Army's responsibility to influence and shape the design and development of these new

technologies to ensure the requirements of the land domain force are satisfied. Commanders and future Modular Force organizations at each echelon will depend upon and leverage the power of space in order to achieve the Army's seven key operational ideas. Technologies and the power of space also represent a threat to the future Modular Force. Potential adversaries will also have access to a widening array of space products and services through commercial ventures or other nations' space efforts. It is likely that adversaries will have the potential to deny, disrupt, deceive, degrade or destroy U.S. access to and use of space capabilities. It is within this framework of space dependence and risk that the future Modular Force must conduct joint, interagency, intergovernmental, and multinational operations.

2-2. Operational Environment.

a. The changing operational environment.

(1) New and emerging technologies will transform the method and manner of warfare. In the next few decades, the U.S. will confront unstable, sometimes diverse, and highly uncertain geopolitical alignments that will generate major changes in adversaries' intent, force array, and strength. There will be increased global and regional interest in local matters that will place increased value in alliances and coalitions. Potential adversaries will apply lessons learned based on their study of U.S. methods. New threats may emerge from aspiring great powers, new regional alignments, or transnational terrorist or criminal organizations. The global explosion in space-based communications, sensor networks, and information technologies, together with continuing proliferation of military and commercial technologies, will allow even less wealthy states, and non-state entities, to enhance their ground combat command, control, communications, computer, intelligence, surveillance, and reconnaissance (C4ISR) capabilities to a level once maintained by armies supported by fully industrialized and national economies.

(2) The physical characteristics of a future theater of war also are likely to prove more challenging. Continuing global urbanization increases the probability that U.S. forces will confront complex topography, even where nature itself does not impose it. Early entry operations, support systems, and facilities will be more vulnerable to direct attack because of the proliferation of hostile communications; sensor, missile, and night vision capabilities; an ever-expanding array of precision munitions; and special operations forces (SOF), and insurgent or terrorist capabilities, together with a growing threat of weapons of mass destruction (WMD). These threats may even dictate that combat forces avoid prolonged occupation of detectable and targetable locations. Additionally, most adversaries will become more sophisticated with the adaptive use of camouflage, cover, concealment, denial, and deception (C3D2). Skilled C3D2 will increase ambiguity, obscuring the identity of potential foes and forces. It is relatively cheap, easy to employ, and in most cases effective, which will ensure its proliferation across the battlespace. Combined with dispersion of forces and other adaptive tactics, C3D2 will affect all forms of intelligence gathering, including space-based assets, making them less effective and harder to employ.

b. Space operational environment.

(1) Space is a distinct operating environment that is different from land, air, and sea domains. Space assets transcend geographical borders unimpeded. Since there are no recognized political boundaries in space, satellites enjoy "open skies" global coverage. Although space transcends geographical borders, it is the subject of international and domestic laws, regulations, and national policy. While there is no formal definition of where space begins, the treaty known as the, *Outer Space Treaty of 1967*, describes the lower boundary of space as the lowest perigee attainable by an orbiting space vehicle. The fundamental difference between the space and air domains is that objects in space orbit the earth while objects in the air domain fly over the earth. In this concept orbital space is defined as that region above 100km mean sea level (MSL).[12] Figure 2-1 provides an illustration of the region of orbital space.

(2) Operations in space are a primary enabler of the information revolution. Space operations and information management capabilities are interdependent. Space systems are critical in moving high volumes of data at great speed, over vast distances to enable the formation of interactive, globally networked databases that provide support to industry, government, and our military forces. The Army must identify its requirements in the development of these systems early, in order to leverage their capabilities in support of Army future Modular Force operations.

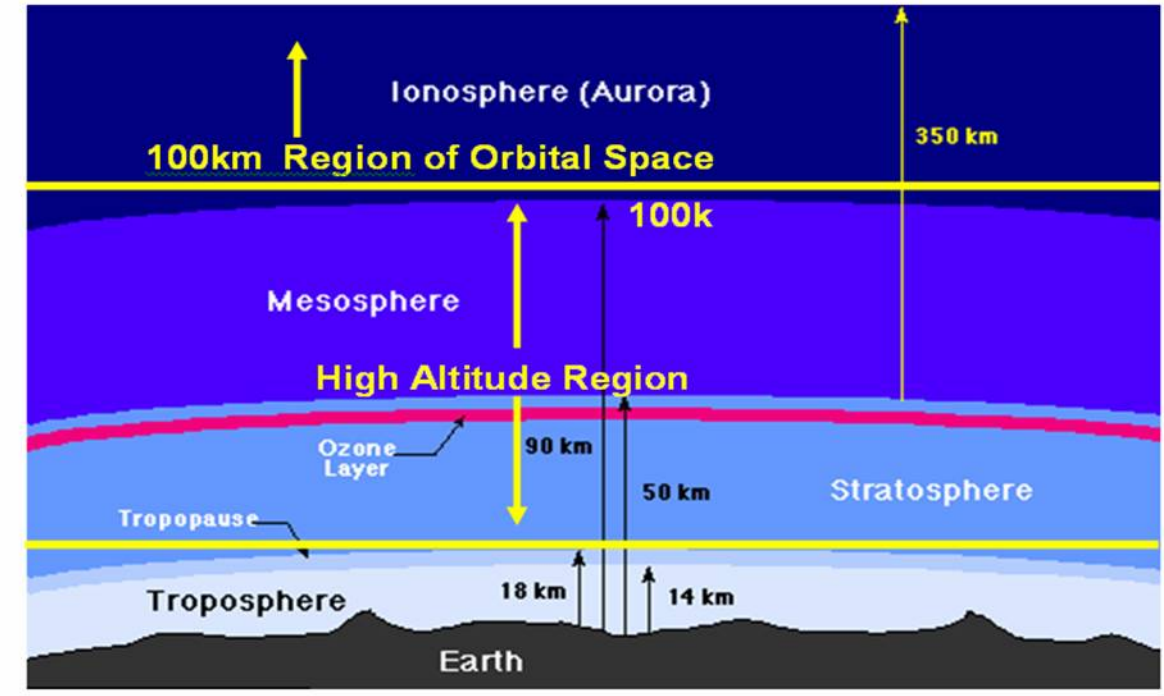

Figure 2-1, Regions of the Earth's Atmosphere and Orbital Space

(3) The region of orbital space is populated by an ever-increasing number of military, civil, and commercial systems competing for orbital position, bandwidth, and profit. The number of nations that have national space programs is rapidly increasing. Commercial space ventures funded by private organizations and consortiums enable nation states, political factions,

[12] US Army Space Reference Text, December 2004, pg. 15.

or individuals to purchase militarily significant space products or services at relatively low cost and without having to build extensive space infrastructures. Advances in space technology continue to expand the wide menu of readily available space products. There are competing military and commercial requirements for space capabilities, such as secure wide-band communications, enhanced multi-spectral imagery, small mobile downlink terminals, and improved launch capabilities. Governmental controls, designed to limit or deny distribution of space products and services, will be increasingly difficult to implement when multinational consortia provide these products and services.

(4) High Altitude Environment.

(a) The increased demand on DOD and national space systems has created a condition where requirements exceed capacity. Commanders require capabilities that are accessible, interoperable, persistent, and assured to provide freedom of action at all operational levels. Current U.S. space-based systems provide capabilities unmatched by our adversaries; however, space superiority is not guaranteed. The high cost and long lead-time for multi-mission space systems, which are not easily replaced, have caused us to explore the high altitude region of the stratosphere and mesosphere to overcome both the high demand and vulnerability of current orbital space resources. In this concept, the high altitude region of the stratosphere and mesosphere is defined as that region between the tropopause and the region of orbital space, 18 to 100km above MSL. Figure 2-1, Regions of the Earth's Atmosphere and Orbital Space, illustrates these regions. The high altitude region can supplement orbital space capabilities and integrate additional high altitude long-loiter capabilities to support the joint force commander in a theater with emphasis at the operational and tactical levels. Systems operating in the high altitude region have the potential to provide rapid, on demand, dedicated capabilities augmenting strategic space assets. Further, high altitude long-loiter systems may be developed as part of the aerial layer, thus providing persistent, organic capabilities to the operational and tactical commander. These systems may provide effects such as robust communications, theater-centric intelligence, surveillance and reconnaissance (ISR), operational environment situational awareness, battle damage assessment, enhanced positioning, velocity, timing and navigation augmentation capabilities, and the capability to cross-cue intelligence and non-intelligence platforms leading to more responsive and comprehensive targeting information.

(b) The proximity of high altitude long-loiter systems over orbital space systems can provide improved performance in support of certain Army operations. A high altitude long-loiter system can provide long duration coverage of up to an 850-mile diameter field of view. Operations in this region allow for flexibility, augmentation to existing air and space systems, and tailorable, recoverable packages that can be reconfigured to meet changing operational needs. In addition, high altitude long-loiter assets have the potential to reduce the operational tail and airspace management issues associated with the aerial layer. The combination of orbital space and high altitude long-loiter capabilities is a critical enabler for implementation of the fundamental principles of the future Modular Force concepts, particularly with respect to achieving information superiority, creating situational understanding, and operating within the high tempo, non-contiguous, simultaneous framework of distributed operations.

c. Threat.

(1) Adversaries will attempt to use space for hostile purposes. Domestic and international commercial space organizations are expanding our capabilities, as well as those of our adversaries. The majority of new satellites will be communication systems, but new and increasingly more sophisticated imaging satellites are also proliferating. Nations that previously showed little interest in space ventures are now purchasing satellites and paying other nations to launch these satellites into orbit. As a result, states, transnational organizations, factions, or individuals are able to buy militarily significant space products or services. In fact, one-meter or better resolution imagery, sufficient for tactical targeting (if timely) is commercially available today. Other commercial products include radar imagery that penetrates clouds; position, velocity, timing and navigation services; and a multitude of highly mobile, highly capable communication systems. Adversaries will not restrict themselves to the use of military satellites, but will use a combination of both military and commercial satellites. Therefore, Army operations must assume an adversary will have at least limited access to overhead observation capabilities and telecommunications satellites, capable of supporting operations in remote or undeveloped areas, as well as in urban environments. Finally, just as the Army future Modular Force seeks space-enabled capabilities delivered directly to forces in the field, technology advances allow adversary forces to quickly receive space-enabled products in a mobile, tactical, or urban environment.

(2) Adversaries, enabled by the worldwide proliferation of space-based telecommunications and information technology, will attempt to undermine the national will to conduct operations, and dissolve the cohesion of coalitions and alliances. This undermining effort will evolve in new directions, stemming from reliance on computer systems for processing and storing sensitive information. Because information dominance is crucial to future Modular Force operations, the linkage between IO and space operations is paramount. Elements of space systems will be targets of information attack operations, to include computer network operations. Left unprotected, links will be jammed, spoofed, monitored, or pirated by adversaries. Protection of this friendly capability will be a major objective of space control operations. The information lines of communication (LOCs) must be protected if the Army is to succeed.

(3) Adversaries may alter the space operations environment by interfering with spacecraft, communication links, ground stations, terminals, or the associated information infrastructure. Adversaries may employ a variety of anti-satellite techniques. Enemy special or conventional forces, theater missiles, electronic warfare means, cyber-attack, and terrorists all pose a threat to vulnerable ground stations, control facilities, and terminals. Future adversaries will likely not be limited to today's conventional munitions, but will likely develop both the intent and capability to employ WMDs or effects. Nuclear and non-nuclear electromagnetic pulse and directed energy weapons must also be considered. Adversaries may also attack spacecraft industrial facilities, launch sites, and even space vehicles during their ascent. The various bottlenecks associated with space systems will make unique space vehicle integration and launch facilities, and control and downlink facilities particularly valuable targets. Electronic attacks will aim to degrade satellite communications; telemetry, tracking, and control links; and ground stations. Low power signals, such as those emitted by the global positioning system (GPS), are particularly susceptible to localized interference.

(4) Remote sensing capabilities may allow the enemy to "see" the battlefield, as clearly as the U.S. forces commander. Imagery, provided in time to support the strategic, operational, or tactical decision (spectral and radar) will be available to potential adversaries through a number of commercial and foreign government-supplied vendors. Adversaries may already have access to direct down link imagery that is operationally equal to U.S. capabilities in terms of military utility. Commercial remote sensing has the potential of providing a potential adversary the information required to make timely and effective decisions which meet their requirements. An important consideration during stability operations is that an adversary can also exploit "non-timely" remote sensing products that depict existing U.S. or allied forces camps and installations. It is important to recognize governmental controls, designed to limit or deny distribution of space-enabled products and services, will be increasingly difficult to implement when multinational consortia provide these products and services.

(5) A proliferation of positioning, navigation and timing (PNT) jammers will give adversaries and terrorists the ability to block or degrade U.S. satellite signals that provide PNT data. The ability of such jammers to interfere with position and timing data has critical impacts. Military, civil and commercial networked computer and communication systems depend on timing signals. Commercial commerce, aviation and local emergency responders are similarly dependent, and this dependence will increase in the future. In addition, PNT data will be increasingly available to adversaries and by 2025 there will be three fully operational and independent satellite based navigation constellations with augmentation capabilities. Commercial and civil use of space-based PNT is increasing exponentially, and the trend is toward equal resolution for government (defense) and commercial users of these capabilities.

(6) Weather data collected from satellites is available to adversaries through any number of commercial and foreign government vendors. Moreover, the remote sensing systems mentioned previously will allow adversaries access to terrain and environmental reports and analyses. Often this information is provided without cost via the internet from governmental organizations like National Oceanic & Atmospheric Administration (NOAA) and commercial sources, such as CNN Headline News, and certain colleges and universities. Access to these types of reports and forecasts support the adversaries' ability to plan and conduct more effective operations.

2-3. Joint Interdependence.

a. The synchronized employment of land, air, sea, space, and special operations forces provides the commander with the widest range of strategic, operational, and tactical options. Joint interdependence is achieved through the deliberate reliance of each Service on the capabilities of others to maximize its own effectiveness, while minimizing its vulnerabilities. Key joint interdependencies include: joint battle command; joint force projection; joint air and missile defense; joint sustainment; joint fires and effects.[13] The Army's capstone, operational and functional concepts recognize and address each of these dependencies.

[13] TRADOC Pam 525-3-0 The Army in Joint Operations–The Army's Future Force Capstone Concept 2015-2024, p 13.

b. Space operations are inherently joint, and joint interdependence is essential for the conduct of all space operations. In the area of space, this interdependence is even more complex in that it extends beyond the traditional Service capabilities to include national agencies such as: the National Reconnaissance Office, the NOAA, National Geospatial Intelligence Agency, National Security Agency, and others. It is critical that the subject matter expertise, roles and unique capabilities provided by each Service, agency and branch or proponent be leveraged in the conduct of day-to-day operations in order to coordinate joint theater operations and integrate space capabilities. Space operations support and architectures must remain flexible and responsive to meet the needs of the joint force commander (JFC).

c. Commander U.S. Strategic Command (USSTRATCOM) is responsible for the DOD oversight, planning and execution of space operations in support the combatant commands and service component forces. USSTRATCOM has delegated authority for operational and tactical level planning, force execution, and day-to-day management of designated space forces to the Joint Functional Component Command Space and Global Strike (JFCC SGS) in order to operationalize space missions. JFCC SGS executes tactical control of USSTRATCOM assigned space forces to support JFC and service requirements, performs mission area operational level planning, integration and coordination with other USSTRATCOM joint and service components and, other combatant commands. The commander USSTRATCOM is also the lead combatant commander for integrating and synchronizing the DOD in combating WMD. This responsibility includes DOTMLPF assessment and advocacy for the development and implementation of capabilities to support interdicting and eliminating WMD and related materials with space playing a large role in the ability to detect and deter.

d. The U.S. Air Force plays a key role in bringing space to the warfighter. As the DOD executive agent for space, the Air Force is responsible for leading the development, production, support and execution of military space operations. The Air Force provides space capabilities that ensure global presence, vigilance and reach for the nation to include:

- C2 of Assigned Space Forces – Plan, task, direct and synchronize space operations to support global and theater missions.
- Space Superiority – Provide surveillance, tracking and intelligence of more than 9,000 man-made objects ranging from active and inactive satellites to vehicle fragments, using a variety of sensors such as phased-array radars and optical surveillance systems. Conduct defensive and offensive counter-space operations, and space environment assessments.
- Surveillance, Warning, and Battlefield Characterization – Provide global and theater ballistic missile warning (strategic and tactical) and tracking capabilities to the U.S. and allied nations through the employment of satellite sensors and phased-array radars.
- Satellite and Network Operations – Command and control over 100 satellites that provide weather, communications, navigation, and surveillance-warning capabilities and operate a global network of satellite control centers and stations supporting a variety of DOD and civil users.
- Space Launch and Range – Provide assured access to space and conduct launch operations from Western and Eastern U.S. launch sites to support military, civil and commercial users. Additionally, operates ranges to include testing and evaluating space, air, and missile systems.

e. The U.S. Navy also plays a role in bringing the power of space to the warfighter. The Naval Network Warfare Command (NETWARCOM) is the Navy's functional component command to USSTRATCOM and the Navy's central operational authority for space. NETWARCOM is the Navy's authority for space and information technology requirements, and network and information operations in support of naval forces afloat and ashore. NETWARCOM operates a secure and interoperable naval network that enables effects-based operations and innovation around the globe. NETWARCOM coordinates and assesses the Navy operational requirements for and use of network/C2/information technology/IO and space. It serves as the operational forces' advocate in the development and fielding of information technology, information operations and space. NETWARCOM's goals include:

- Operation of the Navy component of the GIG as a weapons system.
- Extending and optimizing use of information operations including signals intelligence.
- Ensuring the Navy fully leverages and influences space capabilities.
- Implementing NETWARCOM components of the Naval FORCnet.[14]
- Achieving certification of the Maritime Operations Centers.

f. The U.S. Army Space and Missile Defense Command/Army Forces Strategic Command (SMDC/ARSTRAT) is the Army Service component command (ASCC) to USSTRATCOM and as the Army proponent for space possesses Title 10 responsibilities. SMDC conducts space operations and provides planning, integration, control, and coordination of Army forces and capabilities in support of USSTRATCOM missions; serves as proponent for space and ground-based midcourse defense and as the Army operational integrator for global missile defense. In addition to these functions, SMDC/ARSTRAT provides:

- Payload and transmissions control of the defense satellite communications system (DSCS) which provides super-high frequency (SHF) wideband communications for worldwide fixed and mobile national, strategic, tactical, and governmental users.
- The theater missile warning company operates joint tactical ground stations (JTAGS) that provide early warning of missile launches to deployed U.S. forces worldwide and overhead non-imaging infrared reports and products.
- The Army space support company may provide specialized teams and space operations officers to Army, sister Services, joint psychological operations task force (JPOTF), joint special operations task force (JSOTF), and multinational forces or organizations to provide space SA, space-enabled products and services, and specialized space support and advice across the full spectrum of military operations. These specialized teams and space officers provide the ability to surge Army space support to a theater or supplement space elements in divisions, corps, and Army service component commands.
- The SMDC/ARSTRAT Mission Management Center provides worldwide support to blue force tracking and situational awareness.

[14] FORCEnet is the naval concept for C2 for joint operations and is the operational framework for naval warfare in the Information Age. FORCEnet: A Functional Concept for the 21st Century.

- The Army Space Operations Center serves as a reach back center for Army space operations.
- SMDC/ARSTRAT is the USSTRATCOM lead for global WMD elimination. In this role it is responsible for the planning, integration, coordination, and control of WMD elimination missions.

g. Within this context of joint interdependence there exists a second order dependency in the Army. It is often said that the Army is the largest user of the products and services enabled by space-based systems. For example, Army movement, maneuver, and precision fires rely heavily on GPS for positioning, navigation and timing. Similarly the Army is increasing more dependent on satellite supported functions such as C2 communications, ISR, threat warning and topographic or environmental imaging. As each of these capabilities came on line, Soldiers and leaders in specific branches developed the skills and expertise needed to leverage and apply the growing power of space. In 1999, the Army also recognized its need for a core of professional space operations officers and it created the Space Operations Career Field (FA 40). FA 40 officers are space experts who are trained and managed to function as dedicated Army assets for general space related operations. These two groups (Soldiers and leaders from specific branches, and FA 40 space operations officers) are collectively referred to as the Army's Space Cadre and are the subject of an ongoing analysis under the oversight of the Army G3.

h. For purposes of this CCP, the Army's Space Cadre is comprised of Soldiers and civilians from a wide variety of branches, career fields, disciplines and functional areas. It comprises officers, warrant officers, enlisted Soldiers and civilians from across the Army and constitutes a population of multifunctional space-smart individuals who predominately work space-related issues and requirements. Within the context of an Army Space Cadre, there are two categories – Space Professionals and Space Enablers.

(1) Army Space Professionals are military and civilian career space specialists, whose principal duties include planning, developing, resourcing, acquiring, integrating, or operating space forces, concepts, applications, or capabilities in accordance with DOD Directive 3100.10 and Joint Publication 3-14. This core of the Army Space Cadre includes those individuals who perform space-related duties and tasks as their primary duty for the preponderance of their career. The current population of the Space Professionals consists of officers in Functional Area 40 (FA 40).

(2) Army Space Enablers are military and civilian personnel assigned to positions whose primary career field is not space, but perform unique space related tasks or functions or may require special skills to apply space capabilities. Any needed supplemental training for these personnel is directly related to the duty positions of assignment. Space Enablers do not occupy a space career track and are likely to move in and out of Space Enabler positions throughout their careers. Space Enabler tracking and reporting may be utilized by their respective proponent and career management offices to maximize the use of their multifunctional space-related training and experience in future assignments and to maximize the return on training investment. Career and life-cycle management of the Space Enablers remains the responsibility of the respective individual assignment and proponent offices.

i. Future Modular Force commanders will require reliable, persistent and dedicated space support at the theater, operational and tactical levels. This demand for dedicated space support is likely to be satisfied by a combination of emerging orbital and high altitude long-loiter systems operating under the control of the joint force commander. It is equally likely that many of these assets will be launched by one service component and "handed off" to another for in-theater operation. As space-based systems and the personnel (Army Space Professionals and Army Space Enablers) who perform unique tasks or functions using these systems, become a more integral part of future Modular Force operations, our joint and Army forces will become increasingly more interdependent. Fully integrated and synchronized space operations are only possible through the complementary and collaborative efforts of the Army and joint forces.

2-4. The Central Idea.

> ***"Information gathered from and transmitted through space is an integral component of American military operations. Space-based capabilities let our military forces communicate instantaneously, get near real-time information that can be transmitted rapidly from satellite to attack platform, and navigate to engagement areas. These capabilities also provide the flexibility to deliver precise effects without putting people and equipment in harm's way."***[15]
>
> LTG Larry J. Dodgen, Commanding General,
> U.S. Army Space and Missile Defense Command/
> U.S. Army Forces Strategic Command

a. Introduction.

(1) The traditional role of space support to land component operations focused on the global strategic missions of facilitating national intelligence, surveillance and reconnaissance, long-haul satellite communications relay, positioning, velocity, timing and navigation data, and weather. Theater focused operational and tactical space applications have generally piggy-backed on strategic assets, and with the exception of GPS, are generally neither persistent nor dedicated to the component commanders. This has limited the extent to which space, as an enabler, is integrated into Army C2, reconnaissance, surveillance, target acquisition, and missile defense and warning systems.

(2) To achieve the Army's capstone concept objective of becoming a "…strategically responsive, campaign quality force, dominant across the spectrum of conflict and fully integrated within the joint, interagency, intergovernmental, and multinational security framework…,"[16] the capabilities provided by space-based systems must move into a direct support role for land component operations.

b. Imperatives. This CCP is designed to achieve four imperatives:

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[15] LTG Larry J. Dodgen, Commanding General, US Army Space and Missile Defense Command/US Army Forces Strategic Command, Army Space Journal, 2006 Winter Edition, pg 5.

[16] TRADOC Pam 525-3-0, The Army in Joint Operations, Executive Summary.

- Facilitate the integration of space capabilities across the full range of Army and joint operations.
- Improve the Army's ability to exploit existing space capabilities.
- Deliver space capabilities that address Army capability requirements and priorities by influencing the design of space-based systems and payloads, such as: responsive launch systems with tailorable payloads, onboard processing, direct down link, and the ability to dynamically retask.
- Systematically and deliberately evolve Army space support operations over time to provide dedicated, responsive theater focused support to operational and tactical commanders.

c. Overview.

(1) Future Modular Force Army space operations are built upon two basic tenets—joint interdependence and a layered infrastructure. Space operations and capabilities are inextricably linked with, and dependent upon, a supporting joint infrastructure. Individual services, national agencies and a growing number of commercial enterprises will each continue to play major roles in providing space support to the warfighter. The costs and lead times associated with the development, launch, and mission support of on-orbit systems and capabilities preclude any duplication of effort and demand the joint development of future systems. Space and high altitude long-loiter capabilities and their payloads must operate in a global network-enabled environment, support common access across each echelon, and support distributed operations. Joint space interdependence is fundamental to space operations and is discussed in detail earlier in this chapter.[17]

(2) Future Modular Force joint space interdependence is underpinned by a layered infrastructure of DOTMLPF. The strategic focused infrastructure of the past must be replaced by a layered infrastructure. No single medium will provide the complete operational environment picture. Rather, the future Modular Force will exploit the synergy of space, aerial, and terrestrial assets extending space and space support to the last tactical mile. Space systems supporting each echelon of command must be tailored to provide reliable, focused, persistent, and dedicated space support to the future Modular Force commanders.

(a) Doctrine. Doctrine provides the intellectual foundation of our Army. It provides principles and terminology that guide our use of forces in joint and Army operations. Emerging joint and Army space doctrine will address the strategic, operational, and tactical levels and provide the fundamental principles for the application of space power across the future Modular Force. This emerging doctrine must establish a common frame of reference on the best way to prepare and apply space enablers.

(b) Organization. Army space organizations will provide specialized space support at each echelon of command. At the strategic level, SMDC/ARSTRAT serves as the ASCC to USSTRATCOM. At this level Army space organizations integrate with the JFCC SGS and the Joint Space Operations Center. In support of the land component commander, the Army's

[17] Refer to paragraph 2-2, pages 17 – 20 for an expanded discussion.

operational space forces will provide specialized space operations support such as space control planning, missile warning and battlespace characterization, in-theater space surveillance, commercial space exploitation, and Army space support teams. These forces in coordination with aviation, intelligence, and network personnel may also provide space support in the form of platform configuration or control as well as launch, flight, and payload control of high altitude long-loiter systems operating in the high altitude region and supporting operational and tactical level commanders. Additionally, Army space forces may provide non-lethal tactical space control effects in support of information operations. These specialized organizations may also be task organized to support sister Services, coalition partners and other government or non-governmental agencies.

(c) Training. Doctrine and organizational change cannot be realized without changes to our training systems. Training ensures that our future Modular Force is able to conduct the operations envisioned in our joint and Army concepts and codified in our doctrine. By embedding space capabilities and effects into future Modular Force training, commanders and leaders will begin to realize the impact of applied space power. Training simulations that include virtual space operations and space combat support planning, and assessment will improve our training opportunities in the functional areas of: battle command, operational environment awareness, force application, strike operations, protection, and sustainment. Army training must be flexible enough to train and incorporate new technologies as they mature, and become available. We must develop Soldiers and leaders who possess a joint and expeditionary mindset and who are able of optimize the space capabilities available to them.

(d) Materiel. Space related capabilities equipment and materiel consists of ground equipment, up and downlink materiel, and space or high altitude long endurance platforms. This materiel is diverse in terms of ownership, control, and capabilities. Space systems used by, or relevant to, land forces may be under national, civil, commercial, military, or international consortium control. Space equipment is present across the future Modular Force. Soldier platforms, weapons systems, C2 communications suites, processors and emerging systems, such as warrior unmanned aircraft systems, are but a few examples of the integration of space related materiel and the complementary nature of our emerging families of systems of systems.

(e) Leadership and education. One of the keys in enabling effective Army operations will be the development of leaders and staffs who can perform effectively across the spectrum of conflict in a complex, uncertain, and dynamic operational environment. Leaders must be educated, trained, and developed to be self-aware, innovative, and adaptive throughout training and operations. In the area of space operations they must think strategically, operationally, and tactically to successfully apply the joint and Army aspects of space power. Leaders will also need joint, interagency, inter-governmental, and multinational education, and experience early in their careers. Combined with foundations in doctrine, educational opportunities within our institutional training base will prepare leaders to be as comfortable with space operations as they are with terrestrial operations.

(f) Personnel. Army personnel, from a wide range of branches and proponents, possessing unique space expertise in specific space mission areas and space force enhancement should be present in Army organizations at each echelon. Space Operations Officers, FA 40,

organic to the Army's tactical and operational warfighting headquarters will assist in the integration of space operations in the planning and execution of land force operations across the spectrum of conflict. These space operations officers, will advise Army commanders and staff, and when designated sister service, coalition or other agencies on the capabilities, limitations, and use of space-based systems and capabilities to ensure optimum use of all available systems. Space enabler personnel in the Army's warfighting headquarters and units such as signal and intelligence will perform key Army space operations roles and contribute to the layered infrastructure of the future Modular Force. Supporting this organic, layered infrastructure, space professionals and space enabler personnel assigned to SMDC/ARSTRAT will provide specialized support to the warfighter.

(g) Facilities in the continental United States (CONUS) and theater must be improved to provide greater support to the operational and tactical warfighters. Facilities must be able to exploit capabilities such as onboard processing, direct down-link, and dynamic retasking. Surge capabilities using fixed and mobile stations may be necessary. Mobile facilities may be virtually or physically linked to operational and tactical commanders and the role of these facilities will expand to include both inter- and intra-theater space operations support. Fixed and mobile facilities, in CONUS and in theater, are vulnerable to a wide range of threats such as special or conventional forces, missiles, air, electronic and cyber attack. As facilities with unique space related capabilities are developed they must integrate appropriate protection functions.

(3) This layering and integration of facilities, people, organizations and materiel is needed to provide the strategic, operational and tactical infrastructure required to enable future Modular Force operations. Future Modular Force commanders require reliable, persistent, and dedicated space support to achieve the capabilities outlined in our joint and Army concepts.

2-5. The plan.

a. Army Operations within a Joint Campaign Framework. The joint force will conduct a phased campaign to achieve assigned objectives. The phases, as elements of the joint campaign, can be inferred from the current *Capstone Concept for Joint Operations* and the *Major Combat Operations Joint Operating Concept*. These phases often overlap and are described as: ***prepare and posture, shape and enter, conduct decisive operations,*** and ***transition***.[18] The Army future Modular Force will conduct operations fully integrated within the joint operational or campaign framework across the spectrum of conflict. Army operations will enable the joint force commander to seize the initiative early, transition rapidly to decisive operations, and sustain operations to achieve strategic objectives and maintain stability thereafter. Within the context of the joint campaign framework, the Army future Modular Force will apply adaptive combinations of seven key operational ideas: shaping and entry operations, operational maneuver from strategic distances, Intratheater operational maneuver, decisive maneuver, concurrent and subsequent stability operations, distributed support and sustainment, and network-enabled battle command.[19] To facilitate the vignette based description of Army space operations in support of the future Modular Force this plan will concentrate on the Army's seven key operational ideas.

[18] TRADOC Pam 525-3-0, The Army in Joint Operations, p 10.
[19] Ibid, pgs 16-17.

b. Vignette Operational Setting. The illustrative vignettes used in this CCP are built upon a notional scenario. National and ethnic tensions in the region have grown over a period of years and B-Land initiated a campaign to control areas of A-Land populated by a similar ethnic population (see Figure 2-2). A-Land does nothing to reclaim the region involved and B-Land moves an army corps into the claimed region. Bolstered by the lack of A-Land response, B-Land increases its support of insurgent activities throughout A-Land focusing on population centers. Terrorist acts directed against oil and natural gas production and pipelines increase. B-Land and E-Land initiate military training operations along their shared border and in a show of solidarity with its ethnic brothers E-Land repositions forces along its northern border. Rogue paramilitary forces in the eastern region of C-Land seize key pipeline flow regulation and pump facilities and threaten the flow of oil. A-Land requests United Nations and U.S. assistance and shortly thereafter the President authorizes military intervention.

Figure 2-2. Operational Setting

c. Homeland Defense Implications. Although not discussed in the following vignette descriptions, the supporting joint force objectives or the space-enablers, defense of the homeland remains our highest priority effort. The increase in international tensions associated with these vignettes and the corresponding need for increased vigilance will place additional demands on our space-based systems and capabilities both at home and abroad. Global communication, ISR,

and early warning capabilities are but a few of the capabilities that will continue to support homeland defense operational requirements.

d. Shaping and Entry Operations. Army future Modular Force shaping operations include actions intended to shape regional security conditions and as such are an integral part of the joint prepare and posture phase of a joint campaign (see Figure 2-3). Shaping and entry operations shape the operational environment and set conditions for decisive maneuver.

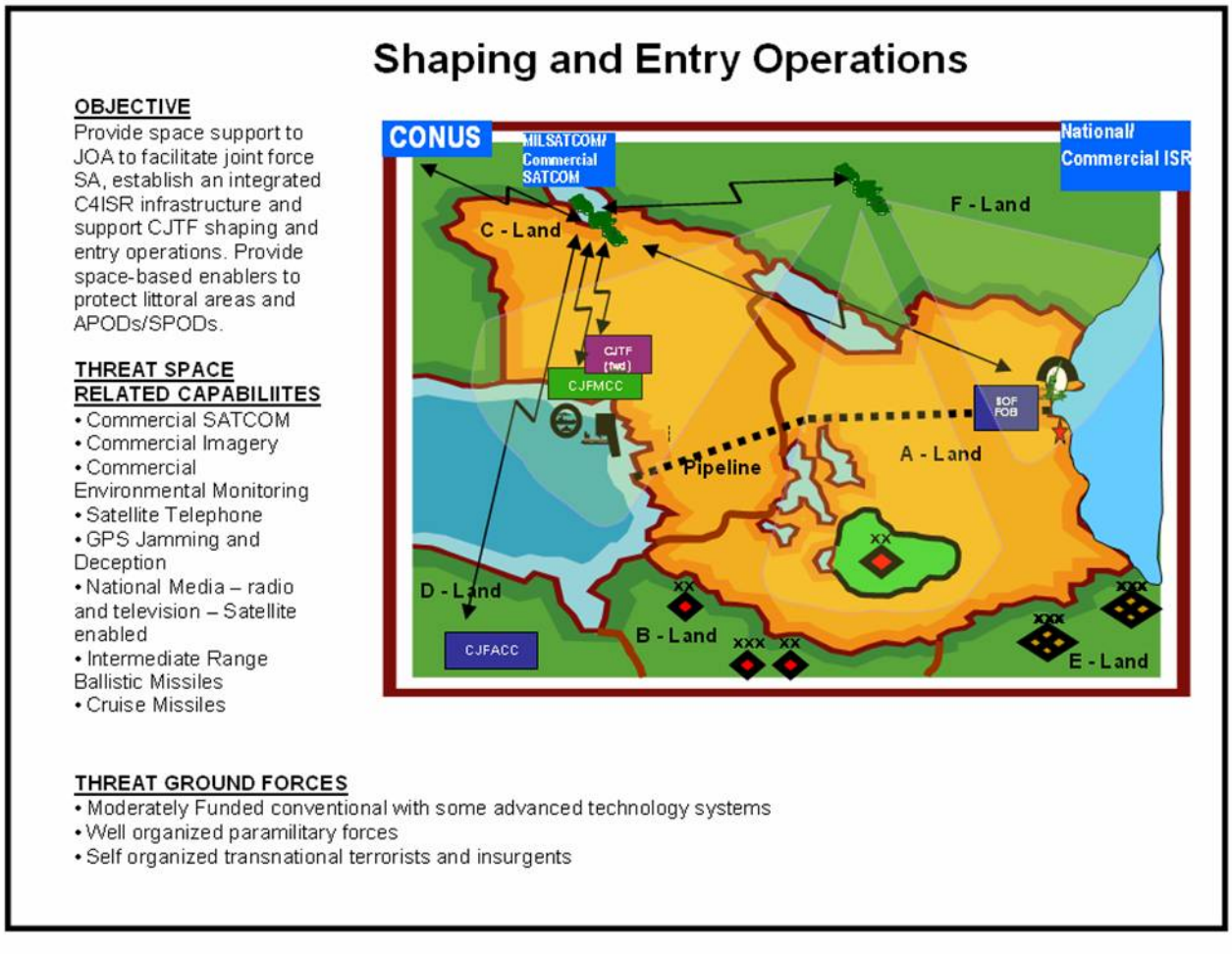

Figure 2-3. Shaping and Entry Operations

(1) The joint force commander, staff and component commanders conduct crisis action planning to update existing contingency plans and initiate shaping and early entry operations. The combined and joint force maritime component command (CJFMCC) initiates deployment to gain maritime superiority secure and establish the sea port of debarkation in west C-Land, and open lines of communication to the east. The combined and joint force air component command (CJFACC) positions an air expeditionary force in D-Land to conduct flexible deterrence options, establish air superiority, conduct initial air operations in support of combined and joint task force (CJTF) forces and coalition partners, and as the joint task force (JTF) space authority coordinates space support. The deputy area air defense commander or the theater area air and missile defense coordinator ensure protection of the joint force commander's air and missile defense

priorities and ensure the integration of all required space enablers to obtain early warning and cue air and missile defense systems throughout the joint operations area (JOA). The combined and joint force land component command (CJFLCC), an Army corps, initiates deployment of a Future Combat System (FCS) brigade combat team (BCT) by air, to the eastern shore of A-Land and two Army divisions via sea lift. Joint special operations task force (JSOTF) conducts reconnaissance and secures the air port of debarkation in eastern A-Land and assists in coordinating arrival of the FCS BCT. Additionally, the JSOTF begins cooperative training with coalition military partners. Endstate for the shaping and early entry operations:

- CJFMCC established maritime superiority and opened sea port of debarkation (SPOD).
- CJTF Forward prepared to deploy and establish initial lodgment area.
- FCS BCT prepared to deploy to eastern port city aerial port of debarkation (APOD) to secure and defend oil fields, and production facilities.
- CJFLCC (Army corps (-)) and lead elements of one division initiating deployment operations.
- CJFACC air operations center and air expeditionary force operational in D-Land. CJFACC conducts flexible deterrence options and joint strike operations to shape the operational environment.
- JSOTF forces in conjunction with (ICW) coalition partner conducting reconnaissance and counter insurgency operations, and providing targeting data to degrade anti-access operations vicinity APOD.

(2) The domain of space hosts a wide range of national, civil and commercial systems and capabilities that influence military operations. It is also a domain in which space operations are conducted. In this first phase of the operation, the future Modular Force relies on the strategic layer of space systems. Key space-based systems and space operations that enable shaping and early entry operations include:

- National and commercial satellite communications systems. These systems provide the space-based links enabling the GIG. As early entry and shaping operations begin, adjustments to bandwidth allocation and prioritization support home station and in theater operations.
- National, civil, and commercial satellite systems also provide the platforms, and sensors that enable the collection, processing and dissemination of a wide range of information. Examples of information that support early entry and shaping operations include ISR data, many types of imagery, weather and environmental data, position, velocity, timing and navigation data, space-based radar, and early warning systems.
- Joint force information requirements drive the reprioritization, direction and redirection of national technical means (NTM) satellites and ISR assets. Priority of collection efforts go to the eastern port city, APOD, SPOD, and threat conventional forces.
- The management and operation of the space segment, and the links to the GIG provide the ability to fuse, share and relay information from a wide variety of sensors and sources in order to support operational planning and comprehensive situational awareness at home station and in theater.

- The management and operation of the space segments supporting the GIG supports voice, data, and imagery communications connectivity with deploying force headquarters, coalition partners, and support enroute mission planning and rehearsal operations.
- Space-based ISR assets assist the JFC and CJFLCC in the detection, location and identification of threat WMD assets. CJFLCC planning and early entry operations include plans to combat WMD by considering interdiction, direct and indirect attacks, or WMD elimination options.
- A combination of space and high altitude long-loiter radars provide an integrated air picture to the Army battle command system (ABCS) and emerging battle command systems (BCS), that will assist in airspace management and strike operations (de-confliction of fires).
- Space-based detectors and processors provide the ability to focus missile warning and battlespace characterization assets on the JOA with priority of effort to counter threat anti-access operations.
- Ground-based midcourse defense (GMD) detectors and sensors provide missile detection, warning and cuing information.
- Operationally responsive space assets (micro-satellites) are configured and launched to supplement strategic space assets in the areas of communications and ISR. These theater focused systems will provide dedicated support to the JFC and early entry forces. Priority of effort to intra-theater beyond line of sight (BLOS) communications and ISR collection requirements. On board processors, direct down-link, and the ability to dynamically retask these assets supports situational awareness for early entry forces.
- Land component commander requests high altitude long endurance (HALE)-type assets to support planned tactical operations.
- Actions to establish sustained control of the space domain are initiated to support shaping and early entry operations, and deny or disrupt the threat's ability to leverage its access to space-based systems, services, and products. These include threat access to unconventional means of C2 such as internet, satellite telephones, e-mail and television.
- Space operations officers at each echelon ensure the planning and integration of space support operations in support of the land forces.

e. Operational Maneuver from Strategic Distances. During both the *prepare and posture and shaping and entry operations* of a campaign, rapid deployment of ground formations strengthen the JFCs ability to deter conflict, limit its escalation, or preclude early enemy success. Units capable of immediate employment upon arrival diminish an enemy's maneuver options. As the theater matures, forces flow from locations outside the theater with some deploying directly into objective areas while others flow through more traditional staging bases or lodgments (see Figure 2-4).[20]

(1) The joint force and land component rapidly project modular combined arms forces into the JOA. Where possible these mission tailored force packages bypass intermediate staging bases and deploy in combat-ready unit configurations to carefully selected positions of advantage, and initiate operations immediately upon arrival. Priority of effort is to the FCS BCT air deployment to the eastern shore of A-Land to secure oil fields and production facilities, and the intra-theater deployment of divisional elements to C-Land to preclude the enemy from setting

[20] TRADOC Pam 525-3-0, The Army in Joint Operations, p 21.

defenses and conducting access denial operations. As the theater matures, forces flow from outside locations through a combination of direct deployment to objective areas and initial lodgment areas. CJFMCC maintains maritime superiority, continues to expand the sea port of debarkation in west C-Land and expands lines of communication to the east. CJFACC maintains air superiority, conducts strategic and intra-theater lift operations, establishes air exclusion zones, executes counter-air operations, conducts ISR, and air operations to degrade enemy anti-access capabilities. The deputy area air defense commander or the theater area air and missile defense coordinator extend the protection of air and missile defense priorities and ensure the

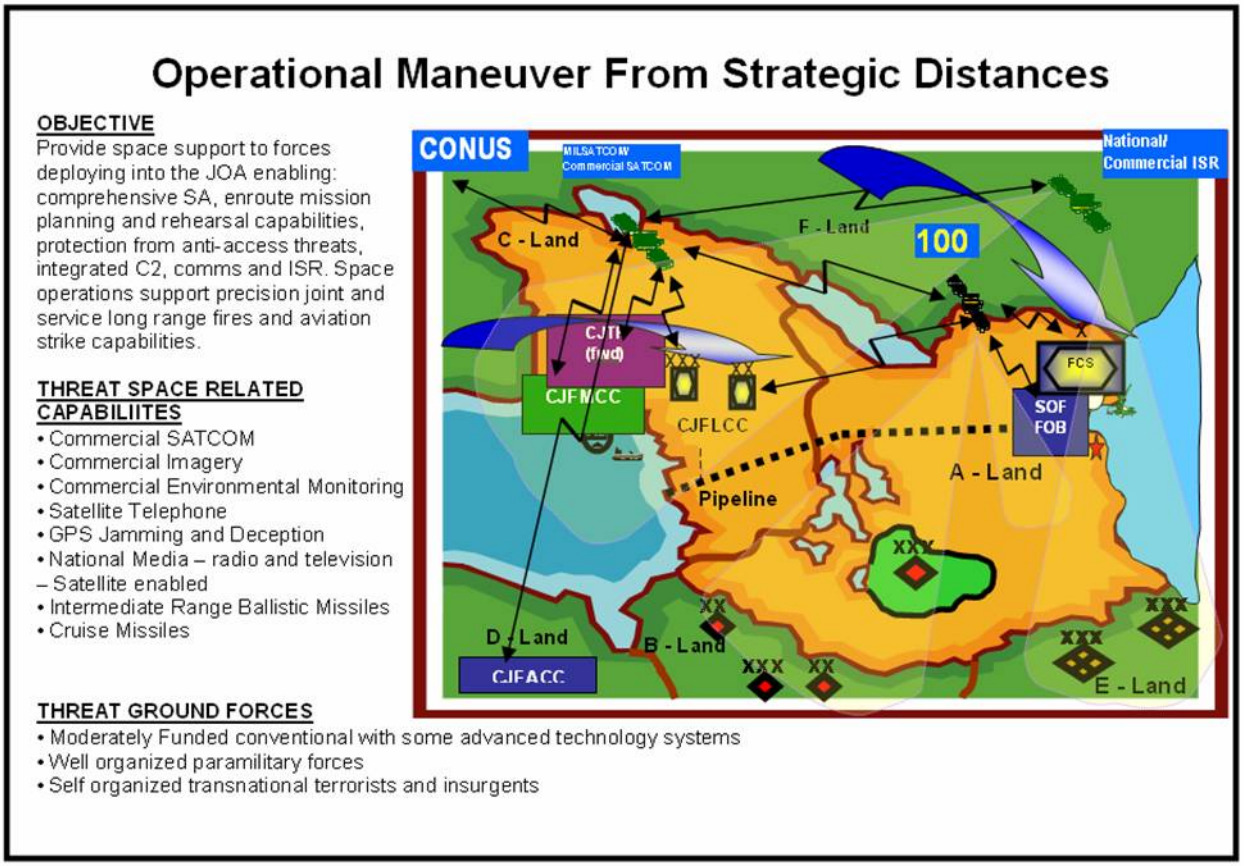

Figure 2-4. Operational Maneuver from Strategic Distances

integration of all required space enablers to obtain early warning and cue air and missile defense systems as the JOA expands. CJFLCC establishes entry points, secures critical infrastructure, and conducts military operations in support of A-Land forces against B-Land conventional forces as well as paramilitary, insurgents and transnational terrorists. Two divisions prepare for Intratheater operational maneuver. JSOTF continues to conduct reconnaissance and cooperative training with coalition military partners. Endstate for the operational maneuver from strategic distance operations:

- CJFMCC established maritime superiority and SPOD fully operational.
- CJTF Forward operational in fixed facilities.

- FCS BCT deployment complete, oil fields and production facilities secure, conducting coordinated operations with A-Land forces.
- CJFLCC (Army corps (-)) entry points established, combat forces in theater, continues to secure critical infrastructure, conducting initial combat operations in support of A-Land forces and combating unconventional forces in area of responsibility.
- CJFACC air operations center and air expeditionary force operational in D-Land, strategic lift 70 percent complete, maintains air superiority, conducting air operations in support of JFC objectives.
- JSOTF forces ICW coalition partner continues reconnaissance and counter insurgency operations.

(2) The space-based systems and operations initiated during the shaping and early entry operations continue to support operational maneuver from strategic distances. Key space-based systems and space operations that enable operational maneuver from strategic distances include:

- Operationally responsive space assets are on orbit and able to provide dedicated support to deploying forces. This expanded set of capabilities results in the reprioritization, allocation, planning, integration and operation of the strategic NTM and operationally responsive space assets supporting the joint forces. The strategic and operational layers of space support expand to support the additional requirements of the deploying forces.
- BLOS satellite communications relays support deployment, enroute mission planning and rehearsal, and battle command on the move.
- Enhanced position, velocity, timing and navigation capabilities aid strategic deployment operations and SOF operations. Precise position, velocity, timing and navigation data enables deploying force mission accomplishment with the accuracy and precision required.
- Terrestrial and space-based systems supporting combat identification (CID), joint blue force situational awareness (JBFSA) and BFT are integrated into the GIG. Tracking and identification systems to support key coalition units are coordinated and activated.
- Direct tasking and down-link of space-based ISR focuses on entry and initial operations areas.
- Dissemination of space-enabled missile warning is tailored to the needs of the expanding force.
- Deployment of tactically responsive, high altitude long endurance systems to support future tactical operations—tactical layer—is initiated. Purpose is to establish a dedicated, persistent layer of communications and ISR support for subsequent Intratheater movement and decisive operations.
- A combination of space and high altitude long-loiter radars provide an integrated air picture to the ABCS and emerging battle command systems, that will assist in airspace management and strike operations (de-confliction of fires).
- Space control operations focus on support for entry and initial operations areas in order to deny or disrupt the enemy's use of available space-based systems for command, control, and communications (C3) and ISR.
- Space operations officers at each echelon continue the planning and integration of space support operations in support of the land forces.

f. Intratheater Operational Maneuver. The future Modular Force executes intratheater operational maneuver to extend the reach of the joint force enabling the JFC to respond to uncertainty, isolate portions of the battlefield, exploit success, and accomplish key campaign objectives. Intratheater operational maneuver can secure positions of advantage to destroy key capabilities and forces, extend tactical reach, achieve surprise, accelerate the advance of the overall force, and block enemy forces (see Figure 2-5).[21]

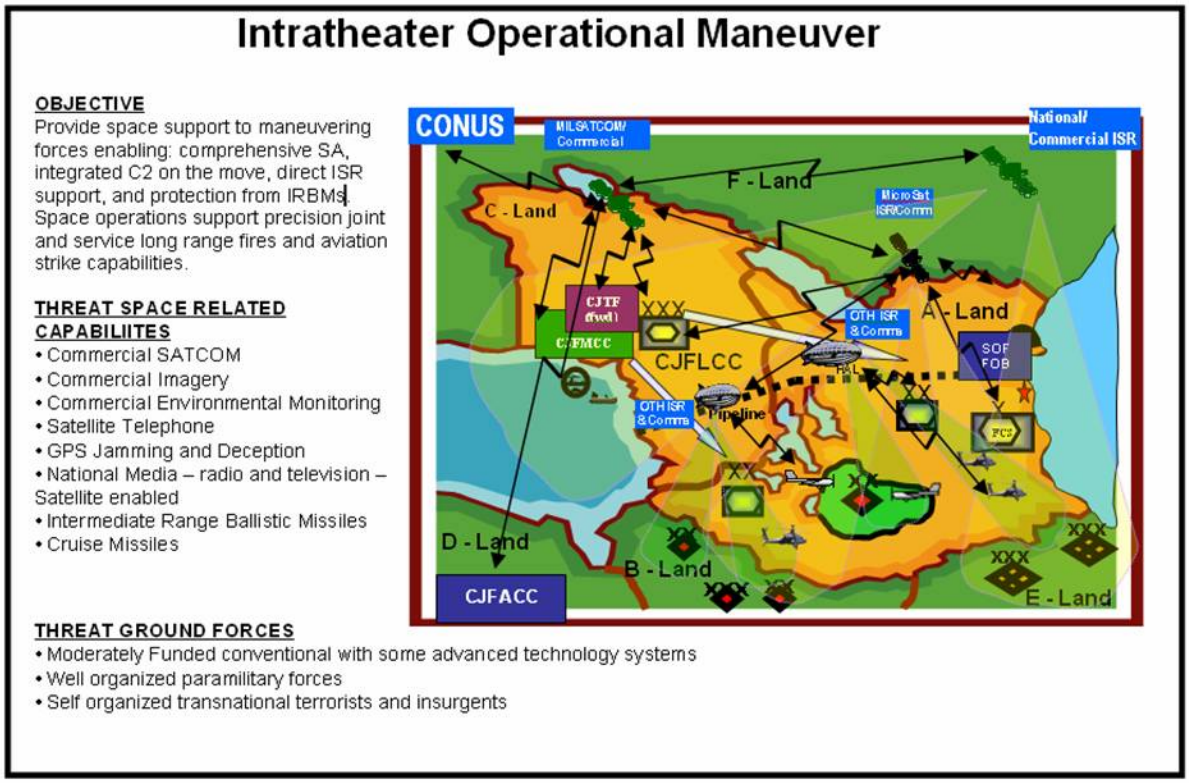

Figure 2-5. Intratheater Operational Maneuver

(1) The CJFLCC executes the intratheater operational maneuver of two tailored division forces for the purpose of blocking enemy force and preventing them from advancing on the capital city. The division in the north, main effort, uses a combination of intratheater lift and ground maneuver to secure blocking positions and prepare to attack of the B-Land corps. The division in the south, supporting effort, executes ground maneuver to secure blocking positions that prevent enemy forces from reinforcing the B-Land corps. Extended range unmanned aircraft systems (UAS) and CJFLCC aviation assets combined with joint fires support the maneuver of both divisions. Theater air and missile defense assets protect maneuvering forces and provide early warning throughout the JOA. The CJFACC provides joint fire support and intratheater lift assets. Endstate for this operation is:

- CJFLCC divisions in objective areas blocking the advance of B-Land forces on the capital city. The division in the north preparing to attack the B-Land corps and restore the

[21] TRADOC Pam 525-3-0, The Army in Joint Operations, p 23.

territorial boundary of A-Land. The division in the south preventing the reinforcement of the B-Land corps. The FCS BCT securing the oil fields and production infrastructure.

- CJFACC completes the intratheater lift of the division in the north, maintains air superiority throughout the JOA and provides joint fires.

(2) The space-based systems and operations initiated during previous operations continue to support intratheater operational maneuver and sustainment. Key space-based systems and space operations that enable intratheater operational maneuver include:

- NTM and commercial imagery support for the planning and execution of the operation. Areas of interest include forward airfields, objective areas, routes, choke points, and enemy locations. The position and activity of E-Land forces is a high priority.
- Detailed topographic data combined with hyper- and multi-spectral imagery products support maneuver planning and enable forces to avoid obstacles and terrain that will not support high speed maneuver.
- Operationally responsive space assets are on orbit and provide dedicated communications and ISR support to the JFC and staff.
- The earlier launch of tactically responsive, high altitude long endurance systems provide each division dedicated and persistent communications and ISR. The systems enable the over the horizon and BLOS control and command data links for both unmanned and manned reconnaissance, surveillance, and target acquisition (RSTA), battlefield surveillance brigade, and attack aviation operations.
- Similarly, these systems enable the integration of communications between terrestrial systems operating BLOS and in non-contiguous areas. Commanders are able to task and retask dedicated sensors and platforms to ensure local SA and satisfy information requirements for current operations and the planning for decisive operations.
- Terrestrial and space-based systems supporting combat identification, JBFTSA and BFT are integrated into the GIG and focused on SA for maneuver forces.
- Dissemination of space-enabled missile warning is tailored to the needs of the expanding force.
- A combination of space and high altitude long-loiter radars provide an integrated air picture to the ABCS and emerging BCS, that will assist in airspace management and strike operations (de-confliction of fires).
- Space control operations focus on support for denying the enemy the ability to use space-based systems to monitor and track JTF operations and forces.
- Enhanced position, velocity, timing and navigation aids in precision strike operations and supports both ground and air maneuver. Precise timing data enables the seamless entry and synchronization of command, control, communications and computer systems.
- Space operations officers at each echelon continue the planning and integration of space support operations in support of the land forces.

g. Decisive Maneuver. The future Modular Force executes decisive maneuver to achieve the operational tasks assigned by the JFC. It is characterized by simultaneous, distributed

operations; direct attack of enemy decisive points and centers of gravity and controlled operational tempo (see Figure 2-6).[22]

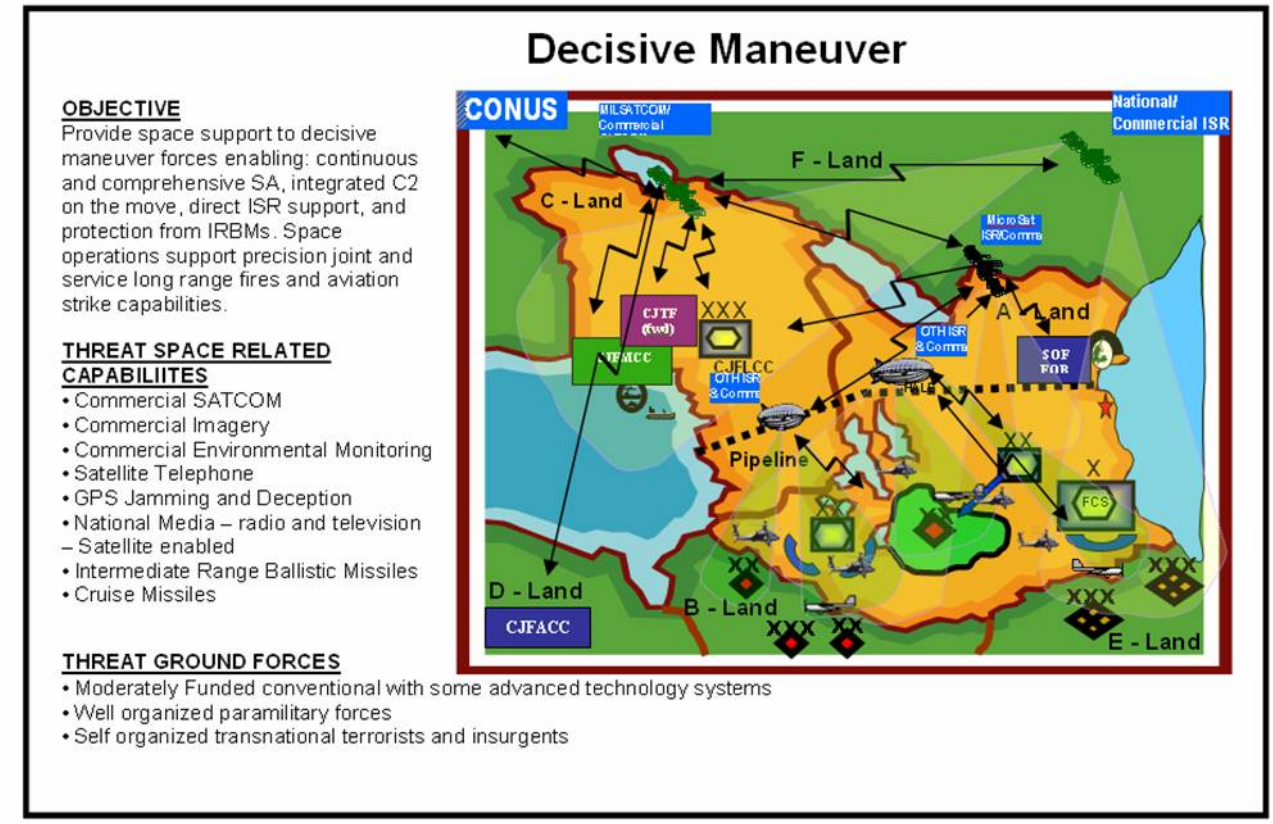

Figure 2-6. Decisive Maneuver

(1) The CJFLCC executes decisive, simultaneous, distributed operations to conduct a direct attack of enemy forces occupying A-Land (main effort) and defensive operations to ensure the security of attacking forces and prevent further cross border operations by B-Land (supporting effort). The FCS BCT moves to prevent any involvement by E-Land and secure the east coast approaches to the capital city. CJFMCC maintains LOCs security and conducts operations to prevent paramilitary force disruption of sustainment operations. Extended range UAS and CJFLCC aviation assets combined with joint fires continue support the maneuver forces. The CJFACC maintains air superiority, provides joint fire support and conducts reconnaissance operations to monitor threat force movement. Endstate for this operation is:

- CJFLCC divisions destroy B-Land forces and restore the territorial integrity of A-Land. E-Land forces are prevented from any cross border operations. Paramilitary forces are incapable of conducting operations above team level. The capital city, its domestic infrastructure and government are intact and coalition forces are conducting security operations throughout the eastern provinces of A-Land.

[22] TRADOC Pam 525-3-0, The Army in Joint Operations, pgs 24-26.

- CJFACC maintains air superiority throughout the JOA and provides joint fires as required.

(2) The space-based systems and operations initiated during previous operations continue to support decisive maneuver operations. Key space-based systems and space operations that enable decisive maneuver include:

- NTM and commercial imagery support the execution of the operation. Areas of interest include enemy concentration, the position and activity of E-Land forces.
- Detailed topographic data combined with hyper- and multi-spectral imagery products support tactical maneuver, out of contact, to positions of advantage for blocking forces.
- Operationally responsive space assets are on orbit and provide dedicated SA, communications and ISR support to the JFC and staff.
- HALE systems under the control of each division provide dedicated and persistent communications and ISR. These systems enable distributed operations in complex terrain, provide uninterrupted C2 of BLOS units and platforms and support the integration of joint fires. Commanders are able to task and retask dedicated sensors and platforms to ensure local SA and quickly satisfy information requirements for the conduct of the decisive operation.
- Terrestrial and space-based systems supporting combat identification, joint blue force tracking and situational awareness and blue force tracking are integrated into the GIG and focused on SA for maneuver forces.
- Space-based early warning systems detect a ballistic missile launch, provide missile warning to affected forces, provide track engagement data to air defense systems, and cue surveillance assets to the launch area.
- Space-based radar, cued by early warning systems, track the launcher system to its hide position and cross cue other collection assets to identify the target. A combination of space and high altitude long-loiter radars provide an integrated air picture to the ABCS and emerging BCS, that assist in airspace management and strike operations (de-confliction of fires).
- Operationally responsive space assets provide over the horizon and beyond line of sight command data links and in-flight updates to joint strike assets enabling the destruction of the launcher system.
- Space control operations deny the enemy the ability to use space-based systems to command and control or coordinate its units isolating them from their higher headquarters. These operations also protect the vital communications and ISR links necessary to support the force.
- Enhanced position, velocity, timing and navigation data aids in the precision fires and strike operations supporting the maneuver force, and supports both ground and air maneuver.
- Space operations officers at each echelon continue the integration of space support operations and ensure land forces optimize the space-based enablers available to them.

h. Concurrent and Subsequent Stability Operations. The future Modular Force will conduct stability operations throughout the campaign, often simultaneously with major combat operations. Stability operations (see Figure 2-7) present significantly different operational requirements to the future Modular Force. They place a high premium on multifunctional units and Soldiers, involve dynamic mission tailoring, integrate and synchronize the actions of joint, interagency, intergovernmental, and multinational entities. At the core of this challenge is the

requirement to maintain continuous pressure against hostile elements, such as terrorists or insurgents, to deny them freedom of movement and action over an extended period of time.[23]

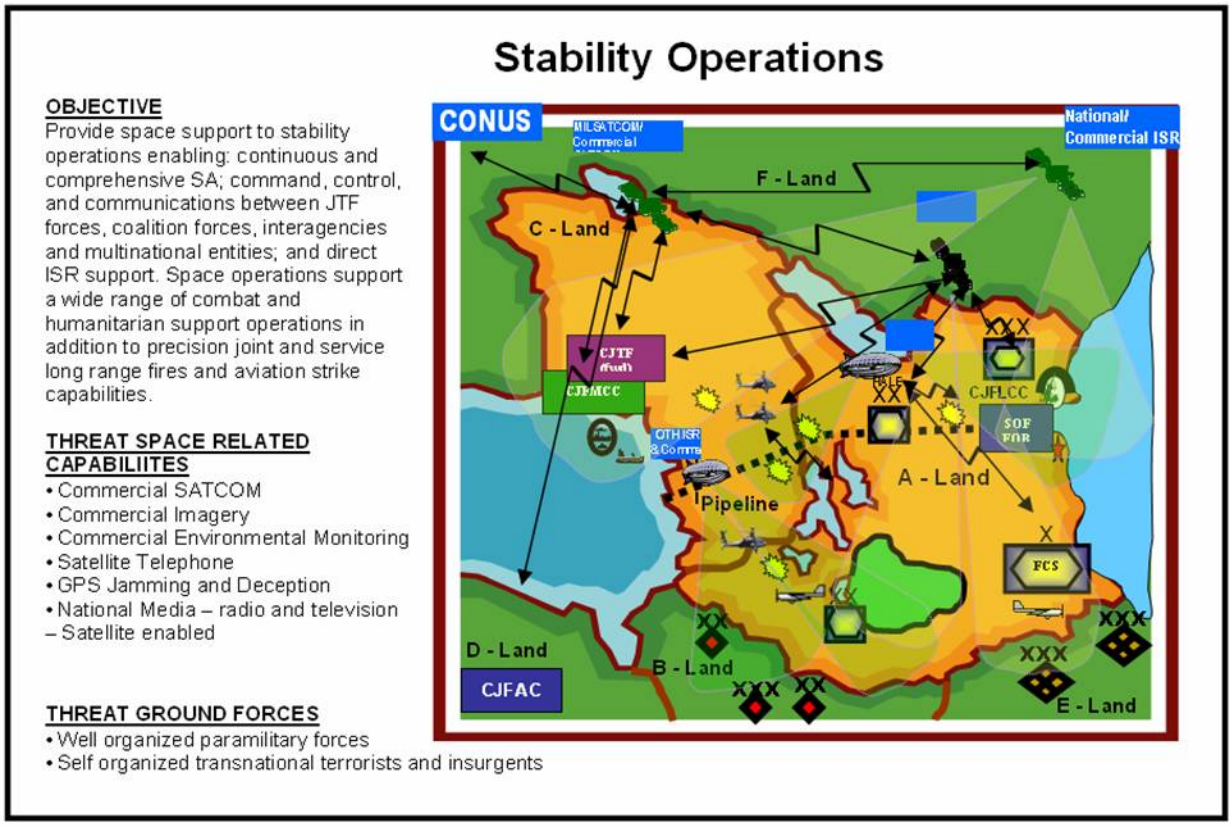

Figure 2-7. Stability Operations

(1) The success of decisive maneuver operations causes the remaining team-sized paramilitary forces to withdraw to the more restricted portions of the JOA. These forces initiate ambush and improvised attacks using remote controlled devices on the lines of communication. Paramilitary forces target oil pipeline pumping stations and above ground segments. Insurgents operating in and around the capital city conduct attacks against A-Land government and municipal facilities in an effort to undermine the government. In a coordinated effort the JTF, in conjunction with its coalition partner, multinational entities and interagencies, conduct stability operations throughout the JOA. The CJFLCC conducts counter insurgency operations in and around the capital city with mission tailored forces. These forces team with national and local civil authorities to ensure synchronization of action. One division using a heavy brigade combat team conducts security operations to protect the oil pipeline. CJFMCC continues LOC security and operations to defeat the remaining paramilitary forces. CJFACC conducts intratheater lift operations to support stability and humanitarian operations, conducts reconnaissance, and provides joint fire support. The deputy area air defense commander or the theater area air and missile defense coordinator ensure the continued protection of CJFLCC and CJFACC air and missile defense priorities. Endstate for this operation is:

[23] TRADOC Pam 525-3-0, The Army in Joint Operations, pg 27.

- CJFLCC and coalition partner reduce the insurgent threat to a level civil authorities are able to manage. The remaining paramilitary forces are defeated and the oil pipeline and production infrastructure is intact. Local security missions are being transferred to coalition units.
- CJFMCC defeats remaining paramilitary forces operating vicinity the LOC and the LOC are secure.
- CJFACC continues intratheater lift operations as required and begins the transition to coalition and civil operations and control.
- The legitimate government of A-Land is intact and fully functional.
- Heavy BCT (HBCT) and two combined arms battalions maintains pressure.

(2) The space-based systems and operations initiated during previous operations continue to support stability operations. Key space-based systems and operations that enable stability operations include:

- NTM and dedicated operational or tactical space systems are linked directly to the units conducting counter insurgency and paramilitary operations.
- Commercial (unclassified) products and services support multinational and interagency actions.
- Hyper- and multi-spectral imagery products provide change detection information in support of pipeline and production facility surveillance operations, and detection of improvised explosive devices.
- Space-based radar supports the tracking of small and widely dispersed threat forces.
- A combination of space and high altitude long-loiter radars provide an integrated air picture to the ABCS and emerging BCS enhancing stability operations airspace management. This supports and includes military, civil and commercial airspace management.
- Overhead non-infrared imaging systems provide information on events in the JOA and cue other ISR and JTF assets.
- HALE tactical platforms and sensors continue to provide dedicated, tailored communications and sensor packages in support of widely dispersed, non-contiguous operations.
- A combination of space and high altitude long-loiter radars provide an integrated air picture to the ABCS and emerging BCS, that assist in airspace management and sustainment operations.
- Space operations officers extend their advice and support to interagency stability operations.

i. Distributed Maneuver Support and Sustainment. Distributed maneuver support and sustainment (see Figure 2-8) are integrated throughout all phases of future Modular Force operations. Collectively they provide a significant portion of the backbone and infrastructure enabling the success of the future Modular Force. Integrated maneuver supports helps shape the operational environment and combines a variety of functional capabilities such as military police; engineers; aviation; and chemical, biological, radiological, and nuclear (CBRN) assets to accomplish the following tasks: understand the operational environment, enable theater access, provide assured mobility, deny enemy freedom of action, enable force protection and security, engage and control populations, and neutralize hazards and restore the environment. Maneuver sustainment focuses on the continuous, precise, and assured provisioning of the deployed Army

and supported sister Service forces. To achieve this, sustainment must flow through a fully integrated national-to-theater-to-tactical distribution system. Continuous sustainment presumes global resource management and depends upon a unified joint theater and global logistics C2 structure.[24]

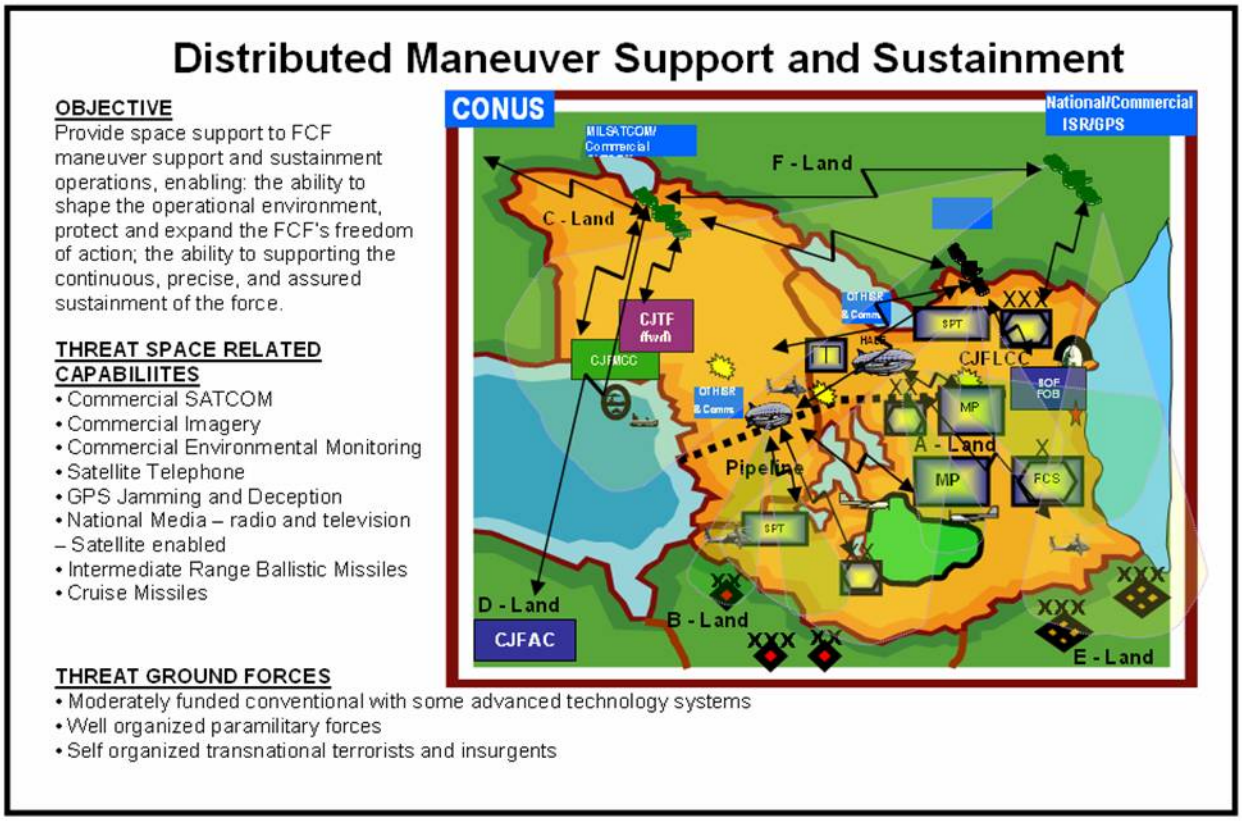

Figure 2-8. Distributed Maneuver Support and Sustainment

(1) The CJFLCC conducts decisive operations with two divisions and one FCS BCT. Although one division is designated the main effort, maneuver support and sustainment forces play significant roles in shaping and controlling the operational environment while ensuring the continuous sustainment of the force.

(a) Military police (MP) units conduct maneuver and mobility support and area security operations, ensuring the smooth flow of forces and resources along the lines of communication**,** and internment and resettlement operations to support refugee and displaced persons to minimize non-combatant interference with ongoing and future operations. These operations are closely coordinated with coalition and multinational partners, government agencies and supporting nongovernmental organizations.

(b) Additionally, MPs perform law and order operations partnering with host nation and multinational organizations to establish a stable operating environment, area security operations to protect critical assets, and police intelligence operations in order to provide

[24] TRADOC Pam 525-3-0, The Army in Joint Operations, pgs 30-32.

operational commanders with critical criminal intelligence that impacts operations traffic control and circulation operations ensuring the smooth flow of forces and resources along the LOCs. Engineer units maintain the lines of communication, enhance mobility in complex terrain, monitor the status of critical infrastructure and assist coalition government in the provision, repair, and reconstruction of essential services. Aviation units support reconnaissance and surveillance operations in non-contiguous areas of the operational environment, conduct operational and sustainment lift operations, and when necessary conduct attack operations to support the protection of combat, maneuver support and sustainment forces.

(c) CBRN units conduct reconnaissance and surveillance operations to identify the full range of CBRN contamination, to include weapons research, development, production, storage, and delivery systems, as well as, toxic industrial materials within the JOA. Maneuver sustainment is critical to the success of combat operations.

(d) Sustainment units and centers monitor consumption and status of units and push tailored packages directly to consumers. This responsive replenishment and repair logistical network maintains the smallest feasible deployed logistical footprint, leveraging the theater and global logistics C2 structures.

(2) Space-based systems and operations ongoing in each phase of the JTF operations also provide support to maneuver support and sustainment operations. Key space-based systems and operations that enable maneuver support and sustainment include:

- NTM and commercial imagery contribute significantly to understanding the operational environment and enables the force to conduct assessments, detailed mission planning and prioritization for operations such as force mobility, lines of communication monitoring and infrastructure maintenance, airfield, port and rail assessments, refugee and humanitarian support operations.
- Space-based radar enables the monitoring of traffic flow and concentrations on the major lines of communication.
- Detailed topographic data combined with hyper- and multi-spectral imagery products enable maneuver support forces to monitor and assess the impact of events such as industrial chemical spills, ruptures or disruptions in oil and gas pipelines, and the identification of potential remote ambush locations.
- Operationally responsive space assets are on orbit and provide SA, communications and ISR support.
- HALE systems enable the links to the GIG and logistics C2 structure enabling the exchange of critical maneuver support and logistical information for units operating BLOS and platforms operating over the horizon.
- Accurate BFT data and enhanced PNT navigational aids provide sustainment units the same level of situational understanding as the formations they support enabling rapid, precise and assured logistical support.
- A combination of space and high altitude long-loiter radars provide an integrated air picture to the ABCS and emerging sustainment and BCS enhancing maneuver support and sustainment operations airspace management.

- Space-based early warning systems detect a ballistic missile launch and provide missile warning to affected forces.

j. Network-Enabled Battle Command. Network-enabled battle command is the keystone of future Modular Force operations (see Figure 2-9). Battle command is an art with the commander at the focal point of decision-making and execution of combat operations.[25] Command requires an integrated view of the operational environment that combines knowledge of self, knowledge of the environment, and knowledge of the enemy in order to plan, decide and execute future Modular Force operations. The network provides the critical infrastructure that ties all components of the joint interagency, intergovernmental, and multinational force together. It allows ready access and sharing of information from and between national, component, and multi-national partners.[26]

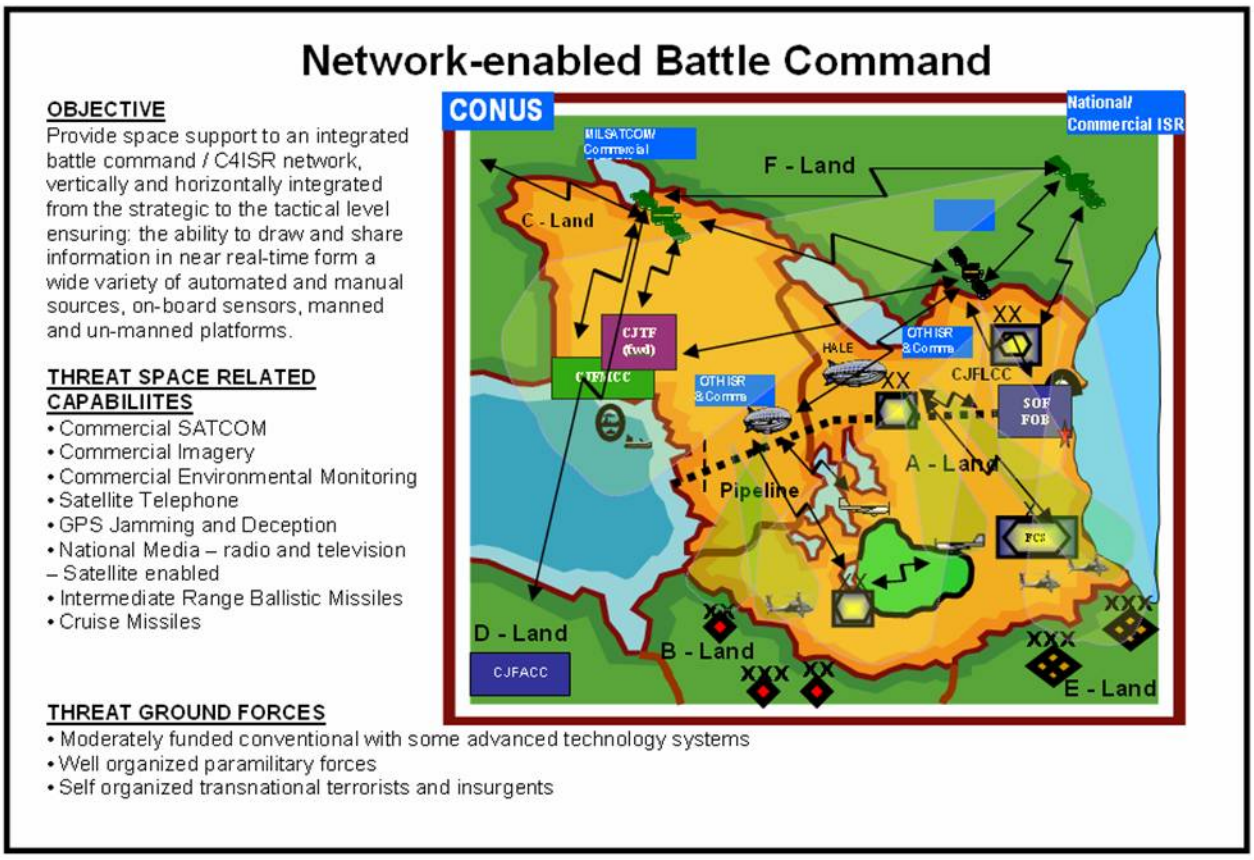

Figure 2-9. Network-enabled Battle Command

(1) More than any other single entity, network-enabled battle command is the life blood of the future Modular Force. The network expands as the forces flow into the JOA and enables both inter and intratheater communications. The network allows commanders to draw from other commanders, joint resources, and home stations, in addition to live and virtual staffs. To enable this ubiquitous future Modular Force network, a layering of platforms, sensors,

[25] TRADOC Pam 525-3-3, Battle Command Functional Concept, dated 17 Nov 05, pg 11.
[26] Ibid, pg 15.

processors, and relays is required. The JFC will expand the existing strategic network with operationally responsive space assets such as micro satellites in specific orbits with tailored sensors and payload packages designed to meet the needs of the operational force. These resources enable key portions of the operation such as initial ISR operations, planning and executing shaping and entry operations with the associated enroute updates and rehearsals.

(2) Operationally responsive space assets are key enablers of the operational maneuver of forces over strategic distances. As the CJFLCC and tactical forces flow into the JOA, the networks, and the demands on it, continue to grow. HALE platforms in the high altitude region are dedicated to tactical commanders. These assets link and provide positive C2 of operations such as: over-the-horizon and BLOS reconnaissance and surveillance, and attack operations; long range maneuver in difficult and restricted terrain; non-contiguous operations over extended distances. It is these assets that bring the connectivity of the network to the "last tactical mile."

(3) Space-based systems and operations that are key components of network-enabled battle command include:

- National and DOD satellite communications relays.
- Commercial satellite communications relays.
- National technical means satellites and systems. This includes the full complement of ISR systems.
- Commercial imagery satellites and systems.
- Space based radar satellites and systems.
- Weather satellites.
- GPS satellites and systems.
- Missile warning and non-infrared imaging satellites and systems.
- The ability to develop and configure platform payloads for the strategic, operational, and tactical needs of the force.
- Space surveillance systems and the systems able to deny, disrupt or degrade threat access to space services.
- JBFTSA systems.
- On-board processors combined with the ability to dynamically retask sensors and payloads, and direct down-link the information.

2-6. Summary. The success of the future Modular Force depends significantly upon the domain of space, the systems in space, and the operations that take place in space. Our dependence on this joint domain, and the facilities, personnel, organizations and materiel that bring the power of space to the warfighter cannot be understated. Space is an integral component of future Modular Force operations and the capabilities that enable the application of space power must be viewed in the larger construct of joint operations. Army space operations depend on the successful Army and joint transformation and exploitation of the space domain.

Chapter 3.
Required Capabilities.

3-1. Introduction.

a. The Army's functional concepts provide both explicit and implicit descriptions of the space-based and space-enabled functions necessary to achieve the objective state of the future Modular Force. These capabilities are not ends unto themselves but integral components of a larger capability goal. The influence of a single space-enabler is not confined to a single functional concept but often enables or effects one or more of the functional concepts and multiple proponent areas of responsibility. Because of this, when space-based and space-enabled capabilities are applied simultaneously, they have the potential of creating a synergy no commander or military force has ever enjoyed.

b. For the purpose of this CCP and to avoid confusion regarding the use of the terms "space-enabler" or "space-enabled" the following clarification is provided. Chapter 2, paragraph 2-3 h. (2) describes "Space Enablers" as military or civilian personnel who perform unique space related tasks or functions. This is consistent with the Army Space Cadre definition approved by the HQDA G3/5/7. The use of capital letters denotes the description of personnel with unique skills. When referring to required capabilities or functions that are either based in the region of space, or enabled by systems in space, this CCP will use lower care letters and hyphenate the terms.

c. This listing of required capabilities should be interpreted as optimum capabilities for the 2015-2024 timeframe. The Army space operations required capabilities listing is presented in relationship to the Army functional concepts. The listing is not all inclusive and will be further refined and developed as the Army space operations concept emerges and as the Joint Concepts Integration Development System (JCIDS) analysis is executed. Technological and threat advances may also drive changes to the listed space related capability requirements

3-2. Battle Command Space Enabled Capabilities.

a. The Battle Command functional concept provides a visualization of how Army future Modular Force commanders will exercise command and control of Army operations in a joint, interagency, intergovernmental, and multinational environment. The battle command function is a blend of the cognitive and the technical. Central to the technical component is the concept of a single, integrated Army battle command system enabled by an agile, ubiquitous communications network. It is achieved by combining the art of well prepared leaders with the enabling science and technical systems of the future Modular Force. Many of the key ideas within the Battle Command functional concept relate to or are enabled by space-based systems.[27] These include:

- Collaborative planning; accelerated military decision making process (MDMP).
- Information and decision superiority.
- A single, integrated Army battle command system.

[27] TP 525-3-3 Battle Command Functional Concept 2015-2024, Coordinating Draft, 15 August 2005, pgs. 8-12.

- Interagency and multinational interoperability and integration.
- Horizontal and vertical fusion.
- An agile, ubiquitous communications network from space to mud.

b. Full achievement of the capabilities described in the Battle Command functional concept will require the integration of a wide range of DOTMLPF solutions. The following space-based and space-enabled capabilities may contribute to achieving the Army's future Modular Force battle command capability requirements:

- Ability to provide pervasive, extended range, inter-theater and intra-theater global BLOS communications relay capability and broadcast services between non-contiguous forces at the halt, at the quick halt, and on the move in all operational environments and conditions. Communications include data, voice, imagery, and video. (Company and team to Army Force (ARFOR) and CJFLCC level.)
- Ability to provide space links and processors enabling the JBFT SA components of joint battle command (JBC) worldwide in all operational environments and conditions. (Soldier platform through ARFOR and CJFLCC.)
- Ability to provide accurate and reliable timing data worldwide for synchronization of the network and its supporting elements. (Company and team to ARFOR and CJFLCC level.)
- Ability to provide the space and high altitude long-loiter platforms, links and processors to enable the fusion, sharing, push, pull and update information from a wide variety of sensors and sources in all domains, access that information simultaneously from multiple non-contiguous locations in order to provide timely, actionable, and relevant information in support of the planning, execution and assessment operations of the joint force and component commanders. (Soldier platform through ARFOR and CJFLCC.)
- Ability to establish early and sustained control of the space domain to enhance joint-integrated information operations in all operational environments and conditions. (Division through ARFOR and CJFLCC level.)
- Ability to provide an enhanced, fully networked, space-based theater and global missile warning, detection, processing and dissemination system in all operational environments and conditions. (Company and team to ARFOR and CJFLCC level.)
- Ability to position, cue, cross-cue, task and dynamically re-task netted layers of redundant space, air, and surface sensors and relays. (BCT to ARFOR and CJFLCC level.)
- Ability to conduct space combat support operations and planning for an ASCC, corps, or division to include its roles as CJFLCC or JTF. Ability to reach back to space knowledge center and national agencies, ability to reach outside DOD to rapidly obtain space related information in all operational environments and conditions. (Division through ARFOR and CJFLCC level.)
- Ability to provide high-resolution geospatial data and comprehensive environmental information, including real time collection, in order to visualize and describe the operational environment and assess the impact of terrain, atmosphere, weather, and space variables in all operational environments and conditions. (Company and team to ARFOR and CJFLCC level.)

3-3. See Space Enabled Capabilities.

a. The See function describes how the future Modular Force will acquire and generate knowledge of itself, its opponent and the operational environment. Without the ability to see, the

Army is incapable of creating a force capable of seeing first, understanding first, acting first and finishing decisively.

b. Full achievement of the capabilities described in the See functional concept will require the integration of a wide range of DOTMLPF solutions. The following space-based and space-enabled capabilities may contribute to achieving the Army's future Modular Force see capability requirements:

- Ability to deny the enemy access to communications; ability to deny the enemy access to information such as satellite television; ability to deny the enemy access to unconventional means of C2 such as internet, satellite telephones, e-mail, television. (Division through ARFOR and CJFLCC level.)
- Ability to provide space-enabled, persistent imagery and signal intelligence (SIGINT) surveillance; ability to enable the rapid collection and dissemination of intelligence; ability to enable the rapid reallocation and re-tasking of surveillance assets; ability to cross- link information and cue complementary aerial systems such as the warrior UAS. (Company and team to ARFOR and CJFLCC level.)
- Ability to enable autonomous control and information transfer, over the horizon and beyond line of sight, with UAS RSTA missions. (Soldier platform through ARFOR and CJFLCC.)
- Ability to rapidly downlink, process, and analyze national and commercial imagery from archive and databases in theater. Ability to rapidly obtain the needed data and transfer to the proper location in such a way as to avoid information overload. Ability to cross link information and cue complementary aerial systems such as the warrior UAS. (Company and team to ARFOR and CJFLCC level.)
- Ability to rapidly identify the locations of friendly and enemy forces; ability to rapidly assess effects to friendly systems and determine if it is the result of friendly or enemy action; ability to identify enemy application of asymmetric weapons or efforts; ability to exploit national and strategic systems for tactical needs; ability to conduct long-loiter surveillance. (Company and Team to ARFOR and CJFLCC level.)
- Ability to monitor weather and environment remotely. (Company and team to ARFOR and CJFLCC level.)
- Ability to protect satellite communications (SATCOM) from deliberate or accidental interference; ability to protect the integrity of data while in transit in all operational environments and conditions. (Combined Arms Battalion (CAB) to ARFOR and CJFLCC level.)

3-4. Move Space Enabled Capabilities.

a. The Move function focuses on strategic force projection and operational agility in support of joint campaign objectives. Operational maneuver from strategic distances, and achievement of the deploy equals employ paradigm are heavily reliant on accurate situational understanding, reach, and the ability to execute enroute mission planning and rehearsal.

b. Although full achievement of the capabilities described in the Move functional concept will require the integration of a wide range of DOTMLPF solutions, the following space-based

and space-enabled capabilities may contribute to achieving the capabilities described in the Move functional concept:

- Ability to support high-speed dispersed maneuver for positional advantage and enhanced fires through non-line of sight (NLOS) and BLOS situational awareness by providing discrete imaging and targeting data, detection and characterization of obstacles, and NBC contaminated areas. (Company and team to ARFOR and CJFLCC level.)
- Ability to provide accurate and timely PNT and accurate terrain data in all operational environments and conditions. (Soldier platform through ARFOR and CJFLCC.)
- Ability to provide seamless in-transit visibility of sustainment assets. (Soldier platform through ARFOR and CJFLCC.)

3-5. Strike Space Enabled Capabilities.

a. The Strike function addresses future Modular Force fires and effects at the strategic, operational and tactical levels. The concept explicitly describes "…routine access to space at all levels…," as a required capability. This access provides near real-time situational awareness and understanding, enables precision strike operations, and is equally applicable to both lethal and non-lethal effects.

b. Although full achievement of the capabilities described in the Strike functional concept will require the integration of a wide range of DOTMLPF solutions, the following space-based and space-enabled capabilities may contribute to achieving the Army's future Modular Force strike capability requirements:

- Ability to provide routine and unlimited access to dedicated, persistent space assets at all levels of command in support of strike operations to include: space support to an integrated worldwide joint C4ISR network supporting C2, ISR, and SA functions and processes. (CAB to ARFOR and CJFLCC level.)
- Ability to provide a continuously updated collaborative information environment to support strike operations. (Soldier platform through ARFOR and CJFLCC.)
- Ability to detect, deny, and disrupt adversary attempts to conduct anti-satellite operations. (Division through ARFOR and CJFLCC level.)
- Ability to provide on demand access to space and high altitude C2, ISR, weather, PNT, and early warning information in all operational environments and conditions. Ability to rapidly and precisely determine physical locations in three dimensions. (CAB to ARFOR and CJFLCC level.)
- Ability to provide improved real-time, or near-real-time space based ISR, on-board sensor processing and direct down link to supported ground systems. Ability to dynamically task and re-task space and high altitude long-loiter assets in support of JFC objectives. (BCT to ARFOR and CJFLCC.)
- Ability to support extended range aviation operations with secure over the horizon and beyond line of sight communications, ISR and control data links that provide: weather forecasting, terrain and infrastructure updates to include imagery support for enroute mission planning and rehearsal, and enemy situation updates in the presence of jamming and counter measures. (Soldier platform through ARFOR and CJFLCC.)

- Ability to dynamically re-task aviation missions. Over the horizon and BLOS A2C2 and airspace management. (Soldier platform to ARFOR and JFCC level.)
- Ability to conduct over the horizon and BLOS autonomous UAS and aviation RSTA missions. (Soldier platform through ARFOR and CJFLCC.)
- Ability to provide tailored payloads to augment and provide surge or replacement capabilities for high demand space-enabled capabilities. (Division to ARFOR and CJFLCC levels.)
- Ability to provide an improved space-based technical means to detect, locate and ID enemy forces and efforts. (Division to ARFOR and CJFLCC levels.)
- Ability to facilitate the use of non-lethal effects in order to deny, disrupt, or degrade adversary access to the effects of space-based systems. (Division to ARFOR and CJFLCC levels.)
- Ability to provide full spectrum dominance of space, to include unrestricted access to space-based communications, ISR, weather terrain and environmental monitoring (WTEM), PNT, and the ability to deny these options to the enemy at the time and place of our choosing. (Division to ARFOR and CJFLCC levels.)
- Ability to employ space as a tool to achieve and maintain information superiority; Ability to exploit space ISR capabilities in support of IO and deception. (BCT to ARFOR and CJFLCC.)
- Ability to conduct offensive space control negation operations; ability to plan and execute space control operations in a timely manner; ability to execute space control operations in support of a coordinated IO campaign. (Division to ARFOR and CJFLCC levels.)
- Ability to employ advanced space control technologies space based radar, space-based SIGINT, space-based jamming for tactical and civil communication systems. (CAB to ARFOR and CJFLCC level.)

3- 6. Protect Space Enabled Capabilities.

a. The Protect function describes how the future Modular Force will protect people, physical assets and information against the full spectrum of threats. This concept also explicitly describes the function of protect taking place in space. Each of the seven enabling tasks contained in the Protect concept: detect, assess, warn, prevent, deter, defend, and respond are enhanced by space-based systems and enablers.

b. Although full achievement of the capabilities described in the Protect functional concept will require the integration of a wide range of DOTMLPF solutions, the following space-based and space-enabled capabilities may contribute to achieving the Army's future Modular Force protect capability requirements:

- Ability to detect missile launches from space in order to cue ballistic missile defense (BMD radar), provide missile warning to the force, provide cuing information for tracking and counter strike operations. (BCT to ARFOR and CJFLCC.)
- Ability to exploit hyper-spectral and multi-spectral imagery in a rapid matter to detect and defeat improved camouflage and obscurants, the presence of biological or chemical agents, and other signs of tampering, sabotage, or enemy presence. Provide detection of improvised explosive devices (IED), unexploded ordnance (UXO), and non-explosive obstacles with change

detection capability. Provide urban environment detection capabilities to identify threats based on civil activities. (CAB to ARFOR and CJFLCC level.)

- Ability to deter, warn, and if necessary, defend against enemy attack; assuring that hostile forces cannot prevent our own use of space; ability to enhance operations of U.S. and allied forces ensuring our ability to conduct military and intelligence space-related activities. (Division to ARFOR and CJFLCC levels.)
- Ability to provide dedicated, persistent and redundant space support for the protect functions of: detect, assess, warn, prevent, deter, defend and respond. Ability to detect jamming operations conducted as part of the anti-access efforts. (CAB to ARFOR and CJFLCC level.)

3-7. Sustain Space Enabled Capabilities.

a. The Sustain function describes future Modular Force logistics as a single, coherent system that senses and interprets the operational environment and responds through network capabilities. The ability to execute a sustainment system from the source of support, generally CONUS, to the point of effect, generally an organization deployed in a theater of operation is heavily dependent on space-based and enabled systems.

b. Although full achievement of the capabilities described in the Sustain functional concept will require the integration of a wide range of DOTMLPF solutions, the following space-based and space-enabled capabilities may contribute to achieving the capabilities described in the Sustain functional concept:

- Ability to provide space links to facilitate transmission of data such as position, operational status, equipment or aircraft conditions, and maintenance diagnostics and prognostics anywhere in the JOA. Ability to maintain in-transit visibility of all supporting logistical activities, supplies, and services. (Soldier platform through ARFOR and CJFLCC.)
- Ability to provide a secure, pervasive, logistics C2 and support infrastructure emphasizing speed, precision, accuracy, visibility, and centralized management from Soldier platform to CONUS through a logistics COP to include: logistics requirements, supply distribution and management, reach back to industry and knowledge centers, passive radio frequency identification (RFID) tags, Soldier health status, petroleum and fuel supply, ability to support a logistics COP, proactive and anticipatory maintenance, munitions, water and logistics preparation of the battlefield. (Soldier Platform through ARFOR and CJFLCC.)
- Ability to conduct space-based route reconnaissance and convoy monitoring. (CAB to ARFOR and CJFLCC level.)

Chapter 4.
Bridging Current to Future Capabilities.

4-1 Introduction.

a. This chapter identifies the space enabled capabilities required by the future Modular Force and describes the systems that enable the achievement of those capabilities. Chapter 2 of this CCP described the plan for Army space operations as "being underpinned by a layered infrastructure of doctrine, organization, training, materiel, leadership and education, personnel and facilities" [28] and this infrastructure is evident in the enablers. The description of the enablers is organized by Army functional concept area and divided into three timeframes. Figure 4-1, Capability Development Blocks, represents the incremental steps associated with achieving the future Modular Forces' required space enabled capabilities. These blocks are defined by the timeframes of the DOD program objective memorandum.

b. Bridging the gap between current and future space enabled capabilities is a complex task involving national and civil agencies, the joint community, and numerous Army proponents. As such, the future capabilities described in this chapter, and the associated solution components, are crafted in the "best possible" scenario. They represent the optimum space-enabling facilities, personnel, organizations and materiel for the timeframe, the threat, and the full range of military operations. Many of the space enabled capabilities identified in this chapter will be addressed in more detail in other CCPs such as, the Network Transport and Services CCP, the Intelligence, Surveillance and Reconnaissance CCP, Army Aviation Operations CCP, and the Combating Weapons of Mass Destruction CCP.

4-2. Assessment of Battle Command Related Space Enablers.

a. Battle Command encompasses a commander's need to continually address changing situations and missions by dynamically linking functions within and across the joint operation environment. Fundamental to meeting this need is a secure global communication and data infrastructure employing a robust set of systems, facilities, and organizations comprised of well trained Soldiers. Tables 4-1 thru 4-5 depict the current, mid term and far term space enablers required by the future Modular Force.

[28] Chapter 2, para 2-4, c. (2) pg 22.

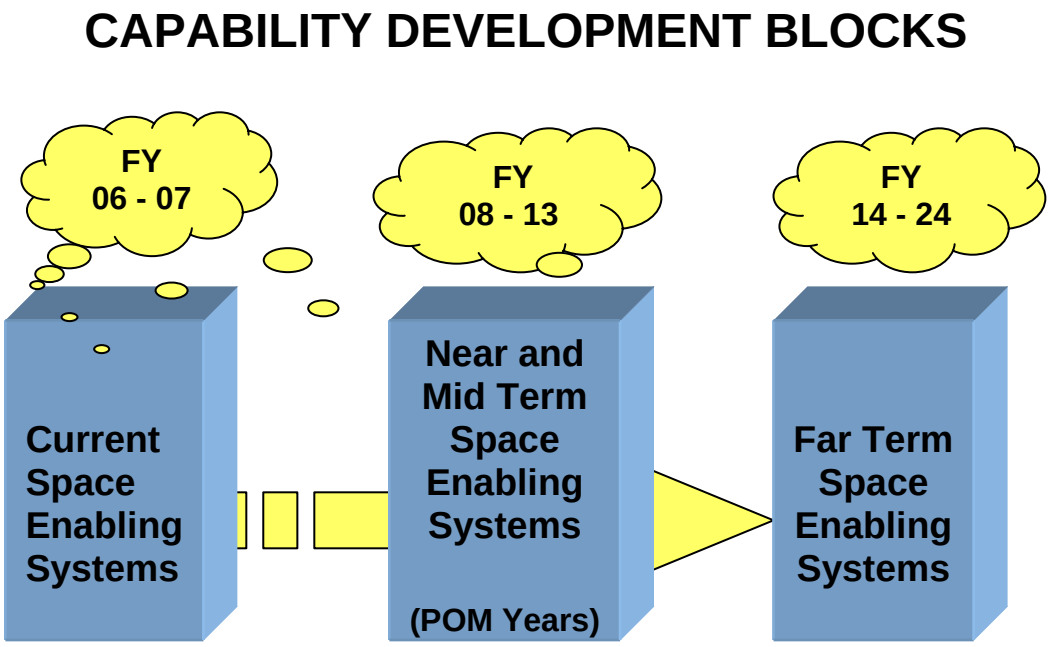

Figure 4-1. Capability Development Blocks

BATTLE COMMAND – SATCOM Enabling and Extending the Network			
Space Enabled Capability Statement	**Current Enablers**	**Mid Term Migration 08 – 13**	**Far Term Migration 14 – 24**
Ability to provide pervasive, extended range, intertheater and intratheater global BLOS communications relay capability and broadcast services between non-contiguous forces at the halt, at the quick halt and on the move in all operational environments and conditions. Communications include data, voice, imagery, and video.	MILSTAR I / II UHF Fleet Satellite UHF Follow-on Defense Satellite Communications System Global Broadcast Service SMART-T SCAMP AN/TSC-85D AN/TSC-93D International Maritime Satellite (INMARSAT) Iridium	Advanced Extremely High Frequency (AEHF) MUOS Wideband Gap-filler System Wideband Gap-filler System SMART-T SCAMP AN/TSC-85D AN/TSC-93D Commercial SATCOM	Transformational Communications Satellite System (TSAT) MUOS HC3

Table 4-1. BATTLE COMMAND – SATCOM Enabling and Extending the Network

b. SATCOM Enablers. The cornerstone of current space-based inter- and intra-theater communication enablers are the satellite communications systems available to the joint force. They are generally organized into five system groupings: Milstar, UHF fleet satellite or UHF follow-on, DSCS, global broadcast service (GBS), and commercial SATCOM. The following is a description of the current space enabling systems, and the programmed enablers for the mid and far term.

(1) Milstar.

(a) Current. The constellation of Milstar satellites operates in the extremely high frequency (EHF) and SHF bands. Milstar satisfies the U.S. military's communications requirements with worldwide, anti-jam, scintillation resistant, low probability of detection communications services. It is designed to meet the minimum essential command, control and communications requirements of the President and Secretary of Defense, strategic and tactical military forces. The system allows the flexible reconfiguration of the transponders and antennas to optimize the allocation of resources in the satellites. There are two types of Milstar satellites. Milstar I satellites carry a secure, robust, low-data-rate communications payload and a crosslink payload that allows the satellites to communicate globally without using a ground station. Milstar II satellites extend the communications capabilities to higher data rates by adding a medium-data-rate payload. There are only three Milstar II satellites are on orbit and the intent is to replace these with a new Advanced EHF satellite. Milstar II SATCOM ground terminals include the secure mobile anti-jam reliable tactical terminal (SMART-T) and single channel anti-jam, man-portable terminal (SCAMP).

(b) Mid Term. The advanced extremely high frequency (AEHF) system is the follow-on to the Milstar system, augmenting and improving on the capabilities of Milstar, and expanding the MILSATCOM architecture.

- AEHF will provide connectivity across the spectrum of mission areas, including land, air, and naval warfare; special operations; strategic nuclear operations; strategic defense; theater missile defense; space operations; and intelligence. The system consists of three satellites in geosynchronous earth orbit (GEO) providing up to 100 times the capacity of the 1990s-era Milstar satellites, servicing up to 4,000 networks and 6,000 terminals. Assuming a full constellation of three AEHF and the launch of the first transformational satellite (TSAT), this provides continuous 24-hour coverage between 65 degrees north and 65 degrees south latitude. AEHF allows the National Security Council and unified combatant commanders to contact their tactical and strategic forces at all levels of conflict and supports the attainment of information superiority.
- The AEHF System will provide warfighters with broadcasting, data networking, voice conferencing, and strategic report back capabilities. It will also provide commanders with the advantages of near-worldwide coverage, multi-user connectivity, protected data, and ease of use AEHF protections include anti-jam capabilities, low probability of detection (LPD), a low probability of intercept (LPI), and advanced encryption systems. User terminals supported by AEHF include SMART-T, SCAMP (in the Milstar mode only), family of advanced BLOS terminals (FAB-T), and Navy multi-band terminals (NMT).
- The AEHF satellites will respond directly to service requests from operational commanders and user terminals providing real-time point-to-point connectivity and network services on a priority basis. On-board signal processing will provide protection and ensure optimum resource utilization and system flexibility among the military services and other users who operate terminals on land, sea, and air.
- The AEHF system will be backward compatible with legacy Milstar satellites and terminals, while providing extended data rates and other improved functionality at substantially less cost than the previous system. Finally, the AEHF system is a multinational effort with

international partners from the United Kingdom, the Netherlands, and Canada. These international partners will gain access to the AEHF network through their own terminals. The MILSATCOM Joint Program Office (MJPO), Space and Missile Systems Center (SMC), is responsible for development, acquisition, and sustainment of the AEHF program.

(c) Far Term. Transformational Communications Satellite System (TSAT). The TSAT program is one node in a broad spectrum of programs known as the transformational communications architecture (TCA), which was approved by a Joint Requirements Oversight Council Memorandum (JROCM) on October 23, 2003. TSAT is intended to provide internet-like capability that extends high-bandwidth satellite capabilities to deployed troops worldwide, and delivers a significant increase in available military bandwidth. Using laser communications inter-satellite links to create a high data-rate backbone in space, TSAT will be one of the key enablers of network-centric warfare. A visual image from an UAS that would take 2 minutes to process with the Milstar II satellite system would take less than a second over TSAT. A radar image from a Global Hawk UAS (12 minutes), or a multi-gigabyte radar image from space-based radar (88 minutes), would also take less than a second with the TSAT network. Best of all, the recipient can be on the move with a relatively small receiver, anywhere in the world. TSAT is a joint satellite constellation project between the U.S. military and the national intelligence community. The task of monitoring the synchronization of the TCA is the responsibility of the National Security Space Office's (NSSO) Communications (comms) Functional Integration Office (Comms FIO). The TCA envisions a GIG that includes the wideband gap-filler system, the mobile user objective system and the AEHF System. Among the various ground systems, the high capacity communication capability (HC3) terminals will provide the Army with connectivity to the wideband and TSAT networks.

(2) UHF Follow-on and Fleet Satellite Systems.

(a) Current. The UHF follow–on (UFO) constellation is the primary source of UHF SATCOM and is augmented by the aging fleet satellite system. The fleet satellite system is a commercially owned and operated system, which the military leases for UHF SATCOM services. The UFO eight satellite constellation is a UHF Navy owned and operated SATCOM system that provides worldwide operational communications for aircraft, ships, submarines and ground stations. Although UFO satellites are owned by the Navy, the system provides SATCOM for DOD and national users.

(b) Mid Term. Mobile User Objective System (MUOS). MUOS is a next-generation narrowband tactical satellite communications system designed to significantly improve ground communications for U.S. forces on the move. Slated for first launch in FY 2010, MUOS will provide 10 times more throughput than the current UFO System, and will provide U.S. troops a much more reliable way to communicate. MUOS will have two communications payloads, one to support legacy users, and a newer more efficient waveform known as wideband code division multiple access (WCDMA). WCDMA is a waveform based upon the CDMA waveform used in many ground based cellular phone networks. Because MUOS uses UHF, it's more resistant to degradation due from weather, environmental constraints, or foliage. MUOS will be a protected narrowband (64 kbps and below) satellite communications system that will support a worldwide, multi-Service population of mobile and

fixed-site terminal users. MUOS will provide true “communications on the move” capability to the mobile warfighter. MUOS will be compatible with both the legacy terminals that are already fielded and the joint tactical radio system (JTRS). JTRS terminals will be software programmable to accommodate a multitude of communications waveforms. These new terminals will range from handheld terminals to platform-specific (vehicle, aircraft) and fixed-site terminals. Users of these terminals will require on-demand communications services that include narrowband voice, fax, low-speed data, alphanumeric short message paging, voice mail, and call waiting.

(c) Far Term. MUOS is programmed in the latter stages of the mid term window and has a life span that carries it well into the far term. MUOS is an integral part of the TCA and the GIG.

(3) Defense Satellite Communications System.

(a) Current. The DSCS is designed to provide SHF wideband communications for worldwide long haul communications to fixed station and mobile critical national, strategic, tactical and other designated governmental users. DSCS includes the global command and control system and broadcasts between early warning sites, operations centers, unified and specified commands, and tactical forces. DSCS provides substantial worldwide capacity of high quality voice and wideband data circuits. There are two communications subsystems on DSCS III. The primary system provides range extension for networks such as:

- Global command and control system.
- Defense switched network.
- Tactical warning and attack assessment networks.
- Joint network node.
- White House Communications Agency.
- Navy flagship C2 network.
- Ground and mobile forces and afloat communications.
- SATCOM ground terminals include: AN/TSC-85D version 1 and AN/TSC-93D version 1.

(b) The secondary communications subsystem on DSCS is AFSATCOM. This system is an Air Force system and has its own UHF transmitting and receiving antennas.

(c) Mid Term. Wideband gap-filler system (WGS). WGS leverages commercial methods and technological advances in the satellite industry to rapidly design, build, launch, and support a constellation of highly capable military communications satellites. Upon its first launch WGS will be the DOD’s highest capacity communication satellite. Ultimately, five satellites will be on-orbit providing service in both the X and Ka-band frequency spectrums. WGS will augment, and eventually replace X-band communications now provided by the and one-way Ka-band service provided by the Global Broadcast Service (GBS). Additionally, WGS will provide a new two-way Ka-band service. These digitally channelized, transponded satellites provide a quantum leap in communications capacity, connectivity and flexibility for U.S. military forces while maintaining interoperability with existing and programmed X and Ka-band

terminals. A new ground terminal supporting WGS in the mid term is the Phoenix Block II. WGS will provide essential communications services for the combatant commanders to command and control their tactical forces. Tactical forces will rely on WGS to provide high-capacity connectivity into the terrestrial portion of the Defense Information Systems Network. The MILSATCOM Joint Program Office (MJPO), Space and Missile Systems Center (SMC), is responsible for development, acquisition, and sustainment of the WGS program.

(d) Far Term. The Military Joint Program Office is studying the possibility of upgrading or extending the WGS; however, there is no new wideband system programmed for the far term.

(4) Global Broadcast Service.

(a) Current. In order to meet the demands of a rapidly deployed, highly mobile force structure the GBS capitalizes on the commercial direct broadcast satellite technology to provide critical information to the nation's warfighters. The GBS system is a high-data-rate communications link for the asymmetric flow of information from the U.S. or rear echelon to deployed forces. It is designed to provide information in a dynamically reconfigurable format rapidly adaptable to peace and wartime circumstances, and deliver it to theaters of operation worldwide. GBS is an extension of the Defense Information Systems Network and includes GBS theater injection points and receiver terminals. The GBS will broadcast to small, mobile, tactical terminals. Phase II GBS brought high-power satellite transponders, high speed wideband, simplex broadcast. Typical products include video, mapping, charting and geodesy, imagery, weather, and digital data.

(b) Mid Term. The mid term plan for the GBS is to migrate to the Wideband Gap-filler System. The backward compatibility of the WGS will enable use of the GBS constellation throughout its serviceable life span. WGS will continue to utilize theater injection points and GBS receivers. GBS is currently in the process of changing over to an IP rather than the original asynchronous transfer mode-based broadcast service. This will enable fielding of small terminals to ground and SOF combatants.

(c) Far Term. The future of the GBS beyond WGS 3 has not been decided.

(5) Commercial SATCOM.

(a) Current. The warfighter will always require the ability to communicate over DOD SATCOM systems; however, it is unlikely these systems will ever satisfy all of the requirements for SATCOM. Commercial SATCOM systems provide a flexible means to provide additional or surge capabilities. Administrative and logistics traffic as well as peacetime operations can be satisfied by commercial means. INMARSAT, iridium, Globalstar, Telesat and Telos present some of the better known systems. Commercial leases of the C-, L- and Ku-band capacity have long been an accepted part of the MILSATCOM system. A disadvantage to commercial SATCOM is that it is often expensive and does not offer the high degree of security present in the DOD systems.

(b) Mid Term. The Army's vision for the mid term continues to rely on significant use of commercial SATCOM systems. These systems provide additional capacities enabling military SATCOM to support operational missions while administrative tasks remain on commercial networks. Specific information regarding the mid term use of commercial SATCOM is not available; however, the DOD's goal is to reverse the ratio of MILSATCOM to COMSATCOM usage in favor of increased deployment and use of MILSATCOM systems.

(c) Far Term. Specific information regarding the far term use of commercial SATCOM is not available.

b. CID-BFT and JBFSA enablers. The medium of space and the movement of information in, from and through this medium continue to become more important. The automated exchange of CID-BFT and JBFSA data is an example of the growth and dependence on space-based systems and enablers. Underpinning this exchange of information is the space-based network of satellites providing position, velocity, timing and navigation data.

(1) Force XXI Battle Command Brigade and Below (FBCB2) and L-Band Commercial SATCOM Interface.

(a) Current. The need to develop an integrated joint battle command picture and enable blue force situational awareness has long been a goal of the joint and Army communities. The extended range of operations and noncontiguous battlefield of the current force drove the Army to adopt interim solutions to the battle command and CID-BFT and JBFSA problem. The integration of the FBCB2 communications system with a commercial L-band satellite system enabled greater CID-BFT and JBFSA and the ability to populate the COP. However, this solution is only applicable to those systems with the FBCB2 communications system.

BATTLE COMMAND – Space-based Communications Enabling Joint Battle Command and Blue Force Situational Awareness			
Space Enabled Capability Statement	**Current Enablers**	**Mid Term Migration 08 – 13**	**Far Term Migration 14 – 24**
Ability to provide space links and processors enabling the JBFT and SA components of JBC worldwide in all operational environments and conditions.	Future Battle Command Brigade and Below (FBCB2) L-band commercial SATCOM Grenadier Brat (NTM carrier) Mobile Transmitter (MTX) MTS Logistics tracking system L-band commercial SATCOM Iridium – use with coalition partners	Commercial SATCOM Joint Battle Command Platform Family of Systems Grenadier Brat (NTM carrier) MTX II Commercial SATCOM Iridium – use with coalition partners	Mobile User Objective System (MUOS) Family of New COBRA systems Commercial SATCOM FCS Battle Command System enabled by JTRS and WIN-T
Ability to provide accurate and reliable timing data worldwide for synchronization of the network and its supporting elements in all operational environments and conditions.	NAVSTAR Global Positioning System (GPS) Block IIR	NAVSTAR Global Positioning System (GPS) Block IIF	NAVSTAR Global Positioning System (GPS) Block III

Table 4-2. Battle Command, Space-based Communications Enabling Joint Battle Command and Blue Force Situational Awareness

(b) Mid Term. The mid term plan is to continue to leverage commercial SATCOM for the exchange of data to maintain BC, CID-BFT, and JBFSA. Standardization of formats and protocols will enable more systems to utilize this system. The FBCB2 and L-band commercial SATCOM interface will migrate to the JBC platform during the mid term. The JBC-platform family of systems (FBCB2, MTS/DAC-T, MTX, Grenadier Brat) will achieve

joint, platform-level interoperability for our aviation, ground vehicles and dismounted Soldiers. Development of the joint tactical radio system (JTRS) and warfighter information network–tactical (WIN-T) will provide the systems needed to move the majority of military systems and platforms to a military network.

(c) Far Term. The far term solution to BC, CID-BFT, and JBFSA is the integration of platform terminals (ground and air) with the Mobile User Objective System (MUOS). MUOS was described in detail in paragraph 4-2a(2)(b).

(2) Grenadier Brat (GB) and mobile transmitter (MTX).

(a) Current. The GB is a small transmitter that communicates with satellites and provides vital position data via secure encrypted communications. Once processed, this information is disseminated to populate the common operating picture enabling commanders to follow movements of forces and supplies in near-real time anywhere in the operational environment. GB provides BFT for non-digitized forces and has a very low probability of intercept or detection.

(b) Mid Term. The current GB and MTX capabilities are projected to continue into the mid term.

(c) Far Term. The far term projections for the GB and MTX type capabilities include the migration to the MUOS and TSAT TCA environment. Both of these are described in paragraph 4-2a.

(3) Mobile Tracking System (MTS).

(a) Current. The MTS is a low-cost solution designed for the Army and its vehicle operators for tracking vehicles and communicating while on and off the road during war or peacetime. MTS is a mobile satellite two-way messaging system that is totally wireless from the MTS-equipped vehicles to the control station. The mobile component of the system is mounted on a unit’s vehicles and the control station component monitors vehicle locations. Both components use the same basic communications software and hardware. Communication between the two is provided by a commercial L-band satellite allowing units to send and receive traffic over the horizon, anytime, anywhere. MTS technology allows the transportation coordinator to “talk” to the driver of any truck, regardless of location, without having to put up antennas or involve more Soldiers.

(b) Mid Term. MTS is currently being adapted to incorporate radio frequency technology, an upgraded military GPS capability, automatic reporting of vehicle diagnostics (future), and other features that support in-transit visibility.

(c) Far Term. Unknown - TBD.

(4) Iridium satellite telephones.

(a) Current. Iridium satellite telephones linked to a GPS receiver may be used to provide BFSA. Position location data is sent to a processing center via digital communication and then integrated into the common operating picture. This system is particularly useful in the integration of coalition forces without digital compatibility with existing U.S. or allied systems.

(b) Mid Term. Continued integration of this commercial based capability is anticipated. Growth prospects include the integration of computing systems to expand the data exchange capabilities.

(c) Far Term. Unknown – TBD.

(5) FCS BCS enabled by JTRS and WIN-T. The FCS BCS allows the future brigade combat team (FBCT) commander, through the warfighter machine interface and a suite of software packages, to access information and decision-making tools and quickly communicate decisions from anywhere on the battlefield. The BCS' software domain-level packages are C2, ISR, training, sustainment, and network management system (NMS) with the software infrastructure functionality provided by system of systems common operating environment middleware and NMS. The BCS, and the associated sensors and platforms, will enhance the operational capability of the FCS (FBCT), at every echelon from team level on up, by increasing its situational understanding and networked lethality. The BCS will enable units to better see first, understand first, act first and finish decisively. The FBCT platforms ensure network connectivity while on the move (OTM) by leveraging the JTRS and WIN-T transport systems to provide terrestrial, aerial, and space-based connectivity. Resident on select FBCT platforms are WIN-T's points of presence (PoP), with the Ka/Ku IP-based network-centric waveform, providing reachback to higher echelon and enabling battle command on the move when terrain restricts terrestrial connectivity. Additionally, the WIN-T PoP version 2 provides the FBCT a GBS receive capability.

(6) NAVSTAR GPS.

(a) Current. The Navstar GPS Joint Program Office (JPO) is a joint service effort directed by the U.S. Air Force and managed at the Space and Missile Systems Center. The JPO is the DOD acquisition office for developing and producing GPS satellites, ground systems, and military user equipment. GPS is a space-based radio-positioning system nominally consisting of a minimum of 24-satellite constellation that provides navigation and timing information to military and civilian users worldwide. GPS satellites, in one of six medium earth orbits, circle the earth every 12 hours emitting continuous navigation signals on two different L-band frequencies. In addition to the satellites, the system consists of a worldwide satellite control

network and GPS receiver units that acquire the satellite's signals and translate them into precise position and timing information. GPS provides the following:

- 24-hour, worldwide service.
- Highly accurate, three-dimensional location information.
- Position, velocity, timing and navigation services.
- Accessibility to an unlimited number of global military, civilian, and commercial users.

(b) Four generations of GPS satellites have flown in the constellation. Block II, IIA and IIR satellites make up the current constellation. Block IIR began replacing the older Block II and IIA in 1997. There are currently twelve Block IIR satellites on orbit. The Block IIR satellites boast dramatic improvements over the previous blocks. They also have reprogrammable satellite processors enabling problem fixes and upgrades in flight. Eight Block IIR satellites are being modified to radiate the new military (M-Code) signal on both the L1 and L2 channels as well as the more robust civil signal (L2C) on the L2 channel. The M-Code signal is a more robust and capable signal architecture.

(c) Mid Term. Block IIF GPS represent the mid term improvement package. Block IIF satellites are the next generation of GPS space vehicles and provide all the capabilities of the previous blocks with some additional benefits. Improvements include an extended design life of 12 years, faster processors with more memory, and a new civil signal on a third frequency. The first Block IIF satellite is scheduled to launch in 2007.

(d) Far Term. Far term improvements to the GPS family is the GPS III satellites, which will include all of the legacy capabilities, plus the addition of high-powered, anti-jam military-code, along with other accuracy, reliability, and data integrity improvements. Plans are being formulated to conduct an architecture study for the next-generation satellite navigation system, GPS III, capable of meeting military and civil needs through 2030. This jam resistant, modernized version of the world's greatest free utility will be developed and delivered to ensure the U.S. has the most precise and secure positioning, navigation and timing capability. The GPS III program objective is to develop and deploy an improved systems architecture for the NAVSTAR GPS to assure reliable and secure delivery of enhanced position, velocity, and timing signals for the evolving needs of GPS civil and military users. GPS III eliminates numerous existing shortcomings and vulnerabilities inherent in the current GPS architecture that threaten to severely impact vital civil commerce, transportation, public safety, as well as military operations in the future. The next-generation GPS III system is expected to have about 500 times the transmitter power of the current system, multiplying its resistance to jamming.

c. Sensor Integration. Joint and Army future Modular Force concepts describe very clearly the need to transform the sensor and communication networks into a single, integrated, network enabled battle command system. In this capability area the region of space, and the operations that take place within it, is a critical future Modular Force enabler. Table 4-3, Battle Command – Sensor Integration, provides a brief description of the current space enabling systems, and the programmed enablers for the mid and far term.

BATTLE COMMAND – Sensor Integration			
Space Enabled Capability Statement	**Current Enablers**	**Mid Term Migration 08 – 13**	**Far Term Migration 14 – 24**
Ability to provide the space and high altitude long-loiter platforms, links and processors to enable the fusion, sharing, push, pull and update information from a wide variety of sensors and sources in all domains, access that information simultaneously from multiple non-contiguous locations in order to provide timely, actionable, and relevant information in support of the planning, execution and assessment operations of the joint force and component commanders.	GBS National Classified Satellite Systems (National Technical Means) NASA Satellites: EO1-ALI EO1-Hyperion LANDSAT 7 Terra EOS AM-1 Commercial Satellite Systems: Quickbird IKONOS ORBVIEW 2/3 GeoEye-1 Other nations' spectral systems Ground terminals: TES / D-TES	GBS National Classified Satellite Systems (National Technical Means) NASA Satellites: EO1-ALI EO1-Hyperion LANDSAT Data Continuity Mission Terra EOS AM-1 Commercial Satellite Systems: Quickbird IKONOS ORBVIEW 3/5 GeoEye-1 Other nations' spectral systems Ground terminals: DCGS-A	
Ability to position, cue, cross-cue, task and dynamically re-task netted layers of redundant space, air, and surface sensors and relays.	National Classified Satellite Systems (National Technical Means)	Distributed Common Ground System – Army (DCGS-A) National Classified Satellite Systems (National Technical Means)	JC2/Network Enabled Command and Control (NECC) Distributed Common Ground System – Army (DCGS-A) National Classified Satellite Systems (National Technical Means)
Ability to provide high-resolution geospatial data and comprehensive environmental information, including real time collection, in order to visualize and describe the operational environment and assess the impact of terrain, atmosphere, weather, and space variables in all operational environments and conditions.	National Classified Satellite Systems (National Technical Means) NASA Satellites: EO1-ALI EO1-Hyperion LANDSAT 7 Terra EOS AM-1 Commercial Satellite Systems: Quickbird IKONOS ORBVIEW 2/3 GeoEye-1 Other nations' spectral satellite systems Defense Meteorological Satellite Program (DMSP) National oceanic and Atmospheric Administration Ground terminals: DTSS, TES / D-TES Eagle Vision IMETS	National Classified Satellite Systems (National Technical Means) NASA Satellites: EO1-ALI EO1-Hyperion LANDSAT Data Continuity Mission Terra EOS AM-1 Commercial Satellite Systems: Quickbird IKONOS ORBVIEW 3/5 Worldview 2 GeoEye-1 Other nations' spectral satellite systems National Polar-Orbit Environmental Satellite System (NPOESS) (NPOESS) Ground terminals: DCGS-A	National Classified Satellite Systems (National Technical Means) Commercial Satellite Systems: Other nations' spectral satellite systems National Polar-Orbit Environmental Satellite System (NPOESS) (NPOESS) Ground terminals: JC2/NECC

Figure 4-3, Battle Command – Sensor Integration

d. Missile Warning. Missile warning is a key component of developing a commander's situational understanding under the Battle Command functional concept and providing accurate and timely detection, assessment, and dissemination under the protection functional concept. Table 4-4 provides a brief description of the current space enabling systems, and the programmed enablers for the mid- and far-term.

BATTLE COMMAND – Missile Warning			
Space Enabled Capability Statement	**Current Enablers**	**Mid Term Migration 08 – 13**	**Far Term Migration 14 – 24**
Ability to provide an enhanced, fully networked, space-based theater and global missile warning, detection, processing and dissemination system in all operational environments and conditions.	Defense Support Program (DSP) Theater Event System (TES) Integrated Broadcast Service (IBS) Cheyenne Mountain Operations Center (CMOC) Joint Tactical Ground Station (JTAGS)	Space Based Infrared System (SBIRS) Defense Support Program (DSP) Theater Event System (TES) Integrated Broadcast Service (IBS) Cheyenne Mountain Operations Center (CMOC) Multi-Mission Mobile Platform (M3P)	Space Based Infrared System (SBIRS) Defense Support Program (DSP) Theater Event System (TES) Integrated Broadcast Service (IBS) Cheyenne Mountain Operations Center (CMOC) Regional Missile Warning and Battlespace Characterization Organizations

Table 4-4 Battle Command – Missile Warning

e. Space Support and Space Control. The ability to provide space support and space control advice, products, services and planning at each echelon—tactical through strategic, is an emerging concept. Space operations officers and space support elements are organic to our future Modular Force modular divisions, corps and army level headquarters. These officers provide space situational awareness, ensure the commander and staff understand the capabilities, limitations and availability of space enablers, and develop the space annex to plans and orders which ensure the effective integration of all available space enablers in future Modular operations. Table 4-5, Battle Command – space support and space control, provides a brief description of the current space enabling systems, and the programmed enablers for the mid and far term.

BATTLE COMMAND – Space Support and Space Control			
Space Enabled Capability Statement	**Current Enablers**	**Mid Term Migration 08 – 13**	**Far Term Migration 14 – 24**
Ability to conduct Space combat support operations and planning for Army, Corps, Division to include its roles as CJFLCC and JTF. Ability to reach back to space knowledge center and national agencies, ability to reach outside DOD to rapidly obtain space related information in all operational environments and conditions.	Army Space Operations Officers – FA40, organic to divisions, corps, and ASCC headquarters Army Space Support Teams Space Support Enhancement Toolset	Army Space Operations Officers – FA40, organic to divisions, corps, and ASCC headquarters Army Space Support Teams Space Support Enhancement Toolset	Army Space Operations Officers – FA40, organic to divisions, corps, and ASCC headquarters Theater Space Effects Organization
Ability to establish early and sustained control of the space domain to enhance joint-integrated information operations in all operational environments and conditions.			Space Control Effects Organizations and Systems

Table 4-5 Battle Command – Space Support and Space Control

4-3. Assessment of See Space Enabled ISR. The functional concept, See, focuses on the contribution of data acquisition, transformation of data into information and knowledge, and providing information and data to the future Modular Force. The continuous acquisition and synthesis of data and information from joint and interagency capabilities, coalition partners, and non-traditional sources permits the future Modular Force to maintain an accurate understanding of the operational environment. Tables 4-6 thru 4-7 depict the current, mid term and far term space enablers that support the See functional concept.

SEE – Space Enabled ISR			
Space Enabled Capability Statement	**Current Enablers**	**Mid Term Migration 08–13**	**Far Term Migration 14–24**
Ability to provide space enabled persistent imagery, ELINT, MASINT and SIGINT surveillance; Ability to enable rapid collection and dissemination of intelligence; ability to enable rapid reallocation and retasking of space-based surveillance assets.	National Classified Satellite Systems (National Technical Means) Global Broadcast Service	National Classified Satellite Systems (National Technical Means) Wideband Gap-filler System DCGS-A	National Classified Satellite Systems (National Technical Means) Next Generation Wideband Satellite System TSAT JC2/NECC DCGS-A High Altitude Long-loiter Systems
Ability to enable autonomous control and information transfer, over the horizon and beyond line of sight, with Unmanned Aircraft Systems (UAS) RSTA missions.		MUOS	TSAT
Ability to rapidly downlink, process, and analyze national and commercial imagery from archive and databases in theater. Ability to rapidly obtain the needed data and transfer to the proper location in such a way as to avoid information overload.	National Classified Satellite Systems (National Technical Means) TES / DTES Global Broadcast Service	National Classified Satellite Systems (National Technical Means) DCGS-A Wideband Gap-filler System	National Classified Satellite Systems (National Technical Means) JC2/NECC DCGS-A Next Generation Wideband Satellite System TSAT
Ability to rapidly identify locations of friendly and enemy forces; ability to rapidly assess effects to friendly systems, determine if it is the result of friendly or enemy action; ability to identify enemy application of asymmetric weapons or efforts; ability to exploit national and strategic systems for tactical needs; ability to conduct long-loiter surveillance.	National Classified Satellite Systems (National Technical Means)	National Classified Satellite Systems (National Technical Means)	National Classified Satellite Systems (National Technical Means) Space Based Radar
Ability to monitor weather and environment remotely	DMSP NOAA TRIOS GOES	NPOES TRIOS GOES	

Table 4-6 See – Space Enabled ISR

SEE – Space Control			
Space Enabled Capability Statement	**Current Enablers**	**Mid Term Migration 08–13**	**Far Term Migration 14–24**
Ability to deny the enemy access to communications; ability to deny the enemy access to information such as satellite television; ability to deny the enemy access to unconventional means of C2 such as internet, satellite telephones, e-mail, television	EW Systems Strike operations against terrestrial terminals	EW Systems Strike operations against terrestrial terminals	EW Systems Strike operations against terrestrial terminals Space Control Effects Organizations and Systems
Ability to protect SATCOM from deliberate or accidental interference; ability to protect the integrity of data while in transit in all operational environments and conditions.	Information Assurance Programs and Systems	Information Assurance Programs and Systems	Information Assurance Programs and Systems

Table 4-7 See – Space Control

4-4. Assessment of Strike Related Space Enablers. The Strike functional concept focuses on future Modular Force networked fires and effects at strategic, operational and tactical levels, to include aviation interdiction attack. The Strike functional concept incorporates the effects of fires capabilities as well as effects achieved by other means such as information operations, to include the IO core capabilities of electronic warfare, computer network operations, psychological operations, military deception and operations security, and the IO-related capabilities of PA, CMO, DSPD, plus other effects related to space control. Tables 4-8 thru 4-9 depict the current, mid term and far term strike related space enablers required by the future Modular Force.

STRIKE – Space Enablers			
Space Enabled Capability Statement	**Current Enablers**	**Mid Term Migration 08 – 13**	**Far Term Migration 14 – 24**
Ability to provide routine and unlimited access to dedicated, persistent Space assets at all levels of command in support of STRIKE operations to include: space support to an integrated worldwide Joint C4ISR network supporting C2, ISR, and SA functions and processes.	National Classified Satellite Systems (National Technical Means) Global Broadcast Service	National Classified Satellite Systems (National Technical Means) Wideband Gap-filler System DCGS-A	National Classified Satellite Systems (National Technical Means) Next Generation Wideband Satellite System TSAT DCGS-A JC2/NECC High Altitude Long-loiter Systems
Ability to provide a continuously updated collaborative information environment to support STRIKE operations.	MILSTAR I / II	Advanced Extremely High Frequency (AEHF) Mobile User Objective System (MUOS) Wideband Gap-filler System	Transformational Communications Satellite System (TSAT) Mobile User Objective System (MUOS) Next Generation Wideband Satellite System

STRIKE – Space Enablers (continued)			
Space Enabled Capability Statement	**Current Enablers**	**Mid Term Migration 08–13**	**Far Term Migration 14–24**
Ability to provide on demand access to space and high altitude C2, ISR, weather, PNT, and early warning information in all operational environments and conditions. Ability to rapidly and precisely determine physical locations in three dimensions	National Classified Satellite Systems (National Technical Means) GBS	National Classified Satellite Systems (National Technical Means) WGS DCGS-A	National Classified Satellite Systems (National Technical Means) Next Generation Wideband Satellite System TSAT JC2/NECC DCGS-A High Altitude Long-loiter Systems
Ability to provide improved real-time and near-real time space based ISR, on-board sensor processing and direct down link to supported ground systems. Ability to dynamically task and re-task space and high altitude long-loiter assets in support of JFC objectives.	National Classified Satellite Systems (National Technical Means) GBS	National Classified Satellite Systems (National Technical Means) Wideband Gap-filler System DCGS-A	National Classified Satellite Systems (National Technical Means) Next Generation Wideband Satellite System TSAT MUOS JC2/NECC, and High Altitude DCGS-A Long-loiter Systems
Ability to support extended range aviation operations with secure over the horizon and beyond line of sight communications, ISR and control data links that provide: Weather forecasting, terrain and infrastructure updates to include imagery support for enroute mission planning and rehearsal, enemy situation updates in the presence of jamming and counter measures.		MUOS	TSAT MUOS
Ability to dynamically re-task aviation missions. Over the horizon and beyond line of sight A2C2 and Airspace Management.		MUOS	TSAT MUOS
Ability to provide tailored payloads to augment and provide surge or replacement capabilities for high demand space-based capabilities.			Operationally Responsive Space Systems and Supporting Organizations High Altitude Long-loiter Systems

Table 4-8 Strike – Space Enablers

STRIKE – Space Control Enablers			
Space Enabled Capability Statement	**Space Enabled Capability Statement**	**Space Enabled Capability Statement**	**Space Enabled Capability Statement**
Ability to detect, deny, and disrupt adversary attempts conduct anti-satellite operations.	EW Systems Strike operations against terrestrial terminals	EW Systems Strike operations against terrestrial terminals	EW Systems Strike operations against terrestrial terminals Space Control Effects Organizations and Systems
Ability to facilitate the use of non-lethal affects in order to deny, disrupt, or degrade adversary access to the effects of space-based systems.	EW Systems	EW Systems	EW Systems Space Control Effects Organizations and Systems

STRIKE – Space Control Enablers (continued)			
Space Enabled Capability Statement	**Space Enabled Capability Statement**	**Space Enabled Capability Statement**	**Space Enabled Capability Statement**
Ability to provide full spectrum dominance of space, to include unrestricted access to space-based communications, ISR, WTEM, PNT, and the ability to deny these options to the enemy at the time and place of our choosing.	EW Systems Strike operations against terrestrial terminals	EW Systems Strike operations against terrestrial terminals	EW Systems Strike operations against terrestrial terminals Space Control Effects Organizations and Systems
Ability to conduct offensive space control negation operations; ability to plan and execute space control operations in a timely manner; ability to execute space control operations in support of a coordinated IO campaign.	EW Systems Strike operations against terrestrial terminals	EW Systems Strike operations against terrestrial terminals	EW Systems Strike operations against terrestrial terminals Space Control Effects Organizations and Systems
Ability to employ advanced space control technologies space based radar, space-based SIGINT, space-based jamming for tactical and civil communication systems.	EW Systems	EW Systems	EW Systems Space Control Effects Organizations and Systems

Table 4-9 Strike – Space Control Enablers

4-5. Assessment of Protect Related Space Enablers. The Protect functional concept describes how the future Modular Force will protect people, physical assets, and information against the full spectrum of threats. Space-based enablers are key elements of the protect function and Table 4-10 depicts the current, mid term and far term protect related space enablers required by the future Modular Force.

Protect – Space Enablers			
Space Enabled Capability Statement	**Current Enablers**	**Mid Term Migration 08–13**	**Far Term Migration 14–24**
Ability to detect missile launches from space in order to cue BMD radar, provide missile warning to the force, provide cuing information for tracking and counter strike operations.	Defense Support Program (DSP) Theater Event System (TES) Integrated Broadcast Service (IBS) Cheyenne Mountain Operations Center (CMOC) Joint Tactical Ground Station (JTAGS)	Space Based Infrared System (SBIRS) Defense Support Program (DSP) Theater Event System (TES) Integrated Broadcast Service (IBS) Cheyenne Mountain Operations Center (CMOC) Multi-Mission Mobile Platform (M3P)	Space Based Infrared System (SBIRS) Defense Support Program (DSP) Theater Event System (TES) Integrated Broadcast Service (IBS) Cheyenne Mountain Operations Center (CMOC) Regional Missile Warning and Battlespace Characterization Organizations

Protect – Space Enablers (continued)			
Space Enabled Capability Statement	**Current Enablers**	**Mid Term Migration 08–13**	**Far Term Migration 14–24**
Ability to exploit hyper-spectral and multi-spectral imagery in a rapid matter to detect and defeat improved camouflage and obscurants, the presence of biological or chemical agents, and other signs of tampering, sabotage, or enemy presence. Provide detection of IED, UXO, and non-explosive obstacles with change detection capability. Provide urban environment detection capabilities to identify threats based on civil activities.	GB) National Classified Satellite Systems (National Technical Means)) NASA Satellites: EO1-ALI EO1-Hyperion LANDSAT 7 Terra EOS AM-1 Commercial Satellite Systems: Quickbird IKONOS ORBVIEW 2/3 GeoEye-1 USSTRATCOM MASINT AGI Other nations' spectral systems Ground terminals: TES / D-TES	GBS National Classified Satellite Systems (National Technical Means)) NASA Satellites: EO1-ALI EO1-Hyperion LANDSAT Data Continuity Mission Terra EOS AM-1 NPOESS Commercial Satellite Systems: Quickbird IKONOS ORBVIEW 3/5 Worldview 2 GeoEye-1 USSTRATCOM MASINT AGI Other nations' spectral systems Ground terminals: DCGS-A	
Ability to deter, warn, and if necessary, defend against enemy attack; assuring that hostile forces cannot prevent our own use of space; ability to enhance operations of U.S. and allied forces ensuring our ability to conduct military and intelligence space-related activities.	GBS National Classified Satellite Systems (National Technical Means))	WGS MUOS DCGS-A	Next Generation WGS MUOS TSAT JC2/NECC DCGS-A
Ability to provide dedicated, persistent and redundant space support to the protect functions of: detect, assess, warn, prevent, deter, defend and respond. Ability to detect jamming operations conducted as part of the anti-access efforts.	National Classified Satellite Systems (National Technical Means)) Global Broadcast Service	National Classified Satellite Systems (National Technical Means)) Wideband Gap-filler System DCGS-A	National Classified Satellite Systems (National Technical Means)) Next Generation Wideband Satellite System TSAT JC2/NECC DCGS-A High Altitude Long-loiter Systems

Table 4-10 Protect – Space Enablers

4-6. Assessment of Move Related Space Enablers. The Move functional concept describes the best means to improve the strategic responsiveness and operational agility of the future Modular Force. Space-based systems enable both strategic responsiveness and operational agility. Table 4-11 depicts the current, mid term and far term move related space enablers required by the future Modular Force.

Move – Space Enablers			
Space Enabled Capability Statement	**Current Enablers**	**Mid Term Migration 08–13**	**Far Term Migration 14–24**
Ability to support high-speed, dispersed maneuver for positional advantage and enhanced fires through NLOS/BLOS situational awareness by providing discrete imaging and targeting data, detection and characterization of obstacles and NBC contaminated areas.	NAVSTAR GPS Block IIR NASA Satellites: EO1-ALI EO1-Hyperion LANDSAT 7 Terra EOS AM-1 Commercial Satellites Orbview 2 National Classified Satellite Systems (National Technical Means)	NAVSTAR GPS Block IIF NASA Satellites: EO1-ALI EO1-Hyperion LANDSAT Data Continuity Mission Terra EOS AM-1 Worldview 2 Commercial Satellites Orbview 3/5 National Classified Satellite Systems (National Technical Means)	NAVSTAR GPS Block III National Classified Satellite Systems (National Technical Means)
Ability to provide accurate and timely PNT and accurate terrain data in all operational environments and conditions.	NAVSTAR GPS Block IIR National Classified Satellite Systems (National Technical Means)	NAVSTAR GPS Block IIF National Classified Satellite Systems (National Technical Means)	GPS Block III National Classified Satellite Systems (National Technical Means)
Ability to provide seamless in-transit visibility of sustainment assets.	MTS Commercial SATCOM	Improved MTS Commercial SATCOM	TSAT MUOS

Table 4-11 Move – Space Enablers

4-7. Assessment of Sustain Related Space Enablers. The Sustain functional concept establishes the overarching framework for logistics support to the future Modular Force. The concept seeks to answer the challenges that flow from joint operating environment of the future Modular Force. Table 4-12 depicts the current, mid term, and far term sustain-related space enablers required to sustain the future Modular Force.

Sustain – Space Enablers			
Space Enabled Capability Statement	**Current Enablers**	**Mid Term Migration 08–13**	**Far Term Migration 14–24**
Ability to provide space links to facilitate transition of data such as position, operational status, equipment and aircraft conditions, and maintenance diagnostics and prognostics anywhere in the JOA. Ability to maintain in-transit visibility of all supporting logistical activities, supplies, services.	NAVSTAR GPS Block IIR FBCB2 L-band commercial SATCOM Grenadier Brat (NTM carrier) MTX MTS Logistics tracking system L-band commercial SATCOM Other commercial SATCOM	NAVSTAR GPS Block IIF Commercial SATCOM MUOS Grenadier Brat (NTM carrier) MTX Commercial SATCOM	NAVSTAR GPS Block III JC2/NECC MUOS TSAT Commercial SATCOM

Sustain – Space Enablers (continued)			
Space Enabled Capability Statement	**Current Enablers**	**Mid Term Migration 08 – 13**	**Far Term Migration 14 – 24**
Ability to provide a secure, pervasive, logistics C2 and support infrastructure emphasizing speed, precision, accuracy, visibility, and centralized management from Soldier platform to CONUS through a logistics common operating picture to include: logistics requirements, supply distribution and management, reach back to industry and knowledge centers, passive RFID tags, Soldier health status, petroleum and fuel supply, ability to support a logistics COP, proactive and anticipatory maintenance, munitions, water.	FBCB2 L-band commercial SATCOM Grenadier Brat (NTM carrier) MTX MTS Logistics tracking system L-band commercial SATCOM	Commercial SATCOM MUOS Grenadier Brat (NTM carrier) MTX Commercial SATCOM	JC2/NECC MUOS TSAT Commercial SATCOM
Ability to conduct space-based route reconnaissance and convoy monitoring, and logistics preparation of the battlefield.	National Classified Satellite Systems (National Technical Means) Commercial HSI, MSI	National Classified Satellite Systems (National Technical Means) Commercial HIS, MSI	National Classified Satellite Systems (National Technical Means) High Altitude Long-loiter Systems Space Based Radar JC2/NECC

Table 4-12 Sustain – Space Enablers

Chapter 5.
Army Space Operations Operational Architecture.

5-1. Army Space Operations Operational Architecture Products. The primary purposes for developing the Army space operations operational architecture products are to support the development of the Army Space Operations CCP, and to describe how Army space operations integrate with and perform as a part of the future Modular Force. Included in this plan are two high-level operational concept graphics. They are not intended to be full OV-1 operational architecture view products, but pictorial illustrations of two phases of a future operation that include: shaping and entry operations and decisive operations.

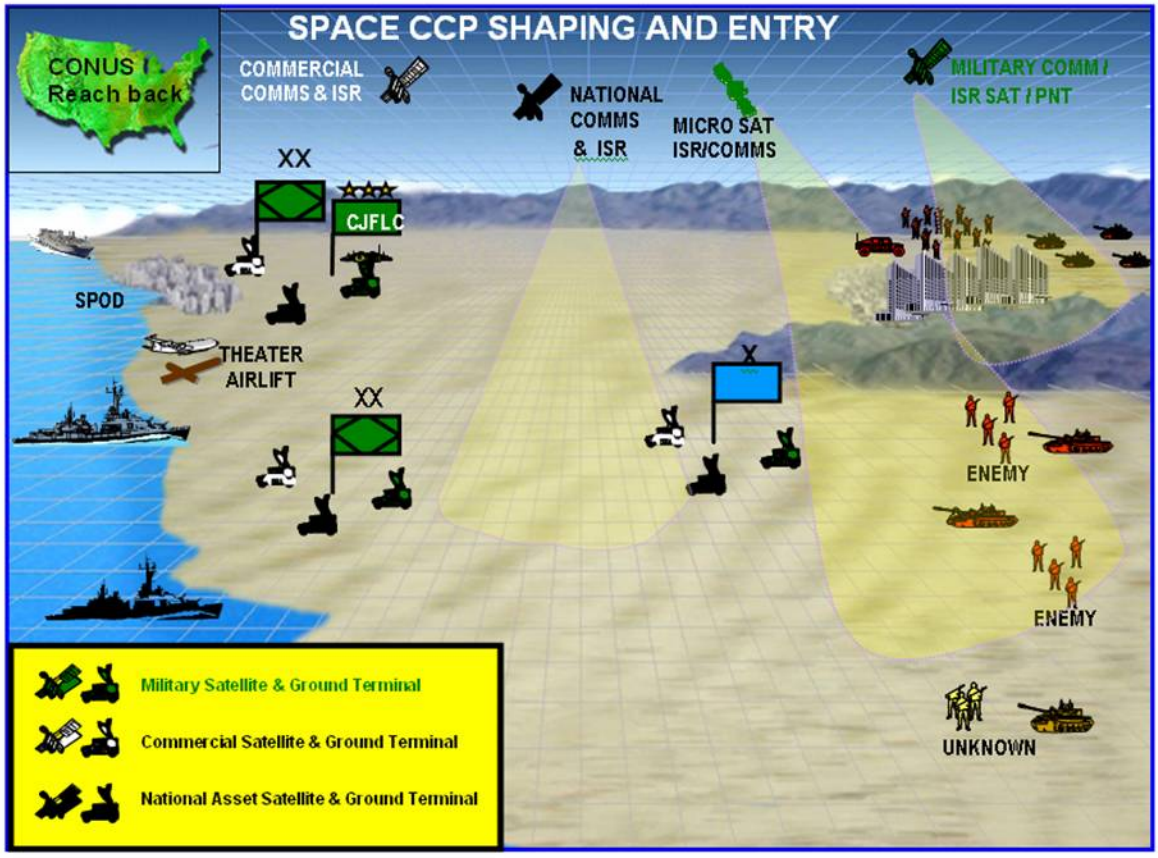

Figure 5-1. Shape and Enter Operations Graphic

5-2. High-Level Concept Graphic - Shaping and Entry Operations. Space support as described in this CCP is a layered construct combining the expertise, skills and capabilities of space professionals and space enabler personnel organic to many of our units at the theater, corps and tactical levels. When necessary, specialized space forces provided by joint and Army space organizations may augment and provide support to theater, corps and tactical forces.

a. In this phase of the operation, the future Modular Force relies on the strategic layer of space communications, ISR and PNT systems. This integrated network of national, military and commercial satellite coverage provides important communications, ISR, imagery, weather, navigation, and timing data to support shaping and entry operations. Space support and enablers serve as important links between the warfighter, national agencies, and a variety of dissemination entities.

b. As shown in Figure 5-1, strategic space platforms provide the backbone enabling and supporting the global projection of military force. This backbone is a component of the GIG and provides an uninterrupted reach capability to all deploying forces and geographically separated units. Theater focused micro-satellites dedicated to the JTF increase the BLOS communications and ISR capabilities. These micro-satellites focus on entry points, enemy centers of gravity, enemy forces, and the missile warning mission.

c. Additionally, space systems provide a C4ISR infrastructure to support enroute mission planning and rehearsal and gives the JFC the ability to shape the battlefield and conduct entry operations which preclude achievement of initial enemy objectives. Space-based ISR provides the JFC with advanced knowledge of key ports and airfields, location of cruise missile and intermediate range ballistic missile sites, location of threat forces, route assessments and the establishment of sensor to shooter links for joint fires. BLOS communications for special operations forces and other forces introduced in non-contiguous areas of operation (AO) are also supported by space-based assets.

d. Space-based systems support information operations, combat identification and joint blue force tracking, and situational awareness. These systems provide support for the uninterrupted flow of land power into the area of operations setting the stage for decisive operations. Space-based systems and assets enable reach to home stations, information centers and national agencies. During the shaping and entry phase of operations, space-based systems and capabilities are used to establish and maintain communications links (for example, SIPR, NIPR, DRSN, STU, STE, FAX), maintain current status of forces (for example, situation reports (SITREPs), unit status reports (USRs)), and respond to requests for information (RFIs) from deployed forces. Space-based systems and capabilities establish conditions that permit the JFC to rapidly transition to decisive operations.

5-3. High-Level Concept Graphic - Decisive Operations.

a. Space support to decisive operations continues its layered approach combining the expertise, unique skills and capabilities of space professionals and space enabler personnel organic to our theater, corps and tactical forces. In this phase of the operation, the layered infrastructure of national, military and commercial space based assets is enhanced by high altitude long-loiter assets. This addition to the infrastructure provides dedicated and persistent support at the tactical and operational levels, maintains the BLOS communication and ISR links to extended range operations, and is an integral part of the GIG.

b. Joint and Army space support serve as important links between the warfighter, national agencies, and a variety of dissemination entities. Figure 5-2 portrays the decisive operations phase of the space support mission. Space support provides an uninterrupted reach capability to all deployed forces while increasing the ISR capability through the use of theater focused micro-satellites and high altitude long-loiter assets in the high altitude region. In addition, Space support provides JFC the situational awareness and understanding needed to conduct rapid, integrated, and near simultaneous application of forces throughout the AO. Space-based systems are key enablers of decisive maneuver on multiple non-contiguous axis by providing precise position, velocity, timing and navigation data, near real-time situational awareness, BLOS communications and the direct downlink and dynamic re-tasking of ISR assets. Space and high altitude long-loiter systems are instrumental in conducting manned and unmanned aviation operations by maintaining command data links and facilitating the real-time flow of vital information. National, military and commercial ISR platforms continue to support planning, enable sensor to shooter linkage and support area of responsibility SA. Space-based systems support the sustainment operations necessary to support the operational tempo and reach of the future Modular Force.

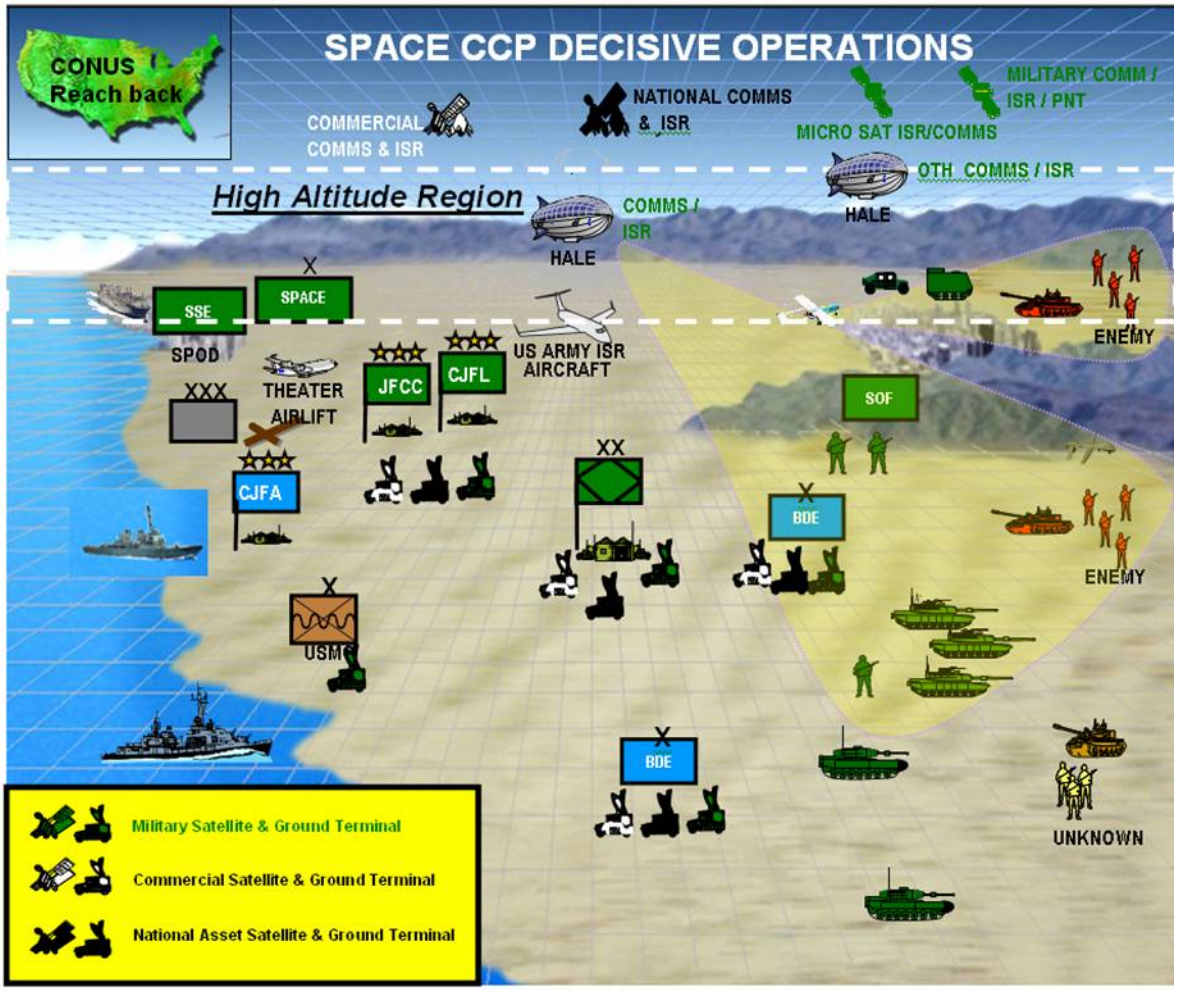

Figure 5-2. Decisive Operations Graphic

Chapter 6.
DOTMLPF Integrated Questions List.

6-1. Introduction.

a. There are significant implications for the Army and the joint community as we evolve Army space operations and the synchronization of these operations across the DOTMLPF domains is required. Because of the joint interdependence associated with space, some study issues transcend the Army's direct role; however, the ability to influence the design and development of the range of DOTMLPF solutions for the joint force is an Army responsibility. Specific areas of space operations should be examined fully as the Army, and the joint community move to an advanced form of integrated joint and Army space operations. The Army concepts used in the development of this CCP include a discussion of the implications of the concepts for DOTMLPF. In many cases those implications relating to space are explicit enough to generate some action for change within the DOTMLPF domains by responsible proponents and agencies.

b. This CCP presents a number of future Modular Force situations that underscore the need for a full assessment of the DOTMLPF implications related to Army Space Operations. Examples of questions that will facilitate the assessment of these implications are described below.

- What are the most effective organizational designs for implementation of the Army space operations concept?
- What are the objective and threshold capabilities required for achieving the capabilities and supporting space enablers identified in the space operations concept?
- What future operational and organizational challenges remain from today's conceptual efforts?
- What space operations capabilities does the Army have to provide other services in order for them to implement the space operations concept?
- What space operations training and training support capabilities does the Army have to provide to other services or integrate with other services to implement the "train-as-you-fight" concept?

6-2. Doctrine.

a. Emerging joint and Army doctrine will focus on the necessary capabilities to engage adversaries across the full range of joint operations sharing common systems, tactics, techniques, and procedures (TTPs), and doctrine. The doctrinal concepts necessary to initiate the organizational and cultural changes are described in the *Capstone Concept for Joint Operations*, TRADOC Pamphlet (TP) 525-3-0, *The Army in Joint Operations*, TPs 525-3-0, operating concepts for operational maneuver, (TP 525-3-1), and tactical maneuver (TP 525-3-2), and the Army's six functional concepts. These concept documents must also be viewed in light of existing Army doctrinal publications such as: Field Manual (FM) 1 *The Army*, FM 3-0 *Operations*, and FM 6-0 *Mission Command*: *Command and Control of Army Forces*.

b. As the future Modular Force nears operational readiness, these documents will continue to evolve. The evolution of organizations is driven by concepts and doctrine. Consequently, new doctrine and TTPs will be required to effectively plan and manage battles collaboratively. Evolving Army doctrine must seamlessly integrate joint doctrine to optimize planning and execution of warfighting operations at all levels. Doctrine questions include, but are not limited to, the following:

- How does joint space doctrine influence the conduct of Army space operations?
- Is current joint space doctrine adequate?
- Does joint doctrine adequately address the joint interdependence of the services in the area of space operations?
- Is current Army space doctrine adequate?
- What are the impacts of international law on joint and Army doctrine?
- What are the impacts of national rules of engagement, policies, and law on Army space doctrine?
- Is space operations adequately addressed in Army doctrine for the theater, corps, and division doctrinal publications?
- Are current TTPs adequate to execute required Army space operations?
- Do proponent doctrinal publications integrate requisite Army space operations?
- What emerging space technologies, processes and capabilities need to be codified in Army doctrine?

6-3. Organization.

a. To effectively support future operations, organizations must transform into a more modular, scalable, mission-tailorable organizations with multifunctional capabilities. They must become more versatile and agile to support joint operations and must possess capabilities to adequately support the operations of maneuver and support forces. Joint mutual support becomes the key factor in determining Service roles and missions and mission context will determine the apportionment of Army headquarters and forces. The range of missions assigned to Army forces will force an alignment change from the traditional command echelons. Army HQ will support the combatant commander with the command structure appropriate for land operations.

b. The rank of the commander and the functions of the HQ will not necessarily correspond to the numbers of forces assigned to it. In many operations, the number and composition of subordinate units will differ dramatically. As each operation unfolds, the makeup of the deployed Army force will evolve, shifting in composition as the mission and circumstances require. While units that are stationed with the HQ may align for training and readiness, actual operational groupings will be based upon mission requirements. Organizational questions include, but are not limited to, the following:

- What are the appropriate organizational structures to enable effective Army space operations?
- Are current Army space organizations adequate to meet the space operations requirements of the future Modular Force?

- Can current organizational structures be augmented to satisfy the capabilities of Army space operations?
- Is a new organizational structure required to achieve the required capabilities?
- What Army space operations capabilities should reside in our tactical and operational forces?
- What Army space operations capabilities should reside in Army space organizations?

6-4 Training.

a. Doctrine and organizational change cannot be realized without changes to our training systems. Training ensures that our future Modular Force is able to conduct the operations envisioned in our joint and Army concepts. By embedding space capabilities and effects into future Modular Force training, commanders and leaders will begin to realize the impact of applied space power. Training simulations that include virtual space operations and space combat support planning, and assessment will improve our training opportunities in the functional areas of: battle command, operational environment awareness, force application, strike operations, protection and sustainment.

b. Army training must be flexible enough to train and incorporate new technologies as they mature, and become available. The Army must develop Soldiers and leaders who possess a joint and expeditionary mindset and who are able to optimize the space capabilities available to them. Training questions include, but are not limited to:

- How is the integration and application of space power included in current training and leader development?
- How can the Army adapt its training to better integrate Army space operations?
- How will evolving technologies and ongoing or planned changes in organization affect the ways in which Army units and leaders operate and what are the training implications of these changes to support Army space operations?
- How will evolving space doctrine impact units and leaders?
- What training designs will develop units and leaders able to capitalize on the full range of space capabilities?
- What are the space operations training requirements for enlisted personnel, noncommissioned officers, officers, contractors and DA civilians?
- What type, scope, and frequency of Army space operations training must the future Modular Force conduct to enable effective operations?
- What space test and training ranges are necessary?
- What space modeling and simulations are required to support Army space operations at the tactical, operational and strategic levels?
- What joint space training is necessary and for whom?
- What national and commercial agency training is necessary and for whom?

6-5. Materiel.

a. Resources are always limited and the joint interdependence of space operations makes the selection and development of space-based systems and space operations materiel more

demanding and difficult. Modernization and sustainment ensure that baseline capabilities are maintained and future Modular Force capabilities are pursued. Realization of the Army space operations concept is dependent upon the development and incorporation of advanced technology in the domain of space and on the battlefield.

b. Space operations materiel solutions must proceed along a top-down, joint-driven path. Materiel questions include, but are not limited to, the following:

- What space-based military satellite communications relay systems are needed for the future Modular Force?
- What commercial space-based communications assets are needed to support future Modular Force operations?
- What space-based ISR assets are necessary to support future Modular Force operations?
- What is the role of commercial space-based systems in ISR?
- What ground terminal systems are needed?
- What position, velocity, timing and navigation systems are needed for the future Modular Force?
- What weather and environmental monitoring systems are needed for the future Modular Force?
- What space-based early warning detection, assessment, and dissemination systems are needed for the future Modular Force?
- What space control systems are needed to meet the requirements of the future Modular Force?
- What high altitude long-loiter assets are needed and what is the role of these systems in providing dedicated and persistent support to the warfighter?
- How will space-based systems contribute to the establishment of a single, integrated, network enabled joint battle command system?
- How will space-based systems and terrestrial nodes enable multi-echelon and multidimensional ISR, fires, and maneuver that are fully networked?
- What are the required space-based systems to support the expanding role of unmanned systems on the battlefield?
- What space enabled sensor-to-shooter linkages are needed to support future Modular Force operations?
- How will space based systems enable dominant situational understanding?

6-6. Leadership and Education.

a. One of the keys in enabling effective Army operations will be the development of leaders and staffs who can perform effectively across the spectrum of conflict in a complex, uncertain, and dynamic operational environment. Leaders must be educated, trained, and developed to be self-aware, innovative, and adaptive throughout training and operations. In the area of space operations they must think strategically as well as tactically, possess a joint and expeditionary mindset, and successfully apply the joint and Army aspects of space power.

b. Leaders will also need joint, interagency, intergovernmental, and multinational education, and experience early in their careers. Doctrine will provide an operational foundation, and

combined with educational opportunities that provide an intellectual foundation we will prepare leaders who are as comfortable with space operations as they are with terrestrial operations. Leader development questions include, but are not limited to:

- How can we develop more adaptive space savvy leaders?
- How do we provide world-class leader development in the area of space operations in a joint and multinational construct?
- How do we develop leaders ready to deal with the complexity of space, its associated operating environment, threats, and interagency implications?
- What leader development programs are needed in OES, WOES, and NCOES?
- What civilian leader development programs are needed?

6-7. Personnel.

a. Soldiers are the Army's greatest resource and the most important factor in maintaining and effecting unit readiness. The integration of space operations into future Modular Force operations will increase the demands on an already stressed population. Selecting and assigning the right personnel to space related positions and occupational specialties is a difficult task. The personnel management system must ensure that it provides the career paths needed to fully utilize the space expertise of the force. New organizational constructs may rely on experienced civilian personnel to provide the expertise needed to support training readiness and global space operations.

b. The right combinations of Active and Reserve components, Army civilian and contractor attendants can only be determined through research and exercise. Personnel questions relating to space operations include, but are not limited to:

- How do we recruit and retain the personnel necessary to perform Army space operations functions?
- What skill sets are required in our Army civilian and contractor support personnel?
- What is the best means of selecting Army space officers?
- Should our pre-commissioning programs include a space operations component?
- What is the right mix of personnel between space professionals and other personnel selected to serve in space related positions?

6-8. Facilities.

a. As the Army's role in space operations continues to grow, so does demand for a supportive facilities infrastructure. The joint nature of space operations will require special communications facilities, adequate security, and facilities to support the training and operational forces. The special access programs associated with space operations will also increase the demand for unique facility requirements. These facilities will have varying capabilities of training, projection, reach, and knowledge. Installation information facilities will enable distributed information sharing among the sustaining base and deployed forces during all phases of operation.

b. Prior to deployment, fixed facilities on the installation can collect, process, and analyze large volumes of space based data such as terrain databases. Installations will require suitable facilities for skilled civilian personnel supporting a military staff. Space training ranges and space power labs in addition to modeling and simulations may be needed. Facilities questions include, but are not limited to:

- Are there adequate facilities available to Soldiers, leaders, battle staffs, non-uniformed personnel, and units to attain and maintain acceptable levels of space training effectiveness?
- What infrastructure is required at forts and installations to adequately support space operations in both training and operational constructs consistent with Army, joint and multinational concepts?
- What infrastructure is required in theater to support Army space operations missions?
- What facilities are needed to support space special access programs?
- What installation infrastructures are needed to support home station space operations functions?

Chapter 7.
Hypothesis Testing – Experimentation and Wargames

7-1. Introduction. The Army is pursuing the most comprehensive transformation of its forces since the early years of World War II. This transformation is happening while the nation is at war. The urgency of supporting the current fight blurs the usual dichotomy between the current and future Modular Force. The Army must seek to accelerate inculcation of select future Modular Force capabilities into the current Modular Force to support today's fight, while simultaneously ensuring that today's lessons learned are applied to future Modular Force developments, and timing. This transformation encompasses more than materiel systems. Adaptive and determined leadership, innovative concept development and experimentation, and lessons learned from recent operations produce corresponding changes in the DOTMLPF domains. Experimentation, wargames and experience are the methods the Army uses to mitigate risk while considering and improving capabilities for the future Modular Force.

7-2. Experimentation. Experimentation is the process of exploring innovative methods of operation to access feasibility, evaluate utility and or determine limitations of the concepts being explored. Experiments conducted in support of JCIDS efforts use the 2015–024 timeframe. The Army also conducts wargames using futuristic scenarios (15 to 20 years and beyond) to explore concepts in order to better define which of those concepts should be the subject of experimentation. Army experimentation is usually conducted in the form of discovery (usually in a constructive modeling and simulation environment), hypothesis (also in a M&S environment but with human in the loop role players) and demonstration (live or simulation) settings.

a. Discovery experiments are designed to inform a concept. The setting tends to lack the degree of control necessary to infer cause and effect.

b. Hypothesis Testing Experiments. Hypothesis testing experiments are the traditional type used by individuals to build, confirm and advance knowledge. This occurs by seeking to falsify

specific hypotheses (specifically if…then statements) or discovering their limitations. In order to conduct hypothesis-testing experiments, the experimenter shall create a situation in which one or more factors of interest can be observed systematically under conditions that vary the values of factors thought to cause change in the factors of interest – while other potentially relevant factors are held constant.

c. Demonstration experiments are used to display knowledge and the settings tend to be somewhat orchestrated. Often times the Army uses this method to display prototypes of emerging technologies that are nearing maturity and are potentially ready for fielding to the force.

7-3. Modeling and Simulations (M&S) . Models and simulations are often called upon to make an informed assessment. Scenarios or vignettes are built to look at one or more sets of conditions that will best help to evaluate these hypotheses, but the raw data is often not conclusive or requires reasoned review by seasoned subject matter experts (SMEs) to confirm the reliability of these simulation or modeling efforts.

7-4. Concept Development and Experimentation (CD&E). CD&E is fundamentally a risk reduction activity; failure to conduct effective CD&E significantly increases developmental risk for the future Modular Force and operational risk to the Current Force. Specific actions are required to reduce operational risk to the Current Force and development risk for the future Modular Force.

- *Operational risk to the current force.* Increase the capabilities of the current Modular Force through prototype experiments that test the compelling solutions and develop DOTMLPF capability packages to support the spiraling forward of future Modular Force capabilities to satisfy critical current force operational needs.
- *Developmental risk for the future Modular Force.* Reduce future Modular Force development risk by developing concepts and capabilities that meet the needs of the future joint force commander through rigorous concept development experimentation.

a. Army Efforts. Army **w**argaming and experimentation to support this CCP for Army space operations and its impact on DOTMLPF sets will be developed and studied using approved defense planning scenarios and vignettes, if required, other scenarios and vignettes may be recommended or other methods found to evaluate aspects of space, high altitude and Army space operations. Experimentation will help define how the capability requirements, outlined in Chapter 3 of the CCP, can best be implemented.

b. Joint Efforts. Joint wargaming and experimentation will also support this CCP. Active participation in other Service and well as joint events are critical to the full assessment of the Army's DOTMLPF solution sets. Army space organizations and operations will be tested, evaluated and modified as conditions (for example, scenario, vignette) change during experimentation. Scenarios and vignettes selected for experimentation will provide an illustration of how Army space organizations will conduct or support operations throughout the deployment cycle while supporting the full spectrum of conflict.

7-5. Wargaming. Wargaming is a process of discovery and assessment—discovering insights into the Army space warfighter and assessing the validity of strategic visions and emerging concepts—while looking 20-to-30 years into the future. Wargaming begins by attaining operational research on future warfighting systems and concepts and applying them to simulated military operations in order to prove or disprove visionary ideas and to discover gaps and seams in future Army Space operations. Wargaming examines Army functional concepts of Command, See, Move, Strike, Protect, and Sustain, the results of which inform experimentation and eventually informs the development of Army Space CONOPS, TTPs, architectures, and future systems. Wargame personnel lead participation in Army, joint, interagency, and multinational wargames to integrate Army space assets, concepts, and visions into wargame scenarios, orders of battle, force laydowns, and computer simulations.

7-6. Past and Future Experimentation and Wargames.

a. Past Experimentation and Wargames. TRADOC and its proponent schools have conducted extensive experimentation that has implications on the Army Space Operations CCP. The following is a list of major experiments and wargames conducted over the last two years involving space operations support:

- TRADOC Omni Fusion experimentation to include: Omni Fusion Builds 0, I, II, and the Omni Fusion Build II integrating experiment.
- UA focused experiments and events on UA FCS brigade operations.
- Unified Quest 2004, 2005, 2006.
- Air Force experimentation and wargaming conducted as part of the bi-annual Schriever wargames.
- Joint Forces Experiment 04 and JEFX 06.
- Schriever III.
- Thor's Hammer II.

b. Future Experimentation. The following experiments and wargames will further assist in defining the Army Space Operations CCP:

- TRADOC FY07 ACDEP.
- Urban Resolve 2015 in FY06 and FY07.
- Unified Quest 2007.
- Joint Forces Experiment 06 and JEFX 08 (beginning in FY06).
- Schriever IV.
- Thor's Hammer III.

c. In addition to these listed events there are many small analysis events and experiments that occur within the Space and Missile Defense Battle Lab and throughout various installations that will also provide insights to further refine this CCP.

7-7. Study Questions. Reference the integrated questions list in Chapter 6, questions which support future experimentation are included below.

- What are the identified Army space capability gaps?

- In a distributed operation environment, what space operations forces and capabilities are required at each echelon of command?
- What is the best organization for the provision of low density space support operations – regional missile warning, high altitude long-loiter systems and effects, operational and tactical space control?
- What space operations, missions, and functions is the responsibility of the signal, military intelligence, engineer, and air defense proponents? How do Army space forces support these operations?
- What advanced operational and training tool sets are required to support adequate Soldier training and development for space operations?
- What are future Modular Force vulnerabilities to technology failures in the area of space-based enablers?
- What are the current critical space enabling capability gaps for near-term, mid-term, and far-term?
- What space-based or enabling technologies are so compelling as to warrant immediate prototyping?
- What prototypes are under development?

Chapter 8.
Alternative CCP

8-1. Introduction.

a. Currently, there are no U.S. Army documents that provide a concept for integrated Army space operations. This Army Space Operations CCP is the first Army specific document that attempts to provide a concept for integrated space operations. There are many concepts referenced in the development of this document. The required and related references included in the Appendix A, detail the numerous capabilities researched and the mission areas that were studied either prior to or during the formulation of the Army Space Operations CCP.

b. The organization of the required space enabled capabilities in Chapter 3, is based on the contents and focus of each of the six Army functional concepts. Chapter 4, Bridging current to future is organized in the same manner. Army space operations are an integral component of future Modular Force operations across the spectrum of conflict.

8-2. Future CCP and JCIDS Efforts.

a. The integrated concept development team preparing this CCP consisted of nine core members and eight supporting members. (U.S. Army Intelligence and Security Command and U.S. Army Network Enterprise Technology Command were added after the original charter bringing the total to 19.) Each of these proponents is likely to develop its own concept or plan for how it will operate in the future. The number of proponents involved and the range of their proponent responsibilities indicates that the development of additional CCPs, which include space-based enabling capabilities, is likely.

b. As a minimum it is expected that approval of this CCP will result in TRADOC ARCIC directing one or more capability based assessment (CBA). The underlying intent of this CCP is to provide a holistic view of the Army's collective dependence on the medium of space and the space enabled capabilities of the future Modular Force.

Appendix A.
References.

Section I
Required References

Defense Planning Guidance (DPG)

National Military Strategy (NMS)

National Security Strategy (NSS)

Capstone Concept for Joint Operations (CCJO)

Joint Operating Concepts (JOpsC)

CJCSM 3500.04D
Universal Joint Task List (UJTLs)

Army Strategic Planning Guidance (ASPG)

Army Concept Development and Experimentation Plan (ACDEP)

Army Concept Capability Development Plan (AC2DP)

FM 7-15
Army Universal Task List (AUTLs)

TRADOC Regulation 10-5
TRADOC Organization and Operations

TRADOC Pam 525-2-1
The U.S. Army Functional concept for See 2015-2024

TRADOC Pamphlet 525-3-0
The Capstone Concept for the Army in Joint Operations

TRADOC Pam 525-3-1
Operational Maneuver (OM) Concept

TRADOC Pam 525-7-4

TRADOC Pam 525-3-2
Tactical Maneuver (TM) Concept

TRADOC Pam 525-3-3
The U.S. Army Functional concept for Battle Command 2015-2024

TRADOC Pam 525-3-4
The U.S. Army Functional concept for Strike 2015-2024

TRADOC Pam 525-3-5
The U.S. Army Functional concept for Protect 2015 - 2024

TRADOC Pam 525-3-6
The U.S. Army Functional concept for Move 2015-2024

TRADOC Pam 525-4-1
The U.S. Army Functional concept for Sustain 2015-2024

Section II
Related References

Joint Publication 3-14
Joint Doctrine for Space Operations

CJCSI 3170.01
Joint Capability Integration Development System Instructions, (JCIDS)

CJCSI 3170.01
Joint Capability Integration Development System Manual (JCIDS)

FM 3-14
Space Support to Army Operations

FORCEnet: A Functional Concept for the 21st Century.

U.S. Army Space Reference Text

Appendix B.
Master Roll Up Consolidated Listing of Derived Space Enabled Capabilities

LEGEND:

Functional Concept Reference Number: Refers to the Army functional concepts as noted below. The alpha-numeric designation (e.g. C1) refers to the Battle Command Functional Concept C + the number of the derived space capability. This is also found in column G of the Functional Concept Spread Sheet. (P6 = Protect Functional Concept + derived capability statement 6).

C = Battle Command Functional Concept **P = Protect Functional Concept**
S = See Functional Concept **M = Move Functional Concept**
STR = Strike Functional Concept **Sust = Sustain Functional Concept**

Joint Functional Areas ASMP Reference: This number refers to the five joint functional areas and the space gaps identified in the preparation of the Army Space Supplement to the TRADOC CNA 08-13.

JC = Joint Command and Control **BA = Joint Battlespace Awareness**
FA = Joint Force Application **PR = Joint Protection Functional Concept**
FL = Focused Logistics

- DEFINITIONS:

***Future Modular Force Mission Risk*: Degree of future Modular Force dependence on the enabling space capability and the associated risk to mission accomplishment if the space gap is not satisfied. Mission accomplishment is the future Modular Force ability to perform operational required capabilities within the context of approved Army and Joint Concepts**.

HIGH. *The ability of the future Modular Force to perform Army missions, IAW approved concepts, is* ***predominantly dependent*** *upon this space enabled capability. Without this capability the future Modular Force has a* ***high risk of mission failure****.*

MEDIUM. *The ability of the future Modular Force to perform Army missions, IAW approved concepts, is* ***significantly dependent*** *upon this space enabled capability. Without this capability the future Modular Force will endure* ***significant mission impairment*** *requiring extraordinary steps to preclude failure.*

LOW. *The ability of the future Modular Force to perform Army missions, IAW approved concepts, is* ***marginally dependent*** *upon this space enabled capability. Without this capability the future Modular Force experiences* ***minor impact on mission accomplishment.***

This information is available via SIPR. If additional information is required please contact the Army Space Operations Integrated Capabilities Development Team Lead Action Officer at Commercial 913-684-2355.

B-1. BATTLE COMMAND RELATED SPACE CAPABILITIES

FUNCTIONAL CONCEPT REFERENCE NUMBER	REFINED SPACE ENABLED CAPABILITY STATEMENT Battle Command	Future Modular Force MISSION RISK	ASMP CROSS REF NUMBER
C1, C6, C14 C15, C 16, C17 P1, P2, P6, P15, P16, P17 P1 M2, M5, M 14 M11 Sust 1	Ability to provide pervasive, extended range, inter-theater and intra-theater global BLOS communications relay capability and broadcast services between non-contiguous forces at the halt, at the quick halt and on the move in all operational environments and conditions. Communications include data, voice, imagery, and video. (Company team to ARFOR and CJFLCC level)	High	JC1 JC2
C1, C18 S3, S10, S11, Str 4, 11, 14 M6	Ability to provide space links and processors enabling the JBFT SA components of JBC worldwide in all operational environments and conditions. (Soldier platform through ARFOR and CJFLCC)	Medium	P3
C1	Ability to provide accurate and reliable timing data worldwide for synchronization of the network and its supporting elements in all operational environments and conditions. (Company, team to ARFOR and CJFLCC level)	High	JC3 FA1
C2, C5, C9, C13 S2, 3, 5 P3, P5 M3, M10 M12, M13 Sust 3 Sust 4 SEE FC	Ability to provide the space and high altitude long-loiter platforms, links and processors to enable the fusion, sharing, push, pull and update information from a wide variety of sensors and sources in all domains, access that information simultaneously from multiple non-contiguous locations in order to provide timely, actionable, and relevant information in support of the planning, execution and assessment operations of the joint force and component commanders. (Soldier Platform through ARFOR and CJFLCC)	Medium	BA2

FUNCTIONAL CONCEPT REFERENCE NUMBER	REFINED SPACE ENABLED CAPABILITY STATEMENT Battle Command (continued)	Future Modular Force MISSION RISK	ASMP CROSS REF NUMBER
C3 STR 2	Ability to establish early and sustained control of the space domain to enhance joint-integrated information operations in all operational environments and conditions. (Division through ARFOR and CJFLCC level)	Medium	JC4
C4 M1, M8	Ability to provide an enhanced, fully networked, space-based theater and global missile warning, detection, processing and dissemination system in all operational environments and conditions. (Soldier platform to ARFOR and CJFLCC level)	Medium	P1
C5, C10 S2, 4, 12 P5, P21, P24 M1, M7	Ability to position, cue, cross-cue, task and dynamically re-task netted layers of redundant space, air, and surface sensors and relays. (BCT to ARFOR and CJFLCC level)	Medium	BA1
C7 S6	Ability to conduct Space combat support operations and planning for Army, Corps, Division to include its roles as CJFLCC and JTF. Ability to reach back to space knowledge center and national agencies, ability to reach outside DOD to rapidly obtain space related information in all operational environments and conditions. (Division through ARFOR and CJFLCC level)	Medium	JC6
C 6 and C 8 C11, C12 S4, 10, 11	Ability to provide high-resolution geospatial data and comprehensive environmental information, including real time collection, in order to visualize and describe the operational environment and assess the impact of terrain, atmosphere, weather, and space variables in all operational environments and conditions. (Company, team to ARFOR and CJFLCC level)	Medium	BA3

B-2. SEE RELATED SPACE CAPABILITIES

FUNCTIONAL CONCEPT REFERENCE NUMBER	REFINED SPACE ENABLED CAPABILITY STATEMENT See	Future Modular Force MISSION RISK	ASMP CROSS REF NUMBER
S1	Ability to deny the enemy access to communications; ability to deny the enemy access to information such as satellite television; ability to deny the enemy access to unconventional means of C2 such as internet, satellite telephones, e-mail, television. (Division through ARFOR and CJFLCC level)	Medium	P2
S2, S12, S15	Ability to conduct persistent imagery, ELINT, MASINT and SIGINT surveillance; Ability to rapidly disseminate collected intelligence; Ability to rapidly reallocate and re-task space-based surveillance assets. (Company, team to ARFOR and CJFLCC level)	High	BA1 BA2
S3 STR 7	Ability to enable autonomous control and information transfer, over the horizon and beyond line of sight, with UAS RSTA missions. (Soldier platform through ARFOR and CJFLCC)	High	BA1
S4, S5 P23, P22	Ability to rapidly downlink, process, and analyze national and commercial imagery from archive and databases in theater. Ability to rapidly obtain the needed data and transfer to the proper location in such a way as to avoid information overload. (Company, team to ARFOR and CJFLCC level)	Medium	BA1 BA2
S9	Ability to rapidly identify the locations of friendly and enemy forces; ability to rapidly assess effects to friendly systems and determine if it is the result of friendly or enemy action; ability to identify enemy application of asymmetric weapons or efforts; ability to exploit national and strategic systems for tactical needs; ability to conduct long-loiter surveillance. (Company, team to ARFOR and CJFLCC level)	High	BA1

FUNCTIONAL CONCEPT REFERENCE NUMBER	REFINED SPACE ENABLED CAPABILITY STATEMENT See (continued)	Future Modular Force MISSION RISK	ASMP CROSS REF NUMBER
S10, S11 STR8 M9	Ability to monitor weather and environment remotely; ability to conduct robust ISR; ability to maintain SA of blue forces. (Company, team to ARFOR and CJFLCC level)	Medium	BA3
S14	Ability to protect SATCOM from deliberate or accidental interference; ability to protect the integrity of data while in transit in all operational environments and conditions. (CAB to ARFOR and CJFLCC level)	High	JC5 P2

B-3. STRIKE RELATED SPACE CAPABILITIES

FUNCTIONAL CONCEPT REFERENCE NUMBER	REFINED SPACE ENABLED CAPABILITY STATEMENT Strike	Future Modular Force MISSION RISK	ASMP CROSS REF NUMBER
STR 1	Ability to provide routine and unlimited access to dedicated, persistent Space assets at all levels of command in support of strike operations to include: space support to an integrated worldwide Joint C4ISR network supporting C2, ISR, and SA functions and processes. (CAB to ARFOR and CJFLCC level)	High	FA3
STR 1 C6, C7	Ability to provide a continuously updated collaborative information environment to support strike operations. (Soldier platform through ARFOR and CJFLCC)	High	BA3
STR 2 S1 P2	Ability to detect, deny, and disrupt adversary attempts conduct anti-satellite operations. (Division through ARFOR and CJFLCC level)	Medium	JC4a P2

FUNCTIONAL CONCEPT REFERENCE NUMBER	REFINED SPACE ENABLED CAPABILITY STATEMENT Strike (continued)	Future Modular Force MISSION RISK	ASMP CROSS REF NUMBER
STR 3, STR4 P20	Ability to provide on demand access to space and high altitude C2, ISR, weather, PNT, and early warning information in all operational environments and conditions. Ability to rapidly and precisely determine physical locations in three dimensions (CAB to ARFOR and CJFLCC level)	High	C1 P1 P3
STR 3	Ability to provide improved real-time and near-real time space based ISR, on-board sensor processing and direct down link to supported ground systems. Ability to dynamically task and re-task space and high altitude long-loiter assets in support of JFC objectives. (BCT to ARFOR and CJFLCC)	High	BA1
STR 5 STR7	Ability to support extended range aviation operations with secure over the horizon and beyond line of sight communications, ISR and control data links that provide: Weather forecasting, terrain and infrastructure updates to include imagery support for enroute mission planning and rehearsal, and enemy situation updates in the presence of jamming and counter measures. (Soldier Platform through ARFOR and CJFLCC)	High	FA3
STR 5	Ability to dynamically re-task aviation missions. Over the horizon and beyond line of sight A2C2 and Airspace Management. (Soldier Platform to ARFOR and JFCC level)	High	FA3
STR 8	Ability to provide tailored payloads to augment and provide surge or replacement capabilities for high demand space-based capabilities. (Division to ARFOR and CJFLCC levels)	High	

FUNCTIONAL CONCEPT REFERENCE NUMBER	REFINED SPACE ENABLED CAPABILITY STATEMENT Strike (continued)	Future Modular Force MISSION RISK	ASMP CROSS REF NUMBER
STR 9	An improved space-based technical means to detect, locate and ID enemy forces and efforts. (Division to ARFOR and CJFLCC levels)	High	BA1
STR 10	Ability to facilitate the use of non-lethal effects in order to deny, disrupt, or degrade adversary access to the effects of space-based systems. (Division to ARFOR and CJFLCC levels)	High	FA4 P2
STR 11	Ability to provide full spectrum dominance of space, to include unrestricted access to space-based communications, ISR, WTEM, PNT, and the ability to deny these options to the enemy at the time and place of our choosing. (Division to ARFOR and CJFLCC levels)	High	BA3 P2 JC4a
STR 13 STR14	Ability to employ space as a tool to achieve and maintain information superiority; ability to exploit space ISR capabilities in support of IO and deception. (BCT to ARFOR and CJFLCC)	High	JC4 FA4 P2
STR 15 STR12	Ability to conduct offensive space control negation operations; ability to plan and execute space control operations in a timely manner; ability to execute space control operations in support of a coordinated IO campaign. (Division to ARFOR and CJFLCC levels)	High	FA4 P2
STR 16	Ability to employ advanced space control technologies such as change detection imagery, space based radar, space-based SIGINT, space-based jamming for tactical and civil communication systems. (CAB to ARFOR and CJFLCC level)	Medium	BA1

B-4. PROTECT RELATED SPACE CAPABILITIES

(Note: These capabilities are unique to the Protect functional concept. Other protect related capabilities are included in other portions of the matrix analysis.)

FUNCTIONAL CONCEPT REFERENCE NUMBER	REFINED SPACE ENABLED CAPABILITY STATEMENT Protect	Future Modular Force MISSION RISK	ASMP CROSS REF NUMBER
P7, P9 M1, M8	Ability to detect missile launches from space in order to cue BMD radar, provide missile warning to the force, provide cuing information for tracking and counter strike operations. (BCT to ARFOR and CJFLCC)	High	P1
P8	Ability to exploit hyper spectral and multi-spectral imagery in a rapid matter to detect and defeat improved camouflage and obscurants, the presence of biological or chemical agents, and other signs of tampering, sabotage, or enemy presence. Provide detection of IED, UXO, and non-explosive obstacles with change detection capability. Provide urban environment detection capabilities to identify threats based on civil activities. (CAB to ARFOR and CJFLCC level)	High	BA2 BA3
P11	Ability to deter, warn, and if necessary, defend against enemy attack; assuring that hostile forces cannot prevent our own use of space; ability to enhance operations of U.S. and allied forces ensuring our ability to conduct military and intelligence space-related activities. (Division to ARFOR and CJFLCC levels)	Medium	FA4 P2
P12 – 14 M9	Ability to provide dedicated, persistent and redundant space support to the protect functions of: detect, assess, warn, prevent, deter, defend and respond. Ability to detect jamming operations conducted as part of the anti-access efforts. (CAB to ARFOR and CJFLCC level)	High	JC1 BA1

B-5. MOVE RELATED SPACE CAPABILITIES

(Note: These capabilities are unique to the Move functional concept. Other move related capabilities are included in other portions of the matrix analysis.)

FUNCTIONAL CONCEPT REFERENCE NUMBER	REFINED SPACE ENABLED CAPABILITY STATEMENT Move	Future Modular Force MISSION RISK	ASMP CROSS REF NUMBER
M4	Ability to support high-speed, dispersed maneuver for positional advantage and enhanced fires through NLOS and BLOS situational awareness by providing discrete imaging and targeting data, detection and characterization of obstacles and NBC contaminated areas. (Company, team to ARFOR and CJFLCC level)	Medium	BA1
M5, M11	Ability to provide accurate and timely PNT and accurate terrain data in all operational environments and conditions. (Soldier platform through ARFOR and CJFLCC)	Low	FA1
M6	Ability to provide seamless in-transit visibility of sustainment assets. (Soldier platform through ARFOR and CJFLCC)	High	P3 FL1

B-6. SUSTAIN RELATED SPACE CAPABILITIES

(Note: These capabilities are unique to the Sustain functional concept. Other sustain related capabilities are included in other portions of the matrix analysis.)

FUNCTIONAL CONCEPT REFERENCE NUMBER	REFINED SPACE ENABLED CAPABILITY STATEMENT Sustain	Future Modular Force MISSION RISK	ASMP CROSS REF NUMBER
Sust 2	Ability to provide space links to facilitate transmission of data such as position, operational status, equipment and aircraft conditions, and maintenance diagnostics and prognostics anywhere in the JOA. Ability to maintain in-transit visibility of all supporting logistical activities, supplies, and services. (Soldier platform through ARFOR and CJFLCC)	High	JC3 FA1
Sust 11 – Sust 18 Sust 20 – S34	Ability to provide a secure, pervasive, logistics C2 support infrastructure emphasizing speed, precision, accuracy, visibility, and centralized management from Soldier platform to CONUS through a logistics common operating picture to include: supply distribution and management, reach back to industry and knowledge centers, passive RFID tags, Soldier health status, petroleum and fuel supply, ability to support a logistics COP, proactive and anticipatory maintenance, munitions, water. (Soldier platform through ARFOR and CJFLCC)	High	JC2
Sust 19	Ability to conduct space-based route reconnaissance and convoy monitoring. (CAB to ARFOR and CJFLCC level)	Medium	BA3

Glossary

A2C2	Army airspace command and control
ABCS	Army battle command system
ACDEP	Army Concept Development and Experimentation Program
AEHF	advanced extremely high frequency
AFSATCOM	Air Force satellite communications
AO	area of operations
AOR	area of responsibility
APOD	aerial port debarkation
ARFOR	Army Force
ARSST	Army space support team
ARSTRAT	Army Forces Strategic Command
ASCC	Army service component command
ATH	at the halt
ATQB	at the quick halt
AWGS	advanced wideband gap-filler system
BC	battle command
BCS	battle command system
BCT	brigade combat team
BDE	brigade
BFSA	blue force situational awareness
BFT	blue force tracking
BLOS	beyond line-of-sight
BMD	ballistic missile defense
C2	command and control
C3	command, control and communications
C3D2	camouflage, cover, concealment, denial, and deception
C4ISR	command, control, communications, computers, intelligence, surveillance and reconnaissance
CAB	combined arms battalion
CBA	capabilities based assessment
CBRN	chemical, biological, radiological, nuclear
CCP	concept capability plan
CCJFACC	combined joint force air component command
CD&E	concept development and experimentation
CID	combat identification
CJFLCC	combined joint force land component command
CJFMC	combined joint force maritime component
CJFMCC	combined joint force maritime component command
CJTF	commander joint task force or combined joint task force
CMO	civil military operations
CNN	Cable News Network
CONUS	continental United States
COP	common operational picture
DA	Department of the Army
DCGS-A	distributed common ground system – Army
DMSP	defense meteorological satellite program
DOD	Department of Defense
DOTMLPF	doctrine, organization, training, materiel, leadership and education, personnel and facilities

DRSN	defense red switch network
DSCS	defense satellite communications system
DSP	defense support program
DSPD	defense support to public diplomacy
D-TES	division – tactical exploitation system
DTSS	digital topographic support system
EHF	extremely high frequency
EW	electronic warfare
FA-40	functional area – 40 (Army Space Operations Officer)
FAB-T	family of advanced beyond line-of-sight terminals
FBCB2	Force XXI battle command brigade and below
FBCT	future brigade combat team
FCS	Future Combat System
FY	fiscal year
GB	Grenadier Brat
GBS	Global Broadcast Service
GEO	geosynchronous earth orbit
GIG	global information grid
GMD	ground-based midcourse defense
GPS	global positioning system
GSU	geographically separated units
HALE	high altitude long endurance
HBCT	heavy brigade combat team
HC3	high capacity communications capability
HQ	headquarters
ICW	In conjunction with
IED	improvised explosive device
IMINT	imagery intelligence
IMETS	Integrated Meteorological System
INMARSAT	international maritime satellite
IO	information operations
ISR	intelligence surveillance and reconnaissance
JBC	joint battle command
JBFSA	joint blue force situational awareness
JBFT	joint blue force tracking
JC2	joint command and control
JEFX	joint forces experiment
JFC	joint force commander
JFCC S&GS	joint functional component command space and global strike
JIM	joint, interagency, multinational
JIMN	joint, interagency, and multinational network
JOA	joint operations area
JPO	joint program office
JPOTF	joint psychological operations task force
JROCM	joint requirements oversight council memorandum
JSOTF	joint special operations task force
JTAGS	joint tactical ground station
JTF	joint task force
JTRS	joint tactical radio system
LCC	land component commander
LOC	lines of communication

LPD	low probability of detection
LPI	low probability of intercept
MACOM	major Army command
MASINT	measurement and signatures intelligence
MILSATCOM	military satellite communications
MDMP	military decision making process
MJPO	Military Joint Program Office
MP	military police
M & S	modeling and simulation
MSL	mean sea level
MTS	movement tracking system
MTX	mobile transmitter
MUOS	mobile user objective system
NASA	National Aeronautics and Space Administration
NBC	nuclear, biological and chemical
NCOES	noncommissioned officer education system
NECC	network enabling command and control
NIPR	non-secure internet protocol router
NLOS	non-line-of-sight
NOAA	National Oceanic & Atmospheric Administration
NMT	Navy multi-band terminals
NRO	National Reconnaissance Office
NTM	national technical means
PA	public affairs
POM	program objective memorandum
OCONUS	outside the continental United States
OES	officer education system
O&O	operational and organizational
OTM	on the move
OV	operational architecture view
POSNAV	position navigation
PNT	positioning navigation and timing
RFI	request for information
RFID	radio frequency identification
RISTA	reconnaissance, intelligence, surveillance, and target acquisition
RSTA	reconnaissance, surveillance, and target acquisition
SA	situational awareness
SATCOM	satellite communications
SCAMP	single channel, anti-jam man portable
SHF	super-high frequency
SIGINT	signal intelligence
SIPR	secure internet protocol router
SITREP	situation report
SME	subject matter expert
SMC	Space and Missile Systems Center
SMDC	Space and Missile Defense Command
SOO	space operations officer
SOF	special operations forces
SORO	stability operations and reconstruction operations
SPOD	sea port of debarkation
SSE	space support element

STE	secure telephone equipment
STU	secure telephone unit
TCA	transformational communications architecture
TES	tactical exploitation system or theater event system
TRADOC	Training and Doctrine Command
TSAT	transformational satellite system
TTP	tactics, techniques, and procedures
UAS	unmanned aircraft system
UHF	ultra-high frequency
USR	unit status report
US STRATCOM	United States Strategic Command
UXO	unexploded ordnance
WIN-T	warfighter information network-tactical
WOES	warrant officer educations system
WGS	wideband gap-filler system
WMD	weapons of mass destruction
WTEM	weather, terrain and environmental monitoring

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