

**LOST IN SPACE:
FUTURE FORCE LEADERS AND VISUALIZATION
OF SPACE OPERATIONS
A Monograph
by
Major Cristine Gibney**



**United States Army
School of Advanced Military Studies
United States Army Command and General Staff College
Fort Leavenworth, Kansas
Academic Year 03-04**

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MONOGRPAH APPROVAL

Major Cristine Gibney

Title of Monograph: Lost in Space: Future Force Leaders and Visualization of Space Operations

Approved by:

James Schneider, Ph.D.

Monograph Director

COL Kevin C.M. Benson, MMAS

Director, School of
Advanced Military Studies

Robert Baumann, Ph.D.

Director, Graduate Degree Program

Report Documentation Page

Form Approved
OMB No. 0704-0188

Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.

1. REPORT DATE

26 MAY 2004

2. REPORT TYPE

3. DATES COVERED

-

4. TITLE AND SUBTITLE

Lost in space: Future Force leaders and visualization of space operations

5a. CONTRACT NUMBER

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER

6. AUTHOR(S)

Cristine Gibney

5d. PROJECT NUMBER

5e. TASK NUMBER

5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

US Army School for Advanced Military Studies, 250 Gibbon Ave, Fort Leavenworth, KS, 66027

8. PERFORMING ORGANIZATION REPORT NUMBER

ATZL-SWV

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)

10. SPONSOR/MONITOR'S ACRONYM(S)

11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT

Approved for public release; distribution unlimited

13. SUPPLEMENTARY NOTES

14. ABSTRACT

Space operations are important to today's Army and will be increasingly important to the Future Force. Currently, the Army has an opportunity to develop Future Force leaders to best utilize space to achieve full spectrum dominance. If the Army does not take this opportunity and develop leaders that can visualize space, there could be grave consequences for the Nation and the Army as the space environment becomes more complex. There are three main documents that provide direction for space operations in the Future Force: Army Space Policy, Army Space Master Plan (ASMP) and Training and Doctrine Command Pamphlet 525-3-14. ASMP outlines the overarching concepts to implement Army Space Policy and TRADOC PAM 525-3-14 details the Army's modernization plan for space. This monograph studies the plans outlined in these documents as they relate to the doctrine, training, leader development, organization and personnel implications for Army space requirements. It examines these concepts in order to answer the question: Is the U.S. Army developing Future Force leaders who will effectively visualize the impact of space capabilities and limitations in their battlespace?" This is a four-part study that first analyzes the Army's plan for space. Next it examines the anticipated threats to space operations and current space-based training, education and doctrine. The third part of the study analyzes the Army's concept of visualization as a function of battle command. Since the Army does not explain how to develop visualization skills in leadership or operational doctrine, the monograph analyzes similar leadership doctrine concepts and examines the concept of intuition as described by Dr. Gary Klein. The final part of the study analyzes the current Army plan for space to determine if the Army's plan will develop intuition or visualization skills in Future Force leaders, which are defined as the division, corps and combatant commanders of the Future Force. The Army must focus on the training and leader development domains to increase the relevance of space operations in the mainstream army. The primary focus should be the training domain, because the leader development domain will most likely change to support issues explored in training. There must be a level of awareness regarding space operations. Without this awareness, our Future Force leaders will be "lost in space."

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:

a. REPORT

unclassified

b. ABSTRACT

unclassified

c. THIS PAGE

unclassified

17. LIMITATION OF ABSTRACT

1

18. NUMBER OF PAGES

62

19a. NAME OF RESPONSIBLE PERSON

ABSTRACT

Lost in Space: Future Force Leaders and Visualization of Space Operations by Major Cristine Gibney, United States Army, 54 pages.

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There are three main documents that provide direction for space operations in the Future Force: Army Space Policy, *Army Space Master Plan (ASMP)* and *Training and Doctrine Command Pamphlet 525-3-14*. *ASMP* outlines the overarching concepts to implement Army Space Policy and *TRADOC PAM 525-3-14* details the Army's modernization plan for space. This monograph studies the plans outlined in these documents as they relate to the doctrine, training, leader development, organization and personnel implications for Army space requirements. It examines these concepts in order to answer the question: "Is the U.S. Army developing Future Force leaders who will effectively visualize the impact of space capabilities and limitations in their battlespace?"

This is a four-part study that first analyzes the Army's plan for space. Next it examines the anticipated threats to space operations and current space-based training, education and doctrine. The third part of the study analyzes the Army's concept of visualization as a function of battle command. Since the Army does not explain how to develop visualization skills in leadership or operational doctrine, the monograph analyzes similar leadership doctrine concepts and examines the concept of intuition as described by Dr. Gary Klein. The final part of the study analyzes the current Army plan for space to determine if the Army's plan will develop intuition or visualization skills in Future Force leaders, which are defined as the division, corps and combatant commanders of the Future Force.

The Army is developing space operations intuition and visualization skills in many officers, but not Future Force leaders. This is crucial to the Future Force, because the experts anticipate that the space operations will become much more dynamic and decisive in the near future. There have been significant doctrinal updates in the last few years regarding space, but these changes are not necessarily relevant to the officers that will command divisions and higher level organization in the next two decades. There are educational opportunities for the target Future Force population, but most officers are not interested in space operations because there are so many other topics that they must study. The Army lacks space-based training at the tactical level, which makes most officers disregard the importance of space operations. Space is not relevant to many officers because the space professionals do a good job. Soldiers use space-based capabilities all the time without cognitive awareness that they are using space assets.

The Army must focus on the training and leader development domains to increase the relevance of space operations in the mainstream army. The primary focus should be the training domain, because the leader development domain will most likely change to support issues explored in training. There must be a level of awareness regarding space operations. Without this awareness, our Future Force leaders will be "lost in space."

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ACKNOWLEDGEMENTS

The author would like to thank many individuals whose guidance and help were essential to the completion of this monograph. I wish to first thank Dr. James Schneider, my monograph director and COL David Sutherland, my Seminar Leader who sent me to Dr. Schneider. There were several space professionals who guided me to the important issues in space: BG Richard Geraci, Major(P) Mike McFarland, Major Keith Phillips, and Mr. Tom Gray. I had several editors and listening boards: Mrs. Suzanne Ross, LTC Bob Rielly, Major Douglas Ollivant, Major Robyn Furgeson, Major Walter Spangler, Mr. Tom Daze and Jim and Gerri Gibney. Finally, Mr. Jeff Barker provided direction, editing and inspiration. Jeff is a one-man space education program. He serves the Department of Defense, the Army and the Command and General Staff College by spreading the space word to all that will listen.

The ideas and views expressed in this paper are those of the author and do not necessarily reflect the official policy or position of the Command General Staff College, the School of Advanced Military Studies, or Department of the Army.

CHAPTER ONE

INTRODUCTION

STATEMENT OF THE PROBLEM

The primary research question is: Is the U.S. Army developing Future Force leaders who will effectively visualize the impact of space capabilities and limitations in their battlespace? The purpose of this paper is to examine the Army's plan to "normalize" space operations into general Army operations and to evaluate if the Army is truly preparing the Future Force to effectively leverage space capabilities and protect the Force from potential vulnerabilities.

BACKGROUND

"There is a clear linkage between the exploitation of space and the warfighter's ability to achieve success on the battlefield."¹ Army leaders must understand space operations to achieve Full Spectrum Dominance. Today, the Army is dependent on space capabilities in the following areas: "communications, intelligence, reconnaissance, navigation, missile warning and weather."² To exploit these capabilities, leaders must understand the significance of space operations on his or her battlespace.

Space Operations will become more complex in the future. The United States currently dominates space power, but this dominance may not continue into the Future Force. Other nations and civil organizations continue to develop their own space capabilities.³ Additionally, as the U.S. becomes more dependent on space capabilities, these capabilities become critical vulnerabilities for U.S. Forces.⁴ The increased complexity of space operations requires Future

¹ U.S. Department of the Army. *United States Army Space Master Plan*, (Washington, D.C.: Government Printing Office, 2000), ES-3.

² Ibid.

³ Nader Elhefnawy, "Four Myths about Space Power," *Parameters* XXXIII, no. 1 (spring 2003): 124-132.

⁴ U.S. Department of the Army. *TRADOC PAM 525-3-14 Concept for Space Support of the Objective Force*, (Fort Monroe, VA: U.S. Training and Doctrine Command, 2003), 5.

Force leaders to not only be aware of space capabilities, but they must be able to visualize these capabilities and vulnerabilities as part of their battlespace. Future Force leaders must consider space when planning operations. Space operations must be in decision-makers thought processes, which includes the elements of operational design as well as the Military Decision-Making Process (MDMP).

The Future Force leaders discussed in this monograph are: division commanders, corps commanders, combatant commanders and Service chiefs. These individuals are the current senior captains, majors and lieutenant colonels of today's Army. The current trend is that the division commanders, corps commanders, etc are combat arms officers.⁵ To establish the training level of Future Force leader, this monograph will focus primarily on the development of current infantry and armor majors.

SCOPE AND LIMITATIONS

This study compares current Army plans for space with Army doctrine, current trends and theory on intuition development. The study focuses on human system elements of the Army's requirement system: doctrine, training, leader development, organization and personnel (DTLOP). The materiel and facilities aspect of requirements is not part of this study.

The Future Force decision-maker is the focus of this study. The target population is Operational Career Field (OPCF), primarily infantry and armor majors. This study discusses Functional Area 40- Space Operations (FA40) only in the context of the way the FA40 may influence the targeted OPCF leaders. FA40s are a cadre of space professionals. The Army has invested many resources in the FA40 program, and the program should be successful in raising space literacy of some populations in the Army. FA40s should have some impact on the OPCF

⁵ U.S. Department of the Army, *Army General Officer Roster* (Washington, DC: General Officer Management Office, accessed 9 October 2003); available from <https://akocomm.us.army.mil/gomo/Roster/PublicRoster.doc>; Internet. As of October 2003, there were the

leaders, but because there are so few of them, the career field is not part of this study. The lowest staff level currently authorized an FA40 is the Corps level. Most of the infantry and armor majors examined in this study will not have direct contact with an FA40.

This study is purely unclassified. No classified material was considered during the conduct of this study.

IMPORTANCE OF THE STUDY

This study is important for two reasons. First, space operations are crucial to future success of the Army and the Nation. The Army must develop leaders that can effectively leverage space capabilities and protect the Nation from vulnerabilities created through U.S. dependence on space. Space operations are extremely dynamic, and many believe that it a matter of time before adversaries will challenge United States' dominance in space.⁶ If Army leaders do not understand the space environment, these adversaries could jeopardize the United States military and civil entities. Secondly, if the Army can establish a way to help Future Force leaders visualize space operations in his or her battlespace, the Army can establish a model to integrate new systems and capabilities into the leaders' decision-making cycles. The Army could take the model for visualizing space, and apply it to other fields, such as Information Operations. While this study is about space operations, it is really a primer to effectively managing change.

ORGANIZATION OF THE STUDY

This is a four-part study. Chapter Two discusses current plans for Army space. Chapter Three looks at Future Force requirements and current trends as they relate to space training and operations. Chapter Four examines Army doctrine and leadership study as it applies to visualization and development of leadership competencies, specifically the development of

following branch breakdown for those positions: Special Forces (1), Infantry (9), Armor (7), Field Artillery (2), and Aviation (1)

conceptual skills and intuition. Chapter Five compares and analyzes the previous three chapters to answer the question: “Is the U.S. Army developing Future Force leaders who will effectively visualize the impact of space capabilities and limitations in their battlespace?”

⁶ Ibid. Elhefnawy

CHAPTER TWO

ARMY PLANS FOR SPACE

ARMY SPACE POLICY

Army Space Policy states that space operations are crucial to achieve full-spectrum dominance. The Army believes that space is inherently joint and crucial to future operations due to the ability to pass information through space and to speed up the decision-making cycles of leaders. The Policy identifies five essential Army tasks for space: Enable situational understanding and joint battle command enroute, off the ramp, and on the move; support precision maneuver, fires, and sustainment; contribute to continuous information and decision superiority; support increased deployability by reducing the in-theater footprint; and protect the force during all phases of operations.⁷

The Army Space Policy identifies several non-material Service responsibilities. The Army must clarify its space organization, roles and responsibilities in the requirements and force development process. It must become a space-enabled Army with the integration of Doctrine, Organization, Training, Materiel, Leadership and Education, Personnel, and Facilities (DOTLMPF). Finally, the Army must organize, train, plan, command, control, and execute the four space mission areas.⁸ These space mission areas are described in more detail below.

ARMY SPACE MASTER PLAN

“The *Army Space Master Plan (ASMP)* provides the overall direction and guidance necessary to implement the Army’s space policy.”⁹ This is the roadmap for the future of space

⁷ U.S. Department of the Army. *Army Space Policy April 2003*, Washington, D.C.: Office of the Secretary of the Army, accessed 9 July 2003); available from <http://www.smdc.army.mil>; Internet.

⁸ Ibid.

⁹ U.S. Department of the Army. *United States Army Space Master Plan*, Washington, D.C.: Government Printing Office, 2000), ES-2.

Operations in the U.S. Army. The *ASMP* recognizes the need to change the way the Army thinks about space. To make this shift, it identifies three goals for Army space operations: normalize space, institutionalize space, and operationalize space. The achievement of these goals will establish an Army that integrates space operations into every aspect of the way it operates.¹⁰

Operationalizing space provides capabilities to rapidly task, process, exploit disseminate, and display the information for the requesting commander.”¹¹ Commanders must understand space capabilities and limitations so they can integrate space-based capabilities into their operations. To ensure commander will have the ability to leverage these resources in wartime, space assets must be used during training. Space Operations should be included in plans, exercises, operations, education and simulations.

Institutionalization is the integration of space operations into the institutions of the Army. Space capabilities should be an aspect of military education from basic training for privates, to CAPSTONE for general officers. Space doctrine must be included in all Army functional doctrine. Institutionalization includes a career functional area, FA40s, Space Operations officers. These officers are the space experts. FA40s, along with the training base are a way to spread the institutional knowledge of space operations throughout the Army.¹² The *ASMP* identifies three pillars for space institutionalization: 1) leader development, training education; 2) corps level special staff officers (FA40s), and examination of the need for an officer at division and below; and 3) integration of space doctrine in Army cornerstone documents and the integration of this doctrine at Army schools.¹³

The Army must institutionalize and operationalize space in order to achieve the third Army Space goal, normalization. The *ASMP* envisions normalization of space as the integration of space in everyday operations.

¹⁰ Ibid., ES-5.

¹¹ Ibid., ES-6.

¹² Ibid., ES-6-7.

Just as leaders at all levels intuitively consider weather, intelligence and fire support, they must integrate space capabilities and the space environment into every facet of training, exercises, and military operations. A constantly maturing, space literate force will identify new and refined requirements for support from space. These efforts will greatly enhance the normalization of space through the deliberate and conscious inclusion of space-based capabilities in the Army's entire planning, training, and operating spectrum.¹⁴

These goals ultimately endeavor to establish space operations as a part of regular Army operations. Space literacy is a common theme among the goals of normalization, institutionalization and operationalization. The *ASMP* identifies the major instruments to increase space literacy. The *ASMP* charges the Army War College and the Command and General Staff College as opportunities for space operations institutionalization. Additionally, the FA40s as special staff officers must integrate space operations into Corps and lower units. Doctrine is also a critical aspect to the *ASMP*. This space doctrine must be integrated into the planning, operations and exercises in the Army.¹⁵

The *ASMP* explores the current and future space environment, current initiatives material solutions, and non-material ways to integrate space operations into the current and Future Force. This monograph details *ASMP* doctrine, training, leader development, organization and personnel plans that will affect the current lieutenant colonels, majors and captains targeted in this study.

The *ASMP* acknowledges that the Army must adjust all doctrinal material to include space operations. This will be a long process; doctrine writers must revise and adjust as concepts, interests and systems change. There are eleven documents listed in the *ASMP* that require space doctrine updates.¹⁶

The *ASMP* acknowledges that training and space literacy are the best way to integrate space operations into everyday life, thus achieving normalization. There are two main initiatives

¹³ Ibid., ES-10.

¹⁴ Ibid., ES-6.

¹⁵ Ibid., ES-13.

¹⁶ Ibid., 4-4 f.

that are the *ASMP* training focus: 1) Space-related instruction integrated into all forms of institutional training, and 2) including space operations and products in all training exercises.¹⁷ Current training initiatives include branch specific space training at TRADOC branch school and the integration of space operations into major exercises. Future initiatives include standardized space instruction in branch Captains Career Courses and the Command and General Staff College. The intent of this initiative is to have all officers understand the role of space in the three levels of war.¹⁸

The *ASMP* leader development domain partially relies on elements from the training domain. The Army will train leaders through the Command and General Staff College and the Army War College. FA40s (Space Operations) fall into the leader development domain, but are not part of this study. Finally, 3Y Space Activities additional skill identifier (ADSI) is another way to develop space-literate leaders who are not “full-time” space operators. Officers can earn the 3Y identifier through on-the-job training, civilian education or through electives offered at the Command and General Staff College.¹⁹

The Army is examining organizational aspects of space operations. Due to the dynamic environment, there are no definitive organizational declarations in the *ASMP*. The *ASMP* states, “The optimal end state may be to have special staff section that are organic to land component commanders, corps commanders, and (potentially) division commanders.”²⁰ Space and Missile Defense Command (SMDC) is the Army proponent for Army space interest.²¹

The *ASMP* section regarding the personnel domain (soldiers) advocates training soldiers on space-based systems, products and capabilities. There are enlisted occupational specialties linked to space, but there are no space specific military occupations at this time. The *ASMP* does

¹⁷ Ibid., 4-5.

¹⁸ Ibid., 4-5 thru 4-7.

¹⁹ Ibid., 4-8 thru 4-10.

²⁰ Ibid., 4-11.

²¹ Ibid.

not state that concept should change. Each Army specialty should integrate space operations into Advanced Individual Training to make certain that soldiers have the space operations skills required for their jobs.²²

The *ASMP* provides goals and a way ahead for space operations. The goals are normalization, operationalization and institutionalization of space operations. The *ASMP* suggests that space literacy is a way to facilitate the ultimate goal of normalization. The training and leader development domains provide the most leverage to achieving the goal of normalization.

TRADOC PAMPHLET 525-3-14

TRADOC Pamphlet 525-3-14, Concept for Space Operations in Support of the Objective Force describes the modernization plan for the Army as it relates to space, and outlines the concept for space support to the objective force (now called Future Force). This concept anticipates that the Future Force will require space support from strategic to tactical levels of war, “space to mud.”²³ Space support will be important in worldwide operation, but the concept anticipates that space support will be essential in immature theaters that do not have a reliable communications infrastructure. Space is a critical enabler for the Future Force in the following areas: 1) information superiority; 2) creating situational awareness; and 3) operating in distributed operations.²⁴

It also identifies the four space operations missions: Space support, force enhancement, space control and force application. Space support involves satellite control, missile technology and Army astronauts. Force enhancement is what most soldiers think of when they think space operations: communication systems, navigation, terrain analysis, weather analysis, ISR and

²² Ibid., 4-13.

²³ U.S. Department of the Army. *TRADOC PAM 525-3-14, Concept for Space Support of the Objective Force*, (Fort Monroe, VA: U.S. Training and Doctrine Command, 2003), 9.

²⁴ Ibid., 9-10.

missile warning. Space control is both active and passive and protects U.S. space capabilities while denying enemy space capabilities. Finally, *TRADOC Pam 525-3-14* identifies force application as a future mission, the ability to attack an enemy from space with military weapons.²⁵ This is no longer a future mission. Recently, SMDC /ARSTRAT added space application to the command's inventory of required capabilities. In a December 2003 *Army Magazine* article, BG Robert Lennox, Deputy Commanding General of SMDC, commented that this new capability is "the application of combat power against terrestrial and celestial-based targets by military weapon systems operation through, from and to space."²⁶

The Future Force is based on the concept of "*See First, Understand First, Act First and Finish Decisively* at the strategic, operational, and tactical levels of operations."²⁷ Space Operations will contribute to each one of these concepts. Space control is a crucial enabler in all four of these concepts. Space forces will enable the Future Force to *see first* by 1) missile warning; 2) intelligence surveillance and reconnaissance (ISR); and 3) satellite communications. *Understand First* support includes: 1) combat identification; 2) in-transit visibility; 3) information operations (IO); 4) position, velocity, navigation and timing (PVNT)—GPS is an example of PVNT; and 5) satellite communications. Space operations will support Act First through: 1) Combat Identification; 2) in-transit visibility; and 3) PVNT. Space Operations contributes to Finish Decisively through: 1) PVNT; 2) precision engagement; 3) ISR; and 4) continuous battle damage assessment.

This document explains the five essential space tasks as outlined in the *Army Space Policy*. First, space operators will focus to "support increased deployability and reduced in-

²⁵ Ibid., 8-9.

²⁶ Brigadier General Robert P. Lennox and Lt Col. Eric Henderson, "The Right Answer to the Warfighter's Questions," *Army Magazine* vol. 53, no 12 (Dec 2003): 42.

²⁷ U.S. Department of the Army. *Concept for the Objective Force White Paper* (Washington, D.C.: Office of the Chief of Staff of the Army, accessed 9 July 2003); available from <http://www.army.mil/features/WhitePaper/ObjectiveForceWhitePaper.pdf> ; Internet. p. iv.

theater footprint”²⁸ This task enables support to forces in-theater, without actually deploying the supporting forces into the hostile area. Examples of this support are enhanced communications or ISR support. *TRADOC Pam 525-3-14* indicates that space control is an import piece to this task, as it helps U.S. forces see the enemy first, while preventing the enemy’s ability to see U.S. forces.

The second space task for the Future Force is Support Situational Understanding (SU) “Off the Ramp.”²⁹ This enhances friendly forces capability to analyze terrain and weather information quickly. TRADOC states that space-based SU aids friendly forces to “offset the enemy’s home-court advantage.”³⁰

Space operations will “support information and decision superiority.”³¹ This enabler is supposed to reduce uncertainty in commanders’ decision-making by the use of space-based products. The superiority piece to this enabler specifically discusses space control as a way to keep the enemy from observing friendly movement, both in friendly and hostile territory. TRADOC describes this concept as, “Superior SU, bases on advanced C4ISR capabilities at all levels, will enable ground commanders to operate on their terms, at the time, place and method of their choosing.”³² The fourth task is “Support precision maneuver, fires, sustainment, and information.”³³ PVNT, ISR and Combat Identification are crucial to the ability of friendly forces to acquire and engage hostile targets in populated areas.

The final space enabler for the Future Force is “Protect the force during all phases of the operation.”³⁴ Space control measures deny the enemy an ability to influence friendly forces

²⁸ TRADOC PAM 525-3-14, 11.

²⁹ Ibid.

³⁰ Ibid.

³¹ Ibid.

³² Ibid., 11 f.

³³ Ibid., 12.

³⁴ Ibid.

through space-based capabilities. Space-based warning systems will enable friendly force to prepare for active and passive missile defense.³⁵

TRADOC Pam 525-3-14 outlines the Doctrine, Organization, Training, Material, Leadership and Education, Personnel and Facilities (DOTLMPPF) implications for Army space requirements. This monograph addresses the systems that impact on human aspects, Doctrine, Organization, Training, Leadership and Education and Personnel. The definitions in *TRADOC Pam 525-3-14* are very general and brief, especially when compared to the concepts in the *ASMP*.

Space doctrine will focus on information superiority, force projection through mission-tailored forces and service support, enhanced training, leader development and multifunctional soldiers. There must be a common understanding of the battlespace through doctrine. Army space doctrine must account for overall Army doctrine as well as Joint space doctrine.³⁶

Space asset organization is similar to the rest of the Future Force. The overall organization will be mission-tailored, and able to integrate into a combined arms organization based on mission. *TRADOC Pam 525-3-14* requires a review of Army Space and Missile Defense Command organization in order to serve as the Army component of Strategic Command.³⁷

In the training domain, *TRADOC Pam 525-3-14* requires mission-focused training to develop multi-functional support for full spectrum operations. Active, Reserve, Joint and Special Operations units should conduct this multi-functional training. Training should be live, virtual and constructive training. Additionally, there is a requirement for FA40 officer qualification, as well as space professional military education curriculum at Army schools.³⁸

Space operations necessitate many leader development and educational requirements. Leaders must understand the impact of space-based assets in decision-making at all levels of war.

³⁵ Ibid.

³⁶ Ibid., 28.

³⁷ Ibid.

“Full integration of relevant space topics into the Army professional military education program, at all leadership levels is required in the near term.”³⁹

For the personnel domain, the Army needs multi-functional soldiers that can work with technology. They must learn to be adaptive through the three pillars of leadership: institutional training, operational experience and self-development.⁴⁰

SUMMARY

Army Space Policy identifies the Army’s approach to space and the Army Space Master plan provides the vision and goals for Space Operations. *TRADOC Pam 525-3-14* provides the overarching concept for Army space operations supporting the Future Force. These three documents show how the Army views future missions and plans as they relate to space. The subsequent chapters examine how the Army is executing some of these plans.

³⁸ Ibid.

³⁹ Ibid.

⁴⁰ Ibid., 29.

CHAPTER THREE

SPACE AND THE FUTURE FORCE LEADER

CURRENT SPACE INITIATIVES

Today, every soldier has some contact with Space Operations. Space is often transparent, but extremely relevant to the warfighter. The modern battlefield has changed from just land, sea, and air to include the additional medium of space. Space is the new high ground.⁴¹

Space has both military and non-military purposes. Most civilians use space daily. Weather satellites help us determine whether we need an umbrella when we go out. Television stations use satellites to conduct interviews around the world. We can even get directions in our cars using global positioning technology.

Satellite launches are not only a national endeavor. There are private multi-national corporations that maintain their own constellations. One example of this is Systeme Probatoire d'Observation de la Terra (SPOT). The Spot Image Group is a multinational company based in France. It has five subsidiaries in the following countries: Australia, China, United States, Japan and Singapore. It also has offices in Germany and the United Arab Emirates.⁴² The SPOT Image website displays the following mission statement:

SPOT Image, along with its partners, is committed to various programmes whose purpose is to make Earth observation images available for worthy causes such as natural and manmade disasters, humanitarian missions, global surveillance of the environment, international security and peace keeping, education and research.⁴³

⁴¹ U.S. Department of the Army. *United States Army Space Master Plan*, Washington, D.C.: Government Printing Office, 2000), ES-1.

⁴² SPOT Image Group, Spot Image Home, The Programmes (accessed 2 February 24); available from http://www.spotimage.fr/html/_167_.php; Internet.

⁴³ Ibid.

SPOT Images are for sale to clients on the internet. *SPOT Products & Services Price List*, effective 15 July 2002 defines a client as “Any individual or legal entity which orders or intends to order one or more PRODUCTS from SPOT Image within the context of its professional activity.”⁴⁴ SPOT Image clients may buy archive products with a 10-meter resolution for as little as approximately \$730 (US) for an area 13KM x 13KM. If the client desires to request a priority program with new photos, they may commission custom imagery with a 2.5-meter resolution for approximately \$15,000 (US) of a 60 KM x 60 KM area.⁴⁵ SPOT Image Group demonstrates that the United States may currently dominate space, but there are multinational companies that can provide imagery to anyone with some money.

The military has established space-based products and capabilities in the following areas: communications, intelligence, surveillance, reconnaissance, missile warning and weather.⁴⁶ Space-based assets are both critical capabilities and critical vulnerabilities for U.S. Forces. These assets help the U.S. dominate the battlefield through precision engagements and real time communications, however they create vulnerabilities as the Army and all U.S. Forces are also dependent on these capabilities.

Joint Publication 3-14 identifies the four military mission areas for space: space control, space force enhancement, space support and space force applications⁴⁷. These mission areas are defined in Chapter Two of this monograph, in the section *TRADOC Pamphlet 525-3-14*. These mission areas are not only the concern of forces with an active role in space. Terrestrial-focused forces, and especially the leaders of these forces must understand the impact of these mission areas on their operations. An example of this is space control. During OPERATION IRAQI

⁴⁴ Spot Image Group. *Spot Products & Services Price List*, (accessed 2 February 2004) http://www.spotimage.fr/automne_modules_files/standard/public/p336_fileLINKEDFILE_price.pdf; Internet. 4.

⁴⁵ *Ibid.*, 2. Dollar amounts estimated from the pricelist in euros. The 13 KM x 13 KM archive product lists for 640 euros. The 60 KM x60 KM priority program service is 9980 euros for the product and 3100 for the priority program.

⁴⁶ Army Space Master Plan, ES-3.

FREEDOM, enemy forces employed GPS-jammers. The U.S. military took space control measures to negate the effects of these jammers, which rendered them ineffective.⁴⁸ The Iraqi forces understood the importance of GPS on U.S. operations and attempted to exploit that vulnerability. Though unsuccessful this time, this example demonstrates that adversaries identify space as a potential vulnerability to American forces and the U.S. must be vigilant when approaching space control issues.

SPACE AND THE FUTURE FORCE

Space will be an important enabler in the Future Force. *TRADOC Pamphlet 525-3-14, Concept for Space Operations in Support of the Objective Force* outlines plans about space support in the Future Force, but the future environment is dynamic. TRADOC published *PAM 525-5-14* in April 2003 and described space application as a potential mission in the future. In the December 2003 issue of *Army Magazine*, the Deputy Commander for Operation, United States Army Space and Missile Defense Command states that SMDC added space application to their inventory of required capabilities.⁴⁹ In less than eight months this mission area transitioned from a future capability to a current capability.

Major General John Urias, the Program Executive Officer for Air and Space Missile Defense believes that space operations will prove critical to the Future Force because there will be a heavier reliance on information superiority and dominance. He noted the importance of space enhancement and emphasizes, “space is emerging as a major contributor to information

⁴⁷ The Joint Staff. *Joint Publication 3-14, Joint Doctrine for Space Operations* Washington, D.C.: Government Printing Office, 2002), IV-5.

⁴⁸ James W. Canan, “Iraq and the Space Factor,” *Aerospace America* August 2003 [magazine on-line]; available from <http://www.aiaa.org/aerospace/Article.cfm?issuetocid=393&ArchiveIssueID=41>; Internet; accessed 9 November 2003.

⁴⁹ Brigadier General Robert P. Lennox and Lt Col. Eric Henderson, “The Right Answer to the Warfighter’s Questions,” *Army Magazine* vol. 53, no 12 (Dec 2003): 42.

dominance.”⁵⁰ Space enhancement also requires space control to be effective, and space control may in fact be the biggest challenge for the United States in the future.

In a November 2003 interview, Lieutenant General Joseph Cusmano, Jr., former Commander, Army Space and Missile Defense Command stated, “The sense of urgency I would feel is in the area of space control.”⁵¹ He believes that space control will be the Army’s most challenging responsibility in the future. Space control is crucial to all five essential space tasks outlined in *TRADOC Pam 525-3-4*. The Future Force needs leaders that understand all four space mission areas, but the need for space control is has the greatest direct impact on Future Force soldiers.

ANTICIPATED SPACE REQUIREMENTS

Currently the United States dominates space operations. Today, there is not one country in the world that can compete with U.S. space supremacy. Other nations are interested in space, as there are at least sixteen nations that currently have some type of military space capability.⁵² *TRADOC Pam 525-3-14* predicts that terrorists and other potential enemies will have access to many space-based products and services as well as a way to destroy or neutralize U.S. space capabilities. Of special note is the rise of CBRNE (chemical, biological, radiological, nuclear, and enhanced high explosive) weapons that require space assets to warn and defend against missile attack.⁵³

While many nations and other actors do not have organic space capability, the commercialization of space provides space for hire capabilities. Nader Elhefnawy asserts that the

⁵⁰ Major General John M. Urias, “Space Technology and Concept Development for the Army’s Future Force,” *Army Magazine* vol. 53, no 12 (Dec 2003): 34.

⁵¹ Ann Roosevelt, “Space Control Vital for Future Operations, General Says,” *Defense Daily* (3 November 2003), [MS-Word document] CGSC Space News, 4 November 2003.

⁵² U.S. Army Command and General Staff College, *U.S. Army Space Reference Text: 2002 Draft*. Fort Leavenworth, KS: U.S. Army Command and General Staff College, (2002), 2.

⁵³ U.S. Department of the Army. *TRADOC PAM 525-3-14, Concept for Space Support of the Objective Force*, (Fort Monroe, VA: U.S. Training and Doctrine Command, 2003), 5.

advantage that the U.S. has over other nations like Iraq is the fact that the U.S. is an information-age power fighting and industrial-age power.⁵⁴ “While no other power can match the United States satellite for satellite, states can have many of the benefits of a space infrastructure without launching a single satellite of their own.”⁵⁵ Commercial space-based products are a way for a nation without organic space capability to buy their way into the information-age.

These commercial space providers create precarious situations for the United States. How do you prevent the use of these commercial capabilities by your adversary? There are not only diplomatic problems with attacking or neutralizing a commercial satellite, but there are economic and informational issues as well. These companies may have many clients, including U.S. companies and U.S. allies. Elhefnawy equates the attack of commercial satellites to the attack of neutral ships during wartime.⁵⁶ The U.S. must be very careful in the handling of these civilian satellites.

Additionally, as the U.S. becomes increasingly dependant on our space-based capabilities, it creates vulnerabilities that our enemies will attempt to exploit. Space Control issues promise to grow in order to protect U.S. Space dominance. As the case with GPS-jammers during IRAQI FREEDOM, states and other actors will attempt to neutralize and disrupt U.S. space capabilities. They can do this in many ways, from computer hackers to terrestrial-based interference.⁵⁷ Adversaries do not need to match U.S. space power to be able to create huge problems for U.S. space-based products.

NEW DOCTRINE

Updating doctrine is a continuous process. Recent space related additions to doctrine include five major publications: FM 7-15, Army Universal Task List, FM 3-91 Division

⁵⁴ Nader Elhefnawy, “Four Myths about Space Power,” *Parameters* XXXIII, no. 1 (spring 2003): 126.

⁵⁵ *Ibid.*

⁵⁶ *Ibid.*, 125.

⁵⁷ *Ibid.*, 126.

Operations (Final Draft), FM 3-93 The Army in Theater Operations, FM 6-0 Mission Command: Command and Control of Army Forces, and FM 5-0 (Draft) Army Planning and Orders Production. These documents are crucial to the full integration of space operations into the mainstream force.

FM 7-15 is significant because it includes space support as a formal, doctrinal task. Army Tactical Task (ARTT) # 7.4.6 in *FM 7-15* is, “Provide Space Support.”⁵⁸ It is a sub-task of Plan Tactical Operations Using the Military Decision-Making Process/Troop Leading Procedures.

FM 3-91 and *FM 3-93* are important because they outline the way that space operations complement division and theater level operations respectively. *FM 3-91* states that Army Space Command should provide an Army Space Element to the division.⁵⁹ While Army divisions do not have organic space operations officers, the manual indicates that doctrinally a space operations element should augment divisions and outlines the Army Space Element’s responsibilities in a division. *FM 3-93* charges the Joint Force Commander with the responsibility to “guarantee US freedom-of action in space during conflict.”⁶⁰ It also identifies space defense as part of operational force protection.⁶¹ *FM 3-93* positions Space Branch as part of the Plans Division in an Army Service Component Command staff and identifies space augmentation in a theater.⁶² *FMs 3-91* and *3-93* increase Army division and theater-level commanders’ responsibility for space operations and provide doctrinal structure to best handle these responsibilities.

FM 6-0 is noteworthy because it outlines space support responsibilities for staffs. *FM 6-0* identifies the G-3 coordinating staff responsibility for space operations. In staffs that

⁵⁸ U.S. Department of the Army. *FM 7-15, Army Universal Task List*, (Washington, D.C.: Government Printing Office, 2003), 7-27 thru 7-28.

⁵⁹ U.S. Department of the Army, *FM 3-91, Division Operations (Final Draft)*, (Washington, D.C.: Government Printing Office, 2002), 3-7.

⁶⁰ U.S. Department of the Army, *FM 3093, The Army in Theater Operations*, (Washington, D.C.: Government Printing Office, 2003), 1-33.

⁶¹ *Ibid.*, 7-1 thru 7-72.

have a Space Support Officer (SOO), the SOO will work in the G3 shop. The G3 is ultimately responsible to integrate space support into all operations.⁶³

FM 5-0 is currently in draft form, but the final draft includes Annex N, Space Annex to Operations Orders. Most of the other doctrine changes discuss staff structure and responsibilities. These changes are very important, but may not require staffs to really think about space. The *FM 5-0* change is particularly important because it integrates space operations into the Military Decision-Making Process. Annex N is a product that staffs must develop during operations. If staffs produce the Space Annex with operations plans and orders, they have an opportunity to develop a familiarity with space operations and may learn the right questions to ask a space-literate officer. The tangible requirement of an annex within a process force staffs to explore issues they would not consider without the requirement to produce a written document.

CURRENT SPACE TRAINING FOR COMBAT ARMS OFFICERS

Army Space and Missile Defense Command published *Space Education and Literacy Training Plan for the Army and Space Cadre* in April 2003. The purpose of this report was “to review all space positions across the Army that require Army Space Officers or personnel with space competencies...include recommendations and timelines for creating a program of space literacy throughout the Army and developing the Army’s Space Cadre.”⁶⁴ The report found that not only does the Army need a Space Cadre, but also there is a need for space education and literacy throughout the Army.

The following personnel are member of the Space Cadre: FA40, Space Operations Officers and officers in the fields of acquisition and research and development with the 3Y, Space

⁶² Ibid., A-58 and E-44.

⁶³ U.S. Department of the Army. *FM 6-0 Mission Command: Command and Control of Army Forces*, (Washington, D.C.: Government Printing Office, 2003), D-62 and D-117.

⁶⁴ U.S Army Space and Missile Defense Command, *Space Education and Literacy Training Plan for the Army and the Space Cadre*, (Washington, D.C.: U.S. Army Space and Missile Defense Command, 2003), 1.

Activities additional skill indicator (ASI) that are assigned to positions that directly support the Army Space Program. There are also officers who are not part of the Space Cadre, but are Space Literate. These officers hold the 3Y ASI, but do not hold positions that directly influence the space field.⁶⁵ The Army sees those individuals who are not Space Cadre, but Space Literate as the space integrators, who can blend space operations with their field. In addition to the officer Space Cadre, the Army is currently studying the structure of the enlisted Space Cadre.⁶⁶

This report includes a study Survey of Army Space Training. Thirty-three schools across the Army responded to this nineteen-question survey. This survey demonstrates the lack of space literacy across the Army. The strongest affirmative response to a question in the survey (54% positive response from 18 schools) was to the question, “Do you provide any instruction on the Global Positions System?”⁶⁷ This question was the only question that more than half the respondents answered affirmatively. Only four questions had more than ten schools respond affirmatively. Command and General Staff Officer Course (CGSOC) was the only school that taught all of the items surveyed, however the survey annotates that this instruction is through electives taught at the school, not as part of the core course.⁶⁸ With the current curriculum, the Army will not become space literate through the Army’s schoolhouses.

CGSOC AND THE 3Y PROGRAM

The CGSOC provides more Space Education to the mainstream Army than any other school. There are two populations schooled at CGSOC. The basic space course is the Space Orientation (Course A537), a 27-hour course that teaches basic space concepts, from National policy, to Space Mission Areas and capabilities. In Academic Year (AY) 2003, 226 students took this course. The largest student populations came from Military Intelligence (27 students), Signal

⁶⁵ The author of this monograph is in this category as an Operations Career Field (OPCF), Air Defense Artillery Officer with a 3Y ASI.

⁶⁶ Space Education and Literacy Training Plan for the Army and the Space Cadre.

⁶⁷ Ibid., Annex C

Corps (24 Students) and Acquisition Corps (21 Students). There were four students from Infantry, two from Armor, three from Field Artillery, fifteen from Air Defense Artillery, and no students Aviation Branch.⁶⁹

Students must take the second Space Elective, A543 Space Operations in order to earn the 3Y ASI. This course focuses on Space support planning and includes briefs from many of the National Space offices and agencies. It is a 54-hour course. There are seats for 81 students. Military Intelligence (12 students), Signal Corps (9 students) and Acquisition Corps (9 students) were also the largest student populations of the AY 2003 students. There was only one Infantryman in the class, two Field Artillerymen and three Air Defenders. There were no representatives from the Armor or Aviation Branches in A543, which means that both branches did not have anyone graduate from CGSC in AY2003 with a 3Y ASI.⁷⁰

The Space Education at Command and General Staff College (CGSC) Brief states, “CGSC produces more space educated officers than anywhere else in the Army.”⁷¹ Since 1997, there have been 1098 enrolled in A537, Space Orientation. CGSC has awarded 469 total 3Y ASI since 1997 through the completion of A543 Space Operations.⁷²

The Space Program at CGSC provides a foundation for space savvy officers. Several informal aspects of the CGSC space program enhance Space understanding throughout the Army. The Space instructors publish *CGSC Space News* weekly, which compiles important space articles and news that relates to Space operations. Currently, 1,500 subscribers receive this newsletter via email. About 50% of the recipients are former A537 and A543 students⁷³.

⁶⁸ Ibid., Annex C and D

⁶⁹ Space Instructors, Department of Joint and Multinational Operations, *Space Education at CGSC* Brief, 2003.

⁷⁰ Ibid.

⁷¹ Ibid.

⁷² Ibid.

⁷³ Ibid.

The CGSC Space Office also provides A537 and A543 students with several take-away products. Students leave CGSC with: Space Orientation Course CD, Space Environment/Space Weather Effects CD, Orbital Mechanics CD, and the Army Space Reference Text. Most importantly, the instructors provide an environment that encourages former students to contact them when they have questions about Space issues

SUMMARY

Space operations are a dynamic field. The United States is currently a dominant force in space, but adversaries have many ways to compete with that dominance. Due to the commercialization of space, Nations and other actors do not need organic space capability to exploit U.S. vulnerabilities as they relate to space.

Army leadership has identified space control as the most pressing space issue. Currently the Army has developed new doctrine that integrates space operations with general Army operations. The current doctrine indicates that Army commanders have a larger responsibility for space operations than they had in the past, however *there are few opportunities for these commanders to learn about these new tasks*. Some institutional space training occurs in Army schools, but not to the extent recommended in the *Army Space Master Plan* or *TRADOC PAM 525-3-14*.

CHAPTER FOUR

LEADERSHIP COMPETENCY AND VISUALIZATION

BATTLE COMMAND AND VISUALIZATION

Field Manual 3-0, Operations, defines battle command as, “the exercise of command in operations against a hostile, thinking enemy.”⁷⁴ This ability comes from incorporating the following functions: visualization, decision-making, and leadership. *FM 3-0* states that these functions come from “experience, training, study, and creative thinking.”⁷⁵ These functions are the art of command, instead of the science of command.

Visualization is critical to effective battle command. Commanders must be able to visualize the battle in his or her mind as he or she makes plans and decisions for operations. *FM 3-0* emphasizes, “Operational success depends on the ability of the operational commander to visualize and describe complex land operations.”⁷⁶ To do this, commanders must understand their battlespace. Doctrinally, commanders should visualize their battlespace using the following considerations: mission, enemy, terrain and weather, troops and time available, and civil considerations; the elements of operational design; input from other commanders and staff and the commanders experience and judgment.⁷⁷ However, visualization is an art, not a science so the approach cannot be reduced to a checklist. *FM 3-0* states that commanders develop this art “by professional study, constant practice, and considered judgment.”⁷⁸

FM 3-0, Operations identifies visualization as crucial to operational art, but does not explain how to develop visualization. Experience is crucial to the way the commander approaches visualization. “Experience, combined with situational understanding provides the

⁷⁴ U.S. Department of the Army. *FM 3-0 Operations*, (Washington, D.C.: Government Printing Office, 2001), 5-1 f.

⁷⁵ *Ibid.*, 5-2

⁷⁶ *Ibid.*, 5-3

intellectual setting around which commanders visualize the operational design.”⁷⁹ This intellectual setting and the commander’s experience drive the way the commander will visualize execution of the operation.

Visualization is crucial to battle command, but the manuals do not answer the key question. How does the Army develop senior level leaders who can visualize their battlespace? Army doctrine emphasizes visualization, but it does not describe a method to develop visualization. The conceptual skills and sub-skills described in *FM 22-100, Army Leadership* describe ideas that support visualization, but does not discuss visualization directly. This monograph addresses conceptual skills and ways to develop visualization through intuition later in this chapter.

Field Manual 6-0, Mission Command: Command and Control of Army Forces elaborates on the *FM 3-0* concept of visualization. *FM 6-0* states, “Visualize means to create and think in mental image. Human beings do not think in terms of data, or even knowledge; they generally think in terms of ideas and images—mental pictures of a given situation.”⁸⁰ There are two factors that commanders must consider when visualizing: human factors and the dynamics of operations. Human factors are the commanders understanding of his or her own soldiers, their cohesion, training and overall readiness to accomplish the given mission. Commanders must understand those same factors as they apply to the enemy. The dynamics of operations refer to three forces and the relationships between the three forces: friendly forces, enemy forces and the environment. The commander’s understanding of the relationship between the forces is as important, perhaps more important than understanding the forces among them.⁸¹

⁷⁷ Ibid.

⁷⁸ Ibid, 5-1

⁷⁹ Ibid., 5-13

⁸⁰ U.S. Department of the Army. *FM 6-0 Mission Command: Command and Control of Army Forces*, (Washington, D.C.: Government Printing Office, 2003), 2-18.

⁸¹ Ibid., 2-18 thru 2-21

FM 6-0 defines commander's visualization as a specific concept that augments other doctrinal visualization discussions. The *FM 6-0* definition is:

Commander's visualization is the mental process of achieving a clear understanding of the force's current state with relations to the enemy and environment (situational understanding), and developing a desired end state that represents mission accomplishment and the key tasks that moves the force from its current state to the end state.⁸²

Commander's visualization includes three factors: 1) the ability of a commander to foresee an end state; 2) The commander's ability to understand the current state of friendly forces and enemy forces (situational understanding); and 3) the commander's ability to visualize the dynamics of the operations through to the end state.⁸³

The second factor, situational understanding requires the commander to have a complete understanding of friendly and enemy capabilities. The language in *FM 6-0* suggests that this is not just the science of capabilities, but that the commander must have a "feel"⁸⁴ for the situation. "Commanders base their commander's visualization of a situation not only on facts but also on their interpretations of them."⁸⁵

Army doctrine suggests that visualization is crucial to the effectiveness of commanders. Visualization is a nebulous concept that the Army attempts to explain through doctrinal publications and encourage development of in Army leaders. *FM 6-0* is a new manual, published in August 2003. The definition and discussion of visualization is more mature than the concept discussed in the 2001 version of *FM 3-0*. Both manuals discuss the importance of visualization, but do not identify specific ways to develop this skill. The Army published the *FM 3-0* and *FM 6-0* visualization concepts after the publication of *FM 22-100; Army Leadership* in 1999, so they were not developed concepts when the Army published the leadership manual. There are

⁸² Ibid., 2-21.

⁸³ Ibid.

⁸⁴ Ibid., 2-17.

two reasons why Army leadership doctrine is not clear about the development of visualization as a leadership concept: 1) the timeframe of the publication of the concept of visualization; and 2) visualization is a soft skill, so it is difficult to examine the best way to develop this skill.

LEADER DEVELOPMENT

DA Pamphlet 350-58, Leader Development for America's Army outlines the leader development process in the Army. The Army has a "...progressive, sequential, and three-pillar approach to leader development..."⁸⁶ The three pillars are: institutional training and education, operational assignments, and self-development. Institutional training and education is the foundation and provides a theoretical base for the other pillars. The operational assignments pillar complements the institutional pillar and gives leaders the opportunity to apply the skills, knowledge and behaviors they developed in the institutional pillar. The final pillar, self-development occurs throughout the leader development process. Self-development focuses on individual leader development goals.⁸⁷

The Army intends this three-pillar process to be a collaborative interaction between the individual, supervisors and the institutional Army. It is a continuous cycle that involves 1) education and training, 2) experience 3) assessment, 4) feedback, 5) reinforcement and remediation. *DA Pam 350-58* outlines the concept for Army leader development. Additional doctrine regarding leader development is in *FM 22-100, Army Leadership*.

LEADERSHIP COMPETENCIES

In *FM 22-100, Army Leadership* Army doctrine identifies four dimensions of leadership as: Army values, attributes, skills and actions. Doctrine delineates skills as "competence: what a

⁸⁵ Ibid., 2-17.

⁸⁶ U.S. Department of the Army, *DA Pamphlet 350-58, Leader Development for America's Army*, (Washington, D.C.: Government Printing Office, 1994), 3.

⁸⁷ Ibid.

leader must know.”⁸⁸ There are four skill domains that an Army leader must exhibit to be competent: interpersonal skills, conceptual skills, technical skills, and tactical skills.⁸⁹ Students of Army doctrine must make a mental leap when comparing some operational concepts in *FM 3-0* and *FM 6-0* to *FM 22-100*, as there is not a direct doctrinal link between concepts. *FM 22-100* does not specifically explain the development of visualization as a skill, but since it is such an important concept in operational doctrine, one can assume that Army leaders should endeavor to develop their ability to visualize.

The skill that most closely relates to visualization is conceptual skill, which *FM 22-100* defines as, “the ability to understand and apply the doctrine and other ideas required to do your job.”⁹⁰ Conceptual skills, coupled with technical and tactical skills are what leaders need to effectively understand his or her battlespace and more importantly, how he or she can influence that battlespace.

FM 22-100 identifies three levels of leadership: direct leadership, organizational leadership and strategic leadership.⁹¹ This monograph focuses on developing conceptual skills in the organizational and strategic level leaders of the Future Force. By definition, organizational level leaders are at the brigade through corps level, influence hundreds to thousands of people and have staffs that help them lead indirectly through their subordinate leaders.⁹² The organizational leaders addressed in this study are the division and corps commanders of the Future Force.

Strategic leaders are the most senior level leaders in the military and are responsible for thousands of people. Strategic leaders work in uncertain, highly complex environments and events outside of military scope affect their decision-making. Some of the things strategic leaders must concern themselves with are: Congressional activities, acquisition, and inter-Service

⁸⁸ U.S. Department of the Army. *FM 22-100, Army Leadership*, (Washington, D.C.: Government Printing Office, 1999), 2-24.

⁸⁹ *Ibid.*, 1-7.

⁹⁰ *Ibid.*

⁹¹ *Ibid.*, 1-10.

cooperation. “They establish force structure, allocate resources, communicate strategic vision, and prepare their commands and the Army as a whole for their future roles.”⁹³ The strategic leaders addressed in this study are the Army Chief of Staff and combatant commanders of the Future Force.

The conceptual skills required by organizational leaders are: establishing intent, filtering information and understanding systems. To lead effectively, the conceptual skills must accompany tactical and technical skills. At the organizational level, there are two tactical skills, synchronization and orchestration. Technical skills are defined as: maintaining critical skills, resourcing and predicting second and third order effects.⁹⁴

Strategic leader competencies build upon the organizational leader skills. The conceptual skills required by strategic leaders are: envisioning, developing frames of reference, and dealing with uncertainty and ambiguity. The technical skills required by strategic leaders are: strategic art, leveraging technology, translating political goals into military objectives.⁹⁵ *FM 22-100* does not identify additional tactical skills for strategic leaders.

The competencies detailed for strategic and organizational leaders require visualization as described in *FM 3-0* and *FM 6-0*. As organizational leaders establish intent, manage information and understand systems, they must be able to visualize these processes as a tactical leader visualizes a battle. Most organizations will require space-based capabilities or products, so space operations must be part of the organizational leader’s intent or the way that they manage information. Organizational leaders must be able to visualize the way space systems tie into the other systems that they must manage in their large organization.

Envisioning is one of the skills that strategic leaders must develop. The strategic leader’s visualization is broader than the scope identified in *FM 3-0* and *FM 6-0*. Envisioning requires

⁹² Ibid., 1-11.

⁹³ Ibid., 1-12.

⁹⁴ Ibid., 6-9 f.

strategic leader to “design compelling visions for their organizations and inspire a collaborative effort to articulate the vision in detail.”⁹⁶ Strategic leaders must tie their vision to the vision of the United States as a Nation. It is crucial for strategic leaders to understand the capabilities of space capabilities and vulnerabilities because they influence the acquisition and policy processes. If strategic leaders cannot visualize the future of military operation and the way space operations can influence the future strategic environment, the Nation as a whole could be at risk.

The second conceptual sub-skill, developing frames of reference, links the other two strategic sub-skills, envisioning and dealing with uncertainty and ambiguity. *FM 22-100* states that, “All army leaders build a personal frame of reference from schooling, experience, self-study and reflection on current events and history.”⁹⁷ Through this frame of reference, leaders build patterns that they use to make decisions.

The manuals only talk around the concept of intuition, but intuition is crucial in all of the conceptual skills that leaders must develop. Organizational and Strategic leaders need intuition or the ability to recognize patterns in order to leverage these skills: establishing intent; filtering information; understanding systems; envisioning; developing frames of reference; and dealing with uncertainty and ambiguity. *FM 22-100* and *DA Pam 350-58* do not really explain how to develop these patterns or intuition, but Army doctrine continues to advocate experience and study to develop leaders. The ambiguous nature or complexity of these skills may be the reason that Army doctrine does not elaborate on these skills, but the Army as an institution should attempt to further develop intuition as a leadership function.

INTUITION

The term intuition has an almost mystical sound. Intuition is difficult to explain and even more difficult to develop. The American Heritage Dictionary defines intuition as, “The act or

⁹⁵ Ibid., 7-7 thru 7-13.

⁹⁶ Ibid., 7-7.

facility of knowing without the use of rational processes; immediate cognition.”⁹⁸ There is little written in doctrine regarding intuition, but that may be because it is a difficult concept to define or quantify. How does someone develop intuition if there is no rational process? Does intuition have a place in military leadership or doctrine? If it does, can the Army better develop intuition in its leaders?

The Army can develop intuition in its leaders through experience and study. While intuition has a mystical sound, it has always been a factor in warfare and leader development. Clausewitz discusses military genius in *On War*, Book One, Chapter Three, and he suggests that great leaders have a sense of instinct that overrides emotion and “psychological fog” found in battle.⁹⁹ He states, “Often there is a gap between principles and actual events that cannot always be bridged by a succession of logical deductions.”¹⁰⁰ This instinct is similar to the immediate cognition in the dictionary definition of intuition.

In the same chapter he discusses the importance of imagination. The context is terrain, but one can expand terrain to the space environment in the twenty-first century. He discusses the way leaders perceive that which they cannot see. They fill gaps by guessing, based on things they have learned or experienced, “If the whole is to be vividly present to the mind, imprinted like a picture, like a map, upon the brain without fading or blurring is detail, it can only be achieved by the mental gift we call imagination.”¹⁰¹ Clausewitz’s picture and map analogy is similar to visualization discussed in present day Army operational doctrine. His concept of imagination appears to be very similar to intuition.

⁹⁷ Ibid., 7-8.

⁹⁸ American Heritage Dictionary, New College Ed. (1980), s.v. “intuition.”

⁹⁹ Carl Von Clausewitz, *On War*, Michael Howard and Peter Paret, eds. (New York: Random House, Inc., 1993), 125.

¹⁰⁰ Ibid.

¹⁰¹ Ibid, 127.

FM 22-100 briefly addresses intuition in Chapter Two, “The Leader and Leadership: What the Leader Must Be, Know, and Do.”¹⁰² The section on the mental sub-attribute, intelligence, discusses the importance of intuition as it relates to overall intelligence. The *FM 22-100* definition of intuition is, “direct, immediate insight or understanding of important factors without apparent rational thought or interference.”¹⁰³ COL Joshua Chamberlain of Little Round Top fame is an example of this concept illustrated in *FM 22-100*. The authors suggest that his subordinates believed he had a special ability to “see through forests and hills and know what was coming.”¹⁰⁴ The authors then go on to explain that it was the skills that Chamberlain developed through study and reflection that made his subordinates believe he possessed the omnipotent quality.¹⁰⁵ Chamberlain knew what was coming because he developed intuition through study, thought and experience. This example of intuition is similar to what Clausewitz describes as imagination.

Although *FM 22-100* places intuition as a mental attribute instead of a conceptual skill, the conceptual skill discussions imply that intuition is an important skill, which leaders develop through study and experience. In the section on strategic conceptual skills, the manual states, “Strategic leaders need wisdom—and wisdom is not just knowledge.”¹⁰⁶ The paragraph goes on to state that the strategic leaders develop wisdom by “spending time thinking, simply thinking.”¹⁰⁷ This *thinking* appears similar to the concept of reflection required as part of intuition defined in the second chapter. The same section discusses developing the sub-skill, envisioning, and states that leaders develop the vision for their organizations from a “mixture of ideas, facts, conjecture, and personal experience.”¹⁰⁸ Army doctrine does not call this intuition, but in essence, the skill

¹⁰² Ibid., 2-1

¹⁰³ Ibid., 2-14

¹⁰⁴ Ibid.

¹⁰⁵ Ibid.

¹⁰⁶ Ibid., 7-7

¹⁰⁷ Ibid.

¹⁰⁸ Ibid.

they wish to develop in senior leaders is the same ability *to know what is coming* identified by the example of COL Chamberlain as a mental attribute. The leadership manual acknowledges the existence of intuition, but does not elaborate on it, so this monograph considers intuition part of a conceptual skill.

FM 3-0, Operations lists intuition as one method that a commander uses to exercise judgment as part of battle command. Intuition is especially helpful when visualizing operations in an ambiguous environment. “In unclear situations, informed intuition may help commanders make effective decisions by bridging gaps in information.”¹⁰⁹ This ability to bridge gaps in information is similar to Clausewitz’s description of the gift of imagination.

FM 6-0, Mission Command: Command and Control of Army Forces introduces the concept of intuitive decision-making. “Intuitive decisionmaking [sic] is the act of reaching a conclusion which emphasizes pattern recognition bases on knowledge, judgment, experience, education, intelligence, boldness, perception, and character.”¹¹⁰ The manual states that intuitive decision-making requires the commander to have an ability to recognize patterns and elements of a situation. Intuitive decision-making is faster than the methodical analysis traditionally used as part of the Military Decision Making Process (MDMP). Intuitive decision-making is an aspect of command and is most effective when the commander substitutes his or her intuition to fill in gaps in information. *FM 6-0* notes that intuitive decision-making is not effective in the following situations: 1) commander is inexperienced; 2) situation is complex or unfamiliar; or 3) courses of action that the commander is considering appear to be equally valid.¹¹¹

FM 6-0 defines intuitive decisionmaking, but does not define intuition. There are many discussions of intuition in Army doctrine, but no definition. The authors of *FM 22-100*, *FM 3-0* and *FM 6-0* acknowledge that intuition is a skill that Army leaders need to be effective, but do

¹⁰⁹ *FM 3-0, Operations*, 5-2.

¹¹⁰ *FM 6-0 Mission Command: Command and Control of Army Forces*, 2-13.

¹¹¹ *Ibid.*

not go on to describe intuition, or how explain how to develop intuition. If intuition is important to leaders, Army doctrine should explore ways to develop intuition.

How can Army leaders develop intuition? Dr. Gary Klein states that, “Intuition depends on the use of experience to recognize key patterns that indicate the dynamics of the situation.”¹¹² Klein asserts that intuition is developed. Intuition comes from experience.¹¹³

Klein’s book, *Sources of Power* examines the way people make decisions under pressure. Instead of studying people in a laboratory with analytical checklist, Klein conducted his studies in the field of naturalistic decision-making. He defines naturalistic decision-making settings as: (1) time pressure situations, (2) situations with high stakes, i.e. life and death or high dollar amount involved in the situation, (3) decision-makers are experienced in their field of expertise (4) there is inadequate information available to the decision-maker, i.e. missing, ambiguous, or erroneous information, (5) ill-defined goals, i.e. decision-maker does not totally understand what needs to be accomplished (6) poorly defined procedures (7) situation involves cue learning, i.e. decision-maker must perceive patterns and make distinctions, (8) tasks must be performed within larger context (9) situation includes dynamic conditions and (10) situation involves people working in teams.¹¹⁴

Klein’s naturalistic decision-making subjects include: firefighters, pilots, nurses, military personnel, nuclear power plant operators, and chess masters.¹¹⁵ These fields develop the type of situations that Klein requires for his research. Klein developed two approaches to study naturalistic decision-making. His initial study involved firefighters. First, he studied the thought processes of fire commanders. This allowed him to observe how the fire commanders function in high stress situations. Second, he studied exceptional cases, which were the most difficult

¹¹² Gary Klein, *Sources of Power: How People Make Decisions* (Cambridge, MA: The MIT Press), 31.

¹¹³ *Ibid.*, 33.

¹¹⁴ *Ibid.*, 4-6.

¹¹⁵ *Ibid.*, 2.

situations that the firefighters had to face (instead of routine situations).¹¹⁶ Through this study, Klein developed “Recognition-Primed Decision-Making Model”¹¹⁷ (RPD).

RPD is a model that shows how people make decisions in the high stakes, high pressure situations described earlier. It is not a checklist type model; it is a natural model that describes the process. He explains RPD through the fire commander study and their approach to fires. He determined that their experience helped them “see a situation, even a non routine one, as an example of a prototype, so they knew the typical course of action right away. Their experience let them identify a reasonable reaction as the first one they considered, so they did not bother thinking of others.”¹¹⁸ A crucial piece of this model is intuition. Klein believes that intuition may have other factors of which he is unaware, but there are aspects of intuition that individuals derive from experience.¹¹⁹

Klein states that his study subjects use terms like “sixth sense” or ESP (extrasensory perception) when discussing acts that he categorizes as intuition.¹²⁰ Intuition is a critical component of RPD. Klein compares intuition to the simple version of his RPD model. “We size up the situation up and immediately know how to proceed: which goals to pursue, what to expect, how to respond. We are drawn to certain cues and not others because of our situation awareness.”¹²¹ Klein has determined that intuition is not mystical; it is actually based on the decision-maker’s ability to recognize patterns and the decision-makers understanding of a particular situation.

Klein asserts that people can develop intuition in many areas if they concentrate on pattern matching and typical cases. This is difficult to do, but if experienced people can break down their own thought processes into patterns that they can share with others, they can help less

¹¹⁶ Ibid., 8-10.

¹¹⁷ Ibid., 15.

¹¹⁸ Ibid., 17.

¹¹⁹ Ibid., 31-33.

¹²⁰ Ibid., 31-33.

experienced people develop their own intuition in a particular area.¹²² One of Klein's examples of this concept is a story about a paramedic who notices that her father-in-law does not look "right" to her. She insists that he go to the hospital, and it turns out that the father-in-law had major artery blockage. It was the paramedic's intuition that made her insist the father-in-law go to the hospital, but this intuition was based off scientific patterns that a trained person can identify: swollen ankles, gray skin, etc. In this story, the paramedic had a reaction that her father-in-law did not look right at the holistic level, not by breaking down the symptoms into a checklist-type format.¹²³ Some people would refer to her response as a "gut reaction" but her reaction had a scientific basis. It was not a gut reaction, she was responding to her experience and ability to recognize patterns. As a professional, she learned the scientific approach through patterns established by people who saw many artery blockage cases. Her experience combined with her learned scientific approach helped her make an accurate diagnosis.

Klein concludes that intuition is not the mystical, sixth-sense that many people believe it to be. Klein asserts that people can develop their intuition, through their ability to recognize patterns. This pattern recognition is not for novices, pattern recognition must be combined with experience. Intuitive decision-making as described in *Field Manual 6-0, Mission Command: Command and Control of Army Forces* asserts a similar notion that commander who use intuitive decision-making require experience to be able to interpret patterns correctly in a short amount of time.

SUMMARY

Visualization is identified as crucial to battle command in *FM 3-0 Operations, Field Manual 6-0, Mission Command: Command and Control of Army Forces*. The concept of visualization is difficult to describe, but is a powerful concept if one can develop ability to "see" a

¹²¹ Klein, 33.

¹²² Ibid., 42 f.

situation unfold. Great commanders use intuition to develop the Clausewitzian pictures or maps when there is a gap in information. *FM 22-100, Army Leadership* does not specifically identify how to develop visualization skills, but visualization is emerging as a crucial concept for effective battle command. Visualization is tied closely to the concept of intuition, which Army doctrine does not explore in depth. Dr. Gary Klein's book *Sources of Power* provides some conceptual guidance about the importance of intuition and ways to develop intuition.

The Army needs to further develop concepts like intuition and visualization in its operational and leadership doctrine. This doctrine will most likely take several versions to develop the concept and may require different steps for different people. The Army cannot ignore this power of visualization or intuition because it is difficult to explore. *FM 6-0* demonstrates that the Army can depart from simple linear command skill development to address the ambiguous, dynamic environment that makes up the world today. The Army must continue to develop these battle command concepts and leadership concepts.

¹²³ Ibid., 43 f.

CONCLUSION AND RECOMMENDATIONS

SPACE VISUALIZATION AND THE FUTURE FORCE

Why is visualization important to Future Force leaders? Do division, corps and combatant commanders really need to understand space operations? There are space experts that can help the Future Force leader; does he or she need to understand space operations? Army doctrine asserts that visualization of a commander's battlespace is crucial to successful operations.

FM 3-0 states, "Operational success depends on the ability of the operational commander to visualize and describe complex land operations."¹²⁴

Visualization is more than knowing the types of assets a commander has at his or her disposal. Commanders must understand how space system will interact with other resources in the battlespace. More importantly, visualization of space assets requires a commander to understand how the space system will interact with the enemy forces. If a commander truly understands the capabilities and vulnerabilities of space systems, it increases the commander's ability to dominate his or her battlespace. The Future Force is based on the concept of "*See First, Understand First, Act First and Finish Decisively*."¹²⁵ These concepts require situational understanding (SU) and information and decision superiority that are enhanced by space operations. The commander who is unable to visualize they way space assets will enhance or inhibit his or her operations will not be able to support the Future Force concept.

¹²⁴U.S. Department of the Army. *FM 3-0 Operations*, (Washington, D.C.: Government Printing Office, 2001), p. 5-3.

¹²⁵ U.S. Department of the Army. *Concept for the Objective Force White Paper* (Washington, D.C.: Office of the Chief of Staff of the Army, accessed 9 July 2003); available from <http://www.army.mil/features/WhitePaper/ObjectiveForceWhitePaper.pdf> ; Internet, p. 1.

Visualization of space operations is critical today, but promises to be even more critical in the future. The former commander of Army Space and Missile Defense command that asserts that space control is critical. He believes that space control will continue to be the most difficult task for Army forces in the future.¹²⁶ As the United States becomes technologically advanced, it is unwise to assume that our adversaries will not advance as well. As space operations become more complex, it will be more difficult to visualize the way that space systems will interact with friendly assets and the enemy. Future Force leaders will require a deeper understanding of space assets in order to visualize their battlespace. If adversaries do leverage these assets, there is grave danger for the Future Force.

The commander's ability to visualize space operations will pay great dividends to the Future Force. At the organizational level, a division commander has the potential to save many lives and dominate his battlespace by correctly visualizing space operations with all other resources in theater. As a division commander thinks about his plan, he must consider the vulnerabilities of his forces along with the capabilities. If the commander understands and can visualize space operations in his overall plan, he should visualize space control as part of his plan. He must be aware of vulnerabilities: what can the enemy see; what can the enemy do to harm friendly space assets; can friendly forces protect themselves from enemy space capabilities?

If the commander visualizes space operations as part of the overall operation, he increases his unit's ability to "*See First, Understand First, Act First and Finish Decisively.*"¹²⁷ If a commander believes that an adversary has the ability to collect imagery that will observe his forces, he should develop his plan to array forces so that the enemy may not deduce what the commander's forces are doing, or where they are going. A commander may decide to exploit the enemy's ability to observe his forces from space and create a deception plan. The commander

¹²⁶ Ann Roosevelt, "Space Control Vital for Future Operations, General Says," *Defense Daily* (3 November 2003), [MS-Word document] CGSC Space News, 4 November 2003.

¹²⁷ *Concept for the Objective Force White Paper*

may array forces to make the enemy think friendly forces will act. As the enemy believes that they (the enemy) forces can *see first* and *understand first*, friendly forces will be able to *act first* and *finish decisively* as the enemy falls into the friendly trap.

Visualization is important in this scenario because the space operations piece of the plan is not an afterthought; it is integrated into the plan. If the division commander developed a plan without considering the enemy's ability to see his forces, his plan could require numerous revisions. An even more dangerous scenario is the potential for a commander that cannot visualize the impact of an enemy seeing his forces through space assets to disregard a staff officer's recommendation that he revise his plan to based on enemy or commercial satellite coverage. The ability for a commander to visualize space operations as part of his deception plan enables the commander to build a plan that uses deception as a base. If the deception plan were integrated into the plan after the commander developed the main plan, it most likely would not have the same effect as a plan that is orchestrated together. Visualization permits the commander an ability to create a more holistic plan.

Another example of the importance of a division commander's ability to visualize space operations is through reconnaissance and surveillance. Space operations provide enhanced intelligence, surveillance and reconnaissance (ISR) capabilities. A commander who understands and can visualize space operations in his battlespace has the potential to create a highly effective reconnaissance plan. If he integrates his space assets and his scouts he has the potential to save lives and provide a holistic intelligence picture. A commander that does not have the ability to visualize space has the potential to fall into a few traps. First, the commander that does not understand space capabilities may not use all space products at his disposal, thus risking the scouts lives unnecessarily. A commander that does not use available technology can cost lives, but over reliance on space-based technology can prove even more deadly. Space products provide a great resource to gather information about the enemy, however there are limitations to the space ISR capabilities. There are situations that require human beings to conduct

reconnaissance and surveillance that space technology cannot effectively provide. If a commander substitutes space products for human reconnaissance he has the potential to send large units into danger. The commander's ability to visualize space operations is crucial to deciding the proper balance of space technology and human observation.

Visualization requires competency in the skills identified in *FM 22-100, Army Leadership*: establishing intent, filtering information and understanding systems. Additionally visualization requires commanders to master the tactical and technical skills: synchronization, orchestration, maintaining critical skills, resourcing and predicting second and third order effects.¹²⁸ The preceding examples demonstrate that the commander must be able to put those skills together to visualize the battlespace. Once the commander puts those skills together, he can intuitively develop a plan by using a mental process described by Dr. Gary Klein as Recognition-Primed Decision-Making Model (RPD).¹²⁹ These skills have a common thread in the requirement for intuition. In order to develop this intuition, these officers must have experience, in this case, experience with space operations.

What makes space operations different from other aspects of operations? Division commanders are generally infantry and armor officers. They develop intuition and an ability to visualize signal operations and logistics, although it is not their area of expertise. The difference between space operations and many of the other division assets are that almost every soldier uses space assets, but space operations are transparent to the soldier. An infantry battalion commander has signal officers and logisticians assigned to the unit. Infantry lieutenants interact with these other specialties. The infantry officer that is communicating with a satellite phone or using a GPS navigation device most likely has no idea about the satellite constellation that is making those capabilities possible. Currently, there are Space Operations officers at the Corps level. An

¹²⁸ U.S. Department of the Army. *FM 22-100, Army Leadership*, (Washington, D.C.: Government Printing Office, 1999), p. 6-9.

¹²⁹ Gary Klein, *Sources of Power: How People Make Decisions* (Cambridge, MA: The MIT Press), p.15.

infantry major that is potentially a Future Force division commander is using space products as an infantry operations officer, but may never interact with the FA40 or know anything about the support he receives from space. This officer is not developing the skills that will help him visualize a space deception plan or a reconnaissance plan. This officer must be exposed to space operations now so he will be able to visualize these scenarios as a Future Force division commander.

Strategic level leaders must also be able to visualize space as part of overall operations. The strategic leader has different responsibilities than the organizational leader. A combatant commander or the Chief of Staff of the Army required competencies are: envisioning, developing frames of reference, and dealing with uncertainty and ambiguity. Their required technical skills are: strategic art, leveraging technology, translating political goals into military objectives.¹³⁰ These leaders must understand and be able to visualize the impact of space operations at the National level.

The strategic level of war is the most crucial level for space integration. If strategic level leaders do not integrated space operations, tactical level leaders will not be able to leverage space. Strategic leaders must be able to visualize different ways to leverage space operation to ensure that the Army, Department of Defense and National assets effectively manage space systems correctly in the acquisition process. Right now, strategic leaders must use current frames of reference to anticipate the space threat in 2020 and beyond. Strategic leaders must have intuition as it relates to space operations. If they do not, they are at the mercy of experts that may not understand the strategic leader's vision for the Service or Nation. Strategic leaders affect force structure. The strategic leader has the potential to fall into traps similar to those of the organizational leader. If a strategic leader does not believe in the benefits of space-based products, he may not allocate the necessary funding or force structure for space. If the strategic

¹³⁰ *FM 22-100, Army Leadership*, p. 7-7 thru 7-13.

leader believes that satellites can satisfy all ISR capabilities, he may cut force structure in human intelligence. The strategic leader who can visualize the place for space operations in the Future Force will be more likely to balance the requirements between human beings and satellites.

AMSP AND DOTLMPF ANALYSIS

The Army Space Master Plan identifies the three goals for Army Space: normalization, institutionalization and operationalization.¹³¹ Though the concept of normalizing space is ambiguous, it is truly the total integration of space operations into mainstream Army operations and culture. Normalization will occur when commanders integrate space operations into their visualization process and consider space capabilities and vulnerabilities in all aspects of planning. Normalization is difficult to achieve because it requires not only a knowledge shift but also a cultural shift. This shift changes the way Army leaders think about space. Instead of another informational feed, space operations enter the way that a leader thinks about an operation, the visualization process. To achieve normalization, Space operations must become an integral way of how the commander thinks about and plans operations, instead of a periphery input.

Normalization requires that all Army leaders think about space differently. A similar example is the early use of tanks on the battlefield. In World War I, the first tanks supported infantry. It was through experimentation and paradigm shifts that we developed the way we use tanks today. It took a shift in the culture to employ tanks differently and commanders had to change the way they visualized battles.¹³² Space requires a similar mental shift. In today's Army, tanks and infantry complement each other and there is great flexibility in the employment of the two arms. Tanks and infantry can function separately or integrated. They can shift which arm supports the other. Tanks may lead one phase of an operation and support in the next phase. To achieve normalization of space, commanders must be able to apply the same

¹³¹ U.S. Department of the Army. *United States Army Space Master Plan*, (Washington, D.C.: Government Printing Office, 2000), p.1.

flexibility to the concept of space operations in concert with more traditional maneuver operations.

The institutionalization and operationalization goals from the *ASMP* provide the framework to achieve normalization. The *ASMP* and *TRADOC PAM 525-3-14* outline DTLOMPF domains that provide direction to achieve these goals. Many of these enablers overlap between institutionalization and operationalization, but for simplicity sake, this monograph focuses on doctrine and leader development as path to institutionalize space, and training as a way to operationalize space. The structure of the Future Force is currently unknown, so the organizational and personnel aspects are not included in this section.

There are institutional enablers that must occur before space is truly operationalized. The first step is to integrate space operations into current doctrine. The *ASMP* made this recommendation and there have been significant space operations additions to current doctrine. The integration of space operations as a task in *FM 7-15* is a step in the direction to integrate space operations into the commander's visualization process. Space Operations inclusion is significant, but the way it was included is even more important. The fact that the authors choose to put space operations in the section under the command and control battlefield operating system (C2 BOS) demonstrates that space support is crucial to the commander's information and decision thought processes. The selection of the C2 BOS as the parent task for "Provide Space Support" demonstrates that space is a requirement to effectively command and control a unit.

Annex N, Space Operations in *FM 5-0 (Draft)* is important because it forces staffs to produce a product that discusses space operations. It provides a way to enter space operations into the orders production process and military decision process (MDMP) at all levels of the Army. This annex provides a structure and framework to space operations that would not be possible if there was not a requirement to produce a space operations annex. The addition of

¹³² This concept originated from a seminar taught by BG(R) Wayne Michael Hall.

space operations into mainstream Army doctrine is significant to add space operations into everyday Army processes.

FM 3-91 (Final Draft) and *FM 3-93* increase the responsibilities of division and theater-level commanders in regards to space. These documents recommend staff organization for space operations and identify the importance of space operations to terrestrial-based forces. These documents, coupled with Annex N, Space Operations put more emphasis on the ground commanders responsibilities and influence in space operations.

Leader development is the second domain that the Army must embrace space in order to change the way it thinks about space. *TRADOC Pam 525-3-14* recommends that space operation should be integrated into professional military education programs. The *ASMP* recommends the following areas should be leveraged for leader development: the Army War College (AWC), Command and General Staff College (CGSC), the FA40 Space Operations Officer, and the 3Y Space Activities Additional Skill Identifier. The Army has taken the first step by identifying these as focus areas to develop leaders, but currently there is a disconnect between the planning and execution of the plan to use CGSC and the 3Y program to increase space knowledge.

CGSOC does provide solid space operations education through space operations classes, but the college teaches these courses as an elective, so only a small number of students receive this education. In the AY 2003 class, CGSC accepted a total of 226 students in the Space Orientation Course. The students that take the space elective tend to be in fields such as signal and military intelligence, not infantry and armor officers. Unless something happens dramatically in the Army personnel system, infantry and armor officers will be the division and corps commanders of the Future Force. These officers comprised less than 3% of the students in the Space Orientation Class. Only one Infantry officer and no Armor officers took the second course, Space Operations, which is required to receive the 3Y ASI. The Armor and Infantry community

provided a little over 1% of the 3Y awardees (there were 81 students total in the program).¹³³

CGSC does enhance leader development for space operations, but only for a small number of students, most who do not have a career path that will lead them to be the division or corps commanders of the Future Force.

The FA40, Space Operations officer will aid in the leader development process by their presence in operational units, but they are only currently assigned at the Corps level. These officers have the potential to greatly influence the way that the unit they are assigned to views space operations, but they cannot be the only person in the unit who thinks about space operations. The FA40 can help his or her commander visualize the way space operations integrates into a larger operation, but the commander must be able to see the way space impact his operation through his own thought process. The commander must visualize space as part of his operation in his own head.

There must be other mechanisms to aid the FA40 officer. Current space doctrinal initiatives help institutionalize space operations into Army processes, such as MDMP, but units and commanders must apply this doctrine. The FA40 officer can write annexes and provide input to operations as a staff officer, but can he or she influence the commander if the unit does not train space operations?

Both *TRADOC Pam 525-3-14* and the *ASMP* address training space operations. TRADOC's concept is very general, its main focus is on training FA40s and integrating space education into curriculum at Army schools.¹³⁴ The *ASMP* is more detailed and includes several training focuses: Space-oriented education, Major Exercises, Warfighting Experiments and Joint Experimentation.¹³⁵ *Space Education and Literacy Training Plan for the Army and Space Cadre*

¹³³ U.S. Department of the Army. *United States Army Space Master Plan*, (Washington, D.C.: Government Printing Office, 2000).

¹³⁴ U.S. Department of the Army. *TRADOC PAM 525-3-14, Concept for Space Support of the Objective Force*, (Fort Monroe, VA: U.S. Training and Doctrine Command, 2003), p. 28.

¹³⁵ *Army Space Master Plan*, pp. 4-5 thru 4-7.

demonstrates that there is some space education that currently occurs in Army branch schools, however not to the extent that one could consider space education institutionalized. The *ASMP* focuses on training exercises that are higher-level exercises and joint experimentation exercises. There are four exercises listed as major exercises to increase Army-wide space training. Only one of the exercises listed (ULCHI FOCUS LENS) will affect large numbers of the target population of Armor and Infantry officers. Two of the other exercises are primarily Air and Missile Defense Exercises (ROVING SANDS and OPTIC WINDMILL). The fourth exercise listed in the *ASMP* is PRAIRIE WARRIOR, which used to be the CGSC Capstone exercise. CGSC eliminated PRAIRIE WARRIOR from the curriculum due to the transition to the Intermediate Level Education program for majors. In AY 2003, none of the ILE exercises included any space operations play.¹³⁶

One aspect of training not addressed in either the *ASMP* or *TRADOC Pam 525-3-14* is lower-level (brigade and below) space training. Neither document discusses including space operations in the National Training Center (NTC), Joint Readiness Training Center (JRTC) or the Combat Maneuver Training Center (CMTC). Most of the Future Force division, corps and combatant commanders will train at these centers. If space operations were an active part of these training centers, the Army could expose most Future Force leaders to space operations. Through the training centers, Future Force leaders would begin to develop the patterns so important to developing intuition. The training centers could bring the doctrine and the leader development domains together to help Future Force leaders to think about space operations.

The combination of training, doctrine and leader development has the potential to help Future Force division, corps and combatant commanders visualize space operations. Once these officers begin to develop patterns to aid in their intuition, space operations will become part of

¹³⁶ The author was a student in the ILE Pilot program in AY 2003.

their visualization process. It is the ability of the Future Force leader to visualize space operations as part of a larger operation that will ultimately normalize space operations.

TRAINING CHALLENGES

The Army must ensure that Future Force leaders have training opportunities in order to develop patterns that will help develop intuition relating to space operations. This intuition will enable Future Force leaders to visualize space operations as part of their battlespace. The *ASMP* provides a solid plan, but two domains inhibit the full normalization of space operations. First, the *ASMP* identifies institutional training and education, such as branch schools and CGSC to provide leader development for space operations. At this time, that developmental training does not happen in those institutions (with the exception of CGSOC which educate small number of students through electives). Second, the training domain targets exercises that will not affect large numbers of the captains, majors and lieutenant colonels that will lead the Future Force.

As the Army moves to full spectrum operations, the branch schools and CGSC will continue to build more requirements to train and educate students. Curriculum developers must prioritize the subjects the institution will teach. This prioritization is very difficult, if branch schools trained and educated students on all information that they should know, they would spend much more time in school. Thus, curriculum developers do the best they can to teach the major tasks that they believe will be most relevant to the student.¹³⁷

Most likely, space operations do not end up high on that priority list for four reasons. First, Space operations are transparent for most of the Army. Most officers use GPS or satellite communications, but do not understand how the satellites rotate or the impact of space weather on space and terrestrial-based systems. Second, curriculum developer and tactical leaders may decide that space operations are not important because they expect the FA40 or someone else to

¹³⁷ The author was the Air Defense Artillery Officer Basic Course Branch Chief and Commander, 1999-2000 and responsible to develop the Program of Instruction (POI) for new ADA lieutenants.

handle the details of space. Third, most curriculum developers may not understand basic space operations, so they do not think space operations are important. This sends space operations to the bottom of the priority list. There is no emphasis on space operations at training centers and most exercises, so it does not appear important to teach space operations. Ultimately, There is no consequence for lack of space knowledge at this time.

The leader development domain would most likely increase space literacy education if the units in the field felt the impact of space operations in the field, especially at the training centers. It is crucial that the Army leaders experience this kind of training before the enemy develops the capability to compromise our space systems. A commander's first experience with space control must not be on the battlefield. Imagine a NTC rotation where the GPS satellite failed to function. Not only would there be many soldiers lost in the desert, units would not be able to use precision munitions. Suddenly, space would not be transparent. It is this kind of training that would lead to the normalization of space. Space challenges in the training centers would most likely lead a path back to the branch schools and CGSC. Curriculum developers would understand the impact of space and students would be alert to the relevance of the instruction. Space operations must work its way into unit training if the Army expects to normalize space.

VISUALIZATION AND INTUITION

The Army is slowly refining its doctrine to include the concept of intuition. Currently, the *Operations* manual as well as the *Mission Command* manual recognizes the importance of intuition as part of battle command. *FM 22-100, Army Leadership* does not address a way to develop this intuition and does not categorize intuition as an important leadership skill.

Intuition is important to battle command, and specifically the visualization part of battle command. The Army must include intuition as a part of its leadership doctrine. Dr. Gary Klein's studies about intuition are extremely relevant for Army decision-makers. The Army must seek to

actively enhance the intuition of its leaders. This is not important only for space operations but for Army operations in general.

Future Force leaders must develop intuition as it relates to space, if they are going to be able to visualize space operations as part of the overall operation. Currently, infantry and armor captains, majors and lieutenant colonels, most likely the leaders of the Future Force, do not have enough exposure to space operations to develop this intuition. Klein explains that intuition people can develop intuition if someone experienced teaches them pattern matching and explains typical cases.¹³⁸ However, that type of training would be time consuming for a new division commander, especially if the training was deemed necessary as a reaction to an enemy action. Right now, the United States has a technological advantage and time to develop the intuition in Future Force leaders. It is much better to develop this intuition now, through training exercises and leader development, then to play catch up when adversaries find ways to out maneuver the United States in space.

SPACE VISUALIZATION AND THE FUTURE FORCE LEADER

Is the U.S. Army developing Future Force leaders who will effectively visualize the impact of space capabilities and limitations in their battlespace? The Army is developing a cadre of staff officers that can visualize space. Many professionals make space operations in the Army work transparently for the rest of the force. Functional Area 40--Space Operations Officers, many acquisition, signal and military intelligence officers provide excellent space operations support to the Army. However, the division, corps and combatant commanders of the Future Force do not have significant experience to effectively visualize space operations. The space cadre and others involved in space operations do such a good job managing space operations that it becomes irrelevant to the individuals that will most likely lead the Future Force. These future

¹³⁸ Klein p.42-43

leaders do not have a frame of reference to visualize space because space operations are not part of their decision process or conscious thought process.

RECOMMENDATIONS

The Army must develop intuition for space operations in the minds of Future Force leaders. Officers must develop the patterns that make up intuition before adversaries try to compromise our dominance in space. It is feasible to believe that space operations will become exceedingly complex in the next decade or two. Changes in the Army's approach to space must happen now, or the United State will have to play catch up when competitors become shrewder in their use of space. The space community has sufficiently added significant doctrine into Army Service doctrine to aid in this process. The Army must leverage two additional areas to enhance this intuition, Training and Leader Development.

Of the two, the Army must emphasize the training domain first. The Army must introduce space operations training down to the infantry and armor battalion at a minimum. Training will develop the patterns required to develop intuition relating to space operations, which will move toward the normalization of space. Introducing structured space operations at the training centers is one way that the Army can ensure that this training occurs across the entire Army.

If the Army begins to emphasize space training, the leader development domain will most likely fall into place. As officers become cognizant of space operations, there will be a higher demand for institutional level training at branch schools and CGSC. Officers will be more likely to study space operations as part of self-development. The training domain will make space operations mainstream. Training space operations will make space relevant to infantry and armor officers. Why would any officer waste valuable institutional training time on a skill that they do not use in the force? If units train space operations, especially if space operations prove a challenge to units, officers will take the lead to learn how to control space as part of their overall

operation. Officers will demand space training in their institutions. The combination of space training and leader development will greatly enhance the Future Force leaders' visualization skills as they relate to space.

The Army currently has quality institutional space operations training through CGSC. CGSC provides a great leader development opportunity, but much of this opportunity is untapped. There are two shortfalls currently in the program. First, there are not enough armor and infantry officers taking these courses. The space electives are very popular at CGSC, but they are popular among Military Intelligence, Signal and Acquisition Corps officers. The officers trained in these courses are valuable to the Army, but they do not directly increase the visualization tools for future division commanders. More infantry and armor officers must take these courses. This requires emphasis from both CGSC and the basic branches. Students must find space operations relevant to their next job. They must see the value in attending a space operations class when they have other options such as "Light Division Operations" or "Logistics for XO's." Students know that other courses will be relevant to their next job. They must believe that space operations will be relevant to entice them to take the course. The Army must emphasize space operations in units so that students will be more inclined to find value in space classes.

The second shortfall in CGSOC is the failure to use space operations in exercises. The ILE Pilot exercises attempted to include non-traditional maneuver operations such as Information Operations (IO) and Civil Affairs (CA) in several exercises, but space operations was noticeably lacking. CGSC must integrate space operations into CGSOC exercises. The *ASMP* recommended that space operations integrate into Prairie Warrior, the old CGSOC capstone exercise. There must be space operations in all exercises throughout the CGSOC school year. This will become more important in future years, as the Functional Area (those not in the Operations Career Field) students attend ILE programs away from Fort Leavenworth.

If training and leader development does not occur now, the Army will be forced to offer crash courses to future leaders as other countries increase their space capabilities. Klein states that one can develop intuition if courses use an expert that concentrates on pattern matching and typical cases.¹³⁹ If the Army does not begin space training and leader development for these Future Force leaders now, the crash course in space operations will be the only option when space operations become a greater issue as our adversaries attempt to dominate space. Do we want to have Division and Corps commanders go through intensive space operations courses to attempt to force-feed them this intuition, or should we develop it slowly over time through experience, so that these leaders develop their own intuition along the way. The enemy and technology will make the space environment extremely ambiguous in the future. There may not be time to develop courses for leaders in evolving space operations because of the dynamic environment. Intuition may be all we have. Since we (hopefully) have time before a space competitor develops, we should develop intuition as it relates to space operations slowly over time. The alternative crash course will be more time and energy intensive.

The Army must also further develop doctrine on visualization and intuition. The doctrine is currently evolving. The most current manual, *FM 6-0* is much more mature than earlier manuals, so it appears that the Army is serious about developing concepts such as intuition and visualization. These concepts have the potential to be powerful command tools. The operational development of soft skills, like intuition and visualization is not easy. It will be a difficult task, and may prove the need for a more individual approach to leader development than the current broad-brush method. It may be difficult to quantify and hard to explain, but the end result, leaders who can “see” what they must do, and develop a plan from that vision, will pay great dividends to the Army.

¹³⁹ Klein, p.42-43.

The Army is developing officers who can visualize the impact of space capabilities and limitations, but many of these officers will not be Future Force leaders at the division, corps, combatant command and Service level. The Army must do a better job to develop intuition as it relates to space in the populations most likely to command the Future Force. The *Army Space Master Plan* provides excellent guidance, but the Army, as an institution must execute the plan to make the plan effective. If the Army follows the training and leader development recommendations from the *ASMP* and trains space operations in the training centers, the Army will develop Future Force leaders who can visualize space operations. This way, the Army can ensure that Future Force leaders will not be “lost in space.”

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