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AIR COMMAND AND STAFF COLLEGE

AIR UNIVERSITY

INTEGRATING SPACE

INTO AN

AIR EXPEDITIONARY FORCE

by

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Preface

The advice, instruction, guidance and mentoring of several groups and individuals were indispensable, as I have researched the question of integrating space into the AEF. I want to thank Lt Gen DeKok and Brig Gen Starbuck for making time in their busy schedules to proof read my paper. I must also thank Lt Col Chris Pope and Major Gene Brislin for their help, encouragement and common sense guidance regarding the Air National Guard in space. Further thanks go out to Col Andersson, Col Hoapili, CAPT Huffine, LTC Glen Collins, USA, LTC Bill Bayles, USA, Maj Brian Creelman, and all my other mentors, colleagues and friends at USSPACECOM for educating me in the "operational art" of space.

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I owe a final, heartfelt thanks to my wife, Gabi, and my family for their patience and encouragement during this project.

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Abstract

This research paper will answer the following two questions regarding the integration of space into an Air Expeditionary Force (AEF):

1. What types of space support does an AEF require?
2. Is the AEF the proper organization to be the Joint Task Force's (JTF's) single focal point for space?

The first two chapters provide background information on AEFs and space power. These chapters lay the foundation for the analyses contained in the Space Support for AEFs chapter as well as the Command and Control of Space Forces chapter.

The analyses show that space-based systems are key enablers for AEFs. Space systems perform critical force enhancement missions of weather, communications, intelligence/surveillance/reconnaissance (ISR), navigation and missile warning. These space-based capabilities, when combined with terrestrial capabilities, provide the AEF with information superiority that translates into battlespace awareness. Space also provides the necessary communications capability for the AEFs to have a distributed command and control (C2) architecture with forward and rear Joint Air Operations Centers (JAOCs). The decentralized execution of space power by an AEF demands responsive tasking, processing, exploitation and dissemination (TPED) processes for space systems. By improving battlespace awareness, the Theater Deployable Imagery System (TDIS) described in Appendix C is but one example of a system providing decentralized execution of space power for the AEF.

However, effective decentralized execution of space power hinges upon effective centralized control of space power. Therefore, three different C2 architectures were compared against each other. The first C2 model was the AEF as the single focal point for space within a JTF. The second was a Joint Space Operations Task Force (JSpOTF) based on the Joint Special Operations Task Force (JSOTF) used by US Special Operations Command. The last C2 architecture was a Director of Space Forces (DIRSPAFOR) modeled after USTRANSCOM's/AMC's Director of Mobility Forces (DIRMOBFOR).

The C2 analysis showed that the AEF is not the organization to be the JTF's single focal point of space because the global nature of space forces requires C2 from a global, rather than a theater, perspective. Consequently, operational control of few (if any at all) of today's space systems can be transferred from USSPACECOM or other agencies to the JTF. Thus, what the JTF requires is an efficient method of coordinating space support via USSPACECOM. The AEF model is not as congruent with joint doctrine as the other models, and it results in a convoluted chain of command. The JSpOTF and DIRSPAFOR are both congruent with joint doctrine and provide unity of effort for the space forces supporting the JTF. However, the JSpOTF will likely create larger logistical support requirements for already over-extended and over-burdened air and sea-lift forces than would the DIRSPAFOR model. In addition, the JSpOTF will not have operational control of any forces. As a result, this study recommends the creation of a Director of Space Forces (DIRSPAFOR) modeled after USTRANSCOM's/AMC's Director of Mobility Forces (DIRMOBFOR). As the senior space operator in theater, the DIRSPAFOR will provide unity of effort for space support within the JTF and simplify reachback to USSPACECOM.

Chapter 1

Introduction

This paper seeks the answer to the following research questions regarding space operations and Air Expeditionary Forces (AEFs) from two perspectives:

1. What are the space support requirements of an AEF?
2. Should the AEF be the single focal point for space operations for the Joint Task Force (JTF)?

Since the Gulf War, space has been recognized as a critical component of our military forces. Space systems provide critical contributions to the modern warrior's battlespace awareness. Today's space systems provide much of the weather information, intelligence/surveillance/ reconnaissance (ISR), missile warning and communications required on today's battlefield. Therefore, the extent of space system support to the AEF needs to be understood.

At a 4 Aug 1998 press conference, Acting Secretary of the Air Force F. Whitten Peters and Chief of Staff Gen. Michael E. Ryan presented a plan to transition the Air Force to an Expeditionary Aerospace Force. The key concept of this briefing was the division of the current force into 10 Air Expeditionary Forces (AEFs), in order to reduce the impact of today's high operations tempo on the current force. Forces from these AEFs would be specifically tailored to project power from CONUS to anywhere on the globe in support of US national objectives throughout the spectrum of crises. Notionally, each AEF would be on call to deploy to a contingency 90 days out of a 15-month cycle, with two being on call at any given time.[1] Taking

advantage of the on-going revolution in military affairs, an AEF must be able to leverage new technologies and capabilities, such as space systems, to reduce the size of deployed forces, while maintaining mission effectiveness.

The primary limitation to this study is that use of both AEFs and space systems is still evolving. As a result, any discussion their capabilities and limitations will be primarily academic in nature because of a scarcity of actual operational use. In order to minimize the impact of this limitation, the most current descriptions of the AEF and space systems were utilized in this research. However, even a theoretical discussion of space operations and AEFs will yield insights that will make AEFs more effective.

The first two chapters of this study will broadly define and describe an AEF and space power. These broad descriptions will provide the necessary background and framework to answer the research questions. For example, the distributed Air Operations Center (AOC) will be described since it is a key concept of an AEF. Individual appendices will contain the details on space power, C2 of space forces, the Theater Deployable Imagery System (TDIS) and the Unified Command Plan (UCP). Chapter Four will discuss the space support an AEF will require to function. Chapter Five will examine the issue of space force command and control (C2) since effective space support requires effective C2. Three different space command and control models will be compared to determine if an AEF should be used as the single focal point of space power to support a Joint Task Force (JTF). In both chapters, TDIS will be used to illustrate the issues. Chapter Six will summarize and draw conclusions from the analyses contained in Chapters Four and Five.

Throughout this research project, the term Joint Force Commander (JFC) will be used to mean “a combatant commander, sub-unified commander, or a joint task force commander

authorized to exercise combatant command (command authority) or operational control over a joint force."[2] In addition, the term AEF will be used to describe the tailored-to-task mix of air expeditionary wings, air expeditionary groups and air expeditionary squadrons that will deploy in support of a joint task force (JTF). Lastly, the analysis regarding the second research question assumes the AEF commander will be designated the joint force air component commander (JFACC) and that the air operations center will then be designated as a joint air operations center.

The answer to the question of the space support required by an AEF is simple. The AEF requires support from the full range of military and national force enhancement systems, and it will need to leverage the coming revolution in commercial communications and imagery space-based systems. This research project will show that the AEF is not the appropriate organization to be the JTF's single focal point for space because effective decentralized execution of space power hinges upon centralized control from a global view point, rather than from a theater perspective. A Director of Space Forces (DIRSPAFOR) should be established in the JTF. Modeled after the Director of Mobility Forces (DIRMOBFOR), the DIRSPAFOR will provide unity of effort for space support within the JTF and simplify reachback to USSPACECOM. USSPACECOM will then provide the necessary global centralized control of space systems for effective decentralized execution of space power by the JTF in the accomplishment of its assigned mission.

Notes

[1] F. Whitten Peters, Acting Secretary of the Air Force and Gen Michael E. Ryan, chief of staff, United States Air Force, *"Air Expeditionary Forces,"* DOD Press Briefing, Washington, D.C., 4 August 1998, n.p.; on-line, Internet, 30 November 1998, available from http:/www.af.mil/lib/misc/eafbrief.html.

[2] Joint Publication 1-0, *Joint Warfare of the Armed Forces of the United States*, 10 January 1995, GL-7; on-line, Internet, 3 February 99, available from http:/www.dtic.mil.

Chapter 2

Air Expeditionary Force

Necessity is the mother of invention.

—Unknown

The end of the Cold War was not the end of instability and conflict in the world. The past decade has shown the world continues to be a dangerous place for the US military, as evidenced by the tragedy of Kohbar Towers. The end of the Cold War has also seen a four fold increase in contingency deployments with an active duty force reduced by over a third overall and with those stationed overseas cut by 50 percent.[1] In addition, advances in computers, computer networks (i.e., the INTERNET), sensors, precision-guided munitions, directed energy weapons, and space systems are fueling a new Revolution in Military Affairs (RMA).[2] This "digital" RMA offers the promise of dissipating the fog of war by providing the war fighter with a clear, common operating picture of the battlespace and by providing the ability to mass weapons effects against the enemy. This chapter will provide the background information on AEFs necessary to answer the research questions posed in Chapter 1.

Characteristics and Organization

The above phenomena, (force protection, a higher ops tempo for a smaller force and a new RMA), are the driving forces behind a new force architecture the Air Force calls the "Expeditionary Aerospace Force."[3] The Air Force intends to create 10 standing Air

Expeditionary Forces, each made up of active and reserve component units from the Air Force's existing major commands and numbered air forces.[4] This reorganization will not restructure the Air Force in terms of base closures. Each AEF will contain a balanced mix of fighters, bombers, tankers, transports and other support aircraft, along with a robust C2 structure.[5] Each AEF will be on call to react to contingencies for three months out of a 15-month period, with two of the ten AEFs on call or deployed at any one time, as shown in Figure 1.[6] According to Lt Gen Lawrence P. Farrell, Deputy Chief of Staff for Plans and Programs, this new architecture should be in place by 1 Jan 2000.[7]

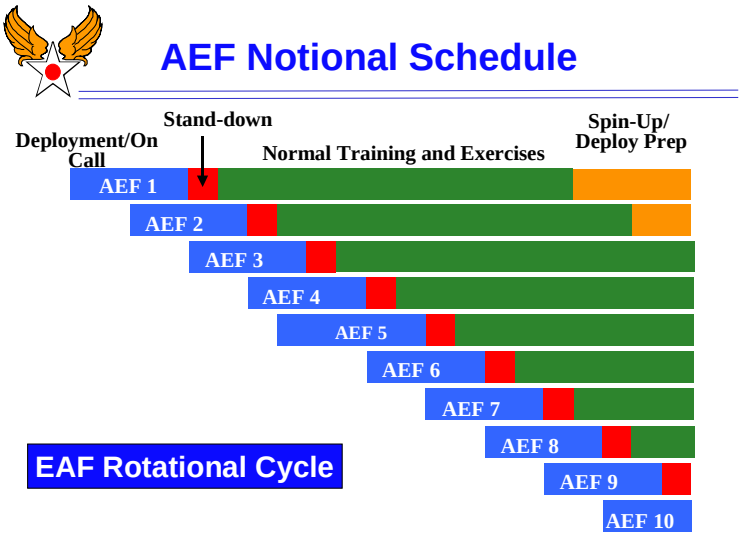

Figure 1 Notional Schedule for AEFs

(From F. Whitten Peters, Acting Secretary of the Air Force and Gen Michael E. Ryan, Chief of Staff, United States Air Force, *"Air Expeditionary Forces,"* DOD Press Briefing, 4 August 1998, n.p.; on-line, Internet, 30 November 1998, available from http:/www.af.mil/lib/misc/eafbrief.html.)

In order to meet unified combatant command Commander in Chief (CINC) operational requirements as presented in Appendix D, AEFs will be tailored to meet the circumstances of any contingency operation that is short of a major theater war (MTW). AEFs will also train together to ensure maximum mission effectiveness while deployed. In addition, AEFs will

typically deploy to theaters within 48 hours of receipt of an operations order, and function under the operational control of the joint air component commander (JFACC), in accordance with Air Force doctrine.[8]

Distributed Operations

An important operations concept embedded in the Chief of Staff of the Air Force's (CSAF) vision for AEFs is that of forward-deployed forces with reachback to CONUS for more forces. The notional construct presented by the CSAF has a mixed force of 75 aircraft deployed with another 100 aircraft available for deployment from CONUS.[9]

This reachback concept also applies to the command and control (C2) of an AEF and is labeled the distributed joint air operations center (JAOC). The distributed JAOC is a simple concept consisting of a forward-deployed JAOC, electronically linked to a larger rear area (usually CONUS) JAOC. The forward JAOC will be minimally manned, while the remainder of the JFACC's staff will be located in the rear JAOC. The two JAOCs will be linked via a wide area net, thereby creating a distributed JAOC.[10] See Figure 5 in Chapter Four.

The distributed JAOC concept offers the JFACC and JFC two advantages over the single large JAOC in theater. Firstly, the distributed JAOC architecture allows for the same C2 capability, but with a smaller footprint in theater. This smaller footprint eases the burden on limited airlift resources. Secondly, force protection is easier to provide to the smaller number of forward JAOC personnel as well as to the rear area JAOC. In September 1998, the Air Force tested the distributed JAOC concept in Expeditionary Force 98 (EFX 98). A forward JAOC, manned by 100 personnel, was set up at Eglin AFB, and the rear JAOC was operated out of Langley AFB by approximately 300 personnel.[11] The preliminary results of EFX 98 indicated that distributed C2 is quite workable.[12] In Desert Storm, the JAOC of more than 1500 personnel

required two weeks and 25 C-17 sized loads to deploy into theater. In contrast, a forward JOAC of the size tested in EFX 98 would require only one day and two C-17 sized loads.[13] Such a reduction in logistical support is required if the AEF Vision is to be fulfilled.

AEF Vision

In 1997, the Air Force Scientific Advisory Board (SAB) conducted a detailed analysis of AEFs, and it articulated a clear vision for AEFs. Unfortunately, the study did not present a clear, centralized examination of the space support required by an AEF, instead, space support was examined piecemeal as it discussed the various aspects of AEF operations. As illustrated in Figure 2, the SAB concluded that to be successful AEFs needed to be rapid, aware, precise, secure, light, and evolvable.[14] Chapter Four will address the space support required for these AEF attributes.

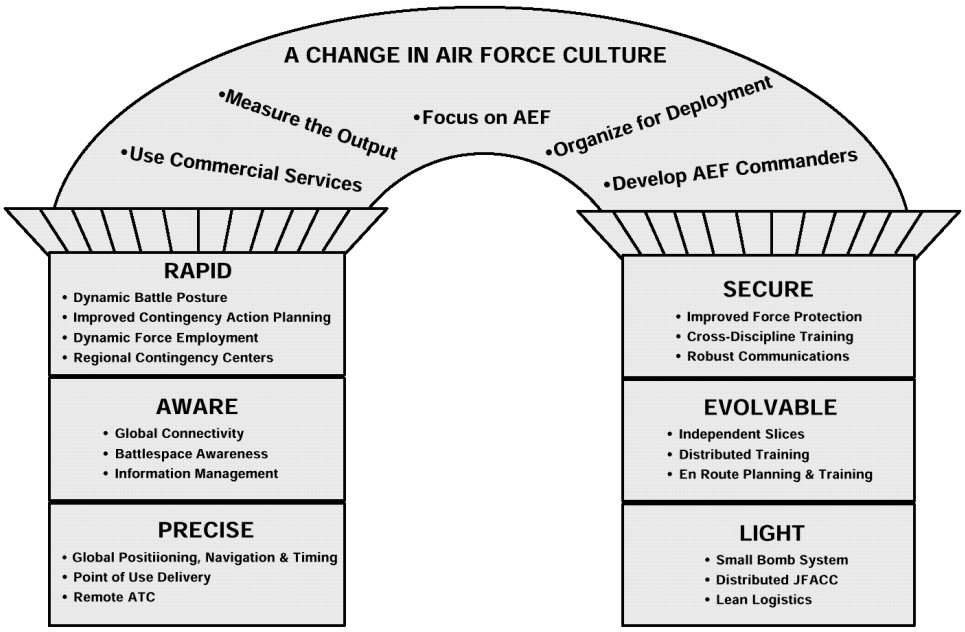

Figure 2 AEF Vision

(From R. Fuchs, et al., *United States Air Force Expeditionary Forces Vol. 1: Summary*, SAB-TR-97-01, [Washington, D.C.: Air Force Scientific Advisory Board (SAB), November 1997], viii; on-line, Internet, 15 October 1998, available from http://web.fie.com/fedix/sab.html.)

In order to achieve this vision, the SAB observed the need for robust command control and intelligence (C2I). The key enablers for this C2I are: Global Connectivity, Information Management, Geospatial Position, Navigation and Timing (PNT), and system assurance.[15] These C2I enablers combine synergistically, providing the AEF with information dominance over any adversary. Again, space systems play a key role in providing the robust C2I necessary for AEF operations.

The AEF promises to be an operations concept that can handle the uncertainties of the multi-polar world of the 21st century. However, the AEF concept of operations described in this chapter, especially the distributed C2, will require support from a myriad of space systems. Chapter Four will address this issue in detail.

Notes

[1] "Expeditionary Aerospace Power," *Air Force Magazine*, November 1998, 4.

[2] Andrew F. Krepinevich, "The Military Technical Revolution: A Preliminary Assessment," in *War Theory Coursebook*, ed. Gwen Story et al. (Maxwell AFB, Ala.: Air Command and Staff College, September 1998), 37.

[3] Bruce D. Callender, "The New Expeditionary Force," *Air Force Magazine*, September 1998, 54.

[4] Ibid., 54.

[5] F. Whitten Peters, Acting Secretary of the Air Force and Gen Michael E. Ryan, chief of staff, United States Air Force, *"Air Expeditionary Forces,"* DOD Press Briefing, Washington, D.C., 4 August 1998, n.p.; on-line, Internet, 30 November 1998, available from http:/www.af.mil/lib/misc/eafbrief.html.

[6] Ibid., http:/www.af.mil/lib/misc/eafbrief.html.

[7] Callender, 55.

[8] Callender, 55.

[9] Peters and Ryan, DOD Press Briefing.

[10] Robert Wall, "Expeditionary Nerve Center," *Air Force Magazine*, August 1998, 64-66.

[11] Ibid., 65.

[12] John A. Tirpak, "The Long Reach of On-Call Airpower," *Air Force Magazine*, December 1998, 24.

[13] Wall, 65.

Notes

[14] R. Fuchs, et al., *United States Air Force Expeditionary Forces Vol. 1: Summary*, SAB-TR-97-01 (Washington, D.C.: Air Force Scientific Advisory Board [SAB], November 1997), 1; on-line, Internet, 15 October 1998, available from http://web.fie.com/fedix/sab.html.

[15] Ibid., 39.

Chapter 3

Space Power

> *Access to space and space products are emerging as a vital interest of the United States. In the same way that oil has provided the energy for our industrial societies, we see that space will be a key pipeline providing the information that will drive the society of tomorrow.*[1]
>
> Gen Estes, USCINCSPACE, 1996-1998

An understanding of space power is critical in answering the research questions posed in this paper. Space power simply is the achievement of national objectives, be they diplomatic, informational, military or economic, via the use of space systems.[2] The proper application of space power requires understanding the various aspects of its nature. Therefore, this chapter will explain space power by discussing its foundations, characteristics, the elements of a space system, and finally the control and execution/exercise of space power. Space power springs from a set of capabilities and understanding this foundation is necessary for understanding who can apply space power and to what extent.

Foundations

The foundations of space power can be described in four parts:

1. Strong technology base – radar, communications, computers, sensors, etc.
2. Rocket manufacturing and launch capability
3. Satellite manufacturing and operation capability
4. Space Surveillance/Track Capability

A fully mature space power will have all four capabilities. Traditionally, nation-states have been the seat of space power, internally developing all four facets of space power. However, space power is not limited to nation-states. A consortium of countries, such as the European Space Agency (ESA), or a large corporation, such as Lockheed-Martin, can be space powers as well.

A nation does not require all aspects of space power in order to function as a space power because the different pieces of space power can be purchased. South Korea is a case in point. South Korea has the requisite technology base to manufacture and operate communications satellites. However, since South Korea lacks a launch capability, they contracted with Boeing who launched their satellites on the Delta II rocket. Other countries simply purchase satellites and their launches and then operate the satellite themselves. Others join international consortia to gain access to space systems.

Today, the pre-eminent space powers remain the United States and Russia, primarily because they have manned spaceflight capability, as well as heavy payload spacelift capability. The next tier of space powers includes ESA, China, Japan, India, and Israel.[3]

Characteristics

The proper application of space power requires understanding its characteristics as well as understanding its foundations. Space power has its own characteristics separate from other types of military power. The recently published Air Force Doctrine Document (AFDD) 2-2, *Space Operations*, lists the following as space power attributes: global coverage, flexibility, economy, effectiveness, and robustness.[4] The following characteristics should be added: predictability, synergy, and transparency. A detailed discussion of these characteristics can be found in Appendix A. These characteristics are important because they impact how space power is applied.

Space System Definition

According to AFDD 2-2, "Space power is derived from the exploitation of the space environment by a variety of space systems."[5] This statement begs the question "What is a space system?" Any space system is comprised of three basic parts – ground segment, space segment, and radio frequency (RF) up and down links connecting the ground segment with the space segment, as depicted in Figure 3.[6]

The ground segment can be further subdivided into any combination of the following: satellite bus control/operation segment, satellite payload control/operation segment and payload user segment. The Defense Satellite Communications System (DSCS) is a good illustration. The 50 Space Wing (50 SW), located at Schriever AFB, CO, is responsible for the operational health of the DSCS satellites. This unit ensures subsystems, such as batteries, thermal control,

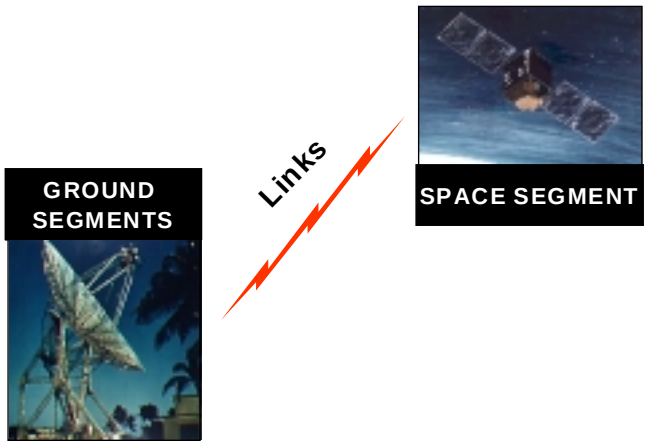

Figure 3 Space System

tracking, telemetry and control system, and attitude control system are operating in support of the payload.[7] The payloads of DSCS satellites are transponders, which are controlled by Army Space Command (ARSPACE). ARSPACE controllers, at various DSCS Operations Centers

worldwide, ensure the proper transponder channels are functioning and available to assigned users.[8] The users, various military units and organizations, then have the ability to transmit voice and data over long distances via the DSCS transponders. Different space systems have different configurations for their ground systems. For GPS, another squadron at Schriever AFB performs both health and status operations as well as navigation payload operations for the satellites.[9] The user segment consists of anyone or anything using the GPS timing and navigation signals.

The space segment is simply a satellite or a constellation of satellites, along with the associated payloads. The payloads can perform missions varying from weather observation, navigation, communication, intelligence/surveillance/reconnaissance (ISR), remote sensing to missile warning.

Last, and by no means least of the three components of a space system, is the RF up/down link. The up/down links are critical because they provide the means to control the satellite and its payload, as well as the means for the users to execute space power.

Control and Execution

In the opening paragraph of this chapter, space power was defined as the use of space systems to achieve national objectives, be they diplomatic, informational, military or economic.[10] AEFs will utilize space power in the accomplishment of their assigned missions. Therefore, understanding the control and execution of space power is vital to the understanding of space integration into AEFs. The pivotal concept in this regard consists of centralized control and decentralized execution.

Centralized control of space systems is different from centralized control of air assets. While airpower is most effectively controlled at the theater level,[11] space assets require centralized control from a global perspective, not a theater perspective. One reason is that

satellites orbit the earth and do not loiter over a theater. Even geo-stationary satellites connect theaters. For example, geo-stationary communications satellites connect Europe with the United States. Another reason is that many ground stations providing day-to-day control of satellites (such as GPS or DSCS) are located in CONUS and not in a regional CINC's area of responsibility (AOR). AFDD 2, *Organization and Employment of Aerospace Power*, recognizes certain Air Force forces and capabilities, such as space, have a global focus, and therefore operational control (OPCON) should not be transferred to the air component commander of a joint task force (COMAFFOR).[12]

Currently, space power is at its most mature in the force enhancement mission assigned to US Space Command (USSPACECOM).[13] Refer to Appendix A for a discussion of all USSPACECOM missions. Space power execution can be defined as the tasking of space systems and the subsequent processing, exploitation, and dissemination of information collected and/or transmitted via space systems to the proper users at the correct time in order to achieve national objectives.[14] This tasking, processing, exploitation, and dissemination is known by the acronym TPED. The degree of decentralized execution of space power is dependent upon the mission of the space system. For example, a mission such as national-level intelligence gathering is highly centralized, while a mission such at the ubiquitous GPS navigation mission is highly decentralized. Space power is being executed every time information from weather satellites leads to an accurate weather forecast or a GPS guided munition hits its target instead of the church across the street. Another aspect of space power is that while specially trained space operators provide C2 of space power, they do not necessarily execute it. Airpower, on the other hand, is commanded, controlled, and executed by specially trained pilots and aircrews.

This chapter examined the various aspects of space power such as its foundations and characteristics, as well as providing a definition for space systems. This discussion shows that space power differs from airpower, especially with regards to centralized control and decentralized execution. Space systems require centralized control from a global perspective, as opposed to the theater perspective required for air forces. These differences must be accounted for in the analyses of the research questions found in Chapters Four and Five.

Notes

[1] CINC's Action Group, United States Space Command, CINC's Command Briefing, October 1998.

[2] Air Force Doctrine Document (AFDD) 2-2, *Space Operations*, 23 August 1998, 32; on-line, Internet, 21 October 98, available from http://www.hqafdc.maxwell.af.mil.

[3] Tamar R. Mehuron, "Space Almanac," *Air Force Magazine*, August 1998, 39; on-line. Internet, 2 February 1999, available from http://www.afa.org/magazine/space/98space.html.

[4] AFDD 2-2, 15.

[5] Ibid., 1.

[6] Ibid., 32.

[7] 50th Space Wing Homepage; on-line, Internet, 3 February 1999, available from http:// www.schriever.af.mil/50sw/.

[8] Army Space Command Forward Homepage; on-line, Internet, 3 February 1999, available from http:/www.armyspace.com/mission.htm.

[9] 50th Space Wing Homepage.

[10] AFDD 2-2, 32.

[11] Air Force Doctrine Document (AFDD) 2, *Organization and Employment of Aerospace Power*, 28 September 1998, 6; on-line, Internet, 21 October 98, available from http://www. hqafdc.maxwell.af.mil.

[12] AFDD 2, 44.

[13] *Unified Command Plan* (U), 1997 (Secret) Information extracted is unclassified.

[14] CINC's Action Group, United States Space Command, Tasking Processing, Exploitation and Dissemination (TPED), staff study, July 1998.

Chapter 4

Space Support for an AEF

This chapter will examine AEF space requirements from the perspective of force enhancement space support. Even a cursory review of AEF functions shows that the AEF requires support from every aspect of the force enhancement area. Of the six synergistic characteristics described in the Scientific Advisory Board's (SAB's) vision of AEF operations, five characteristics (rapid, aware, precise, secure and light) require space-based force enhancement, as illustrated in Figure 2 on page seven.[1] This chapter will examine the space support required for each of these five characteristics. Successful implementation of this vision depends upon robust command and control (C2) of AEF forces. Therefore, this chapter will also investigate the AEF's reliance on space systems for C2.

Characteristics Requiring Space Support

Rapid

The SAB study emphasized the AEF's need to be rapid.[2] Current plans envision the AEF's on-call forces will be able to respond to an execute order within 48 hours.[3] In normal day-to-day operations, space forces are already deployed on-orbit and provide force enhancement to terrestrial forces around the world. Refer to Appendix A for more in-depth discussion of orbital mechanics and USSPACECOM missions. The key to responsive space-based force

enhancement support to an AEF is in how rapidly the various space systems can be tasked to focus their support on the AEF. This tasking of space forces is primarily a "reachback" command and control problem, which will be addressed in Chapter Five.

Aware

The second key characteristic an AEF requires is awareness.[4] Again, space systems are prime contributors to an AEF's situational awareness. Space-based ISR systems, in conjunction with space-based communication systems, will get the right information to an AEF, at the right time. As a result, the AEF will be able to dissipate the fog of war and characterize the battlespace. An imagery system such as TDIS (refer to Appendix C for details) is an example of a system that will improve situational awareness at the wing level of AEF operations.[5]

Precise

In addition to awareness, AEFs need to be precise.[6] Clearly, the Global Positioning System (GPS) has brought about a revolution in precision location and timing. GPS will enable AEFs to rapidly deploy to austere locations. GPS will also enable the AEF to precisely attack targets with maximum effect.

Secure

Security has been and will continue to be a primary concern of AEF commanders and, again, space-based systems make their contribution. In addition to improved battlespace awareness provided by space-based ISR assets, space assets, such as DSP and its follow-on the Space-Based Infrared System (SBIRS), will contribute to an AEF's security by providing warning of theater ballistic missile attack.[7]

Light

An AEF's light weight will yield reduced airlift requirements. The two key features reducing these airlift requirements are smaller, lighter (but still lethal) precision-guided munitions (PGMs) and a distributed C2 architecture.[8] Space force enhancement is required for both of these features. PGMs of today and tomorrow will rely in some manner on the Global Positioning System. In addition, the distributed C2 architecture of a small forward-deployed Air Operations Center (AOC) tied to a larger rear-area AOC will need secure and robust communications. Such an architecture will indeed be heavily reliant on space-based systems, as shown below. This global grid is the foundation upon which the C2 of the AEF rests.

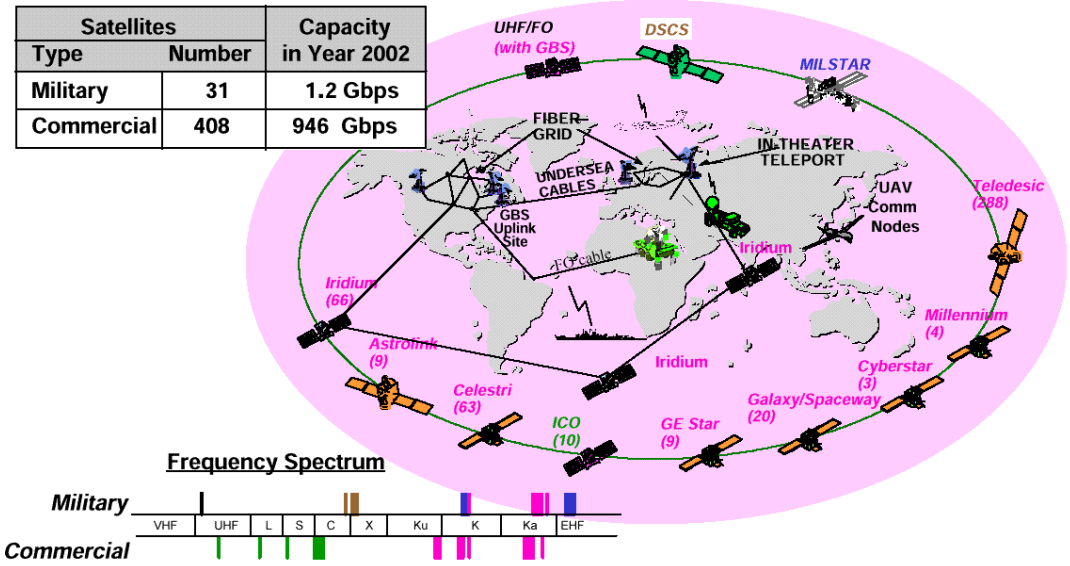

Figure 4 Global Grid for AEF

(From R. Fuchs, et al., *United States Air Force Expeditionary Forces Vol. 1: Summary*, SAB-TR-97-01, [Washington, D.C.: Air Force Scientific Advisory Board (SAB), November 1997], 25; on-line, Internet, 15 October 1998, available from http://web.fie.com/fedix/sab.html.)

C2I Requiring Space Support

According to the SAB, AEFs require a robust and secure foundation for command control and intelligence (C2I) in order to achieve light, lethal and affordable operations. The key enablers for this foundation of C2I are: Global Connectivity, Battlespace Awareness, Geospatial Position, Navigation and Timing (PNT) and system assurance.[9] These enablers require space-based force enhancement, and they combine synergistically to provide the AEF with information dominance over any adversary.

Global Connectivity

Global Connectivity is achieved through a global communications grid utilizing undersea cables and fiber optic networks integrated with military and commercial communications satellites. (See Figure 4) In fact, the global grid will need to make maximum use of emerging commercial satellites systems such as Iridium, Globalstar, and others. This integrated grid will provide the bandwidth and frequency diversity required for AEF operations.[10]

The distributed JOAC will not be viable without global connectivity provided by satellite

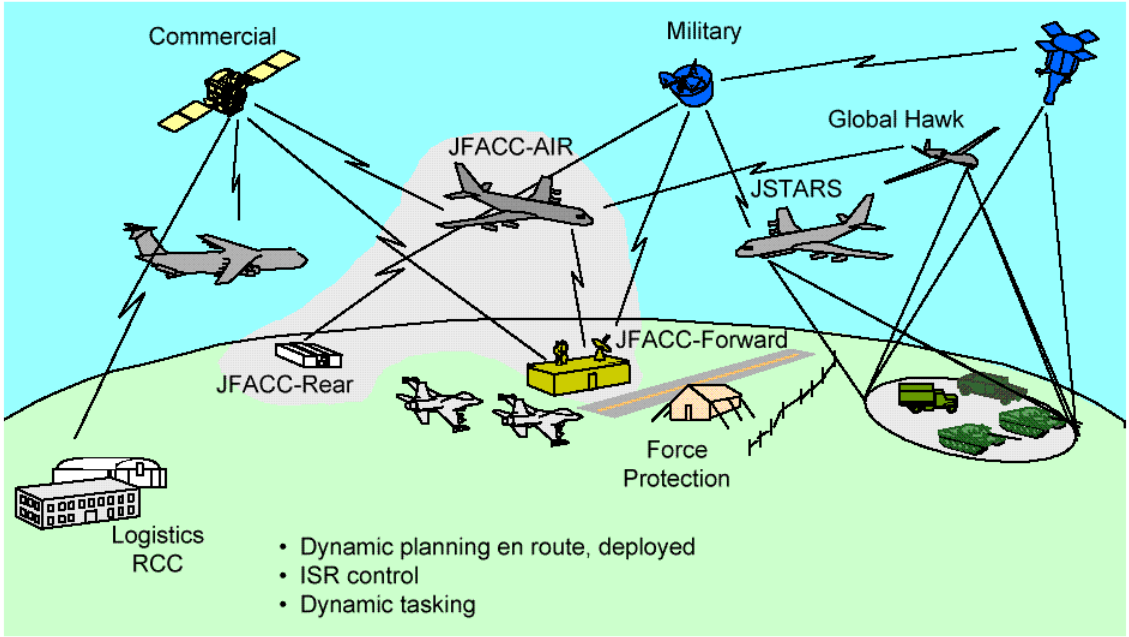

Figure 5 Distributed JFACC

(From R. Fuchs, et al., *United States Air Force Expeditionary Forces Vol. 1: Summary*, SAB-TR-97-01, [Washington, D.C.: Air Force Scientific Advisory Board (SAB), November 1997], 31; on-line, Internet, 15 October 1998, available from http://web.fie.com/fedix/sab.html.)

communications. (See Figure 5) The AEF requires smaller, lighter and more capable communications than what is provided by the current suites of ground mobile force satellite communications equipment. The Air Force is currently fielding a new theater deployable communications structure to meet war fighter needs in the earliest stages of an operation. The light-weight multiband satellite terminal (LMST), which can operate with either military or commercial communications satellites, is one example of the technology upgrades in this new structure.[11]

Battlespace Awareness

Battlespace awareness is another term for a common operating picture that will, in real time, enable the JFACC and his forces to know the location of all friendly and hostile forces on

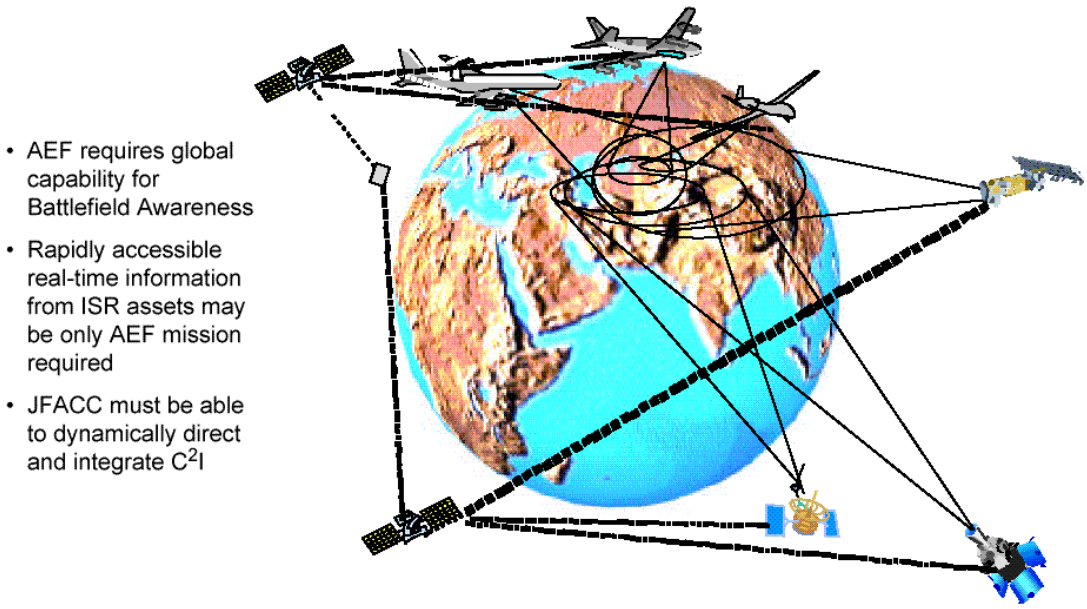

Figure 6 AEF Battlespace Awareness

(From R. Fuchs, et al., *United States Air Force Expeditionary Forces Vol. 1: Summary*, SAB-TR-97-01, [Washington, D.C.: Air Force Scientific Advisory Board (SAB), November 1997], 26; on-line, Internet, 15 October 1998, available from http://web.fie.com/fedix/sab.html.)

the battlefield. Such a level of battlespace awareness will permit the lighter, leaner AEF forces to out-maneuver and defeat any adversary. Battlespace awareness of this magnitude requires improvements in every portion of the TPED process.[12] Space-based ISR assets, both national and commercial, will be major contributors to the JFACC's battlespace awareness. In the initial stages of a deployment, space-based sensors may well be the only sources of battlespace awareness until other sensors such as J-STARS and Unmanned Aerial Vehicles are deployed to the theater. Regardless of sensor type, fast, efficient TPED will provide the AEF with the battlespace awareness it requires to operate inside an adversary's decision cycle.[13] Systems such as TDIS will translate battlespace awareness into situational awareness for the tactical user.

Geospatial Positioning, Navigation and Timing (PNT)

As previously mentioned in this chapter, Geospatial Positioning, Navigation and Timing (PNT) is a crucial factor in AEF operations.[14] A common geospatial reference system will allow for the construction of the common operating picture developed by battlespace awareness. The GPS is the linch-pin for PNT. GPS provides phenomenal worldwide positioning and timing information for the AEF. Aided by GPS, targets can then be precisely located in time and space, which will allow for real-time re-targeting and the maximizing of weapons effects.[15]

System Assurance

AEF commanders will require a robust and reliable C2I for their battlespace awareness, PNT and distributed C2. According to the SAB, the continuing revolution in commercial satellite communications will provide the AEF with bandwidth and frequency diversity, thereby improving communications network survivability.[16] PNT signals such as GPS will need to be made more jam resistant. One method would be the integration of GPS with an inertial navigation system to mitigate the effects of GPS jamming.[17]

The AEF concept of operations is heavily dependent on USSPACECOM's force enhancement mission. Five characteristics of the AEF (rapid, aware, precise, secure and light) require the information provided by space-based weather, navigation, missile warning, ISR, and communications systems. The levels of lightness, leanness and lethality envisioned for AEFs cannot be accomplished by traditional terrestrial-based systems alone. The effectiveness of this decentralized space power execution is directly proportional to the timeliness and responsiveness of centralized global command and control (C2) of space forces. The next chapter will analyze three different C2 models and determine which model best meets the needs of the AEF and JTF.

Notes

[1] R. Fuchs, et al., *United States Air Force Expeditionary Forces Vol. 1: Summary*, SAB-TR-97-01 (Washington, D.C.: Air Force Scientific Advisory Board [SAB], November 1997), 25; on-line, Internet, 15 October 1998, available from http://web.fie.com/fedix/sab.html.

[2] Ibid., 28.

[3] Bruce D. Callender, "The New Expeditionary Force," *Air Force Magazine*, September 1998, 55.

[4] R. Fuchs, et al., http://web.fie.com/fedix/sab.html, 30.

[5] Major Gene Brislin, "Theater Deployable Imagery System", Initiative Abstract EFX 99, (McEntire ANGS, Eastover, SC: 240th Combat Communications Squadron, 2 July 1998).

[6] R. Fuchs, et al., http://web.fie.com/fedix/sab.html, 31.

[7] United States Space Command, *Long Range Plan – Implementing USSPACECOM Vision for 2020*, (Peterson AFB, CO, 1998), 60.

[8] R. Fuchs, et al., http://web.fie.com/fedix/sab.html, 31.

[9] Ibid., 39.

[10] United States Space Command, *Long Range Plan*, 118.

[11] Office of the Assistant Secretary of Defense for Command, Control, Communications and Intelligence (OASD C3I), *C4ISR Handbook for Integrated Planning* (Washington, D.C.: Government Printing Office, 1998), 6-92.

[12] CINC's Action Group, United States Space Command, Tasking Processing, Exploitation and Dissemination (TPED), staff study, July 1998.

[13] Ibid.

[14] R. Fuchs, et al., http://web.fie.com/fedix/sab.html, 50.

[15] AU-18, *Space Handbook: A War Fighter's Guide to Space, Vol 1*, Prepared by Maj Michael J. Muolo, et al., (Maxwell AFB, Ala.: Air University Press, December 1993), 89.

[16] R. Fuchs, et al., http://web.fie.com/fedix/sab.html, 53.

[17] "Antijam GPS Technology Flight Test", 19 Oct 1998, n.p.; on-line, Internet, 3 Mar 1999, available from http:/www.munitions.eglin.af.mil/public/mnav/agtft.html.

CHAPTER 5

Command and Control of Space Forces

"Who ya gonna call???"

Ghostbusters, 1984

Space forces are now recognized as force multipliers that give our military forces a decisive advantage across the spectrum of conflict.[1] However, space system support is provided by many different organizations, making coordinated and synchronized support for the war fighter difficult. Figure 13 in Appendix B illustrates the stovepiped nature of space support to the warrior. A 1997 School of Advanced Aerospace Studies (SAAS) thesis provides an excellent discussion of the various units, agencies, and organizations that provided space support to coalition forces during the Gulf War.[2] The need for a single focal point for space operations was a central theme throughout Gen Estes' tenure as Air Force Space Command Commander and USCINCSPACE from 1996-1998. In a speech to the MILCOM '97 Conference he said, "…I think it's awfully important that the military side designate a single operational focus, a focal point, for space, military space…but we clearly don't have a single operational focal point for space right now."[3]

This chapter addresses the question - is the AEF the proper organization to be a JTF's single operational focal point for space? In answering this question, the following space C2 organizations will be compared and contrasted: 1) the current C2 organization, 2) the AEF, 3) a Joint Space Operations Task Force modeled after the Joint Special Operations Task, and 4) a

Director of Space Forces (DIRSPAFOR) modeled after USTRANSCOM's Director of Mobility Forces (DIRMOBFOR). This examination will be based on both Air Force and Joint doctrine. Refer to Appendix B for a more detailed discussion. The comparison of the different C2 schemes will show that the USTRANSCOM model is the most appropriate for C2 of space forces.

Current C2 for Space

Figure 7 illustrates the current C2 of space forces for the regional Commander in Chief (CINC) or his designated joint task force commander (JFC). A set of space support teams – Joint Space Support Teams (JSSTs), Air Force Space Support Teams (AFSSTs), Army Space Support Teams (ARSSTs), Naval Space Support Teams (NAVSSTs), and National System Space Support Teams (NSSTs) deploy to their respective areas within the JTF.[4] As this figure shows,

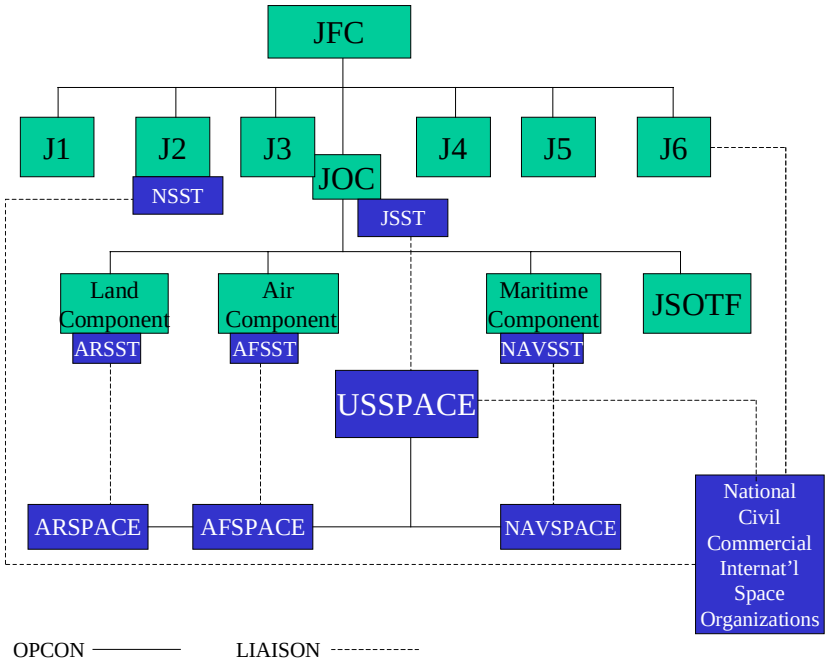

Figure 7 Current Space C2 for a JTF

coordination between the space support teams can be difficult. USSPACECOM has liaison officers with the national space community and with Defense Information Systems Agency (DISA) in addition to its liaison officers (O-6 rank) assigned to the regional unified commands. USSPACECOM does create and issue mission type orders to its components to coordinate and synchronize space support for the JTF. It also provides coordination copies of the mission type orders to the national space community and to DISA in an effort to synchronize every part of the space community's support to the JTF.[5]

Air Force C2 Model

In brief, Air Force doctrine states space assets should be centrally controlled by the Joint Force Air Component Commander (JFACC) because, as an airman, the JFACC will best

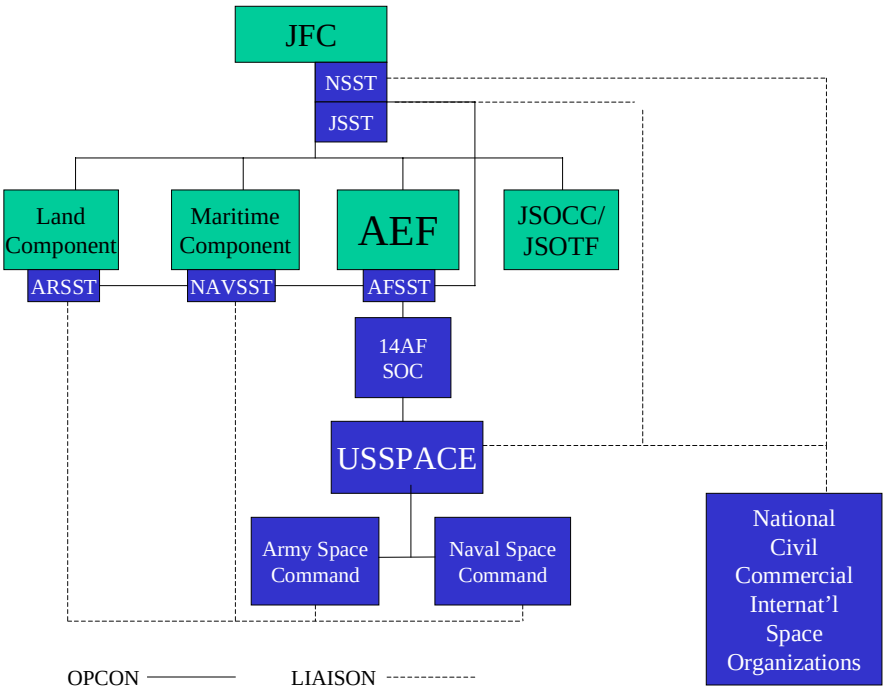

Figure 8 AEF for Space C2

understand how to employ space power.[6] Thus, the AEF commander, when appointed as the JFACC of a JTF, should be responsible for providing space support to the JTF. Gen Ryan,

CSAF, stated in a 1997 speech, "And Howell Estes (AFSPC/CC and USCINCSPACE) is structuring one of his numbered air forces as the reachback capability for our deployed Air and Space Expeditionary Force commander. Our Air and Space Expeditionary Force commanders will provide our regional commanders in chiefs one-stop shopping for air and space power."[7]

Applying the above concepts to C2 of space forces yields a JTF organization as shown in Figure 8. The comparisons to other proposed C2 models will be made after the joint doctrine discussion.

Joint C2 Models

In contrast to Air Force belief that the JFACC should be the JTF's focal point for space, joint doctrine is more open-ended. Refer to Appendix B for detailed discussion. Joint Doctrine gives the JFC the flexibility to organize the JTF in various ways – either by service or by function/component.[8] In addition, the Unified Command Plan assigns to USCINCSPACE the responsibility of being the single focal point of military space operations for the regional CINCs.[9] Thus, any C2 of space forces should leverage USSPACECOM's responsibility to provide global centralized control.

US Special Operations Command (USSOCOM) and US Transportation Command (USTRANSCOM) have each developed different methods for integrating their forces and capabilities into a JTF. While any of the proposed models could be used for the C2 of space forces, the following analysis will show that the USTRANSCOM model is more suitable than the USSOCOM or the AEF models. A detailed discussion of the USSOCOM and the USTRANSCOM C2 models is contained in Appendix B.

C2 Analyses

Each of the C2 models will be applied to the problem of space C2, beginning with the AEF model. Figure 8 shows the chain of command for space forces if the AEF is the JTF's single focal point for space. The advantages of this model are its congruence with Air Force doctrine and unity of command. In addition, the Air Force intends on manning its Air Operations Centers with space experts making it "unnecessary to similarly man and equip the supported CINC's staff or another functional or service component operations center."[10] However, implementation of this model will require USSPACE to delegate its UCP missions to its Air Force component (14AF), effectively placing the Air Force component over its Army and Navy components. Having been assigned to USSPACECOM as a deliberate plans officer, the author believes such a delegation of authority by USCINCSPACE would be viewed as a violation of established command relationships by the other services. The 14AF span of control is normally limited to just the space wings shown in Figure 14, Appendix B. Therefore, making the AEF the single operational focal point via the 14AF would not be feasible from either a practical or a political point of view.

Figure 9 shows the SOCOM model applied to the question of space C2. The creation of a Joint Space Operations Component (JSpOC) or a Joint Space Operations Task Force (JSpOTF) will provide needed unity of command to space forces within the JTF. At the same time it will provide the JFC with a single focal point for his space support. This C2 architecture is congruent with joint doctrine and provides reachback to USSPACECOM to take advantage of USSPACECOM's ability to provide global centralized control for space systems. The global nature of space systems prevents transfer of operational control of space assets to the JSpOTF. If the JSpOTF commander was an airman, then there also would be congruence with Air Force

doctrine. However, the JSpOTF commander should be the senior space professional in theater, regardless of service. The main questions regarding a JSpOTF pertain to this task force's physical residence in theater and its support requirements. The answers to these questions

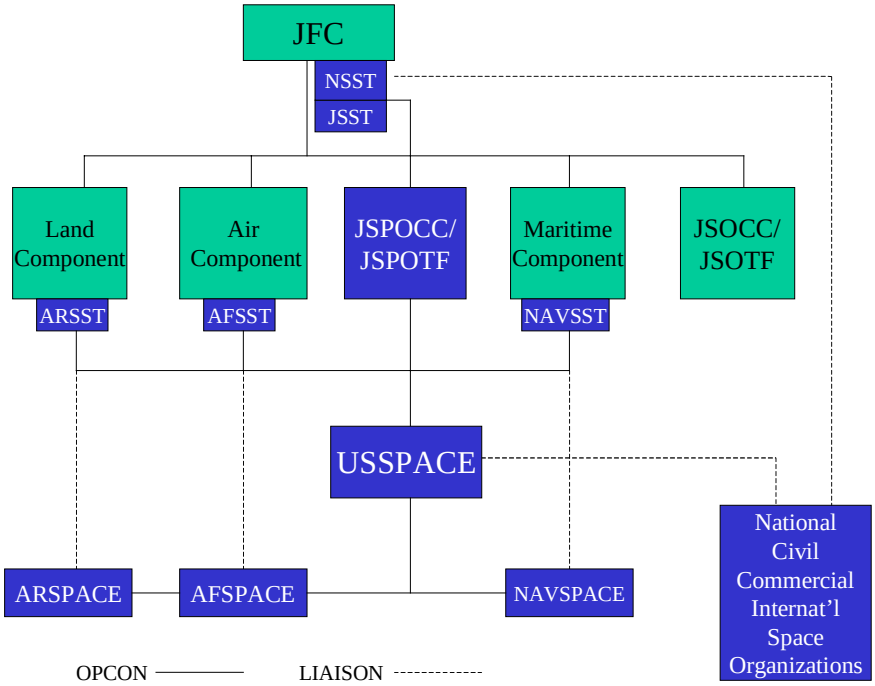

Figure 9 USSOCOM Model for C2

will have an impact on the JTF's Time Phase Deployment Database (TPFDD) flow and its limited transportation resources.

Finally, the USTRANSCOM model for space C2 is shown in Figure 10. This model has the same advantages as the SOCOM model – unity of command, reachback to USSPACECOM and congruence with joint doctrine. The Director of Space Forces (DIRSPAFOR) should be the senior space professional in theater, regardless of service or community. This model makes more effective use of the space support teams and simplifies reachback to USSPACECOM. Locating the DIRSPAFOR in the Joint Operations Center provides two advantages: 1) it simplifies interfacing with the JFC, and 2) it allows the DIRSPAFOR to utilize the JSST

workspaces in an existing command center. By minimizing the creation of extra staff, it minimizes the impact on the JFC's TPFDD flow. In addition, the global nature of space systems is similar to the global nature of strategic lift. As with other strategic lift resources, satellites traverse between theaters, but a satellite's cargo is information. Whereas airlifters create an "air bridge" between CONUS and the JTF, space operators create a "space bridge".

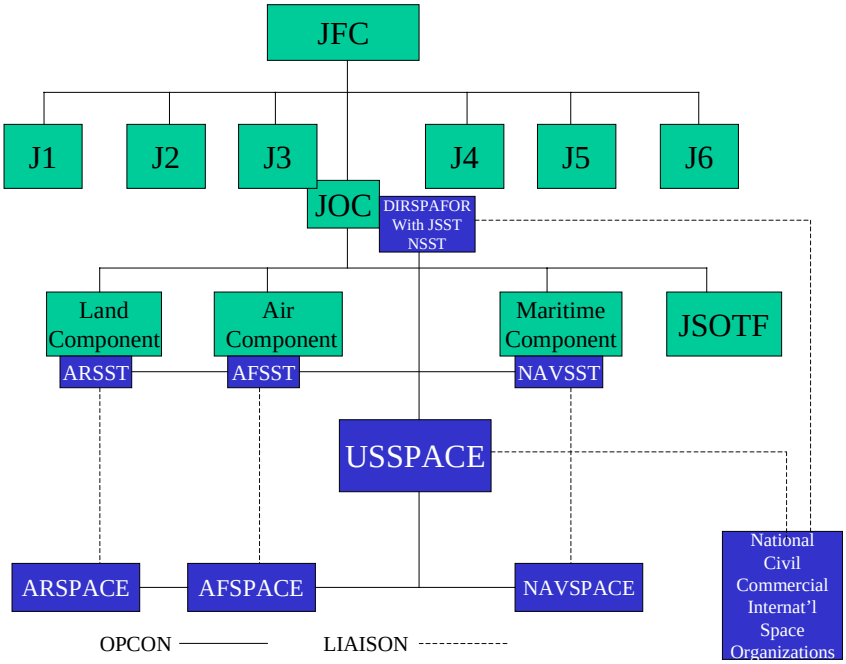

Figure 10 USTRANSCOM Model for Space C2

This "space bridge" carries the information the JTF requires for battlespace awareness and information superiority. The decentralized execution of the force enhancement facet of space power occurs when the information is utilized by the JTF via systems like TDIS, which is described in Appendix C. The DIRSPAFOR will be the critical cog ensuring responsive centralized control of space forces that will in turn result in effective decentralized execution of space power by the JTF.

The above analysis shows that the DIRSPAFOR model is the JFC's best option for C2 of space forces. The AEF model is not as congruent with joint doctrine as the other models, and it results in a convoluted chain of command. Both the JSpOTF and DIRSPAFOR are viable C2 options for the Joint Force Commander (JFC). Both are congruent with joint doctrine, provide unity of command, and simplify reachback to USSPACECOM. Both should be the senior (at least brigadier general) space operator in theater. Arguably, the JSpOTF places space forces on a co-equal status with the other components of the JTF. But operational control of space forces is normally not transferred to the JTF, so why create an extra component staff organization? In contrast, the DIRSPAFOR would have fewer logistical requirements than would a JSpOTF, which is important in today's logistically constrained environment. Consequently, the DIRSPAFOR is the recommended C2 option for space support to a JTF.

Notes

[1] Major Ricky B. Kelly, *"Centralized Control of Space: The Use of Space Forces by a Joint Force Commander,"* (Maxwell AFB, Ala.: School of Advanced Aerospace Studies, 5 March 1997); on-line, Internet, 24 January 99, available from http://www.au.af.mil/au/database/ research.html.

[2] Ibid., http://www.au.af.mil/au/database/research.html.

[3] Gen Howell M. Estes, III., commander in chief, North American Aerospace Defense Command and US Space Command and Air Force Space Command, Commander, address to the MILCOM '97 Conference, Monterey, CA, 3 November 1997; on-line, Internet, 26 January 1999, available from http:/www.spacecom.af.mil/ usspace/speeches.html.

[4] LTC William Bayles, Chief of Theater Support Branch, HQ USSPACECOM/J36, Peterson AFB, CO, interview via e-mail, 13 January 99.

[5] Lt Col Terry Djuric, "AFSPACE Command and Control," briefing, Air War College, Maxwell AFB, Ala., September 1998.

[6] Air Force Doctrine Document (AFDD) 1, *Air Force Basic Doctrine*, September 1997, 54.

[7] Gen Michael E. Ryan, chief of staff, US Air Force, address to the Air Force Association National Symposium, Los Angeles, CA, 14 November 1997; on-line, Internet, 26 January 1999, available from http:/www.aef.org/la97.html.

[8] Joint Publication 0-2, *Unified Action Armed Forces (UNAAF)*, 24 February 1995, IV-9 – IV-10; on-line, Internet, 22 January 1999, available from http:/www.dtic.mil.

[9] *Unified Command Plan* (U), 1997. (Secret) Information extracted is unclassified.

[10] Maj Gen Gerald F. Perryman, Jr., Col Michael L. Wolfert, and Maj T.J. Lea, *Command and Control of AFSPACE Forces, Version 2.0*, white paper, January 1999, 27.

Chapter 6

Conclusion

The AEF has the potential of allowing the Air Force to meet the challenges of our multi-polar world in an effective and efficient manner. This research project focused on the force enhancement aspects of space power as well as the command and control of space forces to answer the following research questions:

1. What are the space support requirements of an AEF?
2. Should the AEF be the single focal point for space operations for the Joint Task Force (JTF)?

The answer to the first question is straightforward. The examination of the light, lean and lethal concept of operation envisioned for AEFs revealed that the capabilities provided by space-based assets are critical. Not only will the AEF require the full range (weather, navigation, missile warning, ISR, and communications) of military and national force enhancement systems, but it will need to leverage the coming revolution in commercial communications and imagery space-based systems. TDIS is an example of a system that will enable an AEF (or a JTF) to better exploit space power. In turn, space power will provide the AEF with the information superiority necessary to lift the fog of war and to accomplish its assigned mission with a light, but lethal, force.

In answer to the second question, the AEF is not the organization best suited to be the JTF's single focal point for space. Space power requires centralized control from a global, not theater

perspective. In recognition of the global nature of space power, the UCP assigns USCINCSPACE the responsibility of being the single focal point for military space operations for the regional CINCs. A comparison of C2 architectures based on the AEF, special operations and strategic airlift models shows that the C2 architecture of USTRANSCOM is the appropriate model for space C2 within the JTF.

A Director of Space Force (DIRSPAFOR), located in the JTF's Joint Operations Center, is the most efficient method of providing the JFC with a single point of contact for space support via USSPACECOM. As the senior space operator in theater, the DIRSPAFOR will provide unity of effort among the various space support teams within the JTF and simplify reachback to USSPACECOM. As a result, space operators will be able to create the "space bridge" required to carry the information necessary for the JTF's battlespace awareness and information superiority. The DIRSPAFOR will be the critical synchronizer for centralized control by USSPACECOM and decentralized execution of space power by the JTF.

Appendix A

Space Power

Space power simply is achievement of national objectives, be they diplomatic, informational, military or economic, via the use of space systems.[1] A former School of Advance Aerospace Studies instructor described in detail the differences between air and space power in an article titled "*Ascendant Realms: Characteristics of Airpower and Space Power.*" Fundamentally, airpower and space power are different because they operate in different environments and use different technologies.[2]

Characteristics

Space power has its own characteristics separate from other types of military power. The recently published Air Force Doctrine Document (AFDD) 2-2, *Space Operations,* lists the following as space power attributes: global coverage, flexibility, economy, effectiveness, and robustness.[3] The following characteristics should be added: predictability, synergy, and transparency. Space power is both global and predictable, because of the nature of orbit mechanics. The orbit of a satellite circles the earth in a given relatively constant period. As a result, even a single satellite system will eventually "fly" over the entire globe. In addition, the ground trace of a satellite can be predicted with great accuracy using the laws of astrodynamics. The period of an orbit is a critical parameter in the design of a space system because it is proportional to the altitude of an orbit. As the altitude of the orbit increases, the period will also

increase. In addition, as the altitude of an orbit increases, the satellite's field of view and loiter time increase, while resolution decreases.[4]

While space systems are global and predictable, they are, paradoxically, flexible. Not only can space systems perform disparate missions such as remote sensing, communications or navigation, but particular systems can also be used in new ways.[5] Both the Global Positioning System (GPS) and the Defense Support Program (DSP) are prime examples. When GPS was tested and then fielded throughout the 1980s and early 90s, no one predicted the massive growth in commercial applications such as tracking over-night packages and precision farming. DSP was designed to detect the launch of intercontinental ballistic missiles, yet DSP was successfully used during the Gulf War to track the much smaller and shorter range SCUD theater missiles.[6]

Space systems are also economical in spite of the fact that the individual components may cost upwards of hundreds of millions of dollars. The bottom line is that space-based systems can provide a service more economically than a similar terrestrial-based system. Space systems are not only economical, but they are profitable as well. Space-based industry has had a 20 percent growth rate for the past seven years and is predicted to continue growing even larger.[7]

What AFDD 2-2, *Space Operations*, describes as effectiveness, is better described as synergism. AFDD 2-2 says:

> Space enhances the simultaneous employment of both dominant maneuver and precision engagement operational concepts by either supporting terrestrial-based operations or providing an opportunity for independent asymmetric employment of forces.[8]

AFDD 2-2 is acknowledging that space power combines with the other forms of national power to make them more effective. Focussing on the military instrument of power, space power is a force multiplier. For example, GPS gave Coalition forces the ability to accurately navigate through featureless desert terrain and thereby out-flank the Iraqi forces during the Gulf War.

Space power in the form of GPS combined synergistically with the coalition forces to make them more effective against Iraq.

Space power is transparent to the user when it is successfully applied. When a person makes a long distance phone call, the transmission of the call via a satellite link is undetectable to the people talking to each other. Thus effective and efficient space power is transparent. In addition, the person making the call does not have to be a specially trained space system operator. However, C2 of space forces does require trained space professionals who understand the space medium, as well as the capabilities and limitations of space systems.

Orbital Mechanics

This discussion of orbit mechanics will focus on the operations aspect versus the science of orbits. The most useful orbits can be divided into three basic types based on altitude: Low Earth Orbit (LEO) approximately 100-300 miles, Medium Earth Orbit (MEO) approximately 12,000 miles and Geosynchronous Orbits (GEO) approximately 22,300 miles. See figure 11. The LEO orbits are typically used for weather, remote sensing, and intelligence/surveillance/reconnaissance satellites. LEO satellites are typically in orbits highly inclined to the equator, such as sun-synchronous orbits or polar orbits. New commercial communications satellite systems, such as Iridium, will also use LEO. MEO is typically used for GPS while GEO is ordinarily used for communications satellites and missile warning satellites.[9]

USSPACECOM Missions

USSPACE, through its components, (and in coordination with other national agencies and commercial companies) accomplishes four missions: space support, force enhancement, space control, and force application.[10]

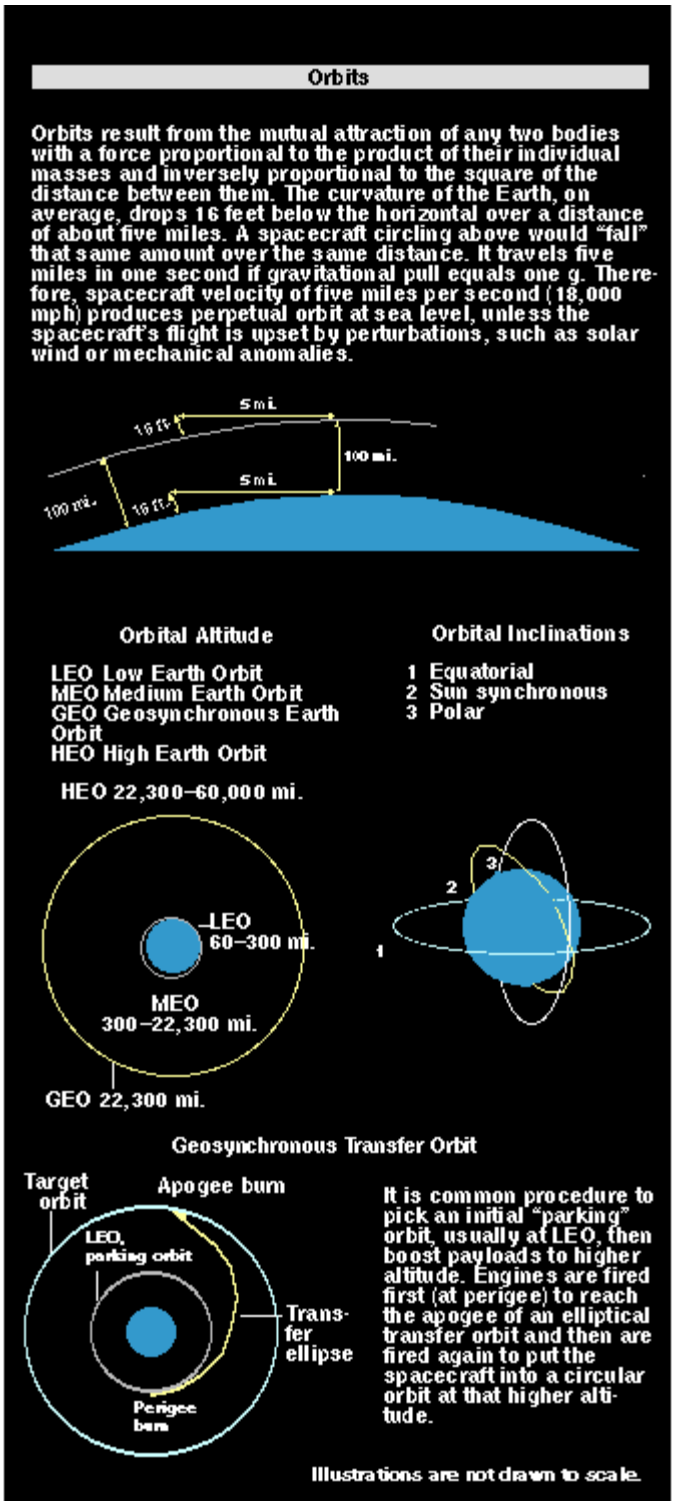

Figure 11 Basics of Orbit Mechanics

(From Tamar R. Mehuron, "Space Almanac," *Air Force Magazine*, August1998, 48; on-line. Internet, 2 February 1999, available from http:/www.afa.org/magazine/space/98space.html.)

Space Support

The space support mission is comprised of those activities required to launch, maintain and move space systems. This mission consists of two basic functions - spacelift and satellite operations. Spacelift simply is the launch of satellites into their intended orbits, while satellite operations consists of those actions required to keep the satellite healthy and in its proper orbit.[11]

Force Enhancement

The force enhancement mission is the mission area most pertinent to an AEF and involves the operation of satellite payloads, as opposed to the health and status satellite operations of the space support mission. Today's space systems provide our terrestrial forces with enhanced mission capabilities by supplying weather, communications, navigation and timing information, intelligence and missile warning information.[12] In performing the enhancement mission, space

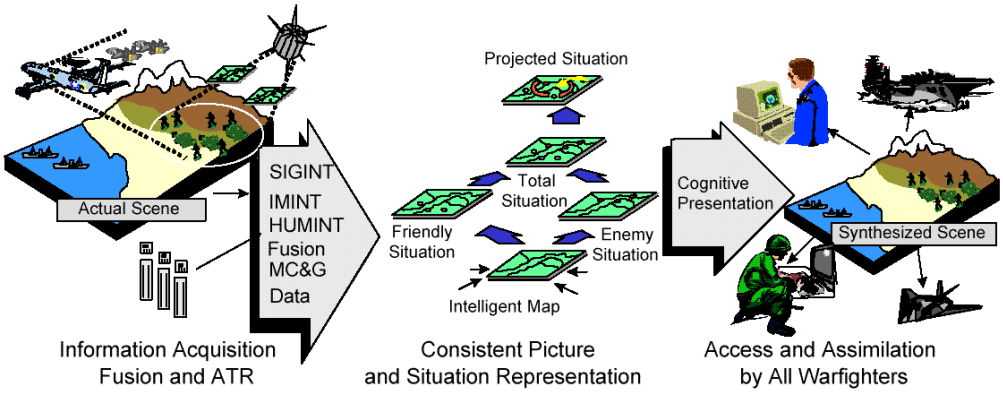

Figure 12 Situational Awareness

(From R. Fuchs, et al., *United States Air Force Expeditionary Forces Vol. 1: Summary*, SAB-TR-97-01, [Washington, D.C.: Air Force Scientific Advisory Board (SAB), November 1997], 23; on-line, Internet, 15 October 1998, available from http://web.fie.com/fedix/sab.html.)

systems provide the war fighter information superiority over an adversary. The information collected by and transmitted through space systems decreases the fog of war for our forces and enables our forces to out-maneuver, out-mass and out-fight any potential enemy. The majority

of the force enhancement mission is conducted by AFSPACE, which is Air Force Space Command's 14th Air Force. AFSPACE controls and operates both GPS and DSP. It is also responsible for the health and status of DSCS communications satellites, while Army Space Command is responsible for DSCS payload operations. Navy Space Command operates its own UHF satellites.[13]

Space Control

Space control comprises the following functions: space surveillance, protection, prevention and negation.[14] Space surveillance is the maturest function of US space control, providing the means by which USSPACECOM achieves situational awareness of the space medium. Using a worldwide network of radars and optical trackers, USSPACECOM detects, identifies and tracks manmade objects in space. Thus, USSPACECOM can monitor potential adversaries' systems as well as space debris for collision avoidance. Surveillance is the keystone of space control because it provides situational awareness. The majority of this function is conducted by AFSPACE, Air Force Space Command's 14th Air Force, which operates the Space Surveillance Network. Navy Space Command contributes to the space surveillance function with its Naval Space Surveillance System, which is operated out of Dahlgren, VA.[15]

Protection is meant to ensure the use of space in any situation and to enhance system survivability. Methods of protection include maneuver, hardening, autonomous satellite operations, and system redundancy. Maneuver is utilized so that satellites can avoid space junk or an anti-satellite weapon. Hardening protects our space systems against radio frequency interference (RFI), both natural and man-made, and against the radiation belts circling the earth. Autonomous operations capability is built into every satellite to some extent and reduces satellite dependence on ground stations for proper operations of the satellite bus and payload. Lastly,

redundancy is built into every subsystem of a satellite to ensure reliable operation over its design life.[16]

Prevention measures are designed to keep adversaries from using our own or allies' space systems against us. The only option currently available to the US is diplomacy to deny a potential adversary the use of friendly space systems.[17]

Negation is negating the adversary's ability to execute their space power. Negating any one portion (ground segments, space segments, or up/down links) of a space system has the potential to negate the entire system. Currently the United States does not have an operational ASAT system capable of negating satellites in orbit. However, the US can apply conventional military capabilities to take-out ground stations or possibly use assets such as an electronic warfare aircraft to try and jam adversary system up/down links.[18]

Force Application

The final mission area, force application, is as controversial as space control. Currently, the United States does not have any capabilities whatsoever to apply force from one space system to another space system or to the ground. According to its Long Range Plan, USSPACECOM does not foresee the development of such a capability for 20 years or more into the future.[19] Thus, in the near term, the force application mission has little bearing on AEF operations.

Conclusion

Space power is different from airpower, which results in different centralized control and different decentralized execution. Due to the nature of space, space forces require centralized control from a global rather than a theater perspective. Specially trained space professionals are required for effective global C2 of space forces. In addition, USSPACECOM is designated by

the UCP as the single focal point for military space operations and is assigned a variety of missions. Terrestrial force enhancement is the maturest of the USPACECOM missions.

Historically, space power has been executed via functions/specialties such as weather, communications and intelligence, which has contributed to "stove-piping" in the space community. In addition, these functional experts do not require much space expertise to utilize the information provided by space systems. Thus the decentralized execution of space power does not require professional space experts the way airpower requires professional pilots and aircrews.

While space power is different than airpower, certain parallels can be drawn, especially between strategic airlift and USSPACECOM's force enhancement mission. Whereas airlifters create an "air bridge" between CONUS and the JTF, space operators create a "space bridge". This "space bridge" carries the information the JTF requires for battlespace awareness and information superiority.

Notes

[1] Air Force Doctrine Document (AFDD) 2-2, *Space Operations*, 23 August 1998, 32; on-line, Internet, 21 October 98, Available from http://www.hqafdc.maxwell.af.mil.

[2] Major Bruce M. DeBlois, "Ascendant Realms: Characteristics of Airpower and Space Power," in *The Paths of Heaven: The Evolution of Air Power Theory by the School of Advanced Aerospace Studies*, ed. Col Phillip S. Meilinger, USAF. (Maxwell AFB, Ala.: Air University Press, 1997), 565.

[3] AFDD 2-2, 15.

[4] Tamar R. Mehuron, "Space Almanac," *Air Force Magazine*, August1998, 22-48; on-line, Internet, 2 February 1999, available from http:/www.afa.org/magazine/space/98space.html.

[5] AFDD 2-2, 16.

[6] CINC's Action Group, United States Space Command, CINC's Command Briefing, October 1998.

[7] Ibid.

[8] AFDD 2-2, 17.

[9] Tamar R. Mehuron, Space Almanac, 48.

[10] CINC's Action Group, United States Space Command, CINC's Command Briefing, October 1998.

[11] Ibid.

Notes

[12] Ibid.
[13] Ibid.
[14] AFDD 2-2, 8.
[15] CINC's Action Group, United States Space Command, CINC's Command Briefing, October 1998.
[16] Ibid.
[17] Ibid.
[18] AFDD 2-2, 8.
[19] United States Space Command, *Long Range Plan – Implementing USSPACECOM Vision for 2020*, (Peterson AFB, Colo., 1998), 71.

Appendix B

Command and Control of Space Forces

Space forces are now recognized as force multipliers that give our military forces a decisive advantage across the spectrum of conflict.[1] However, space system support is provided by many different organizations, making coordinated and synchronized support for the war fighter difficult. This appendix examines in detail Air Force and Joint doctrine regarding

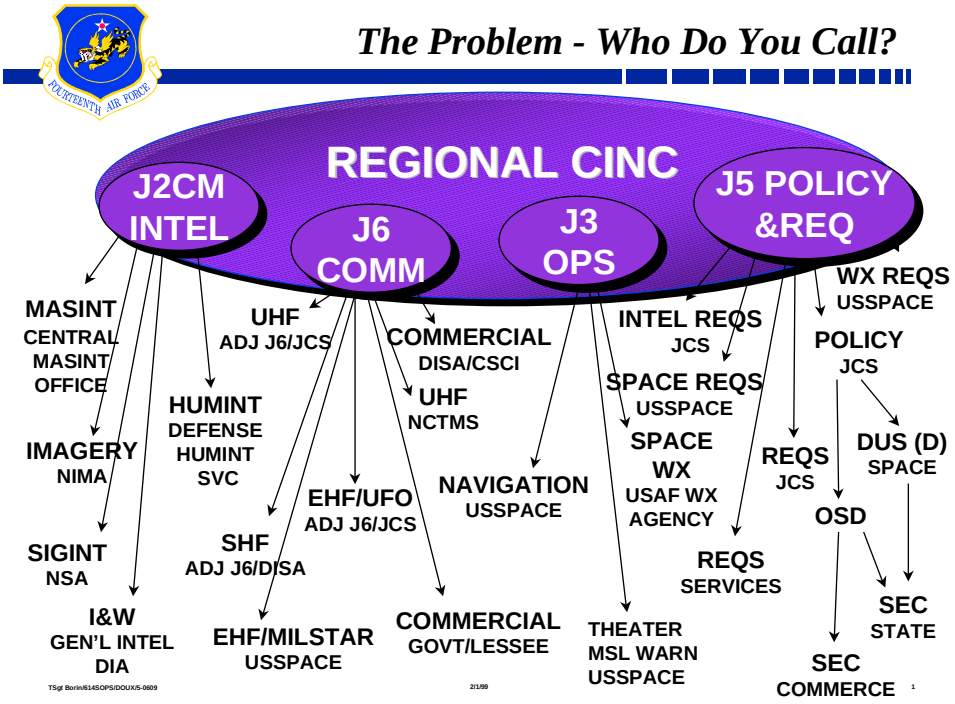

Figure 13 Stove Piped Space Support

(From Lt Col Terry Djuric, "AFSPACE Command and Control," briefing, Air War College, Maxwell AFB, Ala., September 1998.)

space power and the command and control (C2) of space forces.

Air Force Doctrine

Air Force doctrine is articulated through a series of doctrine documents. The documents pertinent to this discussion are Air Force Doctrine Document (AFDD) 1, *Air Force Basic Doctrine*, AFDD 2, *Organization and Employment of Aerospace Power* and AFDD 2-2, *Space Operations*. Each of these documents will be reviewed in order to understand Air Force doctrine for space operations.

AFDD 1

AFDD 1 lays out the basic doctrine – the "officially sanctioned beliefs and warfighting principles that describe and guide the proper use of air and space forces in military operations."[2] Air Force doctrine attempts to logically link air and space operations in spite of their obvious differences. Air Force basic doctrine emphasizes the importance of the principle of war "unity of command"[3] and the corresponding airpower tenet of "centralized control and decentralized execution".[4] AFDD 1 asserts that air and space power "share the advantage of three-dimensional maneuver" and are therefore governed by the same tenets.[5] Thus, according to AFDD 1, the tenet of centralized control and decentralized execution applies to space power just as it applies to airpower. The following quote summarizes the Air Force's official beliefs on centralized C2 of air and space forces: "It is a basic principle of air and space doctrine that C2 of air and space forces be centralized under one officer – an airman."[6] However, AFDD 1 does recognize that space forces are different than most air forces because space forces are global in nature. Therefore, AFDD 1 acknowledges that USSPACECOM retains operational control (OPCON) of space forces just as USTRANSCOM retains OPCON of strategic airlift.[7]

The Air Force is caught on the horns of a doctrinal dilemma. On the one hand, the Air Force believes a single airman should control both air and space forces. But, on the other hand, the Air Force must acknowledge that USSPACECOM and not an air commander in theater retain OPCON of space forces. This dilemma occurs at every level of Air Force doctrine.

AFDD 2

AFDD 2 builds and expands upon the fundamental air and space power beliefs found in AFDD 1. AFDD 2 describes how the Air Force organizes and employs its forces at the operational level of war.[8] AFDD 2 designates the AEF as the source for forces that will deploy in support of JTFs. Thus, the AEF will provide the JFACC a single point of contact for air and space capabilities in a tailor-to-task package.[9] When the AEF provides the preponderance of air power to the JTF, then the AEF commander will normally be designated as the JFACC.

AFDD 2 reiterates AFDD 1's recognition that the global nature of space forces sets them apart from air forces and normally prevents the transfer of OPCON to the JFC or COMAFFOR.[10] However, Air Force operational doctrine does provide some additional detail regarding the coordination of space assets. AFDD 2 allows the JFACC may "coordinate employment of space assets through the Space Operations Center (SOC) at 14AF" when authorized by USCINCSPACE.[11] The SOC will assume for the JFACC the planning, integration and tasking of space assets. Furthermore, 14AF will deploy Air Force Space Support Teams (AFSSTs) to the JAOC to provide planning support for the JFACC, even if the JFACC.[12] AFDD 2 does not address the situation where the JFACC is not the AEF commander.

AFDD 2-2

AFDD 2-2, *Space Operations*, specifically applies the basic and operational doctrine of AFDD 1 and AFDD 2 to space operations, creating operational doctrine for space operations.[13]

AFDD 2-2, like its parent documents, acknowledges USSPACECOM's authority over its Air Force Component (AFSPACE) which is the 14AF.[14] AFDD 2-2 does provide a brief discussion of non-Air Force space assets such as national, commercial, civil, and multi-national systems. Use of these systems does not necessarily follow the usual rules of operational and tactical control, therefore "flexibility and innovation on part of the commander" are required in utilizing them with maximum effectiveness.[15]

AFSPACE (14AF)

AFSPACE (14AF) provides C2 of Air Force space assets through its Space Operation Center (SOC). The SOC transmits tasking-type orders to its subordinate wings.[16]

Figure 14 AFSPACE (14 AF) Span of Control

(From Lt Col Terry Djuric, "AFSPACE Command and Control," briefing, Air War College, Maxwell AFB, AL. September 1998)

The 45th and 30th Space Wings are responsible for operating the nation's launch complexes off of the East and West coasts, respectively. The 21st Space Wing operates the space surveillance network that provides the surveillance portion of USSPACECOM's space control mission. This space wing also operates the nation's missile warning network, providing strategic missile warning to the National Command Authority. The 50th Space Wing operates the Air Force Satellite Control Network, and its satellite operations squadrons operate the GPS constellation and provide health and status operations for various military communications satellites.[17]

The Commander AFSPACE (COMAFSPACE) has recently published a white paper outlining his arguments for designating his SOC as the JTF's reachback command center for space C2 through the JFACC. COMAFSPACE argues that because of limited time and manpower, USSPACECOM should focus on the strategic level of war and delegate "as much operational level control as possible to his component commanders."[18] The white paper further contends that:

> Within a theater of operations a forward-deployed functional component commander should be designated as the supported commander for space operations within the joint operations area (JOA). This theater focal point should normally be the Joint Force Air Component Commander (JFACC).[19]

The reason for designating the JFACC as the space supported commander is that "The JFACC relies more heavily than other theater functional components upon the AFSPACE SOC's adjustment of space forces to support JFC objectives."[20] The argument is then made that given direct liaison authorized (DIRLAUTH) and mutual support relationships with the other USSPACECOM components, AFSPACE can execute forces for the JFC via a support relationship with the JFACC.[21]

The arguments presented in the COMAFSPACE white paper do have some flaws. First, USSPACECOM is clearly given operational level responsibilities by the Unified Command Plan

(refer to Appendix D) and therefore USSPACECOM cannot limit itself to just the strategic level of war. Secondly, the JFC is the supported forward-deployed commander, not the JFACC. Also, the land and maritime components are as heavily reliant on space support as the air component. Lastly, even with DIRLAUTH and mutual support relationships, AFSPACE's SOC span of control is limited to the 14 AF units and therefore cannot provide unity of command for the civil, national and other military space forces. An AEF and a JTF require coordinated and synchronized space support from the entire space community, not just from those systems operated by COMAFSPACE.

Next, joint doctrine will be examined in order to gain insights on what other space force C2 options are available to the war fighter.

Joint Doctrine

The joint doctrine discussion will utilize the following documents: Joint Publication 1.0, *Joint Warfare of Armed Forces of the United States*, the Unified Command Plan, Joint Pub 0-2, *Unified Action Armed Forces*, Joint Pub 3-0, *Doctrine for Joint Operations*, Joint Pub 3-05, *Doctrine for Joint Special Operations* and Joint Pub 4-01.1, *Joint Tactics, Techniques and Procedures for Airlift Support to Joint Operations*.

Joint Pub 1

Joint Pub 1 clearly recognizes the importance of space when it states, "Overhead, space-based capabilities affect all terrestrial forces, with a potential we have only begun to grasp."[22] In its discussion of joint campaign planning, a joint plan should sequence and synchronize air, land, sea, space, and special operations to achieve overwhelming military force.[23]

Unified Command Plan

In recognition of the importance of space in military operations, the Unified Command Plan defines the responsibilities of a functional unified command called United States Space Command (USSPACECOM). The most recent UCP assigns the Commander in Chief of USSPACECOM (USCINCSPACE) to "serve as the single focal point for military space operational matters to include communications..."[24] The UCP further tasks USCINCSPACE to: "in coordination with the Joint Staff, appropriate CINCs, provide military representation to US national agencies, commercial and international agencies for matters related to military space operations…"[25]

When the Joint Force Commander (JFC) requires space forces support, USSPACECOM will issue mission-type orders to its components.[26] In these orders, USSPACECOM describes the JFC's requirements so the components can then develop detailed plans on how to provide the space support. USSPACECOM controls and synchronizes the operations of its components to ensure timely and efficient space support to the war fighter. USSPACECOM also has liaisons with NASA, NOAA, DISA, and the NRO (in addition to liaison officers at the regional unified command headquarters) in order to coordinate the full range of civil, commercial, and national space capabilities for the JFC. The listing of USSPACECOM responsibilities can be found in Appendix D.

Joint Pub 0-2 and 3-0

Joint Pub 0-2[27] and Joint Pub 3-0[28] state that the JFC may establish functional components within the joint task force to provide centralized direction and control of certain functions and types of operations. Joint Pub 3-0 further clarifies that a functional component is appropriate when forces from two or more Services operate in the same dimension or medium.[29]

USSOCOM C2

Special operations forces are integrated into a JTF in one of two ways. The first is a Joint Special Operation Component (JSOC), and the second is a Joint Special Operations Task Force (JSOTF). The selection of the method is up to the discretion of the JFC, depending on the situation.[30] The JSOC commander (JSOCC) or the JSOTF commander will command the in-theater SOF via an organization illustrated in Figure 13. A key factor to note in this C2 arrangement is that OPCON of the SOF is transferred to the JFC because the SOF are in

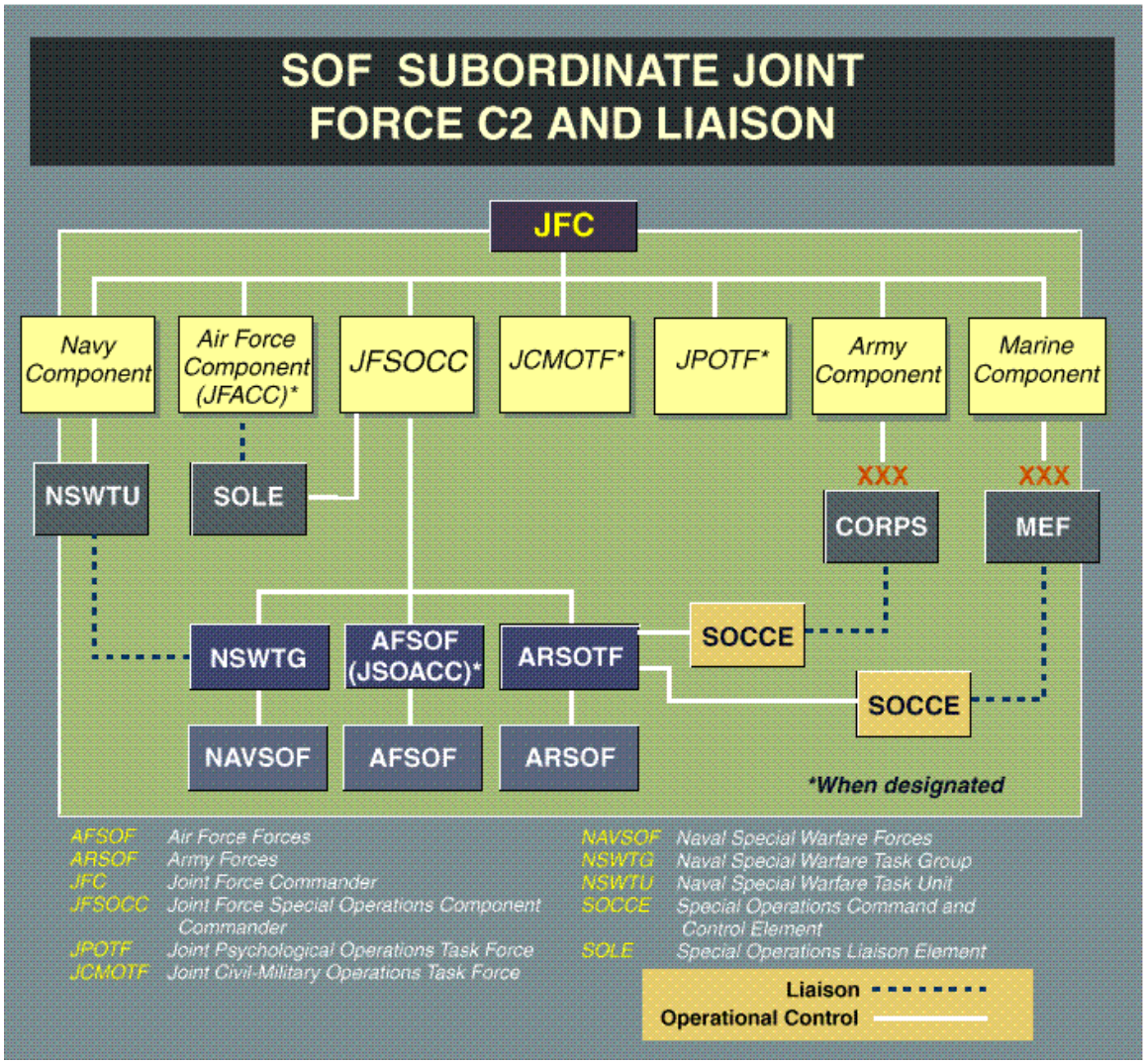

Figure 15 C2 for Special Operations Forces

(From Joint Pub 3-05, *Doctrine for Joint Special Operations*, 17 April 1998, III-4; on-line, Internet, 27 January 1999, available from http:/www.dtic.mil.)

the theater. As noted in both the Space Power Chapter and in Air Force doctrine, space forces, unlike SOF, are not normally under the operational control (OPCON) of the JFC because of their global nature.

USTRANSCOM C2

Like USSPACECOM, USTRANSCOM is a functional unified command with a global mission that supports the regional unified commands. As a result, USTRANSCOM's C2 organization is different from the SOCOM model and can more easily be adapted to USSPACECOM situation.

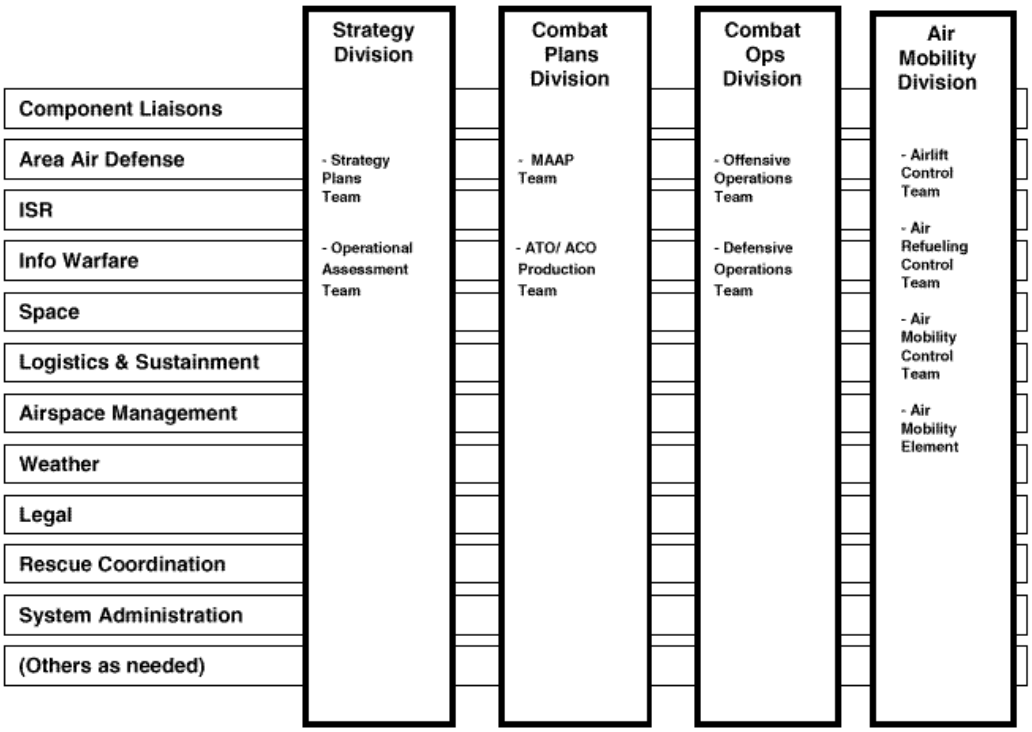

Figure 16 Notional JAOC with Representative Core, Specialty, and Support Teams

(From Air Force Doctrine Document (AFDD) 2, *Organization and Employment of Aerospace Power*, 28 September 1998, 74; on-line, Internet, 21 October 98, available from http://www.hqafdc.maxwell.af.mil)

Day-to-day control of USTRANSCOM's strategic airlift fleet is performed by the Air Force Air Mobility Command's (AMC) Tanker Airlifter Control Center (TACC).[31] The TACC provides centralized C2 of all of strategic airlift around the world. Decentralized execution of the strategic airlift mission is accomplished by AMC units across the globe. Strategic airlift is under OPCON of TACC while intra-theater airlift is under OPCON of the JFACC. Thus, "interface between USTRANSCOM's and AMC's command and control system and the theater airlift command and control system is vital."[32] This interface is accomplished by a Director of Mobility Forces (DIRMOBFOR), who is normally a senior officer with both airlift and in-theater experience. The DIRMOBFOR is the "go to guy" responsible for all (inter- and intra-theater) airlift issues. Both Joint[33] and Air Force Doctrine[34] agree that the DIRMOBFOR works for the JFACC. Air Force Operational doctrine states that the DIRMOBFOR directs the Air Mobility Division (AMD) within the JAOC.[35] Located within the AMD is the Air Mobility Element (AME) which is a forward-deployed element of the TACC providing reachback to the TACC for the DIRMOBFOR.

Refer to Chapter 5, *Command and Control of Space Forces,* and Chapter 6 *Conclusion,* for the comparisons of the different C2 models applies to space forces.

Notes

[1] Major Ricky B. Kelly, *"Centralized Control of Space: The Use of Space Forces by a Joint Force Commander,"* Maxwell AFB, AL: School of Advanced Aerospace Studies, 5 March 1997, n.p.; on-line, Internet, 24 January 99, available from http://www.au.af.mil/au/database/research.html.

[2] Air Force Doctrine Document (AFDD) 1, *Air Force Basic Doctrine,* September 1997, 1.

[3] Ibid., 12.

[4] Ibid., 23.

[5] Ibid., 21-22.

Notes

[6] Ibid., 54.

[7] Ibid., 70.

[8] Air Force Doctrine Document (AFDD) 2, *Organization and Employment of Aerospace Power*, 28 September 1998, i; on-line, Internet, 21 October 98, available from http://www.hqafdc.maxwell.af.mil.

[9] Ibid., 32.

[10] Ibid., 44.

[11] Ibid., 67.

[12] Ibid., 67.

[13] Air Force Doctrine Document (AFDD) 2-2. *Space Operations*, 23 August 1998, v; on-line, Internet, 21 October 98, Available from http://www.hqafdc.maxwell.af.mil.

[14] Ibid., 5.

[15] Ibid., 6.

[16] Lt Col Terry Djuric, "AFSPACE Command and Control," briefing, Air War College, Maxwell AFB, AL. September 1998.

[17]. Ibid.

[18] Maj Gen Gerald F. Perryman, Jr., Col Michael L. Wolfert, and Maj T.J. Lea, *Command and Control of AFSPACE Forces, Version 2.0*, white paper, January 1999, 7.

[19] Ibid., 9.

[20] Ibid., 27.

[21] Ibid., 9.

[22] Joint Publication 1-0, *Joint Warfare of the Armed Forces of the United States*, 10 January 1995, I-2; on-line, Internet, 3 February 99**,** available from http:/www.dtic.mil.

[23] Ibid., IV-2.

[24] *Unified Command Plan* (U), 1997. (Secret) Information extracted is unclassified.

[25] Ibid.

[26] Lt Col Terry Djuric, briefing, September 1998.

[27] Joint Publication 0-2, *Unified Action Armed Forces (UNAAF)*, 24 February 1995, IV-2; on-line, Internet, 22 January 1999, available from http:/www.dtic.mil.

[28] Joint Publication 3-0, *Doctrine for Joint Operations*, 1 February 1995, II-4; on-line, Internet, 22 January 1999, available from http:/www.dtic.mil.

[29] Ibid., II-14.

[30] Joint Pub 3-05, *Doctrine for Joint Special Operations.* 17 April 1998, III-4; on-line, Internet, 27 January 1999, available from http:/www.dtic.mil.

[31] Joint Pub 4-01.1, *Joint Tactics, Techniques and Procedures for Airlift Support to Joint Operations*, 20 July 1996, II-3; on-line, Internet, 25 January 1999,. available from http:/www.dtic.mil.

[32] Ibid., II-9.

[33] Ibid., II-10.

[34] AFDD 2, 72.

[35] Ibid., 72-74.

Appendix C

Theater Deployable Imagery System

The Theater Deployable Imagery System (TDIS), a joint effort of the Air National Guard (ANG) and the National Reconnaissance Office (NRO), will improve battlespace awareness at the tactical level. Leveraging commercial off the shelf (COTS) hardware and software, TDIS is designed to be a portable imagery management system for use in places like a wing operations center (WOC). This chapter will explain TDIS components and its proposed concept of operations.[1]

TDIS consists of microcomputers and a server, to be used to produce both hard and soft copy imagery products for the wing level tactical user. TDIS will be deployable in one C-130 load and will require eight personnel to operate it. The server will be loaded with a baseline imagery archive of the theater provided by NRO and the National Imagery and Mapping Agency (NIMA). The workstations will be able to manipulate and enhance archived images to create both hard and soft copy products.[2]

TDIS will be connected to NIMA imagery archives located back in CONUS via the space-based Global Broadcast System (GBS). Updated imagery flowing into the NIMA archives will be broadcast via GBS, so that the TDIS imagery archive will be updated in a continual and planned manner. This system is designed to use existing combat communications architectures found at the tactical air base (TAB) or AOC level. TDIS is also designed to accept injects from

Eagle Vision (a project using commercial satellite images) and in-theater air-breather intelligence/surveillance/reconnaissance (ISR) assets via satellite links.[3]

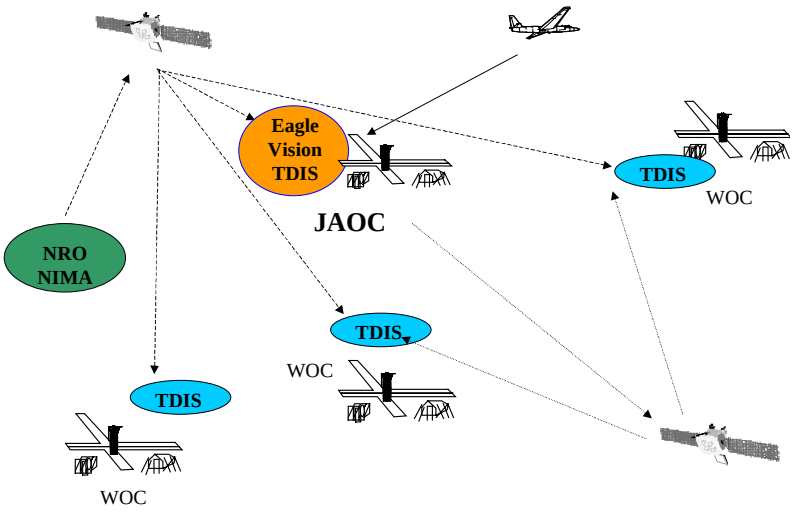

Figure 17 Theater Deployable Imagery System

(From Major Gene Brislin, "Theater Deployable Imagery System", Initiative Abstract EFX 99, [McEntire ANGS, Eastover, SC: 240th Combat Communications Squadron, 2 July 1998]).

In terms of space power, TDIS will improve the exploitation and dissemination portions of the previously mentioned TPED process, enabling the tactical user to manipulate and distribute imagery in a more timely and efficient manner. Thus, TDIS will improve the decentralized execution of space power at the tactical level. As part of its operational test and evaluation, TDIS has been submitted as a candidate for the upcoming Expeditionary Forces Experiment 99.

Notes

[1] Major Gene Brislin, "Theater Deployable Imagery System", Initiative Abstract EFX 99, (McEntire ANGS, Eastover, SC: 240th Combat Communications Squadron, 2 July 1998).
[2] Ibid.
[3] Ibid.

Appendix D

Excerpt From Unified Command Plan

1. Command of unified combatant commands will be exercised as provided for herein and as otherwise directed by the Secretary of Defense.

GENERAL

2. The National Security Act of 1947 and title 10 of the United States Code provide the basis for the establishment of unified combatant commands.

3. A unified combatant command has broad, continuing missions and is composed of forces from two or more Military Departments. The Unified Command Plan (UCP) establishes the missions, responsibilities, and force structure for commanders of unified combatant commands and establishes their general geographic areas of responsibility and functions.

4. Communications between the National Command Authorities (NCA) (the President and the Secretary of Defense) and the commanders of the combatant commands shall be transmitted through the Chairman of the Joint Chiefs of Staff, unless otherwise directed by the President or the Secretary of Defense.

FORCES

5. Forces assigned to unified combatant commands will be under combatant command of the commanders of the unified combatant commands. Except as otherwise directed by the Secretary of Defense, forces assigned to the combatant commands do not include forces assigned to carry out functions of the Secretary of a Military Department or forces performing peace operations under the authority, direction, or control of the United Nations or other multinational peacekeeping organizations.

6. Unified combatant command forces will be assigned to such commands by the Secretary of Defense's memorandum entitled "Forces for Unified Commands."

7. Except as otherwise directed by the President or the Secretary of Defense, all forces operating within the geographic area assigned to a unified combatant command shall be assigned or attached to and under the command of the commander of that command. This includes National Guard and Reserve Forces when ordered to Federal active duty.

8. A force assigned or attached to a combatant command under section 162 of title 10 may be transferred from that command only as directed by the Secretary of Defense and under procedures prescribed by the Secretary of Defense and approved by the President.

AUTHORITY

9. The authority of combatant commanders is established in Chapter 6 of title 10. The commander of a unified combatant command shall exercise command authority, as defined in section 164(c) of title 10, over all forces assigned to that command unless otherwise directed by the President or Secretary of Defense. In addition, the commander of a unified combatant command will, unless otherwise directed by the President or the Secretary of Defense, exercise those functions of command involving the control of assigned resources.

10. When there is a vacancy in the office of the commander of a combatant command, or in the temporary absence or disability of the combatant commander, the deputy commander acts as combatant commander and performs the duties of the combatant commander until a successor is appointed or absence or disability ceases. If a deputy commander has not been designated, interim command will pass to the next senior officer present for duty eligible to exercise command, regardless of Service affiliation.

11. The commander of a unified combatant command is responsible for:

a. Maintaining the security and force protection of the command, including its assigned or attached forces and assets, and protecting the United States, its possessions, and bases against attack, threat of attack, or hostile incursion.

b. Carrying out assigned missions and tasks.

c. Assigning tasks to, and directing coordination among, the command's subordinate commands to ensure unity of effort in the accomplishment of the commander's assigned missions.

d. Planning for and executing military operations as directed by the NCA in support of the National Military Strategy.

12. The commander of a unified combatant command that includes a general geographic area of responsibility is additionally responsible for:

a. Planning and, as appropriate, implementing the evacuation and protection of United States citizens and nationals and, in connection therewith, designated other persons, in support of their evacuation from threatened areas overseas; reviewing emergency action plans within the commander's general geographic area of responsibility.

b. Providing for US military representation, within the commander's general geographic area of responsibility, to international and US national agencies unless otherwise directed by the Secretary of Defense. The US military representatives will provide advice and assistance to Chiefs of US Diplomatic Missions in negotiation of rights, authorizations, and facility arrangements required in support of US military missions in the region.

c. Providing the single point of contact on military matters within the assigned area of responsibility. Unless otherwise directed by the Secretary of Defense, whenever a commander undertakes exercises, operations, or other activities with the military forces of nations in another commander's area of responsibility, those exercises, operations, and activities, and their attendant command relations, will be as mutually agreed between the commanders. The Chairman of the Joint Chiefs of Staff shall prepare for the approval of the Secretary of Defense directions as appropriate.

d. Providing military assessments of the security assistance programs within the commander's assigned security assistance area.

e. Ensuring the coordination of regional security assistance matters under command responsibility with affected Chiefs of US Diplomatic Missions.

f. Commanding, supervising, and supporting the security assistance organizations in matters that are not functions or responsibilities of the Chiefs of US Diplomatic Missions.

g. Carrying out advisory, planning, and implementing responsibilities relating to security assistance within the commander's assigned security assistance areas.

h. Assuming combatant command, in the event of war or an emergency that prevents control through normal channels, of security assistance organizations within the commander's general geographic area of responsibility or as directed by the NCA.

i. Unless otherwise directed by the NCA, commanding US forces conducting peace or humanitarian relief operations within the commander's general geographic area of responsibility, whether as a unilateral US action or as part of a United Nations or other multilateral organization; or supporting US forces under the authority, direction, or control of the United Nations or other multilateral organization.

j. Providing the single DOD point of contact within the assigned area of responsibility for countering the proliferation of weapons of mass destruction in support of nonproliferation policies, activities, and taskings.

k. Reviewing the force protection of all combatant and noncombatant military activities in the commander's area of responsibility, except forces performing peace operations under the authority, direction, or control of the United Nations or other multilateral organizations not assigned to the commander, and identifying to the Chairman of the Joint Chiefs of Staff, responsible Service, and cognizant chain of command any military activity not assessed as satisfactory. Assessments of forces performing peace operations as defined above are the responsibility of the designated DOD Executive Agent and will be provided by the Executive Agent to the commander for review.

13. When necessary, those geographic areas not assigned to a combatant commander will be assigned as directed by the Secretary of Defense.

Paragraphs 14-21 not printed.....

22. US Space Command (USSPACECOM)

a. The Commander in Chief, US Space Command (USCINCSPACE), headquartered at Peterson Air Force Base, Colorado Springs, Colorado, is the commander of a unified combatant command comprising all forces assigned for accomplishment of the commander's missions. USCINCSPACE has no geographic area of responsibility for normal operations and will not exercise those functions of command associated with area responsibility. However, USCINCSPACE's responsibilities include:

(1) Supporting the North American Aerospace Defense Command (NORAD) by providing the missile warning and space surveillance necessary to fulfill the US commitment to the NORAD Agreement.

(2) Exercising combatant command over those assigned US forces that provide warning of missile attack on CONUS and Alaska and warning and assessment of space attack.

(3) Advocating space (including force enhancement, space control, space support, and force application) and missile warning requirements of other CINCs.

(4) Conducting space operations by exercising combatant command over assigned space control, space support (including launch and on-orbit operations), and force enhancement forces, as well as forces that provide strategic ballistic missile defense for the United States.

(5) Planning for and developing requirements for strategic ballistic missile defense and space-based support for tactical ballistic missile defense.

(6) Providing integrated tactical warning and attack assessment of space, missile, and air attacks on CONUS and Alaska should NORAD be unable to accomplish the assessment mission.

(7) Serving as the single point of contact for military space operational matters, to include communications in accordance with the provisions of Memorandum of Policy 37 (MOP-37), Military Satellite Communications Systems, dated 14 May 1992 and subsequent revisions, except as otherwise directed by the Secretary of Defense. Whenever USCINCSPACE undertakes military activities with other nations or unilaterally in the area of responsibility of another CINC(s), those activities and their attendant command relations will be coordinated with the appropriate CINC(s).

(8) In coordination with the Joint Staff and appropriate CINCs, providing military representation to US national agencies, commercial, and international agencies for matters related to military space operations unless otherwise directed by the Secretary of Defense.

(9) In coordination with appropriate geographic CINCs' security assistance activities, planning and implementing security assistance relating to military space operations and providing military assessments as required. Unless otherwise directed by the Secretary of Defense, these activities shall not supersede the responsibilities of other CINCs to coordinate security assistance matters and provide advice and assistance to Chiefs of US Diplomatic Missions.

(10) Coordinating and conducting space campaign planning through the joint planning process in support of the National Military Strategy.

(11) Providing the military point of contact for countering the proliferation of weapons of mass destruction in space in support of nonproliferation policies, activities, and taskings.

b. USCINCSPACE is also Commander, US Element, NORAD, and is normally designated CINCNORAD, commander in chief of the binational command of the United States and Canada. When, in accordance with United States-Canada agreements, CINCNORAD is a Canadian, USCINCSPACE is designated Deputy CINCNORAD. CINCNORAD is responsible for the employment of forces made available by the United States and Canada, with the support of USCINCSPACE and commanders of other unified combatant commands.

Glossary

Abbreviations and Acronyms

AEF	Air Expeditionary Force
AFCC	Air Force component commander
AFDD	Air Force Doctrine Document
AFSCN	Air Force Satellite Control Network
AFSPC	Air Force Space Command
AFSST	Air Force Space Support Team
AMC	Air Mobility Command
AME	air mobility element
ANG	Air National Guard
AOR	area of responsibility
AFSPACE	Air Force component of US Space Command
ARSPACE	Army Space Command
ARSST	Army Space Support Team
ASAT	anti-satellite
AWACS	Airborne Warning and Control System
C2	command and control
C2I	command and control and intelligence
C2W	command and control warfare
C3IC	Coalition Coordination, Communications, and Integration Center
C4I	command, control, communications, computers, and intelligence
CINC	commander of a combatant command; commander in chief
COCOM	combatant command (command authority)
COMAFFOR	commander, Air Force forces (a Service component commander)
CONUS	continental United States
DIRLAUTH	direct liaison authorized
DIRMOBFOR	Director of Mobility Forces
DIRSPAFOR	Director of Space Forces
DMSP	Defense Meteorological Satellite Program
DOD	Department of Defense
DSCS	Defense Satellite Communications System
DSP	Defense Support Program

ESA	European Space Agency
GBS	Global Broadcast System
GEO	geosynchronous earth orbit
GPS	Global Positioning System
HEO	highly elliptical orbit
INS	inertial navigation system
ISR	intelligence, surveillance and reconnaissance
JAOC	joint air operations center
JFACC	joint force air component commander
JFC	joint force commander
JFLCC	joint force land component commander
JFMCC	joint force maritime component commander
JFSOCC	joint force special operations component commander
JSOTF	joint special operations task force
JSpOC	joint space operations component
JSpOTF	joint space operations task force
JSTARS	joint surveillance, target attack radar system
JTCB	joint targeting coordination board
JTF	joint task force
JTTP	joint tactics, techniques, and procedures
LEO	low earth orbit
MEO	medium earth orbit
MILSTAR	military strategic and tactical relay system
MOOTW	military operations other than war
MTW	major theater war
NAVSPACE	Naval Space Command
NAVSST	Naval Space Support Team
NCA	National Command Authorities
NIMA	National Imagery and Mapping Agency
NRO	National Reconnaissance Office
NSST	National Space Support Team
OPCON	operational control
OPLAN	operation plan
PGM	precision guided munition
PNT	geospatial positioning, navigation and timing

RMA	revolution in military affairs
SBIRS	Space Based Infrared System
SOC	Space Operations Center
SOF	special operations forces
SSN	space surveillance network
SWS	space warning squadron
TACON	tactical control
TDIS	Theater Deployable Imagery System
TPED	tasking, processing, exploitation and dissemination
TPFDD	time-phased force and deployment data
TT&C	telemetry, tracking, and commanding
UAV	unmanned aerial vehicle
UCP	Unified Command Plan
UNAAF	Unified Action Armed Forces
US	United States
USCINCSPACE	Commander in Chief, United States Space Command
USCINCTRANS	Commander in Chief, United States Transportation Command
USSOCOM	US Special Operations Command
USSPACECOM	United States Space Command
USTRANSCOM	US Transportation Command
WOC	wing operations center
WMD	weapons of mass destruction

Definitions

combatant command. A unified or specified command with a broad continuing mission under a single commander established and so designated by the President, through the Secretary of Defense and with the advice and assistance of the Chairman of the Joint Chiefs of Staff. Combatant commands typically have geographic or functional responsibilities.

combatant command (command authority). Nontransferable command authority established by title 10 ("Armed Forces"), United States Code, section 164, exercised only by commanders of unified or specified combatant commands unless otherwise directed by the President or the Secretary of Defense. Combatant command (command authority) cannot be delegated and is the authority of a combatant commander to perform those functions of command over assigned forces involving organizing and employing commands and forces, assigning tasks, designating objectives, and giving authoritative direction over all aspects of military operations, joint training, and logistics necessary to accomplish the missions assigned to the command. Combatant command (command authority) should be exercised through the commanders of subordinate organizations. Normally this authority is exercised through subordinate joint force commanders and Service and/or functional component commanders. Combatant command (command authority) provides full authority to organize

and employ commands and forces as the combatant commander considers necessary to accomplish assigned missions. Operational control is inherent in combatant command (command authority). Also called **COCOM.**

combatant commander. A commander in chief of one of the unified or specified combatant commands established by the President. See also **combatant command.**

direct liaison authorized. That authority granted by a commander (any level) to a subordinate to directly consult or coordinate an action with a command or agency within or outside of the granting command. Direct liaison authorized is more applicable to planning than operations and always carries with it the requirement of keeping the commander granting direct liaison authorized informed. Direct liaison authorized is a coordination relationship, not an authority through which command may be exercised. Also called **DIRLAUTH.**

ground-based segment. The land-, sea-, or air-based equipment and personnel used to receive, transmit, and process data from, or to control, the space element of a space system.

link segment. The electromagnetic energy used to convey data and in-formation between the space element and the terrestrial element.

operational control. Transferable command authority that may be exercised by commanders at any echelon at or below the level of combatant command. Operational control is inherent in combatant command (command authority). Operational control may be delegated and is the authority to perform those functions of command over subordinate forces involving organizing and employing commands and forces, assigning tasks, designating objectives, and giving authoritative direction necessary to accomplish the mission. Operational control includes authoritative direction over all aspects of military operations and joint training necessary to accomplish missions assigned to the command. Operational control should be exercised through the commanders of subordinate organizations. Normally this authority is exercised through subordinate joint force commanders and Service and/or functional component commanders. Operational control normally provides full authority to organize commands and forces and to employ those forces as the commander in operational control considers necessary to accomplish assigned missions. Operational control does not, in and of itself, include authoritative direction for logistics or matters of administration, discipline, internal organization, or unit training. Also called **OPCON.**

space segment. A platform in which astrodynamics is the primary principle governing its movement through its environment.

space power. The capability to exploit civil, commercial, intelligence, and national security space systems and associated infrastructure to support national security strategy and national objectives from peacetime through combat operations.

space system. A system with a major functional component which operates in the space environment or which, by convention, is so designated. It usually includes a space element, a link element, and a terrestrial element.

specified command. A command that has a broad, continuing mission, normally functional, and is established and so designated by the President through the Secretary of Defense with the advice and assistance of the Chairman of the Joint Chiefs of Staff. It normally is composed of forces from a single Military Department. Also called **specified combatant command**.

subordinate unified command. A command established by commanders of unified commands, when so authorized through the Chairman of the Joint Chiefs of Staff, to conduct operations on a continuing basis in accordance with the criteria set forth for unified commands. A subordinate unified command may be established on an area or functional basis.

Commanders of subordinate unified commands have functions and responsibilities similar to those of the commanders of unified commands and exercise operational control of assigned commands and forces within the assigned joint operations area. Also called **subunified command.**

tactical control. Command authority over assigned or attached forces or commands, or military capability or forces made available for tasking, that is limited to the detailed and, usually, local direction and control of movements or maneuvers necessary to accomplish missions or tasks assigned. Tactical control is inherent in operational control. Tactical control may be delegated to, and exercised at any level at or below the level of combatant command. Also called **TACON.**

unified command. A command with a broad continuing mission under a single commander and composed of significant assigned components of two or more Military Departments, and which is established and so designated by the President, through the Secretary of Defense with the advice and assistance of the Chairman of the Joint Chiefs of Staff. Also called **unified combatant command.**

Unified Command Plan. The document, approved by the President, which sets forth basic guidance to all unified combatant commanders; establishes their missions, responsibilities, and force structure; delineates the general geographical area of responsibility for geographic combatant commanders; and specifies functional responsibilities for functional combatant commanders. Also called **UCP.**

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