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THE LOGISTICS OF SPACE WARFARE - VOL 1 OF 2

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ELE-154 EXAM PREVIEW

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Exam Preview:

1. Using Table 1.1. Current space capabilities and space-integrated applications, which of the following space systems is used for Surveillance Information?
    a. Polar Satellite Communications
    b. Blue Force Situation Awareness
    c. DSP Satellites
    d. Global Broadcast Service
2. According to the reference material, offensive superiority in a medium enables an efficiency of military action that increases the likelihood of military success.
    a. True
    b. False
3. Using Figure 2.1. Percent of significant terrorist attacks, 1991–2003, which year range, before the year 2000, saw the greatest percentage increase in significant terrorist attacks?
    a. 1991-1992
    b. 1995-1996
    c. 1998-1999
    d. 1994-1995
4. According to the reference material, in order to reduce the scope and the capability of terrorist networks, military planners must consider targeted warfare to achieve devastating effects on every facet of a terrorist network's structure.
    a. True
    b. False

5. With __ percent of crew positions in a career field not related to space superiority, the challenge to retain competency in counterspace operations becomes difficult to imagine because most new accessions receive initial assignment to missile operations for four years.
    a. 19
    b. 23
    c. 46
    d. 58
6. Using Figure 2.5. Characterizing the baseline, state of the art, and goal., which of the following categories does the "Cyberspace infrastructure" belong to?
    a. Targets in cognitive and behavioral domain
    b. Instruments
    c. Direct military operation
    d. "Physical" military targets
7. According to the reference material, in August 2003, Daily Insight posted a story outlining Iran's recent attempt to challenge our use of the space medium.
    a. True
    b. False
8. Using Figure 2.2. Transnational terrorist networks., which of the following terror groups ranked amongst the lowest in terms of threat severity?
    a. Jemmah Islamiya
    b. ISIS
    c. Abu Sayyaf
    d. Al-Qaida
9. Using Table 2.2. Offensive counterspace effects, and Table 2.3. Defensive counterspace effects, which of the following OCS Physical effects does not belong?
    a. Recover
    b. Destruction
    c. Denial
    d. Disruption
10. According to the reference material, using Keidel's "trade-off" model, al-Qaeda is able to maintain global perspective due in part to its ability to maintain autonomy over the organizations.
    a. True
    b. False

Contents

About the Editor

Lt Col Kendall K. Brown, USAFR, PhD, is a technical analyst at the Airpower Research Institute, College of Aerospace Doctrine, Research and Education (CADRE), Air University (AU), Maxwell Air Force Base, Alabama. He is an Air Force Reserve individual mobilization augmentee (IMA) and conducts research to support CADRE and AU in the area of advanced space system technologies and serves to bridge the gap between technologists and the operational war fighter.

He has over 20 years' experience within the Air Force, National Aeronautics and Space Administration (NASA), private companies, and academia in the research, design, development, and testing of facilities, liquid-rocket engines, and launch-vehicle development. He served on active duty at Fairchild AFB, Washington, and as a reservist at McChord AFB, Washington; Arnold AFB, Tennessee; Eglin AFB, Florida; and currently, Maxwell AFB, Alabama.

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Acknowledgments

This book is the culmination of Gen Lance Lord's, former commander of Air Force Space Command, vision to initiate a vigorous discussion about how to best integrate space to support the war fighter. Part of General Lord's vision was for the Space Weapons Officer Air and Space Integration Conference to become a regular event where space weapons officers with experiences from recent operations could gather to discuss those events and propose new and perhaps radical ideas to improve the way space supports the war fighter. In the spirit of the Air Corps Tactical School, the best of these ideas could then be tested during war games and exercises. On behalf of the authors who participated in the conference and their support to this book, I extend our appreciation to General Lord for the opportunity to be part of such a unique event.

The Space Weapons Officer Air and Space Integration Conference in 2005 was a joint event between Air Force Space Command and Air Education and Training Command. The conference could not have been held without the hard work of numerous people at Space Command and Air University, including Brig Gen John Hyten, Col Dwayne Lamb, numerous members from the Space Warfare Center, the 595th Operations Support Squadron, Col Al Sexton, USAF, retired, Mr. Brent Marley, and the Maxwell AFB protocol.

Credit for this work belongs to the space weapons officers who participated in the conference and contributed their perspectives. And last, but certainly not least, the editor wants to recognize the outstanding support of the editorial staff at Air University Press, Dr. Philip Adkins, Mrs. Sherry Terrell, and Mrs. Vivian O'Neal. Their creation of an integrated book from nine distinctly separate research papers was a more complex effort than manuscripts written by a single author.

Introduction

Lt Col Kendall K. Brown, USAFR, PhD

In March 2005 the first Space Weapons Officer Air and Space Integration Conference was held at Maxwell Air Force Base, Alabama, as a joint effort between Air Force Space Command (AFSPC) and Air Education and Training Command. As then-AFSPC commander Gen Lance Lord stated in the invitation to the cadre of space weapons officers (SWO):[1] "We want to hear from the Space Weapons Officers on the best way to integrate space capabilities at the operational level of warfare. What do they think is the best way to do business? Differing views are okay. Articulate pros/cons and support with past experiences—what's worked, what hasn't." General Lord envisioned a regular event where SWOs would gather in the spirit of the Air Corps Tactical School to discuss, argue, and generate new ideas that could then be tested in war games and exercises for incorporation in doctrine, organization, strategy, tactics, and procedures.

General Lord set the stage for the conference with his introductory remarks:

> We've got to get ready for what's going to happen next in the medium of space. When Space starts in a big way, and it will, we have to have the conventional war fighters who have the capabilities, who know the rules of engagement, who are familiar with the laws of armed conflict, who know how to work in this medium and are able to shape and influence and make the right kind of decisions and direct the operational application of space capabilities.

The authors of each chapter presented their ideas directly to General Lord and over a dozen general officers from around the Air Force. The entire cadre of space-officer graduates of the Air Force Weapons School at Nellis AFB, Nevada, was invited, and more than 60 attended. The SWOs presented their ideas not only to senior leadership but also to their colleagues and peers. In the Air University tradition of nonattribution, most of the ideas presented generated lively debate. In particular, a recurring theme of "normalizing" the presentation of space forces to the theater commander was greeted with approval from most SWOs, although some of the senior officers in attendance were not quite as enthusiastic.

The chapters in *Space Power Integration* address issues across a spectrum of air- and space-integration topics at the operational level of war. Several studies argue that current space doctrine regarding organization and command relationships needs to be revised, with recommendations ranging from subtle modifications to paradigm-changing constructs. It is important to note that a major revision to Air Force Doctrine Document (AFDD) 2-2, *Space Operations*, was in process at the time of the conference and during the preparation of this book. As such, many of the fundamental arguments about organizing space forces to best support the theater joint force commander may have been addressed within doctrine. Doctrine does not and cannot provide extensive implementation guidance and direction; therefore, *Space Power Integration* provides some perspectives from space operators who have had direct responsibilities for integrating air and space power at the operational level of war.

Space Power Integration begins with a chapter providing a space-power framework and a recommendation for how the space-coordinating authority should enable unity of effort for diverse information services from space. The next chapter builds upon that background by discussing the importance of counterspace operations and how they are needed to support counterterrorism. Background information in the early chapters helps the nonspace operator put the remaining chapters in better context. The following six chapters discuss various perspectives on problems due to the current command and control (C2) of deployed space forces' organizational models. Some overlap of ideas is present, and no attempt was made to remove this overlap during the development of *Space Power Integration*. Rather, this overlap serves to identify areas of consensus. Conversely, the areas of conflicting observations and recommendations highlight the difficulty of reaching a common understanding on such a complicated subject. The final study was the last presentation of the conference, and rather than focus on the organizational charts and C2 relationships that should or should not be in the doctrine, the author takes a very personal perspective on what problems he has experienced, what he believes are the fundamental root causes, and specific recommendations to address those issues.

Discussions that occurred during the conference could not have taken place in the past because SWOs did not have the operational experience of integrating air and space at the operational level of war. SWOs have learned many lessons and are proposing we use those lessons to improve future operations. These discussions also point out how the Air Force is moving more and more towards a seamless integration of air and space capabilities versus the technically based centralization of space capabilities in the not-so-distant past.

As Gen Gregory Martin, former commander of Air Force Materiel Command, commented during his remarks:

> We do space, the United States Air Force does space, the others use it. We have the preponderance of space warriors and space equipment. It is these advances in technology and personnel that have provided the Air Force the communication, navigation, and imaging capabilities that provide the United States a critical asymmetric advantage. Operation Iraqi Freedom was the first major engagement where these capabilities were so thoroughly integrated in support of the theater commander, through the combined force air and space commander and the air and space operations center. As future adversaries increase their space capabilities, the United States must meet the challenge by improving the efficiency of integrating our space capabilities across the entire spectrum of operations.

That is the challenge for the future, providing effective and efficient integration of air and space capabilities in support of the commanders' objectives. For this level of integration in the theater to become a reality, deployed space forces will be called upon to more actively participate in the commanders' planning and operations. Hopefully, the discussions in *Space Power Integration* will help spur the discussion and debate to arrive upon the doctrine and organizational models needed to provide that support. Planning for the second Space Weapons Officer Air and Space Integration Conference, to be held in spring 2007, has begun and will provide the forum for these discussions to continue.

Note

1. Space weapons officer (SWO) is an unofficial title for career space officers who have graduated from the US Air Force Weapons School. By having a common knowledge basis with their airpower brethren, SWOs have worked in theater operations centers during multiple recent operations to more fully integrate space capabilities into operational planning.

Chapter 1

Space Coordinating Authority

Information Services from Space

Maj Tyler M. Evans, USAF

Too often, combatant commanders are not as involved in space as they need to be—in our current and projected way of war, this paradigm needs to change. Warfighters need to remain personally and persistently engaged.

—Lt Gen Norton A. Schwartz
Director for Operations, the Joint Staff

In recognizing the importance of space to military operations, joint doctrine recommends a single authority to coordinate joint-theater space operations and integrate space capabilities.[1] The space coordinating authority (SCA) facilitates unity of effort as operations often utilize civil, commercial, national, and military space capabilities. This research report provides a space-power framework and recommends how the SCA should enable unity of effort for diverse information services from space.

The 2004 *National Military Strategy* (*NMS*) prescribes three objectives for armed forces: (1) protect the United States, (2) prevent conflict and surprise attack, and (3) prevail against adversaries.[2] The joint force commander (JFC) seeks full-spectrum dominance to achieve these objectives. The ability to control any situation or defeat any adversary across the range of military operations increasingly exploits advantages of space. In seizing and relying upon space, commanders must grasp a relevant sense and intuitive meaning of the nebulous term *space*. Notions of "articulating space to the war-fighter" or "space at the operational level of war" conflict with providing consequential thought to planning and executing military operations.

As a rather new concept, employment of the SCA occurred for the first time when the combined forces commander designated the combined force air component commander (CFACC) as the

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SCA in Operation Iraqi Freedom (OIF).[3] The Air Force has espoused the concept by training, exercising, embedding, and deploying space operators to coordinate operations and integrate capabilities. The latest evolution of the SCA is the director of space forces (DIRSPACEFOR). Originally called the senior space officer (SSO), the DIRSPACEFOR is an Air Force construct that provides a senior space advisor who coordinates, integrates, and staffs activities for tailored space support.

Military operations use space predominately to aid and accelerate observations, decisions, and actions across the entire spectrum of conflict. Space-based capabilities are foundational to the information domain, providing communications; warning; intelligence, surveillance, and reconnaissance (ISR); positioning, navigation, and timing (PNT); environmental; and weather data. These information services, from space, enable war fighters to improve operations through space-integrated applications of combat power. This integration of supporting space services, combined with space superiority, acts as a force multiplier for military commanders.

This chapter conveys an Airman's perspective for operations in joint and coalition environments. Intended readers include the JFC, associated joint staffs, component commanders, and the designated SCA. Any reference to the JFC implies this broader audience. Readers should realize that the SCA concepts are new and still evolving. Since all doctrine written on the SCA has yet to withstand a historical test of time, the likelihood of the SCA becoming an enduring bedrock of joint operations is unknown. Future events and decisions could easily antiquate any recommendations contained herein. With little written on the SCA, the author attempts to capture and propose pertinent thoughts on the subject. Although not specifically addressed, readers can gather applicable information on the DIRSPACEFOR position from the SCA discussion.

This treatise begins by revealing space boundaries, definitions, and seams to provide a basis for exploring space capabilities and space power. A survey of space frameworks and categorizations follows to articulate a recommended space-power framework for the SCA. A document review and comparison provides a noteworthy summary of SCA concepts. Finally, a functional-management versus medium-management discus-

sion ensues, illuminating how to utilize the spectrum of coordination and control with existing process mechanisms. This includes recommending changes to the responsibilities of the SCA in doctrine.

Boundaries, Definitions, and Seams

A common space perspective is required for any SCA discussion with the JFC. This begins with the most basic question: What is space? Doctrine defines *space* as "a medium like the land, sea, and air within which military activities shall be conducted to achieve US national security objectives."[4] The boundary of the space medium does not expose an exact and legalistic delimitation between sovereign airspace and nonsovereign outer space. Since the launch of *Sputnik I*, the first artificial satellite, on 4 October 1957, a de facto definition has developed that any object in orbit under the physical principles of astrodynamics is in space. Complementing this practical approach, an altitude of about 100 kilometers above sea level is generally recognized as the lower limit of space.[5] In the current context of military operations, there is no upper limit to the space medium. For example, the civil *Advanced Composition Explorer* (*ACE*) satellite provides advance warning of solar storms, which can disrupt military communications, from a vantage point of roughly one million miles from Earth.

Operations involving orbiting satellite systems best describe military activities in space. Satellite systems are generically composed of three segments:

1. The satellites or spacecraft in space constitute the space segment.
2. The ground segment consists of users, operators, and associated terminals normally located in air, land, or sea mediums.
3. The space-ground link, connecting the space and ground segments via electromagnetic or radio-frequency communications, is the third segment.

Common infrastructure supporting satellite systems includes launch ranges, tracking systems, and communication networks.

Some may view surface-to-surface ballistic missiles, to include intercontinental ballistic missiles, as military space activities due to short transitory flight through the space medium and scientific similarities to launching satellite systems. However, they should be excluded due to lack of lasting space activity or influence.

Space capabilities form the foundation for space power. The first primary source of military space-power thought is the 1946 Project RAND report titled *Preliminary Design of an Experimental World-Circling Spaceship*.[6] Here, noted radar expert Louis N. Ridenour theorized using satellites to bomb targets, guide missiles, assess bomb damage, forecast weather, relay communications, and scientifically study the planet and solar system.[7] This study eventually led to the first military-satellite-conceived weapon system, WS 117L, and the advanced reconnaissance system (ARS), in 1954.[8] The ARS was the forerunner to today's Defense Support Program (DSP) and national electro-optical imagery intelligence (IMINT) satellites.

The JFC should concentrate on space power and not individual space capabilities in planning and executing operations. Doctrine defines *space power* as the total strength of a nation's capabilities to conduct and influence activities to, in, through, and from space to achieve objectives.[9] This definition devolves into two parts: capabilities to conduct space activities and capabilities to influence space activities. The latter is actually a prerequisite to the former.

Space-capable nations and actors have historically pursued diplomatic cooperation in space rather than outright confrontation. However, the uncertain world found after 11 September 2001 (9/11) precludes the belief of unchallenged freedom of action in a peaceful space medium. Terrorists and adversaries will attempt to defeat asymmetric space capabilities. The *NMS* recognizes this by describing three key aspects of the security environment facing combatant commanders (CCDR): (1) a wider range of adversaries, (2) a more complex and distributed battlespace, and (3) technology diffusion and access to drive concepts and capabilities in future operations.[10] The JFC will seek to control space pursuant to the *NMS* objectives of protect, prevent, and prevail.

With the freedom that comes from control of space, forces are then able to conduct space activities. Space power has tradition-

ally been unchallenged, allowing space capabilities to develop into a robust set of enabling information services and utilities. The JFC utilizes a wide arsenal of space capabilities to aid air, land, maritime, and special operations forces. Capabilities are a part of weapon systems, creating space-integrated applications of combat power. Here it is impossible to unravel and separate space power from other combat functions. For example, positioning and communications space services are a part of combat search and rescue (CSAR), permitting personnel recovery operations to locate and save lost elements. Table 1.1 lists space capabilities and integrated applications available to joint forces. Representative civil, commercial, and foreign systems are included for completeness, but the table does not exhaustively list all operational capabilities. Futuristic and unrealized space capabilities are not listed or considered applicable, as their likelihood of fulfillment cannot be assured.[11] Uncertain future acquisitions are not useful for current operations to the JFC.

Table 1.1. Current space capabilities and space-integrated applications

Agency	Purpose	Space System
US Department of Defense (DOD)	PNT Information	Global Positioning System (GPS)
	Weather Information	Defense Meteorological Satellite Program (DMSP)
	Surveillance Information	DSP Satellites Space-Based Infrared System (SBIRS)
	Communications	Defense Satellite Communications System (DSCS) Military Strategic and Tactical Relay (MILSTAR) Satellite Global Broadcast Service Ultrahigh Frequency Follow-on (UFO) Satellites Polar Satellite Communications
	Counterspace	Space Situation Awareness (SSA) Systems Defensive Counterspace (DCS) Systems Offensive Counterspace (OCS) Systems
	Space-Integrated Applications of Combat Power	CSAR Theater Missile Defense (TMD) Blue Force Situation Awareness

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Table 1.1. (continued)

Agency	Purpose	Space System
US National Intelligence	Reconnaissance Information	IMINT Overhead Signals Intelligence (SIGINT) Overhead Measurement and Signature Intelligence
US Civil	Weather Information	National Oceanic and Atmospheric Administration (NOAA) Geostationary Operational Environmental Satellites NOAA Polar Operational Environmental Satellites
	Remote Sensing Information	National Aeronautics and Space Administration (NASA) Landsat
Commercial	Remote Sensing Information	DigitalGlobe QuickBird Satellite ORBIMAGE OrbView Satellites Space Imaging IKONOS Satellite
	Communications	Intelsat Communications Satellites Inmarsat Communications Satellites Eutelsat Communications Satellites
Allied	Communications	North Atlantic Treaty Organization Communications Satellites
Foreign	PNT Information	Russian Global Navigation Satellite System
	Weather Information	European Meteosats
	Remote Sensing Information	Indian Remote Sensing Satellite System French SPOT Satellite System
	Reconnaissance	Russian SIGINT
	Communications	British Skynet Communications Satellites

In applying space power, the JFC should comprehend that total strength stems from assorted sources of space capabilities. It is easy to fixate on the DOD and national satellite systems. However, the military campaign should consider all space capabilities from military services, national and civil agencies, commercial companies, allied and coalition partners, multinational and consortium organizations, and independent foreign countries to conduct and influence space operations. The *NMS* describes a complex battlespace spanning the common global

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arena of international space and anticipates "unique demands on military organizations and interagency partners, requiring more detailed coordination and synchronization of activities both overseas and at home."[12] Varied sources of space power create a potential seam or disconnection for the JFC to appreciate in leading military operations.

A second seam to be aware of is the imprecise boundary between global and theater space operations. Many space capabilities operate globally and are able to service nearly the entire Earth's surface. For example, constellations of geosynchronous communication satellites provide persistent worldwide coverage all day long, and low-Earth-orbiting reconnaissance satellites can survey areas around the world multiple times per day. Contrary to this global nature of space, some satellite systems are configurable to serve only a specific theater or area of interest. The command and control (C2) of military space capabilities reveals potential friction between global and theater space operations. The Unified Command Plan (UCP) designates US Strategic Command (USSTRATCOM) as the functional combatant command (COCOM) for military space operations. However, the principle of unity of command directs all forces to operate under a single commander. Military space power is a balance between USSTRATCOM's global responsibilities and geographic COCOMs.

Doctrine describes this relationship by suggesting that there are global space capabilities producing global effects, global space capabilities delivering theater-only effects, theater space capabilities yielding global effects, and theater space capabilities supplying theater-only effects. Doctrine then recommends an appropriate command relationship based upon this global versus theater determination.[13] A potential friction point lies in the interpretation of where global space operations stop and theater space activities begin. A manifestation of this occurs when the space power in one geographic area affects multiple military operations. One possible starting point for the boundary between global and theater space power is the UCP assignment of regions to geographic CCDRs. However, with multiple operations occurring in a geographic CCDR area of responsibility (AOR), the boundary could be drawn at the area of operations (AO), joint operations area (JOA), theater of operations

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(TO), or operational area (OA) level.[14] The JFC should use care in creating battlespace boundaries as networked space systems could easily extend past normal geographic definitions.

A third link to space power exists between the levels of war. The application of space power has differing emphasis at the strategic, operational, and tactical levels of war. In the 1950s and 1960s the Cold War forced early space power towards the strategic level of war. Space-based reconnaissance became strategically paramount after the downing of Francis Gary Powers and his U-2 aircraft by the Soviet Union on 1 May 1960.[15] First launched in 1970, the DSP alerted the president and national security leadership of detected intercontinental and sea-launched ballistic missiles heading towards the United States. Even today, space-based reconnaissance and communication capabilities remain integral to high-priority strategic users. This has forced some low-density space capabilities to follow the principle of centralized control and execution, rather than the airpower tenet of centralized control and decentralized execution.

At the tactical level of war, space capabilities are increasingly more integrated. For example, after debuting in the 1991 Gulf War, the GPS became the primary radio-navigation system source of PNT information for the DOD. Congress has mandated that all new or modified aircraft, ships, armored vehicles, or indirect-fire weapon systems come equipped with a GPS receiver after 30 September 2005.[16] Tactical forces often compete with strategic users for space capabilities. Ultrahigh frequency satellite communications (SATCOM) bandwidth is oversubscribed and in high demand with mobile users. The JFC and component commanders at the operational level of war are sandwiched between strategic and tactical space power. With space requirements of their own, operational commanders must potentially balance, lobby, and orchestrate space power across the three levels of war.

The final space-power seam the JFC may contend with is the spectrum of conflict. From stability and support operations and military operations other than war through major theater war, space power will bring to bear advantages to joint and coalition forces. The spectrum of conflict for military operations stretches in increasing intensity from stable peace to unstable peace, crisis, and war. Space power will be utilized as conflict escalation

progresses from peacetime operations to preventative diplomacy, crisis operations, and peacemaking. This continues as de-escalation progresses from peace enforcement to peacekeeping, post-conflict peace building, and back to peacetime diplomacy.

Most information services from space will be employed across the entire spectrum of conflict. Forces will need communications, warning, ISR, PNT, environmental, and weather data during all phases of operations. Of course, the quantity of data may not be equal for all phases. Before forces deploy and hostilities occur, large quantities of space-based surveillance and reconnaissance may be needed to perform intelligence preparation of the battlespace and predictive battlespace awareness. After forces engage the enemy, SATCOM and the GPS could be the most critical space capabilities for the JFC. In campaign planning, the JFC will anticipate the demand for specific space information services across the phases and spectrum of conflict. The JFC should realize that the tempo and emphasis of space power will change as military operations progress.

In understanding the medium of space and application of space power, the JFC can begin to frame an appreciation of the complexity and usefulness of space and associated capabilities. Space capabilities woven into air, land, maritime, and special operations forces enable swift achievement of assigned objectives and tasks. Information services from space are instrumental to and cannot be separate from military operations. However, there are four potential seams in this war-fighting cloth: (1) the various sources of space power, (2) boundaries between global and theater space power, (3) different levels of war, and (4) space employment across the spectrum of conflict. These seams create potential friction points that the JFC should expect to account for and prevent from degrading operations in achieving the assigned military objectives.

Frameworks and Categorizations

We've got in excess of 50 satellites that we're working as part of my quiver in air and space applications. The satellites have been just unbelievably capable . . . in

> *being able to support conventional ground forces, the naval forces, special operations, and the air forces.*
>
> —Lt Gen T. Michael Moseley
> CFACC for OIF

The complexity and diversity of space power encourage the JFC to have a framework or intellectual way to organize the application of space power. Otherwise, the fog and friction from seams in space power combined with competing priorities will inhibit operational economy and balance, thus reducing combat effectiveness. A starting point for intellectual organization is to divide space power into categories. The question becomes, What are the best categories in which to divide space power? A logical choice would be to look at the roles, missions, and functions associated with space power as it applies to the JFC. Roles relate to purpose, missions to tasks, and functions to responsibilities.[17] Since roles are broad and normally associated with military services rather than with war-fighting forces, only missions and functions are appropriate starting points.

The national space policy directs that the DOD maintain the capability to execute mission areas of space support, force application, space control, and force enhancement.[18] This mission framework formed the structure of space power in joint doctrine, but not all mission areas are relatable to the JFC in the context of joint-force operations. *Space support* is defined as "combat service support operations to deploy and sustain military and intelligence systems in space."[19] This includes launch, maintenance, and termination of satellite systems. While analogous to the basic air operations of taking off, flying, and landing an airplane, space support of satellite systems tends to be very deliberate, infrastructure-intensive activities conducted from the continental United States (CONUS). Unlike most military weapon systems, space support is, for the most part, detached and unrelated to JFC objectives and joint-force operations.

Space power is currently unable to force an adversary to capitulate. Joint doctrine defines s*pace force application* as "combat operations in, through, and from space to influence the course and outcome of conflict."[20] There are no force-application capabilities in space. At some point in the future, indirect or di-

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rect firepower in space may be decisive against enemy centers of gravity (COG). However, until that time, the JFC should not be concerned with force application from space.

As stated before, capabilities to influence space activities are half of space-power formation. The terms *space control*, *counterspace*, and *space superiority* describe military actions to influence space. Joint doctrine defines *space control* as "combat, combat support, and combat service support operations to ensure freedom of action in space for the United States and its allies and, when directed, deny an adversary freedom of action in space."[21] Space control should be viewed as the way, mission, or purposeful task to influence space. Space control has a doctrinal divide in the tasks of surveillance, prevention, protection, and negation. The Air Force component to USSTRATCOM conducts space surveillance operations to build and maintain situational awareness of space for all US departments, agencies, and interests. Prevention and protection are defensive actions conducted to ensure friendly space operations with desired exclusivity from adversary efforts. Negation involves offensive actions to disrupt, deny, degrade, destroy, and deceive enemy space capabilities through kinetic or nonkinetic means by joint forces to achieve national security objectives.

Next, *counterspace* is "those offensive and defensive operations conducted by air, land, sea, space, special operations, and information forces with the objective of gaining and maintaining control of activities conducted in or through the space environment."[22] Counterspace is the means, function, or responsibility for resources and capabilities to influence space. Counterspace is doctrinally divided into SSA, DCS, and OCS. There is a direct task-to-action relationship between surveillance to SSA, prevention and protection to DCS, and negation to OCS. Also noteworthy to the JFC, SSA is a global function, OCS is a theater function, and DCS is a combined theater and global function.

Finally, *space superiority* is "the degree of dominance in space of one force over another that permits the conduct of operations by the former and its related land, sea, air, space, and special operations forces at a given time and place without prohibitive interference by the opposing force."[23] It is the desired effect (or ends) of influencing the space medium. Concentrating

on this, the JFC normally sets an objective of gaining and maintaining space superiority.

The last space mission area is *space force enhancement*, defined as the "combat support operations to improve the effectiveness of military forces as well as support other intelligence, civil, and commercial users."[24] This includes ISR, warning, communications, PNT, and environmental monitoring. Space force enhancement is better defined as space-based, decision-quality information or data used in military operations plus space-based systems that collect, process, store, transmit, display, disseminate, and act on information. Therefore, a more descriptive term for space force enhancement to the JFC is *information services from space*. This is the other half of space power, the capability to conduct space activities.

Once space superiority is established, information services from space assist and accelerate observations, decisions, and actions across the entire spectrum of conflict. By controlling space, space power rewards the JFC with greater freedom of action for joint forces. The colossal contribution of space power to military operations is its constant ability to speed up the decision-making cycle. Two process models, the "OODA loop" and the "kill chain," illustrate this point.

Col John R. Boyd realized that behavior is a continuous and interactive cycle of observe, orient, decide, and act (OODA). As applied to military operations at all levels of war and across the entire spectrum of conflict, information from persistent space-based systems overshadows the observation phase of the loop. The JFC and joint forces exploit space-originating ISR information to gain critical awareness of the battlespace and the adversary. Using their cognitive ability to orient and reason, commanders and forces are able to turn observations into decisions and actions. Space-integrated command, control, and communications capabilities aid these decisions and actions, allowing the JFC to respond quicker than the enemy in the battlespace. Feedback, combined with an interactive environment, then drives new observations for iterative continuation of the loop. Destructive manipulation of the opponent ensues as the friendly OODA engine outpaces the foe's ability to seize the initiative.

The ability to find, fix, track, target, engage, and assess (F2T2EA) is commonly referred to as a kill chain. These steps

mark the process to "kill" something in combat at the operational and tactical levels of war. The process starts with finding and fixing an object to identify it as worthy of attacking. Next, forces will track and target the object to zero in before pulling the trigger to fire. Finally, assessment closes the cycle to determine success and sets up the next attack. Integrated space information services augment each step in the kill chain. Space-based ISR supplies flexible and versatile eyes and ears to the chain. The GPS provides common referencing across all steps and greater precision during engagement, limiting collateral damage. SATCOM helps bind the steps together between dispersed tactical forces and centralized operational C2. The JFC profits from information services from space, increasing the ability to execute the kill chain.

A contrary framework comes from Air Force doctrine. It is relevant to consider an Air Force perspective, as the Air Force is the executive agent for space. Additionally, the air component commander or commander, Air Force forces (COMAFFOR) is the leading candidate to execute the SCA on behalf of the JFC. The Air Force normally has the preponderance and expertise of space-power C2 in joint operations. The Air Force doctrinally divides air and space power into 17 key operational functions. Air Force doctrine describes these functions as "the actual operations constructs Airmen use to apply air and space power to achieve objectives."[25] These functions are:

- Strategic Attack
- Counterair
- Counterspace
- Counterland
- Countersea
- Information Operations
- Combat Support
- Command & Control
- Airlift
- Air Refueling
- Spacelift
- Special Operations
- Intelligence
- Surveillance & Reconnnaissance
- Combat Search & Rescue
- Navigation & Positioning
- Weather Services

Obviously, some of the functions like air refueling are airpower unique and do not apply to space. Certain functions are directly mapped to space mission areas, while others intermingle

between multiple mission areas. Spacelift is a function of space support, and force enhancement contains space-based weather services. Tougher to separate is C2, which is integral to all mission areas. The benefit of Air Force operational functions is finer granularity and visibility of specific effects from space power. Effects-based operations (EBO) propel the JFC-led campaign. The JFC directs operations, utilizing space power against adversary systems, which create specific effects. These effects directly contribute to campaign objectives and result in the desired end state. By grouping the relevant operational functions into the two components of space power—space superiority and information services from space—the JFC has a tangible and usable space-power framework to employ in military operations.

Space superiority, from space control and the capability to influence space activities, exploits the operational functions of counterspace, information operations, special operations, combat support, C2, and ISR. It is important to recognize the potential overlap between counterspace, information operations, and special operations as space operations conduct influence, psychological, and electronic warfare operations against the enemy. The JFC needs C2 and combat support communications to carry out effective counterspace operations to gain and maintain space superiority. Also important to counterspace, ISR is the primary mechanism for SSA.

Information services from space, or the capabilities to conduct space activities, furnish combat support, C2, ISR, CSAR, navigation and positioning, and weather services. One focal linkage is SATCOM to combat support. Space-integrated applications of combat power intertwine space information services. For example, space-enabled CSAR performs speedy recovery of isolated personnel by using space-based ISR, SATCOM, and the GPS. Global space utilities enable joint forces to fight with agility. Operations in joint environments leverage space-derived information to be more efficient with better synergy, simultaneity, depth, and anticipation. Greater operational reach and approach are possible with space information services. These space services allow the JFC to capitalize on the facets of operational art found in all military operations.

Therefore, the recommended space-power framework for the JFC is to divide space power into space superiority and infor-

mation services from space. This simplified approach allows the JFC to appreciate, appropriately, the contributions to military operations that result from space power. *Space superiority* best describes the effect of controlling the space medium, while *information services from space* accurately portrays the current functional benefits of space to joint forces. This framework, when combined with the boundaries and seams of space, compels the JFC to designate an SCA to achieve unified action in the battlespace. However, a still larger problem regarding the SCA is that current documentation on the SCA is potentially ambiguous and unrealistic, leading to confusion rather than simplicity for the JFC in utilizing space power.

References to Space Coordinating Authority

[Desert Storm] was a watershed event in military space applications because, for the first time, space systems were both integral to the conduct of terrestrial conflict and crucial to the outcome of the war.

—Lt Gen Thomas S. Moorman Jr.
Commander, Air Force Space Command

Because of the continual evolution of space integration in warfare, there is no single document encapsulating the roles, responsibilities, and employment of the SCA. The genesis of the SCA can be traced to the Gulf War of 1991. Operational and tactical theater forces used, for the first time in a major conflict, strategic space capabilities designed for the Cold War. Previously, communications, weather, and reconnaissance satellites predominately served strategic users in Washington during the Vietnam War. In 1991 the GPS and DSP along with communications, weather, and reconnaissance satellites provided instrumental information directly to the JFC and joint forces.

From the Gulf War two major space-integration efforts emerged. First, emphasis was placed on technological improvements to focus space capabilities towards tactical- and operational-level users. Major weapon systems were modified or designed to receive and integrate information from space. For example, the

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GPS became the timing and navigation standard for all military systems. Second, space personnel deployed and embedded into theater organizations to aid in planning and executing operations. This grew from a limited number of deployable forward space support teams in 1994 to several hundred permanently assigned space personnel by 2000. Reinforced by sustained operations in Southwest Asia enforcing United Nations (UN) resolutions against Iraq and major combat operations in Europe with Operation Allied Force (OAF) in 1999, doctrinal thought anticipated military operations needing SCA.

In analyzing the major doctrine documents and references to SCA, the following terms should be viewed as synonymous: *space coordinating authority*, *coordinating authority for space*, *coordinating authority for space operations*, *coordinating authority for joint theater space operations*, and *space authority*. They are synonymous with a common definition of a consultation relationship for space power within a geographic or regional CO-COM. The purpose of SCA is to achieve unity of effort for space power across the spectrum of conflict. It is not a command authority and does not apply beyond theater operations to functional or global COCOMs. A point to ponder is whether the United States Transportation Command (USTRANSCOM) would ever need SCA for intertheater lift operations. SCA does not achieve unity of command. USSTRATCOM is the functional CO-COM with command authority for military space operations. The terms *global space coordinating authority* (GSCA) and *joint space coordinating authority* (JSCA) refer to consultation relationships for USSTRATCOM in working with other space-power agencies.[26]

Even though early drafts of Joint Publication (JP) 3-14, *Joint Doctrine for Space Operations*, contained SCA language, the first doctrine published with the SCA language was Air Force Doctrine Document (AFDD) 2-2, *Space Operations*, in November 2001. AFDD 2-2 recommends that the joint task force (JTF) commander appoint a coordinating authority for space operations to represent appropriate space requirements. With the possibility of interference between various space operations, redundant space efforts, and conflicting space support requests, the JTF commander should assign the joint force air component commander (JFACC) the responsibility of the SCA. AFDD 2-2

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also proposes that the JTF commander assign the role of supported commander for joint space operations to the JFACC. AFDD 2-2 lists seven responsibilities of the SCA:

- Deconflict/prioritize military space requirements for the JTF
- Recommend appropriate command relationships for space to the JFC
- Help facilitate space target nomination
- Maintain space situational awareness
- Request space inputs from JTF, joint staff (J-staff), and components during planning
- Ensure optimum interoperability of space assets with coalition forces
- Recommend JTF military space requirement priorities to JFC.[27]

JP 3-14, published in August 2002, validated the existence of the SCA in AFDD 2-2 by stating that a supported JFC normally designates a single authority to coordinate joint-theater space operations and integrate space capabilities. Using the term *space authority*, JP 3-14 prescribed the following responsibilities:

- Coordinate space operations, and integrate space capabilities
- Primary responsibility for in-theater joint space-operations planning
- Coordinate with the component space-support teams and/or embedded space operators
- Gather space requirements throughout the joint force
- Provide to the JFC a prioritized list of recommended space requirements based on the joint-force objectives.[28]

Common to JP 3-14 and AFDD 2-2 are the SCA responsibilities to collect, prioritize, and provide space requirements to the JFC. Additionally, both documents stipulate coordinated military operations through integration of space capabilities or interoperability of space assets. Captured in JP 3-14, responsibility of joint space-operations planning as normal planning functions

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is the AFDD 2-2 responsibilities of space target nomination and command relationship recommendations. The only real difference is the AFDD 2-2 responsibility to maintain space situational awareness, which JP 3-14 does not include.

Another important distinction between AFDD 2-2 and JP 3-14 is that JP 3-14 does not specify the JFACC as the recommended SCA. JP 3-14 allows the JFC to either retain the SCA or designate a component commander. Using criteria of mission, nature and duration of operations, preponderance of space-force capabilities, and C2 capabilities, the JFC would typically designate the JFACC, joint force land component commander, or joint force maritime component commander as the SCA. The special operations component commander could be an option for smaller task force operations.

Furthering the argument that the JFACC is the most logical choice for SCA, the Air Force published two more documents articulating the point. The *Air and Space Commander's Handbook for the JFACC*, published in January 2003, recommends in the JFACC checklist to advocate as the SCA in-theater during crisis-action planning.[29] Of note, the designation of the SCA in OIF to the CFACC occurred on 18 March 2003, only days before combat operations commenced and well after the operational plan was finalized. Secondly, AFDD 1, *Air Force Basic Doctrine* lists the SCA as a JFACC function.[30]

USSTRATCOM recognized the SCA from a global perspective by publishing Strategic Command Directive (SD) 505-3, *Space Support to Joint Force Commander or Designated Space Coordinating Authority*, in February 2004. It established responsibilities, guidelines, and procedures for USSTRATCOM organizations and personnel to work with the SCA in-theater. Even though it only references JP 3-14, the list of SCA responsibilities in SD 505-3 contains a combination of responsibilities found in JP 3-14 and AFDD 2-2. Specifically, it describes the SCA responsibility of space-target nomination.[31]

In August 2004, the Air Force published AFDD 2-2.1, *Counterspace Operations*. It reiterates the SCA responsibilities of AFDD 2-2 and recommends the DIRSPACEFOR as the senior space advisor to the COMAFFOR or COMAFFOR/JFACC.[32] Documents and publications dated after August 2004 are slowly propagating the SCA concept. These include Air Force policy

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and operational tactics, techniques, and procedures (TTP) documents. Additionally, material is also referencing the DIRSPACE-FOR position. Noteworthy is a concept of operations for the combined air operations center (CAOC) in Qatar.

Space Coordinating Authority Responsibilities

While the designation of a Space Coordinating Authority was a success [in OIF], we need to . . . codify those roles and responsibilities into our doctrine.

—Dr. James G. Roche
Secretary of the Air Force

There is a spectrum, range, or depth to the term *coordination.* Coordination can vary from simple deconfliction to prioritization, synchronization, collaboration, synergy, integration, interoperability, or complex interdependence. Obviously, the SCA will utilize different levels of coordination based upon the situation and JFC guidance. To grasp the SCA language in AFDD 2-2, it is important to understand the definitional differences between coordinating authority and supported commander. The term *command* is central to all military action. It is authority over subordinates that a commander lawfully exercises. The level of command authority is divided into four types of command relationships: (1) COCOM, (2) operational control (OPCON), (3) tactical control (TACON), and (4) support.[33] The first three command relationships pertain to forces assigned or attached to a commander. Lastly, support is a command authority between commanders. A supported commander is the commander having primary responsibility for all aspects of a task. The supported commander receives assistance from another commander's forces or capabilities and is responsible for ensuring that the supporting commander understands the assistance required.[34]

On the other hand, coordinating authority is a commander or individual assigned the responsibility for coordinating specific functions or activities. It is beyond the four types of command relationships. The commander or individual has authority to require consultation between agencies involved but does

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not have the authority to compel agreement. In the event of disagreement, the matter is referred to the appointing authority. Coordinating authority is a consultation relationship between commanders, not an authority by which command may be exercised.[35] While command authority and relationships are important to the planning and execution of military operations, this last section of recommendations will focus on SCA that is not tied to force assignment. For the foreseeable future, no single geographic or regional JFC will have consolidated control of space power and as such must rely on the SCA to achieve unity of effort.

There are two recommendations from analyzing the responsibilities in AFDD 2-2. First, maintaining space situational awareness was updated to maintaining SSA as part of AFDD 2-2.1 in 2004. There is a subtle difference between space *situational* awareness found in AFDD 2-2 and space *situation* awareness found in AFDD 2-2.1 that may not be generally recognized. Space situational awareness is a knowledge condition or situational awareness of space, while SSA [space situation awareness] is having actual knowledge or awareness of the space situation. The latter is more relevant to the JFC than the former because of the need to integrate the space situation into joint-force operations. Space target nomination and maintaining SSA fall into the framework of space superiority or medium influence. Space target nomination is an OCS planning activity normally done by the JFACC within the joint air operations center (JAOC). As mentioned before, the Air Force component of USSTRATCOM predominately performs SSA globally for all geographic CCDRs. A better SCA responsibility would be to integrate the USSTRATCOM-generated SSA with the theater-common operating picture for more complete awareness of the battlespace. Not included as part of the SCA is any coordination of DCS activities. Protection of theater space operations is the JFC's responsibility and most likely a task for the JFACC to accomplish. As the supported commander for joint space operations, the JFACC needs to coordinate DCS with all sources of space power. The SCA should coordinate DCS for all theater space operations. Second, ensuring optimum interoperability of space assets with coalition forces is possibly beyond the resources of the JFC. For example, some NATO and British com-

munications satellites were designed to be interoperable with US SATCOM terminals, allowing greater flexibility. However, without significant planning and budgetary programming, the ability to modify foreign-made weapon systems to be interoperable with US satellite technology could be significantly challenging for the JFC. Additionally, security considerations could prevent interoperability with certain coalition partners. Ensuring a collaboration of space capabilities in coalition operations should replace the interoperability SCA responsibility. This is a more realistic SCA responsibility.

The final point regarding the SCA is that information services from space emphasizes the SCA as coordinating the functional aspect of space power, while space superiority emphasizes the SCA as controlling the medium aspect of space power. Information services from space needs unity of effort because of the various sources of space power. Space superiority requires unity of command as a military principle of war. The JFC should use a stronger authority than the SCA to compel agreement with space superiority. Lack of deliberate command authority over counterspace capabilities could jeopardize the JFC's ability to influence space operations and freedom of action in space.

Conclusion

In prosecuting the Global War on Terrorism, we have traded the traditional necessity for massed forces by using space capabilities for precision, speed, and the ability to quickly maneuver on the battlefield.

—Gen Lance W. Lord
Commander, Air Force Space Command

The JFC should understand that space power is crucial to achieving strategic guidance. Attaining the national military strategy objectives of protect, prevent, and prevail requires joint forces to exploit the medium of space. The JFC should use a simplified intellectual framework of two space-power categories to ease the planning, coordination, integration, and execution of theater space operations. Space superiority comes from in-

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fluencing space activities with counterspace capabilities. Information services from space are space-based capabilities providing communications, warning, ISR, PNT, environment, and weather data to strategic, operational, and tactical users across the entire spectrum of conflict. These space information services woven together enable space-integrated applications of combat power.

In directing space power, the JFC should understand the boundaries and seams inherent to space. The JFC should designate the JFACC as the SCA to coordinate joint-theater space operations and integrate space capabilities. As the senior space advisor to the COMAFFOR/JFACC, the DIRSPACEFOR should facilitate and lubricate potential friction points or seams in space power, while joint forces engage adversaries in combating terrorism. As an asymmetric advantage of US strength, space power enables full-spectrum dominance.

Notes

1. JP 3-14, *Joint Doctrine for Space Operations*, 9 August 2002, III-1.

2. Gen Richard B. Meyers, *National Military Strategy of the United States of America* (Washington, DC: Department of Defense, May 2004), 2.

3. Maj Mark T. Main, "An Examination of Space Coordinating Authority and Command Relationships for Space Forces" (unpublished paper, Fourteenth Air Force, 2003), 1.

4. JP 1-02, *Department of Defense Dictionary of Military and Associated Terms* (As amended through 31 August 2005), 12 April 2001.

5. Glenn A. Reynolds and Robert P. Merges, *Outer Space: Problems of Law and Policy* (Boulder, CO: Westview Press, 1989), 12; and Carl Q. Christol, *The Modern International Law of Outer Space* (Elmsford, NY: Pergamon Press, 1982), 435–546.

6. David N. Spires, *Beyond Horizons: A Half Century of Air Force Space Leadership* (Maxwell AFB, AL: Air University Press, 1998), 14–16.

7. Project RAND, *Preliminary Design of an Experimental World-Circling Spaceship*, RAND Report SM-11827 (Santa Monica, CA: Douglas Aircraft Company, 2 May 1946), 9–16.

8. Spires, *Beyond Horizons*, 35–47.

9. JP 1-02, *DOD Dictionary*.

10. Meyers, *National Military Strategy*, 4–6.

11. Spacelift and space transportation capabilities are not listed in table 1.1. While these capabilities provide assured access to space, they are space-support missions that launch and replenish space systems. Military, civil, commercial, and foreign spacelift capabilities are available to deploy and replace satellites. Several countries also have manned spaceflight capabilities,

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such as the US Space Transportation System, or space shuttle. The JFC should characterize spacelift, space transportation, and satellite-control capabilities as supportive to maintaining the capabilities listed in table 1.1.

12. Meyers, *National Military Strategy*, 5.

13. AFDD 2-2.1, *Counterspace Operations*, 2 August 2004, 15–17.

14. The point is not to recommend a specific geographic term to use, but rather to highlight the ambiguity and confusion these terms can cause in a space-power situation. Here are some of the JP 1-02 definitions for bounding geographic area. *Area of responsibility* is the geographical area associated with a COCOM within which a CCDR has authority to plan and conduct operations. *Area of operations* is an OA defined by the JFC for land and naval forces. An AO does not typically encompass the entire OA of the JFC, but should be large enough for component commanders to accomplish their missions and protect their forces. *JOA* is an area of land, sea, and airspace, defined by a geographic CCDR or subordinate unified commander, in which a JFC (normally a JTF commander) conducts military operations to accomplish a specific mission. A JOA is particularly useful when operations are limited in scope and geographic area or when operations are to be conducted on the boundaries between theaters. *TO* is a subarea within a theater of war defined by the geographic CCDR required to conduct or support specific combat operations. Different theaters of operations within the same theater of war will normally be geographically separate and focused on different enemy forces. A TO is usually of significant size, allowing for operations over extended periods of time. *OA* is an overarching term encompassing more descriptive terms for geographic areas in which military operations are conducted.

15. Spires, *Beyond Horizons*, 84.

16. Chairman of the Joint Chiefs of Staff Instruction (CJCSI) 6130.01C, *2003 CJCS Master Positioning, Navigation, and Timing Plan*, 31 March 2003, A-2.

17. JP 0-2, *Unified Action Armed Forces* (*UNAAF*), 10 July 2001, I-6.

18. DOD Directive (DODD) 3100.10, *Space Policy*, 9 July 1999, 7.

19. JP 1-02, *DOD Dictionary*.

20. Ibid.

21. Ibid.

22. AFDD 2-2.1, *Counterspace Operations*, 51.

23. JP 1-02, *DOD Dictionary*.

24. Ibid.

25. AFDD 1, *Air Force Basic Doctrine*, 17 November 2003, 38–40.

26. Lt Col Brian E. Fredriksson, "Space Power in Joint Operations: Evolving Concepts," *Air and Space Power Journal* 18, no. 2 (Summer 2004): 93–94. USSTRATCOM order, FRAGO 04 to OPORD05-02 Ch 1, assigned GSCA to Commander, Air Force Space Command/COMAFFOR on 3 February 2005. Maj Lina Cashin, USSTRATCOM/J515, proposed *JSCA* as an alternative term to *GSCA* on 17 February 2005 in conversation with author. (FRAGO [fragmentary order] is a partial change to an operations order [OPORD].)

27. AFDD 2-2, *Space Operations*, 27 November 2001, 23–34.

28. JP 3-14, *Joint Doctrine for Space Operations*, III-3.

29. Air Force Doctrine Center Handbook (AFDCH) 10-01, *Air and Space Commander's Handbook for the JFACC*, 16 January 2003, 6.

30. AFDD 1, *Air Force Basic Doctrine*, 66.

31. Strategic Command Directive (SD) 505-3, *Space Support to Joint Force Commander or Designated Space Coordinating Authority*, 6 February 2004.

32. AFDD 2-2.1, *Counterspace Operations*, 12–15.

33. JP 0-2, *UNAAF*, III-1.

34. JP 1-02, *DOD Dictionary*.

35. JP 0-2, *UNAAF*, III-12.

Chapter 2

Oriented Toward Superiority

Counterspace Operations and the Counterterrorism Fight

Lt Col Michael J. Lutton, USAF

A process of reaching across many perspectives; pulling each and every one apart (analysis), all the while intuitively looking for those parts of the disassembled perspectives which naturally interconnect with one another to form a higher order, more general elaboration (synthesis) of what is taking place. As a result, the process not only creates the "Discourse" but it also represents the key to evolve the tactics, strategies, goals, unifying themes, etc., that permit us to actively shape and adapt to the unfolding world we are a part of, live-in, and feed-upon.

—Col John R. Boyd

To say that the world we live in became more complex on 9/11 is a gross understatement and a misstatement of fact. The incredibly perilous situation existing prior to 9/11 simply had not been recognized in the United States, or so many thought. In fact, as history now reveals, the events of 9/11 appear to be a dramatic and tragic series of terrorist actions that many, if not all, in the United States were ill prepared to counter—the seeds sown nearly a decade prior. The United States failed to alter its methods of addressing terrorism on a global scale or terrorism aimed at the United States before 9/11. The events of 9/11 forced our nation to change. Figure 2.1 shows significant terrorist activity from 1991 to 2003.[1]

National Strategy for Combating Terrorism was not published until 2003—shortly before the invasion of Iraq. As an expression of President Bush's strategic intent for counterterrorism (CT), the *National Strategy for Combating Terrorism* clearly outlines our national effort to prevent future terrorist actions at
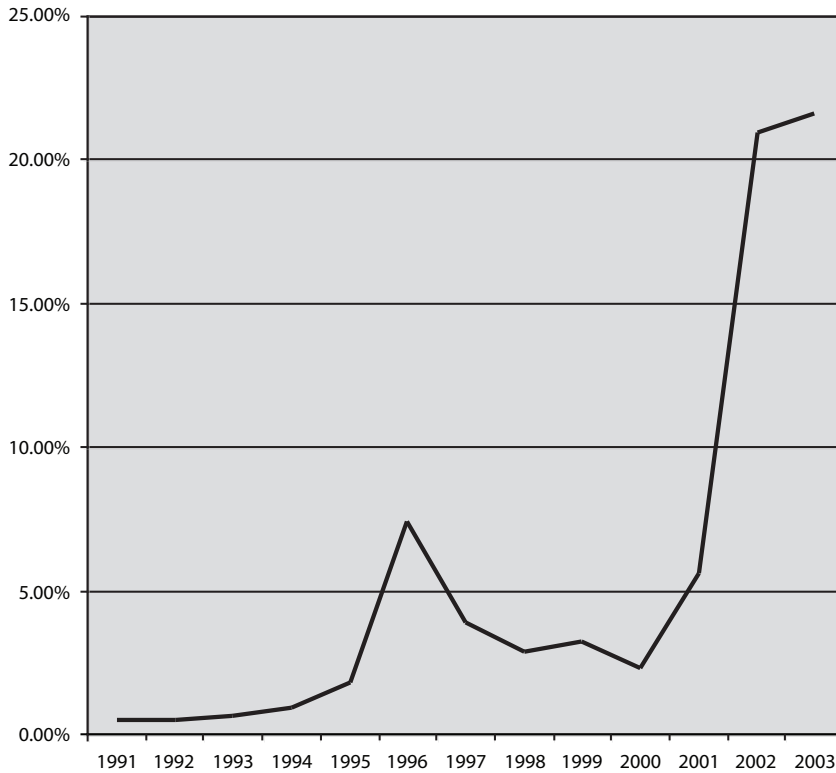
25

Figure 2.1. Percent of significant terrorist attacks, 1991–2003. (*Adapted from* US State Department, Office of the Coordinator for Counterterrorism, "Annual Reports," http://www.state.gov/www/global/terrorism/annual_reports .html.)

home and abroad. The challenge is in its execution—to view the national strategy as a road map to end terrorism is premature and results at best in a partial success. It serves as a fundamental call for reorientation in our approach to CT operations.

Colonel Boyd's unpublished work, "A Discourse on Winning and Losing," achieves what few authors ever accomplish. He provides the reader with a skill set for approaching the many challenges we face in today's world. Colonel Boyd's famous OODA loop symbolizes the skill set used for the continual process of analysis and synthesis—a means to reorient. Throughout this chapter, Colonel Boyd's process is utilized as a means

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to analyze and synthesize—in short, to orient toward superiority in space operations.

Given the nature of terrorist networks today and the focus of the *National Strategy for Combating Terrorism* to provide "direct and continuous action against terrorist groups," it is necessary to broaden the discussion of CT options and consider counterspace operations as an element in the fight against transnational terrorism.[2] Figure 2.2 shows the various links of terrorist networks.

TRANSNATIONAL TERRORIST NETWORKS
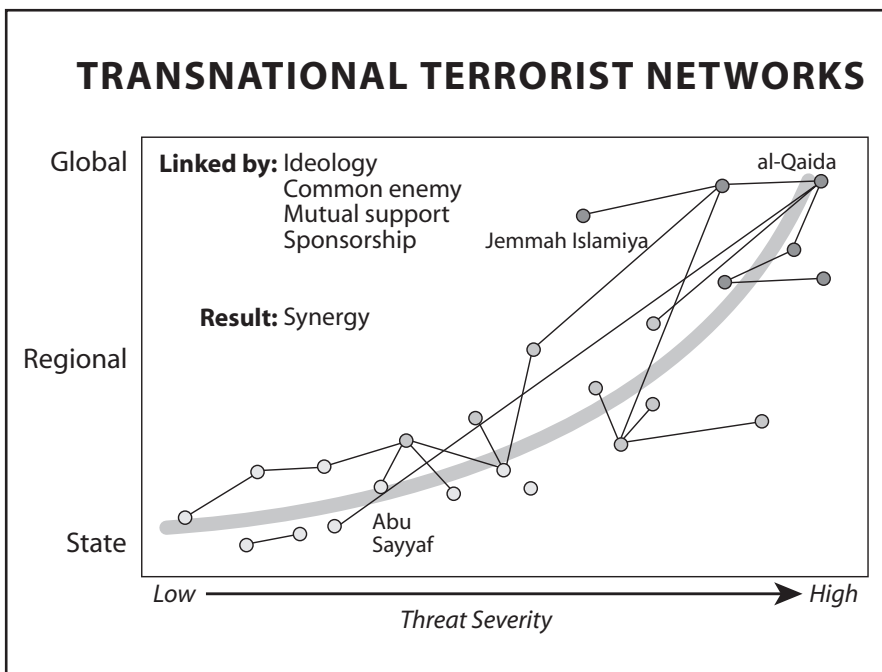
Figure 2.2. Transnational terrorist networks. (*Reprinted from* Pres. George W. Bush, *National Strategy for Combating Terrorism, February 2003* [Washington, DC: White House (Office of the Press Secretary), 14 February 2003], 9.)

While counterspace operations are not a "go-it-alone" option with respect to CT, the author contends that counterspace operations must be considered as a new option in our nation's arsenal. For without effective counterspace operations, the

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United States concedes the use and capability of the medium of space and all its benefits—once the sole domain of superpowers—to terrorist networks. This is a mistake our nation can ill afford to make as we seek to accomplish the goals set forth in our national strategy.

To advance the discussion, this chapter analyzes three essential areas for the effective employment of counterspace operations in combating terrorism: (1) the significance of the medium to the CT fight, (2) articulating and assessing counterspace effects, and (3) the value of consistent and realistic training. The goal is a synthesized solution for future support to CT that enables military forces to establish superiority.

The Significance of the Medium to the Counterterrorism Fight

The Greeks, lying encamped on the mountains, could watch every movement of the Persians on the plain below, while they were enabled completely to mask their own. Militiades also had, from his position, the power of giving battle whenever he pleased, or of delaying it at his discretion, unless Datis were to attempt the perilous operation of storming the heights.

> *—The Fifteen Decisive Battles of the World: From Marathon to Waterloo*
> Sir Edward Shepherd Creasy, 1851

As warfare evolves, the ability to exploit and dominate the mediums of warfare (air, land, sea, and space) becomes a critical factor in a military's success or failure on the battlefield as well as a nation's success or failure in realizing its political objectives—objectives that likely drove the nation to war. The requirement to establish superiority in a medium of warfare is driven by many factors—enemy capability, military objectives, end state, and so forth. Table 2.1 examines the definitions of superiority across mediums.[3] Yet the fundamental precept for a state of superiority in a medium of warfare is offensive as well as defensive.[4]

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Table 2.1. Definitions of superiority across mediums

Medium	Definition of Superiority
Land (fire superiority)	The degree of dominance in the fires of one force over another that permits that force to conduct maneuver at a given time and place without prohibitive interference by the enemy.
Sea (maritime)	That degree of dominance of one force over another that permits the conduct of maritime operations by the former and its related land, sea, and air forces at a given time and place without prohibitive interference by the opposing force.
Air	That degree of dominance in the air battle of one force over another that permits the conduct of operations by the former and its related land, sea, and air forces at a given time and place without prohibitive interference by the opposing force.
Space	The degree of dominance in space of one force over another that permits the conduct of operations by the former and its related land, sea, air, space, and special operations forces at a given time and place without prohibitive interference by the opposing force.

Adapted from US Army Field Manual (FM) 3-90, *Tactics*, 4 Jul 2001; and JP 1-02, *DOD Dictionary of Military and Associated Terms*, 12 April 2001.

Offensive superiority in a medium enables an efficiency of military action that increases the likelihood of military success. Defensive superiority, on the other hand, sustains the military capability employed in or through a medium and the use of the medium itself. For example, all mediums of warfare hold strategic lines of communication as critical to sustaining military operations and seek to defend these strategic lines of communication whether they are on land, at sea, in the air, or in and through space. Without defense of these strategic lines of communication, a military engaged in combat becomes more susceptible to defeat and more likely to fail.

As viewed through the lens of CT operations, military planners must utilize the mediums of warfare as interdependent gears in a machine. Historically, interdependence of mediums challenged military thinking and employment. The US military, without a doubt one of the most skilled and proficient in the world, recently embraced interdependent operations as a preferred method for military employment. With CT, however, the concept of interdependent employment of all mediums of warfare must guide military planners. In Stephen Sloan's *Beating*

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International Terrorism, he cites the challenge of current military doctrine as it confronts terrorism: "'Environmental doctrine . . . is a compilation of beliefs about employment of military forces within a particular operating medium.' Since modern terrorism is very much a product of technology, we cannot overstate the importance of environmental doctrine in developing a capacity for terrorism preemption. Such a doctrine is 'significantly influenced by factors such as geography and technology.'"[5]

To most military planners, the interdependent employment of the three classical mediums of warfare (land, sea, and air) in CT operations goes without question. Quite often, however, the addition of the space medium as a coequal among the classical mediums of warfare in the interdependent employment of CT operations often seems unnecessary. Reorientation toward the terrorist threat today paints a different picture.

In *Mastering the Ultimate High Ground*, Benjamin Lambeth notes that "the United States is now unprecedentedly invested in and dependent on on-orbit capabilities, both military and commercial."[6] Quite objectively, recent military operations in Afghanistan and Iraq were not possible without the use of the space medium. Furthermore, our nation's national and international economic lifeblood are dependent on the use of the space medium. If denied, our ability to project power—economically, diplomatically, and militarily—throughout the world would be severely degraded. Therefore, access to the space medium and all its inherent benefits—perspective, persistence, speed, and situation awareness—becomes decisive in any outcome. Yet, most military planners see the space medium and our use of it as unchallenged.

Apparently, state sponsors of terrorism view access to space as a medium worth challenging. In August 2003, *Daily Insight* posted a story outlining Iran's recent attempt to challenge our use of the space medium. In the article titled "Iran and Cuba Zap U.S. Satellites," the author outlined Iran's effort to disrupt US satellite communications from Cuba. Specifically, the author notes:

> State sponsors of terrorism not only threaten U.S. interests on land, at sea and in the air, but now they have teamed up to attack U.S. assets in space. By successfully jamming a U.S. communications satellite over the Atlantic Ocean, the regimes of Cuba and

> Iran challenged U.S. dominance of space and the assumptions of free access to satellite communication that makes undisputed U.S. military power possible.[7]

The current *NMS* clearly makes the case for the space medium to take its place alongside the classical mediums of warfare. The *NMS* demands interdependence of all mediums of warfare as a prerequisite for achieving its priorities. Furthermore, the current *NMS* identifies winning the war on terrorism while protecting the United States as the first priority for success—access to and superiority in the space medium in a CT fight become more apparent as national military priorities reorient.

With a reorientation of national military priorities, an examination of terrorist networks and their use of the space medium becomes even more pressing. As stated in the *National Strategy for Combating Terrorism*, the terrorist networks facing our nation today are diverse, interconnected, and global. "The al-Qaida network is a multinational enterprise with operations in more than 60 countries" and "its [al-Qaida] global activities are coordinated through the use of personal couriers and communications technologies emblematic of our era—cellular and satellite phones, encrypted e-mail, internet chat rooms, videotape, and CD-ROMs."[8] In essence, terrorist networks, that have long been a part of our world, now reorient their practices to take advantage of modern globalization as well as modern technology. Consequently, terrorist networks, once confined to a region, begin to expand influence and action to a global stage utilizing many communication capabilities including those offered through the medium of space.

Indeed, globalization and technology increase the reach of terrorist networks while allowing them to remain well coordinated across the globe. In *The Pentagon's New Map*, Dr. Thomas Barnett submits, "The real asymmetrical challenge we will face will come from globalization's disenfranchised, or the losers largely left behind in the states most disconnected from globalization's advance."[9] While transnational terrorist networks may be many things, they are far from being disconnected. It is important to realize that Dr. Barnett is discussing an economic disconnectedness experienced by many nations found in the "gap"—not a technological disconnectedness. With respect to CT, the true challenge of globalization lies in the result of eco-

nomic disconnectedness—nation-states vulnerable to parasitic transnational terrorist networks.

Modern technology, facilitated by space-based communications, establishes a ready-made communications architecture for transnational terrorist networks. Transnational terrorist organizations are enabled by "modern technology . . . to plan and operate worldwide as never before. With advanced telecommunications they can coordinate their actions among dispersed cells."[10] With an understanding of transnational terrorist networks' utilization of the space medium, the relevance of the space medium becomes ever clearer.

Yet, the use of the space medium, while critical to transnational terrorist networks, is not an absolute prerequisite for the conduct of terrorist actions. John Arquilla and David Ronfeldt provide excellent counsel on the relevance of technology and its impact to transnational terrorist networks. "New technologies, however, enabling for organizational networking, are not absolutely necessary for a netwar actor. Older technologies, like human couriers, and mixes of old and new systems may do the job in some situations."[11] Arquilla and Ronfeldt's counsel makes the space medium no less important in CT operations.

Their counsel serves to underscore a primary concept in warfare expressed by Colonel Boyd. "Idea: Simultaneously compress own time and stretch-out adversary time to generate a favorable mismatch in time and ability to shape and adapt to change. Goal: Collapse adversary's system into confusion and disorder by causing him to over and under react to activity that appears simultaneously menacing as well as ambiguous, chaotic, or misleading."[12] As discussed later in this chapter, military planners must recognize and take advantage of the mismatch in operating tempo and use the mismatch to combat terrorist networks.

Being oriented toward a transnational terrorist network's use of the space medium is incomplete orientation. It is critical to comprehend the type of warfare we expect terrorist networks to wage, given the use of the medium of space. With a greater insight into the type of warfare we expect terrorist networks to conduct, reorientation in order to counter terrorist networks becomes more complete.

The word *netwar*, described by Arquilla and Ronfeldt as the type of warfare expected of transnational terrorist networks, is somewhat misleading. The temptation to brand netwar as dependent on the technology of the twenty-first century intoxicates most and appeals to our strengths as a nation. However, netwar depends primarily on organizational networking and utilizes the current explosion in technology as a quasi-circulatory system to extend organizational networking.[13] Arquilla and Ronfeldt caution the reader about overestimating the importance of technology in netwar—"netwar may be waged in high-, low-, or no-tech fashion."[14]

However, netwar on a global scale requires some element of technology to effectively conduct operations in a sustained manner and maintain the integrity of the transnational terrorist network. In fact, Arquilla, Ronfeldt, and Michele Zanini all acknowledge the importance of transnational terrorist networks and their relationship to technology. "Terrorist groups are taking advantage of information technology to coordinate activities of dispersed members."[15] Additionally, these networks utilize technology to "better organize and coordinate dispersed activities."[16]

Once constrained by local or regional reach, netwar and the integration of advancing information technologies enable transnational terrorist networks to develop relationships, plan activities, and conduct operations. In "Networking of Terror in the Information Age," Zanini and Sean Edwards outline the impact of these new technologies on netwar—new communication and computing technologies allow the establishment of networks in three critical ways: "First, new technologies have greatly reduced transmission time. . . . Second, new technologies have significantly reduced the cost of communication, allowing information-intensive organizational designs such as networks to become more viable. . . . Third, new technologies have substantially increased the scope and complexity of the information that can be shared."[17]

The conclusion appears obvious but must be underscored— netwar operates across all mediums of warfare. Netwar does not discriminate based on preconceived insular notions of warfare. Netwar adapts and exploits the unique advantages of all mediums and at times challenges the use of those mediums by adversaries that threaten network survivability. Consequently, when

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considering offensive and defensive actions to counter these networks, planners must reorient to an adversary very much unlike conventional enemies. Accordingly, planners must begin to develop effects-based counterspace strategies that effectively establish the defensive in all four mediums of warfare while simultaneously taking the offensive in all four mediums of warfare.

Articulating and Assessing Counterspace Effects

Counterterrorism efforts should target the information flows of netwar groups . . . policymakers should consider going beyond the passive monitoring of information flows and toward the active disruption of such communications . . . over time the integrity and relevance of the network itself will be compromised.

—"Networking of Terror in the Information Age"
Michele Zanini and Sean J. A. Edwards

The *National Strategy for Combating Terrorism* provides sufficient guidance for military planners to consider "going beyond the passive monitoring of information flows."[18] In fact, the strategy outlines a multidimensional plan of attack with two overarching effects: "reduce scope and reduce capability."[19] Geographic reach defines scope and its three subcategories: global, regional, and state. On the other hand, the severity of threat the terrorist organization possesses defines capability. Figure 2.3 outlines the three stages of attacking terrorism and the expected outcomes.

However, the inherent efficiency and adaptability found in transnational terrorist networks complicate execution of the national strategy. Without an initial understanding of the challenge of EBO in a CT fight, articulating desired effects and measuring an outcome become challenging at best. Terrorist networks pose many challenges to planners, but two seem to rise above others—efficiency of terrorist networks vis-à-vis military organizations and an ability to rapidly adapt to new technologies.

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OPERATIONALIZING THE STRATEGY
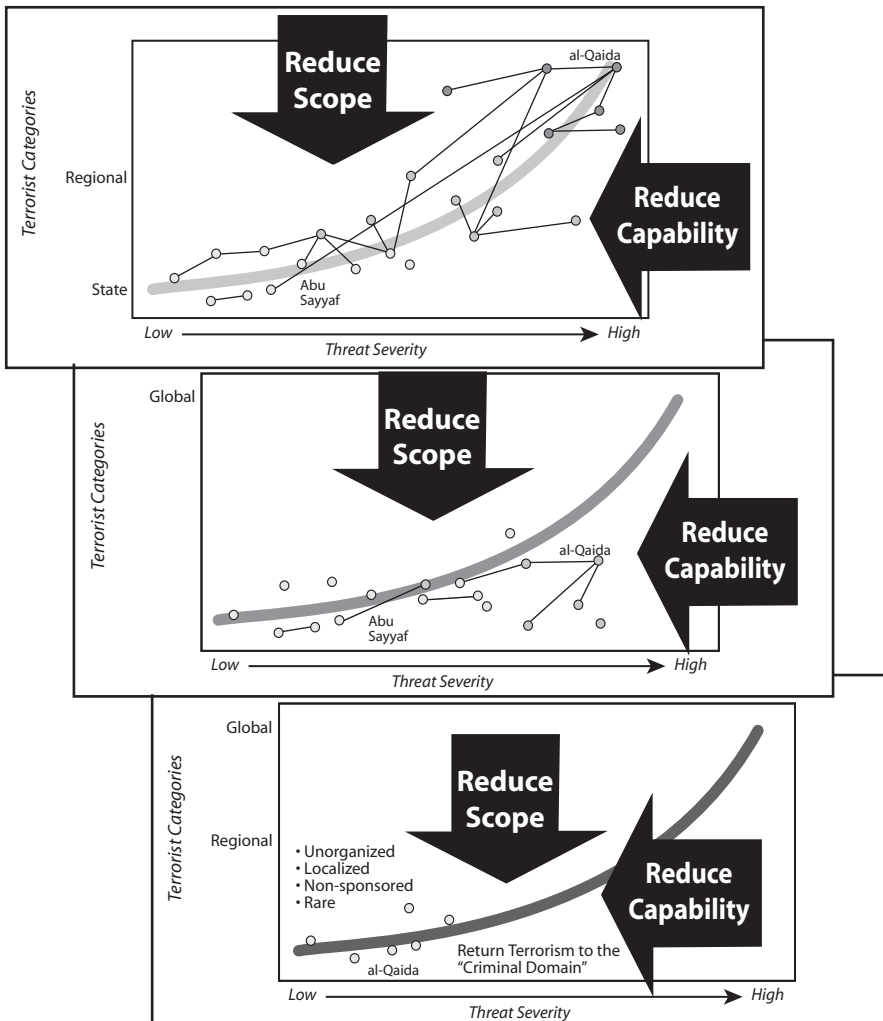
Figure 2.3. Operationalizing the strategy. (*Reprinted from* Pres. George W. Bush, *National Strategy for Combating Terrorism, February 2003* [Washington, DC: White House (Office of the Press Secretary), 14 February 2003], 13.)

Terrorist networks enjoy an advantage in efficiency for many reasons. Yet, the primary reason for efficiency lies in the competition between a nonbureaucratic organization, like a transnational terrorist network, and a modern military organization

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that is highly bureaucratic.[20] In fact, scholars recognize the unique attributes of a networked organization in transnational terrorist groups.[21] Specifically, the attributes of networked organizations consist of "relatively flat hierarchies, decentralization and delegation of decision-making authority, and loose lateral ties among dispersed groups and individuals."[22] Due to the efficiency, a transnational terrorist network enjoys an advantage in terms of time—time to plan, time to organize, time to adapt, and time to reorient—an advantage not to be taken lightly. As Alfred Thayer Mahan noted, "Time is a supreme factor in war."[23]

Transnational terrorist networks couple efficiency with adaptability. Adaptability becomes particularly critical for the networks' survival. Clearly, military organizations fighting terrorist networks often enjoy an advantage in monetary and physical resources. Consequently, transnational terrorist networks must adapt to the environment to deliver global effects. Much has been made of the wealth of certain terrorist organizations and their support architecture. However, Zanini and Edwards highlight a primary reason for adaptability: "Terrorist groups are likely to channel their scarce organizational resources to acquire those [information technology] skills that have the greatest leverage for the least amount of cost and effort."[24]

Soon after 9/11, the world understood the extent of a transnational terrorist network's ability to adapt. While most global armies require an advanced C2 center to conduct operations, the world found out that the Internet Café served as a surrogate C2 center—the quintessential example of terrorist adaptability. Consequently, adaptability occurs not only in the acquisition of information technologies but also in the employment of nonstandard war-fighting means like civil or commercial organizations, institutions, and resources required to maintain a global reach necessary for a transnational terrorist network to survive.

With these challenges as a backdrop, military planners must be capable of effectively articulating effects, specifically counterspace effects, designed to meet the nation's CT strategy—reduced scope and reduced capability. Work by RAND provides organization to the various thoughts on EBO. Figure 2.4 outlines the "simple taxonomy" used by RAND to express the scope of EBO.
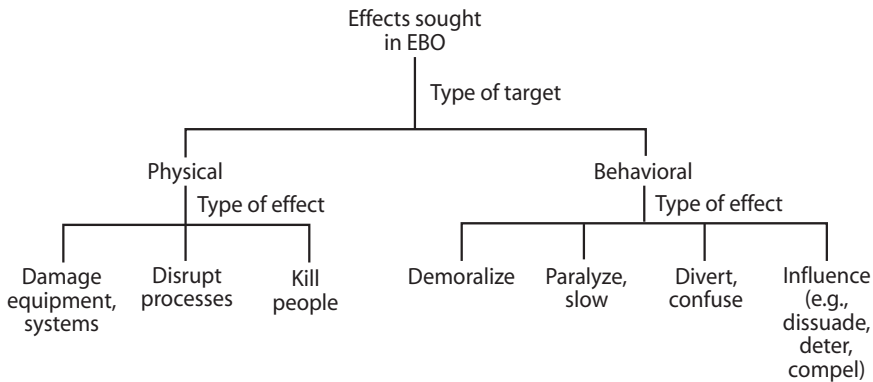
Figure 2.4. RAND's taxonomy of effects. (*Reprinted from* Paul K. Davis, *Effects-Based Operations: A Grand Challenge for the Analytical Community* [Santa Monica, CA: RAND, 2003], 17, http://www.rand.org/pubs/monograph _reports/MR1477/MR1477.ch2.pdf.)

Effects, according to RAND's taxonomy, are divided into physical and behavioral. Based on current USAF doctrine, counterspace effects are physical and behavioral in nature. For example, AFDD 2-2.1, *Counterspace Operations*, highlights the physical and behavioral effects inherent in counterspace operations. See table 2.2 for offensive effects and table 2.3 for defensive effects.

Table 2.2. Offensive counterspace effects

	OCS Physical	OCS Behavioral
	Destruction	Deception
	Degradation	
	Disruption	
	Denial	

Adapted from AFDD 2-2.1, *Counterspace Operations*, 2 August 2004, 31.

Table 2.3. Defensive counterspace effects

	DCS Physical	DCS Behavioral
	Defend	Deter
	Recover	

Adapted from AFDD 2-2.1, *Counterspace Operations*, 2 August 2004, 25.

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An effect, either offensive or defensive, must center on the outcome of the intended action. "Effects consist of a full range of outcomes, events, or consequences that result from a specific action."[25] Proper articulation of counterspace effects is a critical first step in supporting a military strategy of CT designed to meet the overall national strategy. Whether physical or behavioral, effects occur in warfare as either direct or indirect. A direct effect results from the action, such as destruction, with "no intervening effect or mechanism between act or outcome."[26] On the other hand, an indirect effect, such as degradation, results "often from the cumulative or cascading result of many combined direct effects."[27] As noted in *Thinking Effects*, indirect effects often contain a temporal element and are "typically more difficult to recognize than direct effects."[28]

Effects, therefore, serve as the means by which military forces reduce the scope and the capability of transnational terrorist networks. Consequently, the expression of offensive and DCS effects must focus on physical as well as behavioral effects. Additionally, proper expression of a desired effect serves not as an end point in strategy but as a starting point for effects, which are fundamentally intended results. To be accomplished, intended results must be measured. Therefore, complete counterspace strategy must be comprised of a desired effect as well as a measure to determine if the effect is achieved. The challenge in counterspace EBO is not in expressing effects but in delivering on effects, which means an ability to assess effects—physical or behavioral and direct or indirect.

Fundamentally, the challenge of assessing counterspace effects results from several issues facing modern military operations. First, the focus of counterspace effects, in our case transnational terrorist networks, is challenging to model and analyze. Second, the military readily adapts to the current evolution in information technology; however, the military remains less informed on the accompanying evolution in information theory, which serves to illuminate the process of assessing stated effects.

The information theories serve two purposes for military planners: first, theories provide a reasoned set of principles necessary for a better understanding of information systems used by transnational terrorist networks; and second, these principles

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serve to inform assessment of effects and why effects are achieved or not achieved. Finally, due to the transnational nature of terrorist networks, assessment naturally occurs across CCDR boundaries. Consequently, military planners must consider various options involving detailed coordination in determining the proper methods to conduct counterspace assessment.

RAND's analysis of the current situation of modeling and analysis highlights several deficiencies in current military planning capabilities. As illustrated in figure 2.5, the current state of modeling and analysis is focused almost exclusively on military forces in a head-on-head conflict.[29] The RAND article concludes that the dashed "portions of the assessment indicate where the model and analysis tend to be quite thin."[30] Even though the lines are not dashed, the most extreme border of the chart indicates an ideal situation not currently available to military planners.[31]

Several reasons impede military planners from reaching an ideal state of modeling and analysis; however, the concept of unpredictability and adaptability surfaces.[32] Quite simply, the reason for unpredictability is a function of the involvement "of antagonists in war," and these antagonists "are human beings who are regularly making assessments and decisions and taking actions. The 'systems' that one is trying to affect is dynamic, and many of its changes are observable—if at all—only indirectly and after delays."[33]

While challenges exist in modeling and analysis, the expression of counterspace effects remains a requirement for effective military planning in CT operations. With a known limitation in modeling and analysis, a planning and execution challenge confronts military planners with an assessment dilemma—how to determine desired effects. Planners must realize that in assessment "one can always choose a coarser or finer metric."[34]

The art of assessment in counterspace operations lies in determining the metric for assessment—a determination influenced by available assessment capabilities. Furthermore, planners must realize that complete assessment of an effect is often late to need. One hundred percent accuracy in assessment, while ideal, is often unrealistic. "There is a limit on the accuracy of any prediction of a given system, set by the characteris-
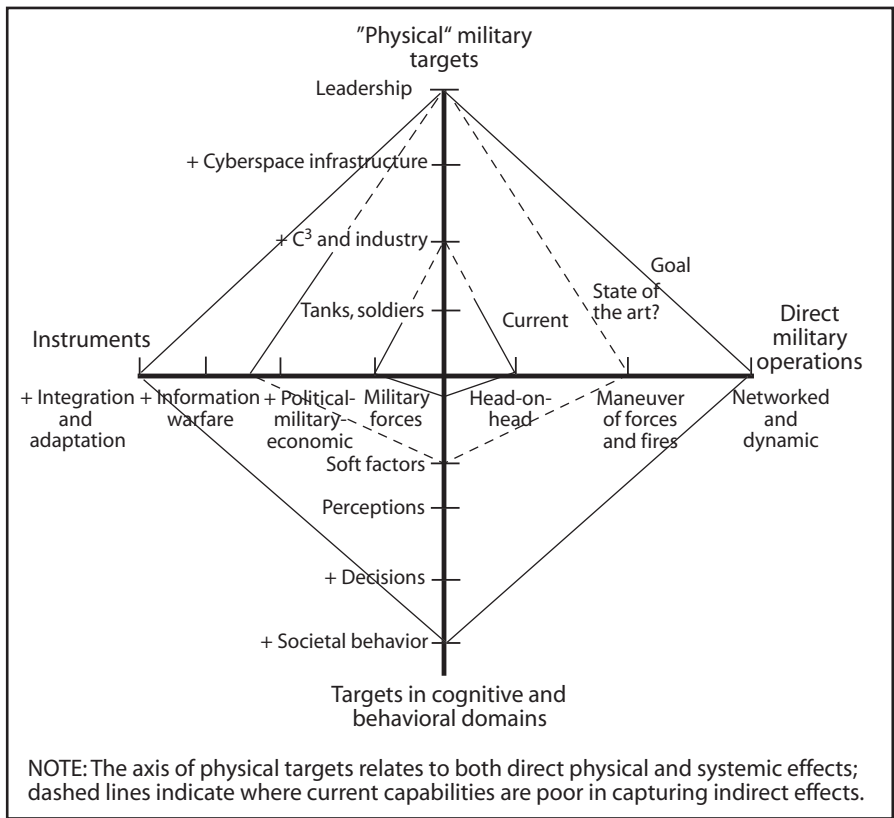
Figure 2.5. Characterizing the baseline, state of the art, and goal. (*Reprinted from* Paul K. Davis, *Effects-Based Operations: A Grand Challenge for the Analytical Community* [Santa Monica, CA: RAND, 2003], 9, http://www.rand.org/pubs/monograph_reports/MR1477/MR1477.ch2.pdf.)

tics of the system itself (limited precision measurement, sensitive dependence on initial conditions, etc.)."[35]

While various information theories influence assessment, military planners considering counterspace effects must be aware of the concept of complex adaptive systems (CAS). Examination of CAS serves a vital role in the discussion of assessing counterspace effects. Jurgen Jost highlights the unique nature of CAS: "A complex adaptive system is situated in an environment. The environment is always more complex than the system itself, and therefore, it can never be completely predictable"

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and "only regularities are useful for the system."[36] Jost notes that regularities serve a vital purpose for a system. "A system will itself be defined by regularities that it constructs from its input and that are maintained through and expressed by internal processes."[37]

Consequently, military planners seeking counterspace effects must not merely focus assessment capabilities on the system targeted for effect but on the environment that interacts with the system as well. By focusing simply on the system targeted for effect, a portion of the assessment equation is conspicuously absent. Thus, military planners usually assure themselves of falling short of meeting the desired effect because the assessment strategy is incomplete or improperly oriented prior to, during, or after execution. Reorientation of assessment, to include the targeted system as well as the terrorist network's use of it, is a prerequisite for military success.

The Targeted System

As stated, reorientation toward the targeted system becomes essential for counterspace EBO. In the case of terrorist networks this involves several elements: organizational structure, COG identification, and an understanding of the action to effect the objective kill chain.

Transnational terrorist network organizational structure informs planners and provides a means of identifying essential elements necessary for the network to function. To better understand terrorist network organizational structure, Robert Keidel provides a model for organizational analysis. In the model, Keidel highlights three organizational design trade-offs that outline essential elements of an organization and how it functions: control, cooperation, and autonomy.[38] With a better understanding of these organizational trade-offs, proper application of counterspace operations through EBO is more likely. Figure 2.6 shows these trade-offs. As an example, Jerrold Post notes that "Al Qaeda was reorganized in 1998 to enable the organization to more effectively manage its assets and pursue its goals."[39] "Strategic and tactical direction comes from Al Qaida's Consultation Council (Majis al-Shura) consisting of five
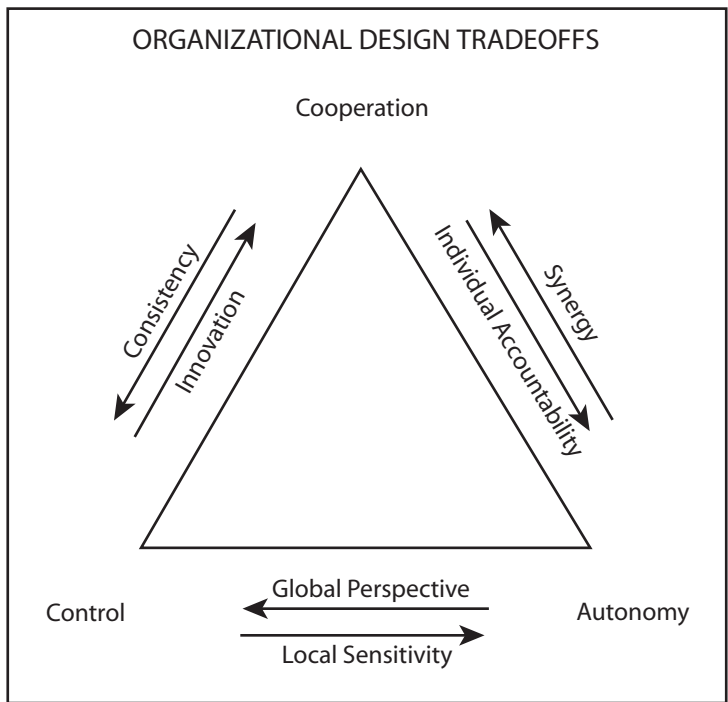
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Figure 2.6. Organizational design trade-offs. (*Reprinted from* Robert W. Keidel, *Seeing Organizational Patterns: A New Theory and Language of Organizational Design* [San Francisco: Berrett-Kockler Publishing, 1995], 6.)

committees (Military, Business, Communications, Islamic Studies and Media)."[40]

Using Keidel's "trade-off" model, al-Qaeda is able to maintain global perspective due in part to its ability to maintain control over the organizations. The control, as Keidel notes, provides the organization with greater ability to maintain a global perspective on operations.[41]

Cooperation appears to be the hallmark of al-Qaeda. Post summarizes al-Qaeda's organization as "a loose umbrella organization of semi-autonomous terrorist groups."[42] Consequently, al-Qaeda appears to have traded consistency in terrorist operations for innovation. In short, al-Qaeda forms loose confederations among terrorist organizations to promote its agenda.

Finally, al-Qaeda appears to provide "guidance, coordination, and financial and logistical facilitation" to supporting terrorist

networks.[43] As a result, it appears that al-Qaeda appreciates the synergy of the loose confederations while still maintaining a certain degree of control over their actions, thus limiting autonomy. The result influences targeting—a centrally controlled network seeking cooperation among a loose and ever-changing confederation of terrorist organizations. The net effect is a global perspective leveraging innovation and synergy through diverse association with other terrorist networks.

With a better understanding of the network's organization, planners are able to conduct COG analysis more effectively. Dr. Joe Strange's model provides excellent insight into a transnational terrorist network utilizing COG analysis.

Table 2.4. Dr. Strange's COG model

Dr. Strange's Model	Example
Centers of gravity	Leadership
Critical capability	Remaining informed and communicating with others
Critical requirement	Resources and means to receive intelligence as well as the resources and means to communicate with others
Critical vulnerability	Components of critical requirements which are deficient or vulnerable to neutralization, interdiction, or attack in a manner achieving decisive results

Adapted from Joseph Strange, *Centers of Gravity and Critical Vulnerabilities: Building of the Clausewitzian Foundation So that We Can All Speak the Same Language* (Quantico, VA: Marine Corps University Foundation, 1996), ix.

As shown earlier, offensive counterspace operations (table 2.2) deliver destruction, degradation, disruption, denial, and deception effects, while defensive counterspace operations (table 2.3) deliver defend, recover, and deter effects. Given these effects and the analysis of transnational terrorist network organizations, successful EBO-achieving objectives such as reduction in scope and reduction in capability become more realistic.

For example, utilizing the analysis of EBO in *Thinking Effects*, several options become apparent. Figure 2.7 displays the variety of actions that must occur in order to support the desired effects. Actions and desired effects are connected by causal

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links. Causal links are critical for targeting and assessment. According to the authors, causal links serve to "explain why the proposed actions are expected to work."[44]
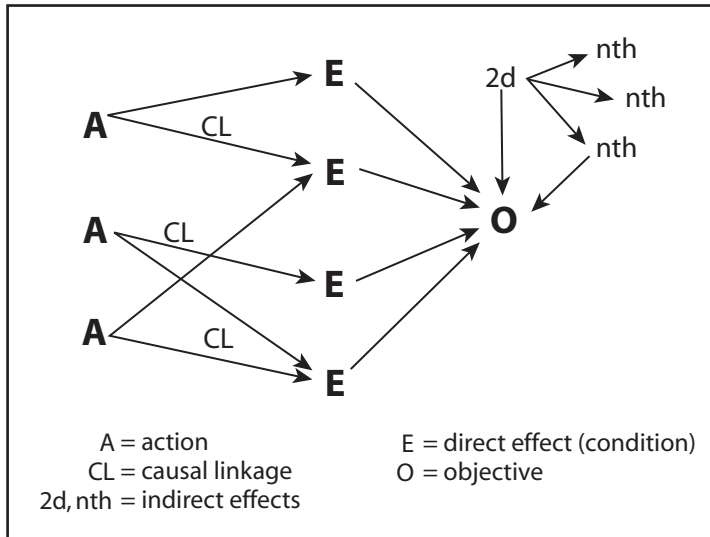

Figure 2.7. Relational model of effects-based operations. (*Adapted from* Edward C. Mann III, Gary Endersby, and Thomas R. Searle, *Thinking Effects: Effects-Based Methodology for Joint Operations* [Maxwell AFB, AL: Air University Press, 2002], 52.)

Consequently, assessment prior to counterspace operations must focus on identification and confirmation of causal links. While not conclusive, Mann's causal links appear to be closely related to Dr. Strange's critical vulnerabilities.

Indirect effects present a challenge to planners. Indirect effects naturally present a temporal challenge to accomplishing an objective that is outside the control of the initiator of the action. For example, Barry Watts discusses the temporal aspect and the challenges faced in Operation Desert Storm. "Resolution of the uncertainty depended on subsequent Iraqi actions, it exemplifies the essential temporal dispersion of fundamental knowledge about military effectiveness."[45] Warfare, as has been stated many times, is a contest between two parties. Planners should expect nothing less in EBO. Consequently, the true mea-

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sure of effectiveness, in some cases, might rely on adversary action or inaction over time.

Organizational learning provides a way ahead. Specifically, organizations focus on the elements of organizational learning—"gaining experience, building competence, and avoiding the repetition of mistakes, problems, and errors that waste resources."[46] Therefore, as operators are able to train in a more realistic manner, their experience and competence increase. While obvious, the second-order benefits of such training are not as apparent—an increase in explicit and tacit knowledge.[47]

According to Watts, explicit and tacit knowledge serve to remove a certain element of friction in warfare—friction associated with assessment of effects.[48] Explicit knowledge, as defined by Watts, consists of "meaningful information that is available for entry into databases and information systems."[49] Over time and through experience, explicit knowledge of terrorist networks grows. Consequently, COG analysis becomes more objective and accurate as explicit knowledge increases.

However, tacit knowledge, as defined by Watts, refers to "implicit information and processing capabilities that humans carry around inside them by virtue [of] . . . cumulative individual experience."[50] Therefore, gaining experience through consistent and realistic training of counterspace operations in support of CT increases explicit knowledge as well as tacit knowledge. Consequently, a corresponding increase in success of EBO directed at the objectives of reducing the scope and capability of terrorist networks should follow.

Information theory and its relationship to transnational terrorist networks are equally important in the statement and the assessment of counterspace effects. While redundancy is an element of information systems used by transnational terrorist networks, its concept needs to be placed in the proper context. Redundancy enables a network system to operate after a planned or unplanned change in network system status. Information theory, however, reminds military planners that unlike a "failure of a gene is often buffered by the rest of the system. This is not the case for electronic circuits, and to a similar extent, by software networks. Failure of any component typically en[d]s in system's failure, no matter how much [*sic*] linked is the given unit."[51]

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Consequently, information theory illuminates a possible vulnerability in the network systems utilized by terrorists. While adaptability is commonplace among transnational terrorist networks, adaptability of network systems is constrained by design. Accordingly, the implications for assessment appear somewhat clearer. The initial assessment of network systems, critical to maintaining and expanding the scope of transnational terrorist networks, illuminates the level of adaptability afforded to terrorist networks.

In their discussion of information theory, Ricard Sole and Sergei Valverde also identify "three relevant characteristics" that also serve to illuminate a discussion of counterspace effects assessment—"randomness, heterogeneity, and modularity."[52] Table 2.5 shows these characteristics.

Table 2.5. Relevant characteristics of networks

Axes of network	Definition
Randomness	Amount of chance involved in the process of network building
Heterogeneity	Measurement of diversity with respect to the link distribution found in the network
Modularity	Measure of network modularity or standard structural components of the information network

Adapted from Ricard V. Sole and Sergei Valverde, *Information Theory of Complex Networks: On Evolution and Architectural Constraints*, SFI Working Paper 03-11-061 (Santa Fe, NM: Santa Fe Institute, 2003), 2, 4, http://www.santafe.edu/research/publications/workingpapers/03-11-061.pdf.

As network characteristics, Sole and Valverde's randomness, heterogeneity, and modularity begin to define characteristics of information networks used by terrorists. By defining the characteristics of information networks, military planners are more apt to realize potential weaknesses in a planned assessment strategy. For example, assessing an information network as having a high degree of heterogeneity informs planners of the need for additional assessment resources to measure counterspace effects designed to influence the network.

Furthermore, modularity begins to explore the concept of repeatable counterspace effects across information networks. For example, a highly modular information network implies a cer-

tain degree of uniformity. Counterspace effects capable of influencing a highly modular network are likely to have similar effects even if the same information network were utilized by a different terrorist network. Consequently, the ability to assess modular networks should become more informed over time and with experience.

Assessment requires the processing of data to gain information on the outcome of an intended counterspace effect. According to Cosma Shalizi, information theory is limited in that data processing inequality suggests that we "can't get more information out of data by processing it than was in there to begin with."[53] However, multiple streams of assessment feeds can be processed to deliver a product greater than the sum of an individual assessment feed. The lesson to military planners assessing counterspace effects is quite simple: do not be one-dimensional in assessment. Multidimensional assessment yields a more complete result and is more capable of determining if a desired effect occurred.

The challenges found in assessing counterspace effects appear to outweigh the challenges of articulating counterspace effects; however, assessment must inform the articulation of effect and not serve to constrain. Arquilla and Ronfeldt summarize the challenge succinctly by stating, "A generation of new assessment methodologies is needed."[54] When considering counterspace effects and counterterrorism operations, two issues seem to rise to the top: parallel warfare requires parallel assessment, and there is a need to pronounce the silent *A* of assessment in (A)F2T2EA.

In order to reduce the scope and the capability of terrorist networks, military planners must consider parallel warfare to achieve devastating effects on every facet of a terrorist network's structure. However, parallel warfare implies an ability to conduct parallel assessment. Yet, the state of parallel assessment necessary to complement parallel warfare remains unclear at best, and likely, fully untested at worst.

One avenue requiring consideration lies in the mutual support current military forces provide each other.[55] By leveraging other forces' capabilities to support counterspace effects assessment, parallel assessment to support parallel warfare becomes more achievable. For example, land force assessment

capability could support counterspace effects assessment. By tying seemingly unrelated capabilities together, parallel assessment begins to take form. Through parallel assessment, military planners increase the success of assessment because "if the strategist/analyst/sensor is not present to observe and record an effect, its value as an input to future plans is nil."[56]

F2T2EA is the mantra of the United States Air Force's attack operations. Yet, little discussion centers on the process of assessment needed to focus F2T2EA. Clearly, its construct has a place in CT operations; however, in order for the F2T2EA chain to be effective in CT operations, assessment must focus on F2T2EA. As outlined above, assessment is essential to realizing effects. Without proper assessment, it is unlikely forces are effectively oriented to find or fix most targets requiring engagement. Consequently, assessment is a precondition for effective F2T2EA.

Like the F2T2EA process, Colonel Boyd's OODA loop model serves as an effective method for coping with the challenges of articulating and assessing counterspace effects. His model supports many aspects of the decision cycle critical to counterspace operations in support of CT. However, the model serves a critical role primarily as a mode for analysis and synthesis because "without analysis and synthesis, across a variety of domains or across a variety of competing independent channels of information, we cannot evolve new repertoires to deal with unfamiliar phenomena and unforeseen change."[57]

The model, as Robert Coram suggests, is Colonel Boyd's most famous legacy, yet likely the least understood.[58] Most likely, all military personnel discussed Boyd's OODA loop model during their professional military education. Unfortunately, little discussion centered on key aspects of prosecuting the model. The model and its execution were likely discussed in serial fashion. Speed, most instructors taught, was the central theme of the model. The speed in executing the model assured victory over an adversary. To understand these concepts and nothing else, students are left at best with a partial understanding of the model and its utility to military operations. Most often, students are not instructed utilizing the model in figure 2.8.

Dr. Grant T. Hammond conducted countless hours of interviews with Colonel Boyd and captured the essence of Boyd's contribution to current military thought in *The Mind of War:*

John Boyd and American Security. Dr. Hammond's work captures a nuance lost on most military personnel instructed on the OODA loop: orientation informs observation. Dr. Hammond writes, "Note how orientation, what Boyd has always called the big O, shapes observation, shapes decision, shapes action, and in turn is shaped by the feedback and other phenomena coming into our sensing or observation window of the world."[59]

In terms applicable to counterspace effects and CT operations, military planners must be properly oriented in order to decide on what counterspace effects to accomplish; on what actions to take in order to achieve the desired counterspace effects; and finally, in a position to observe and assess the counterspace effects. Without proper orientation, counterspace effects are likely to achieve substandard results.

Orientation also serves another vital purpose. It determines the tempo at which Boyd's OODA loop is prosecuted. The tempo may vary—quicker execution of the OODA loop is often better, but not always. In "The Cult of the Quick," Dr. Thomas Hugh captures the military's fascination with speed and the challenges posed in continually executing rapidly. "Obsession with speed denies the fundamental truth that in strategy, everything is contextual, and circumstance is paramount. It transforms doctrine into dogma."[60]

The element of time, as Dr. Hugh notes, is "distinct from speed, [and] is of course an essential element of war. One keen observer believes it 'will rule tactically and operationally' and is 'undoubtedly the least forgiving of error among strategy's dimensions.'"[61] Orientation dictates the tempo of counterspace operations in support of CT and serves the strategist well. As former commandant of the US Marine Corps Gen Charles Krulak commented on the application of the OODA loop, "Boyd's OODA loop taught officers how to use 'time as an ally.'"[62]

The OODA loop serves military planners well when considering the appropriate counterspace effects and assessment strategies in CT operations. Proper orientation guides effects and assessment. It enables planners to use time as an ally, an ally that serves to inform planners on the appropriate time to accelerate or decelerate tempo. By utilizing Boyd's model, planners better understand the terrorist network and its capabilities and limitations. With understanding, offensive and defensive
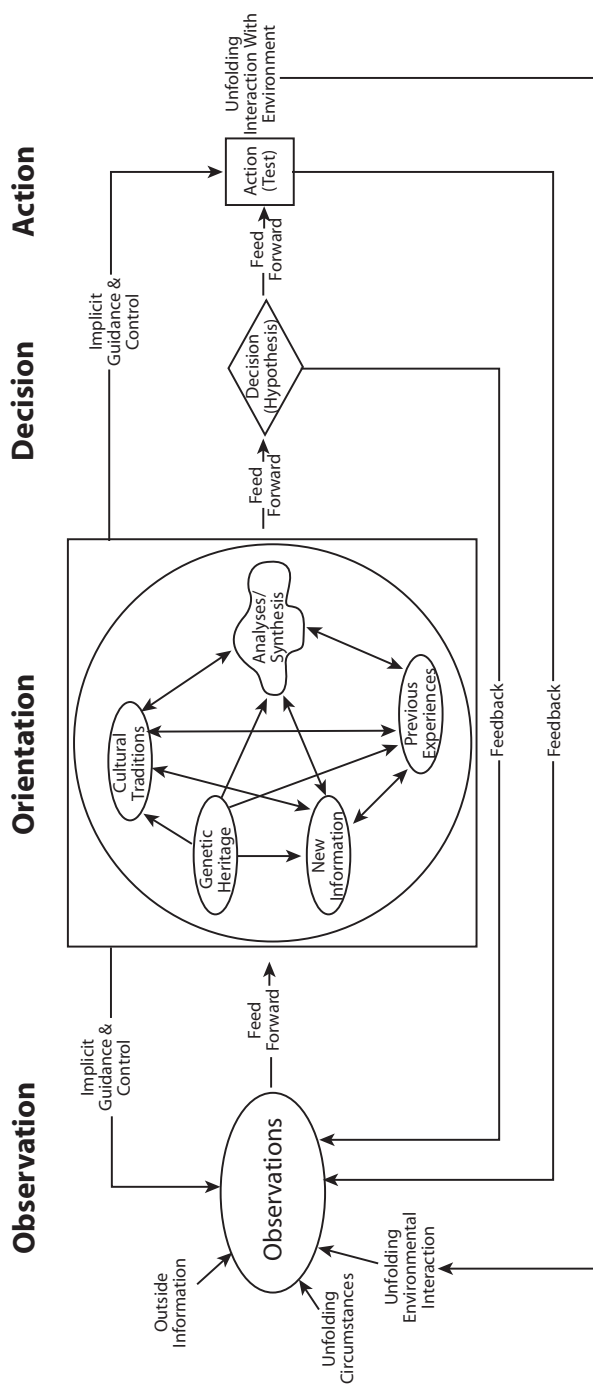
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Figure 2.8. Boyd's final sketch of the OODA loop. (*Reprinted from* Grant T. Hammond, *The Mind of War: John Boyd and American Security* [Washington, DC: Smithsonian Books, 2001], 190.)

operations and the associated tempo of these operations are more effectively integrated with greater effect and success. Yet, to achieve superiority in the medium of space and deliver as well as assess effects, military forces must conduct consistent and realistic training.

Consistent and Realistic Training in Counterspace Operations

For [the Romans] do not begin to use their weapons first in time of war, nor do they then put their hands first into motion, having been idle in times of peace; but as if their weapons were part of themselves, they never have any truce from warlike exercises . . . nor would he be mistaken that would call their exercises unbloody battles, and their battles bloody exercises.

—Flavius Josephus

Superiority in a medium, as well as the ability to deliver and assess effects, relies almost solely on consistent and realistic training. For without consistent and realistic training, organizational learning decays over time.[63] According to Anthony DiBella and Edwin News, three essential elements comprise the foundation of organizational learning: gaining experience, building competence, and avoiding the repetition of mistakes, problems, and errors that waste resources.[64] In the history of modern air warfare, one military organization based future combat operations on consistent and realistic training—USAF fighter combat capability—after Vietnam. By examining the rise of USAF fighter combat training, a road map for consistent and realistic counterspace operations becomes more apparent.

The exact point in time for what some call a training revolution in USAF fighter capability is debatable. However, the driving force behind the institutionalization of organizational learning that led to an increase in USAF fighter capability remains, without question, Gen Wilbur L. "Bill" Creech. The cornerstone of organizational learning for fighters mirrored the textbook definition. First, fighter training required a realistic threat—the

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Aggressors. Second, fighters needed the ability to objectively assess performance—the debrief assisted by modern technology. Finally, tactics, techniques, and procedures required an exercise environment—Red Flag.[65]

At nearly the same time these concepts were coming online, instructors at the USAF Fighter Weapons School advanced the concept of the building-block approach.[66] According to C. R. Anderegg, the essence of the building-block approach is that "the final objective must drive every aspect of the training program"—an approach to instruction that still exists at the USAF Weapons School.[67] As Anderegg notes, the development of the building-block approach in the mid-1970s and its articulation in the *USAF Fighter Weapons Review* changed fighter training— "the Winter '76 and Spring '77 issues [of the *USAF Fighter Weapons Review*] . . . represented a turning point in the fighter community."[68]

However, General Creech wanted improvements over existing Tactical Air Force (TAF) training. In the mid-1970s, General Creech remained concerned over TAF proficiency in night combat operations and the TAF's ability to gain and maintain air superiority at night. "Reflecting Creech's long-held opinion that the Air Force lacked a credible capability to fight at night, RED FLAG exercises began to incorporate night operations at least twice per year shortly after Creech assumed command."[69] At a TAF war-fighter conference, General Creech institutionalized the training road map for the TAF:

> 1. We are going to dramatically change our approach, simply because it's wrong. We're now going to make defense roll-back and taking the SAMS [surface-to-air missile sites] out our first order of business.
>
> 2. We'll train at low altitude, sure, but we'll also emphasize training at high altitude with the munitions that work.
>
> 3. We'll go on a full court press to develop and field the systems and munitions that fit our new tactics.
>
> 4. We'll also launch a major effort to educate tactical people throughout the Air Force on this major shift and the reasoning that lies behind it.[70]

General Creech also adopted the building-block approach to exercises as well when he "insisted that not every mission at

RED FLAG be flown as if it were 'the first mission, on the first second, on the first day of the war.'"[71]

Furthermore, General Creech changed the method of Red Flag training in two dramatic ways. First, he emphasized the role of assessment and learning from experience. According to Lt Col James Slife, commanders of units participating in Red Flag were "placed in charge of participants' training experience with no formal benefit of others' experience. . . . We saw the same mistakes over and over."[72] General Creech drove change so others learned from previous experience. Second, in order to gain experience and build competency, the concept of "kill removal" was adopted at Red Flag. Aircraft assessed as "dead" were removed from the fight and returned to base. Consequently, aircrews experienced a more realistic training environment in which to hone their combat skills.

Assessment served as a cornerstone of the USAF fighter training program. Instrumental in building a realistic training environment capable of assessing training, the TAF spent more than "$600 million on range improvements and instrumentation. . . . Realism of the threats on the Nellis ranges increased substantially."[73] During this period and as it remains today, the necessity of assessment in training is captured best by the quote "if it ain't on film, it ain't."[74]

Under General Creech's leadership, the TAF set the standard for USAF fighter training, a standard that remains with Air Combat Command (ACC) today. The extent of the revolution in USAF fighter training was not lost during a January 2001 report of the Defense Science Board (DSB) titled *Training Superiority and Training Surprise*. The DSB concluded that "the superb performance of our military in the 1990s was not just a result of technological superiority but equally of training superiority" founded on "new combat training approaches invented 30 years ago, . . . instrumented ranges and combat training centers."[75]

Consequently, superiority in a medium and the effects as well as the ability to assess effects becomes a function of training superiority as well as technological superiority. For superiority through counterspace effects and assessment to occur in CT operations, the foundational elements of organizational learning must be present, "gaining experience, building compe-

tence, and avoiding the repetition of mistakes, problems, and errors that waste resources."[76]

The need is apparent. Space superiority and the associated counterspace effects are critical supporting elements of the *National Strategy for Combating Terrorism*. For the USAF, doctrine arrived as early as November 2001. Counterspace doctrine expanded significantly in August 2004 with the publication of AFDD 2-2.1. The challenge now is to understand the organizational learning impact: gaining experience, building competency, and avoiding a repetition of mistakes.

The USAF gains experience through a variety of means. However, exercising in peacetime with combat forces that one expects to fight in combat usually produces the best combat results. Exercises serve a vital role in gaining experience and "serve to orient and reorient."[77] Exercises at all levels achieve many results; however, exercises provide a valuable service for the training audience that builds experience and ensures "better decisions about the future."[78]

Since the publication of AFDD 2-2 in 2001, counterspace experience in support of special operations forces (SOF) and the mission area of CT seems to be lacking for many reasons. The need for exercising is apparent to Headquarters Air Force Special Operations Command (AFSOC) and Air Force Space Command (AFSPC); however, the commands appear limited in their ability to introduce counterspace operations into a counterterrorism exercise. In a recent interview, AFSOC space operations division personnel noted the following challenges:

> Counterspace is a new capability that AFSOC needs to see integrated into exercises to begin training before we go to the fight. . . . Integration occurs as an afterthought and orders of battle are not updated; often [there are] no established master scenario events lists tailored to special operations forces, operations support; and we have not exercised integrating directly with counterspace subject matter experts.[79]

When discussing the issue with AFSPC exercise planners, the planners noted, "No one [in the division] is aware of any time we've denied support to Special Forces, but we also don't have a record of when they requested it."[80] While initially disturbing, Headquarters AFSPC exercise planners provided a possible reason. "We may indirectly support SOCEUR while directly sup-

porting [US]EUCOM [United States European Command]. A good example is [US]EUCOM's SHARP FOCUS '05 exercise, which includes SOCOM's FLINTLOCK '05," and "SOCPAC decided to integrate directly into TERMINAL FURY '05 instead of building a separate exercise."[81]

In order to gain experience, consistent and realistic training must become a priority at AFSOC and AFSPC. The benefits are clear, a consistent and realistic training environment and regimen where counterspace operations integrate with SOF to achieve desired effects. With a realistic environment and consistent training regimen, military forces reorient toward superiority and are more likely to achieve our national strategy for combating terrorism.

With limited exercise exposure in a CT training environment, the ability to build competency in supporting CT operations becomes quite challenging. Building and retaining competency are also challenged by a nonoptimal career "flow" for a counterspace mission designed to deliver superiority in a different medium. Comparing weight of effort in space manning to the objective of space superiority, current Air Force Personnel Center (AFPC) numbers indicate that "23 percent of company grade space operations positions" deal with space superiority support to CT, "19 percent" support space superiority in general terms, and missile operations account for "58 percent of crew positions."[82]

With 58 percent of crew positions in a career field not related to space superiority, the challenge to retain competency in counterspace operations becomes difficult to imagine because most new accessions receive initial assignment to missile operations for four years. Consequently, reassignment to a career field dealing with space superiority becomes difficult in a second tour, and the skill set accompanying reassignment is limited at best. To compound matters, AFPC encourages "interflow between space and missile mission areas."[83] Thus, the pool of experienced operators in the career fields contributing to space superiority is reduced.

In the DSB's *Training Superiority and Training Surprise* report, the board outlined the impact of limited realistic training and indirectly discussed the impact of limited proficiency in combat skills. The DSB noted that training superiority is a function of military performance and investment in training.

The board also advanced the concept of a "hierarchy of learning curves." Effective training designed to achieve training superiority requires continual advancement up the hierarchy of learning until units achieve "high fidelity training with opposing forces historically found at our national training centers." At these centers, the DSB noted that "a culture of frank, critical feedback involving OPFOR" had occurred.[84] To compound matters, the board also noted, "What is learned is often forgotten."[85] The board concluded that "after training, if complex skills are not constantly exercised, proficiency decays substantially in times as short as a few months."[86] With the standard career flow, counterspace skills developed to support CT operations begin to "decay over time."[87] As a result, organizational learning with respect to counterspace support to CT becomes inhibited because the current architecture in place is not properly oriented toward space superiority.

Today, AFSPC and Air Education and Training Command (AETC) invest a significant amount of resources in developing competency. In order to take the next step and orient toward superiority, AFSPC and AETC must consider the "borrowing a page from the building-block" approach. "The final objective must drive every aspect of the training program."[88]

Our final objective is space superiority. Consequently, AFSPC must examine the current career flow for space operators and adjust initial and follow-on training to compensate for shortfalls in training not focused on superiority in space. Furthermore, wing recurring training must focus on the primary mission of the unit; however, additional training in areas of space superiority must be developed to retain competency learned in initial qualification training. Finally, AFSPC must integrate elements of existing Joint Special Operations University training into the existing space professional training program. By doing so, the command establishes a vital educational link necessary to comprehend the various aspects of special operations.

Finally, organizational learning requires a process to avoid repetition of mistakes. As noted earlier, the data points for exercises involving counterspace operations in support of CT are insufficient to draw conclusions. However, in a recent survey of air operations groups (AOG), the survey in table 2.6 illustrates possible challenges ahead.

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Table 2.6. Air operations group survey

Question	Response
Are you satisfied with the debrief process for space following your major exercises?	Debrief experience varies across air operations groups. The spectrum includes weak at best to typically not a portion of the overall air operations center debrief.
What are the qualifications for assessors assessing space operations during your major exercises?	Assessors typically lack a space background. Consequently, assessors provide limited feedback.

Created by Maj Michael J. Lutton, USAF, survey of 607th, 609th, 612th, and 32nd Air Operations Groups, 1 February 2005.

Note: All survey responses were approved by the AOG commanders.

Counterspace support to CT must learn from current AOG experience. To facilitate avoiding repetition of mistakes, subject-matter experts trained as assessors must fulfill the roles of exercise assessors. With experience in the assessor positions, debriefing counterspace support to CT exercises serves the debrief process where lessons learned are captured. With lessons learned, improvement over time should occur.

With improvement in these key organizational learning areas, counterspace operations become more effective at supporting CT operations and directly supporting elements of the *National Strategy for Combating Terrorism*—reduction in scope and reduction in capability. The challenge, however, lies in reorienting toward superiority with respect to counterspace operations and its support to CT. Based on testimony in April 2004, former coordinator for CT Amb. J. Cofer Black testified, "I should stress that while we have made substantial progress toward eradicating the threat posed by al-Qaida, we are on a long, tough road, and we cannot afford to falter."[89]

Conclusion

Following the September 11 attacks, we have forcefully applied the Bush doctrine: any person or government that supports, protects, or harbors terrorists is complicit in the murder of the innocent, and will be held to account. We have done so through our National Strategy

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> *to Combat Terrorism, which creates the policy frame-work for coordinated actions to prevent terrorist attacks against the United States, its citizens, its interests, and its friends around the world and, ultimately, to create an international environment inhospitable to terrorists and all those who support them.*
>
> —Ambassador-at-large J. Cofer Black
> Coordinator for Counterterrorism

As noted earlier, Colonel Boyd achieves what very few authors ever accomplish. He provides the reader with a skill set for approaching the many challenges of the world we live in. Colonel Boyd's famous OODA loop symbolizes the skill set used for the continual process of analysis and synthesis—a means to reorient.

As implied in the *National Strategy for Combating Terrorism*, superiority across all mediums is required to reduce the scope and capability of terrorist networks. In order to achieve space superiority, forces must be capable of delivering and assessing counterspace effects. Training, as history instructs, is vital to superiority in any medium. Additionally, organizations learn when they consistently and realistically train.

The greatest challenge lies in reorienting toward consistent and realistic training for counterspace operations in support of CT. Much work has been done across the USAF by organizations such as AFSPC, Space Warfare Center (SWC), and Air and Space Warfare Center (AWFC). However, reorientation, as Colonel Boyd instructs, remains a continual process—a process critical to success in the world we live in.

In order to orient toward superiority, several areas require additional work. First, the exercise gap must be bridged. Without bridging the gap, experience remains at best incomplete. Furthermore, AFSPC and SWC have taken significant steps to build counterspace operations competency. However, the current career "flow" for space and missile operators inhibits the command's ability to fully realize its contributions to counterspace operations and space superiority. A building-block approach focused on the objective of superiority in space must drive a fundamental review of space operations training. Fi-

nally, effective assessment through trained exercise assessors, along with integrated debriefs, remains a prerequisite in avoiding repeating mistakes of the past. Furthermore, the debrief procedure serves as a means of illuminating the need to reorient.

As stated earlier, counterspace operations are not a go-it-alone solution. Coupled with steps outlined to reorient the current focus, effective employment of counterspace effects, supported by assessment, leads to support of CT operations. Balanced with continual organizational learning, superiority in the space medium becomes a reality in CT operations. Without effective superiority in the space medium, our nation concedes the use and capability of the medium of space and all its benefits—once the sole domain of superpowers—to terrorist networks. This is a mistake our nation can ill afford to make as we seek to accomplish the goals set forth in our national strategy.

Notes

1. The Department of State Web site provides the information contained in figure 2.1. It indicates the increase in the percent of "significant" terrorist attacks over the last decade. The total number of terrorist attacks, however, varies year by year. For example, the highest mark of overall terrorist activities in the last 12 years occurred in 1991, with 565 terrorist attacks worldwide. The low occurred in 2002 with 205 attacks occurring. Consequently, while total numbers of attacks do not follow a trend line, significant terrorist attacks have increased over time—"an international incident is judged significant if it results in loss of life or serious injury to persons, major property damage (more than $10,000), and/or is an act or attempt that could reasonably be expected to create the conditions noted." US Department of State, *Chronology of Significant International Terrorist Incidents, 2003* (Revised 22 June 2004), Appendix A, 1, http://www.state.gov/documents/organization/33890.pdf.

2. Pres. George W. Bush, *National Strategy for Combating Terrorism, February 2003* (Washington, DC: White House [Office of the Press Secretary], 14 February 2003), 2, http://www.whitehouse.gov/news/releases/2003/02/20030214-7.html.

3. Examination of the definitions of *superiority* highlights several concepts. First, there is an interrelationship between space superiority and successful execution of warfare in the other three mediums, to include special operations. Consequently, by joint definition, a degree of space superiority, like land, sea, and air, is required for joint operations conducted by forces operating in those mediums. Second, the joint definitions of *maritime* and *air superiority* exclude space forces as forces requiring some degree of maritime or air superiority to conduct operations. For example, a degree of air superiority might be required to destroy an enemy capability inhibiting space operations.

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Furthermore, a degree of maritime superiority might be required to defend critical elements necessary for space operations to continue. Consequently, the current joint definitions of maritime and air superiority do not fully recognize the interdependence of the mediums and require further evaluation.

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Chapter 3

It Isn't Space, It's Warfare!

Joint Warfighting Space and the Command and Control of Deployable Space Forces

Maj Mark A. Schuler, USAF

The Air Force has made great strides in integrating space effects into theater combat operations with space operators working day-to-day in theater air and space operations centers (AOC) and on CCDR staffs. However, the ongoing debate on the C2 of deployable space forces has hampered development of theater C2 mechanisms and associated training and exercises. Resolving this long-standing issue will improve the integration of space forces into combat operations.

Space personnel assigned to theaters, the Space Air Forces (SPACEAF or Space AOC), and other elements of the space community have worked with this C2 issue for years; yet it remains unresolved. At the heart of the issue is unity of command, a deeply engrained principle of warfare. In fact, Napoléon Bonaparte said, "Nothing is more important in war than unity of command."[1] Yet, achieving unity of command and unity of effort for space forces continues to challenge military planners, doctrine writers, and staffs. Traditionally, space forces have been thought of as global, and some argue, "Space is inherently global."[2] Newly developed capabilities and organizational constructs may shift that mind-set.

Space operations are rapidly expanding from traditional force-enhancement roles, to include on-orbit, near-space, and deployable space forces, which will be able to provide direct effects on the battlefield to achieve JFC objectives. Deployable counter-space capabilities, like the Counter Communications System (CCS or CounterComm), can deny adversary communications directly in support of the theater war fighter.[3] How will we C2 these new capabilities?

"The Operating Concept for Joint Warfighting Space (JWS)," currently in draft, attempts to provide more dedicated and re-

sponsive effects to theater commanders. The mission statement of JWS provides a vision of the future: "Expeditionary space forces develop, plan, and execute responsive JWS operations under JFC control to achieve desired effects of rapid theater response, space superiority and decision superiority to successfully accomplish operational and tactical missions in support of strategic objectives."[4] However, JWS only addresses on-orbit and near-space capabilities in development.[5] This does not resolve the ongoing debate over deployable space forces, such as CCS, which will undoubtedly be part of a growing OCS component of theater campaign plans.

Overview

To determine where we are going with the C2 of deployable space forces, it is important for the reader to understand where we have been. This chapter will first discuss command relationships in Operation Enduring Freedom (OEF), OIF, and recent exercises. The relationships and execution of the relationships have varied widely over time. Myths regarding space power are a key reason for disagreements on C2 of space forces.

To help resolve C2 issues, two myths regarding space power are addressed. The first myth asserts that space power is inherently global. The second myth, fueled by the first, dictates that space power must be centrally controlled globally by a space professional. This will frame our doctrinal discussion.

The chapter continues with a close examination of AFDD 2-2, *Space Operations*, and AFDD 2-2.1, *Counterspace Operations*. While current doctrine addresses the C2 of deployable space forces, the interpretation of the doctrine varies widely. The addition of counterspace capabilities adds a degree of urgency to resolving C2 issues. Counterspace capabilities will be able to provide key effects on the battlefield for the JFC. AFSPC has outlined a vision for counterspace in its *Strategic Master Plan (SMP) FY06 and Beyond*. It includes the newly acquired CCS and other counterspace capabilities.[6] Additionally, the *SMP* outlines a goal of full-theater integration of counterspace capabilities.[7] Is there a way to structure this vision into a concept to support theater JFCs?

JWS has the potential to improve integration of space effects into combat operations while improving responsiveness to the war fighter. Since the concept does not currently include deployable space forces, expanding it to do so will be examined in detail. Ironically, JWS has already incorporated many of the OEF and OIF lessons learned from deployable space forces, laying a solid foundation for expansion. The JWS expansion would normalize the presentation of all space forces dedicated to support the JFC through the transfer of OPCON to the JFC, which will likely be delegated to the COMAFFOR/CFACC.

Past Command Relationships

A variety of command relationships for deployable space forces, including OPCON, TACON, "split-TACON," and direct support, have been used in recent exercises and contingencies.[8] However, we have not achieved a "normalized" presentation of deployable space forces to the theater, despite the language in AFDD 2-2, which states, "When deployed, Air Force space forces are normally attached to an AETF [Air and Space Expeditionary Task Force] under OPCON of the COMAFFOR. When the COMAFFOR is also the JFACC, he may be given TACON of other Service space forces in excess of their organic requirements," thus limiting the scope of the discussion.[9] Although command relationships have been an issue for almost a decade, we will start our examination with OEF.

Operation Enduring Freedom

Command relationships for deployable space forces were an issue during preparations for OEF. Ultimately, command relationships were resolved with the development of a split-TACON relationship and ad hoc C2 procedures. The split-TACON relationship existed between deployable space forces and the CFACC, who had TACON for execution; and commander, Space Air Forces (COMSPACEAF), who had TACON for planning. Imagine the dilemma of a space-operations crew commander receiving conflicting direction from two different organizations with TACON. The OEF experience raises a couple of key questions for war fighters. Is unity of command possible with a "split" C2 re-

lationship? Is space so different that it requires new command relationships not found in our joint or Air Force doctrine?

Operation Iraqi Freedom

US Central Command Air Forces (USCENTAF) and SPACEAF discussed command relationships extensively in preparation for OIF. The CFACC requested TACON while initially, only direct support was being offered. Ultimately, TACON was determined to be the command relationship.[10] However, the coordination of roles and responsibilities between the USCENTAF, Prince Sultan Air Base (PSAB) CAOC, and the SPACEAF AOC continued well into combat operations. This ad hoc coordination of procedures, roles, and responsibilities could have been avoided had the Air Force emerged from OEF with a clear vision for C2 of deployable space forces. Similarly, different organizations took dramatically different lessons from OIF regarding command relationships. Theater AOCs continued to request OPCON/TACON, while the Space AOC maintained that direct support was the correct relationship.

One key takeaway, which all members of the space community should consider, is that the lessons-learned conferences must include all of the principal players. SPACEAF, USCENTAF, and USSTRATCOM all hosted separate lessons-learned conferences following the conclusion of OIF major combat operations. However, all three conferences lacked many of the key players from the other organizations needed to effectively work through outstanding issues or address the wide variance in space "lessons learned."[11] Widely differing accounts of C2 during OIF have emerged. The following is a post-OIF account from the Fourteenth Air Force Weapons and Tactics Division:

> The CFACC often exercises TACON of Navy, Army, and Marine assets. These assets receive C2 from the Air Operations Center where missions are planned, directed, coordinated, and controlled via an Air Tasking Order (ATO). *However, in OIF the CFACC did not command and control space assets.* In fact, during OIF, the CFACC sent guidance in the form of an Air Operations Directive (AOD) to the Space AOC. The AOD provided CFACC guidance for future operations. From this AOD, the Space AOC built a Space Tasking Order [STO], which was approved by the CFACC (SCA) and directed the employment of space forces. Additionally, all combat assessment functions were also performed at the Space AOC. Per

the establishing directive between the CFACC and Space AOC, the CFACC controlled the tempo, timing and effects of space assets. The Space AOC was responsible for the planning. The CFACC did not plan the missions; this was done by the Space AOC strategy and plans divisions. The CFACC did not task assets; this was done via the STO (which was approved by the CFACC). This then raises the question: *"If the CFACC did not plan, task, or assess these assets, what command relationship existed?"* This was, in fact, a Direct Support relationship, vice a delegation of TACON to the CFACC.[12] (emphasis added)

Space personnel who worked in the PSAB CAOC during OIF have a different perspective based on their experience and the memorandum of understanding between CENTAF and SPACEAF.[13] The CFACC exercised TACON of attached space forces during OIF. The PSAB CAOC accomplished operational-level planning, direction, coordination, and control. In addition to the AOD, the CAOC sent master air attack plan (MAAP) guidance to the Space AOC directing timing, tempo, and effects for creation of the unit STOs. The deployed unit STOs, unlike ATOs, incorporate detailed tactical-mission planning. During OIF, this tactical-mission planning was done at the Space AOC in direct support to the CFACC. However, the STO sent to the deployed units was from the CFACC and approved in the PSAB CAOC. The Space AOC was invaluable in conducting tactical-mission planning; however, this should have been transparent to the deployed units since the STO was from the CFACC. Additionally, the CFACC does not conduct tactical-mission planning for Army, Navy, or Marine assets. Space personnel in the CAOC conducted operational-level planning in coordination with Army, Navy, Air Force, and Special Operations personnel for integration of space effects and incorporated them into the AOD and the MAAP. The CFACC planned, tasked, and executed attached space forces from the PSAB CAOC in coordination with joint forces requiring effects in-theater. The PSAB CAOC also conducted operational assessment.[14] Clearly, the roles and responsibilities debate did not end after OIF.

The preceding discussion illustrates the challenges faced with C2 of deployable forces. In OEF, the relationship was split-TACON. In OIF, the CFACC had TACON, and at least some at SPACEAF believed this relationship was direct support. We

have clearly not yet achieved unity of command and unity of effort for deployable space forces.

In 2004 the Air Force Doctrine Center (AFDC) and Fourteenth Air Force conducted a series of meetings with theater leaders to discuss command relationships for deployable space forces. While providing a good dialogue, at its core there is a fundamental disagreement on the nature of space-power employment. Direct-support advocates argue, "Current C2 constructs for air, land, and sea might suffice if space power were not different from other forms of military power."[15] We see this kind of thought manifest itself in terms such as *split-TACON*. Space, air, land, and sea forces all have different characteristics and capabilities. However, after thorough review of Joint Publication 0-2, *Unified Action Armed Forces (UNAAF)*, a reader will not find different C2 constructs for air, land, and sea forces. In fact, the joint community treats global space forces like global mobility forces with global C2. In the same vein, a JFC has theater mobility assets assigned or attached and should have theater space assets assigned or attached as well.[16]

The debate over roles and responsibilities within command relationships continues today. Theaters continue to advocate for OPCON/TACON of deployable space forces, and Fourteenth Air Force continues to advocate direct support as the optimal relationship. Support is a command relationship; however, it is "by design, a somewhat vague but very flexible arrangement."[17] The supported commander will exercise general direction, but the supporting commander determines forces, tactics, methods, procedures, and communications.[18] The supporting commander takes actions to fulfill the needs of the supported forces "within existing capabilities, consistent with priorities and requirements of other assigned tasks."[19] Resolving disagreements is difficult when issues arise, since the common superior is the secretary of defense (SecDef).

Space Myths

Recent exercises have included TACON and direct-support relationships. The success or failure of these relationships depends on your point of view. However, the struggle to agree on

roles and responsibilities continues, and the lack of a normalized presentation of forces persists. This continued debate on command relationships deflects focus from the full integration of space effects into joint war fighting. While our space doctrine outlines OPCON as the "normal relationship," there has been resistance to efforts by theaters to exercise OPCON of deployable space forces. Two myths of space-power employment play a role in this resistance.

Myth no. 1: Space Power Is Inherently Global

Most of our current space capabilities are on-orbit assets and are part of global constellations. However, we must step back from the generalization that *all* space capabilities are global. The JWS concept addresses this issue and states, "JWS will drive changes to our space doctrine and drive us to reconsider the 'all space is global' dogma."[20] Additionally, our current space doctrine recognizes that there are different types of space forces: global space forces, theater space forces, and theater organic space forces.[21]

Theater space forces, such as our deployable counterspace forces, need to become an organic part of the JTF as effects providers. For example, a JFC planning a campaign requests the CCS to disrupt adversary communications.[22] Assume that prior to planning this operation the CCS was in Colorado Springs waiting for a deployment order. Once deployed, the CCS successfully disrupts required communications as an integral part of the JFC's plan. Following the operation, the CCS returns to Colorado Springs to wait for the next theater requirement. TSgt James Logan of the 76th Space Control Squadron stated that, "it [CCS] is a mobile, no-kidding tool that will be deployed—if needed—to assist theater commanders."[23] The CCS will deploy when required to meet theater requirements and will likely support a single theater. Thus, CCS is a theater space force, not a global space force.

Myth no. 2: Space Power Must Be Centrally Controlled Globally by a Space Professional

This myth is included in Maj M. V. Smith's work, *Ten Propositions Regarding Spacepower*, as proposition no. 4.[24] A variation

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of this is included in Maj Samuel McNiel's work, *Proposed Tenets of Space Power*, as tenet two.[25] While most space forces are global in nature and require centralized control, not all space-power assets require this global control. We must shift our paradigm, and JWS is starting this shift: "Any assumption that JWS assets must be centrally controlled by commanders outside the supported JFC's area of responsibility (AOR) is counter to this concept. We must think outside the box."[26]

Operation Torch and the Battle of Kasserine Pass taught us valuable lessons about unity of command and the value of centralized theater C2.[27] This is exactly what theater commanders want, centralized theater C2 of space assets launched or deployed specifically to support their operations. However, global space power advocates will argue that with space power we must replace *theater* with *global* and control all space forces on a global basis to prevent inefficient space "penny packets."[28] This argument relies on myth no. 1: space power is inherently global—and is demonstrably false.

Space assets are not alone in their ability to create combat effects in multiple AORs. An F-15E Strike Eagle could strike targets in multiple AORs on a single mission. This does not affect its change of operational control (CHOP) to a JFC when required for combat in a theater. So why are we creating a different standard for space forces? We do not plan and execute air operations with global C2 because an F-15E has the capability to drop munitions in more than one theater, or was apportioned for planning in more than one operations plan (OPLAN). So why should we treat space differently? The CCS has much more in common with an F-15E than with the GPS constellation. The CCS will likely deploy to support a single theater, as compared to the GPS supporting all theaters continuously. The employment of the F-15E or CCS may cause collateral, secondary, and/or tertiary effects in other AORs. In our global information age, the ability to keep effects from crossing AOR boundaries is nearly impossible—kinetically or nonkinetically.

Another often-cited reason for centralized control is the high demand/low density of space forces.[29] Will deployable space forces, such as the CCS, be high-demand assets with combat requirements in multiple AORs at the same time? It is too early to tell, but as we field dedicated capabilities, we must ensure

forces are available to support our 1-4-2-1 *NMS* with dedicated assets.[30] Not all space forces are the same, and our emerging deployable, near-space, and tactical on-orbit capabilities must not be forced into an "all space is global and must be centrally controlled" package. Can our space doctrine guide us?

Space Doctrine

AFDD 1 states, "Air and space doctrine is a statement of official sanctioned beliefs and war-fighting principles that describe and guide the proper use of air and space forces in military operations."[31] It also shapes "the manner in which the Air Force organizes, trains, equips, and sustains its force."[32] However, in our space doctrine, it is unclear what the official belief is regarding the C2 of deployable space forces. This lack of clarity impacts how the Air Force organizes, trains, equips, sustains, and employs deployable space forces.

AFDD 2-2, *Space Operations*

AFDD 2-2 is ambiguous enough that it provides commanders little help in establishing command relationships for deployable space forces. Consider this statement from AFDD 2-2: "When the effects are focused primarily on an individual theater [requirements], space forces are normally the responsibility of the theater CINC [geographic combatant commander (GCC)]. These forces can produce strategic, operational or tactical effects."[33] To a theater war fighter, this passage supports a CHOP to theater. In our evolving EBO culture, deployable systems such as CCS can generate critical effects against difficult target systems.

Counterspace systems may be used instead of, or in conjunction with, other kinetic and nonkinetic capabilities to create desired effects. Brig Gen David Deptula writes, "As technological innovation accelerates, 'nonlethal' weapons and cyberwar, enabled by information operations, will become operative means in parallel war."[34] The approval and coordination process should account for collateral, secondary, and/or tertiary effects of employment if it will affect other AORs. However, the war-fighting effects can be focused on the individual theater.

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AFDD 2-2 also states,

> USCINCSPACE [Commander, USSTRATCOM (CDRUSSTRATCOM)] would retain OPCON if the deployable space force operation will have global impacts. If the space force's operation only impacts that individual theater, the NCA [President of the United States (POTUS)/SecDef] may direct USCINCSPACE [USSTRATCOM] to transfer the space forces to the geographic CINC [GCC]. *The normal relationship will be OPCON, however, a TACON or support relationship may be appropriate depending on the ability of the theater commander to conduct space operations planning.*[35] (emphasis added)

From our previous discussion on the myth that space is inherently global, we can see how this passage is used to cite why deployable space forces should not be transferred to theater. Some war fighters view any impact (including collateral, secondary, and/or tertiary effects) outside an individual theater as a global impact.

AFDD 2-2 uses the words *effects* and *impacts* somewhat interchangeably. Given our effects-based culture and focus, using *effects* is appropriate. Consider the above passage rewritten in clearer language: CDRUSSTRATCOM would retain OPCON if the space force is deployed by the POTUS/SecDef to provide required effects in multiple theaters. If deployed to provide required effects in an individual theater, the POTUS/SecDef will likely direct USSTRATCOM to transfer the space forces to the GCC. The normal relationship will be OPCON.[36] This language would provide the officially sanctioned and unambiguous belief that if we deploy space forces to provide required effects to an individual theater, they should be OPCON to the JFC they are supporting. The other theaters, which deployed space forces may affect, should be involved in the coordination process, but their involvement does not prevent the transfer of OPCON. Unfortunately, many of the ambiguities from AFDD 2-2 are expanded in our new counterspace doctrine, AFDD 2-2.1.

AFDD 2-2.1, *Counterspace Operations*

The growing importance of counterspace operations in modern warfare became clear on 2 August 2004 with the publication of AFDD 2-2.1. This document "provides operational guidance in the use of air and space power to ensure space superiority."[37] While the C2 section is ambiguous and subject to inter-

pretation, this document addresses key planning issues, including an effects-based approach, legal considerations, course of action (COA) development, targeting, deconfliction, approval authority, rules of engagement (ROE), and assessment. There is also a chapter dedicated to C2 of counterspace forces that includes the decision tree as shown in figure 3.1.
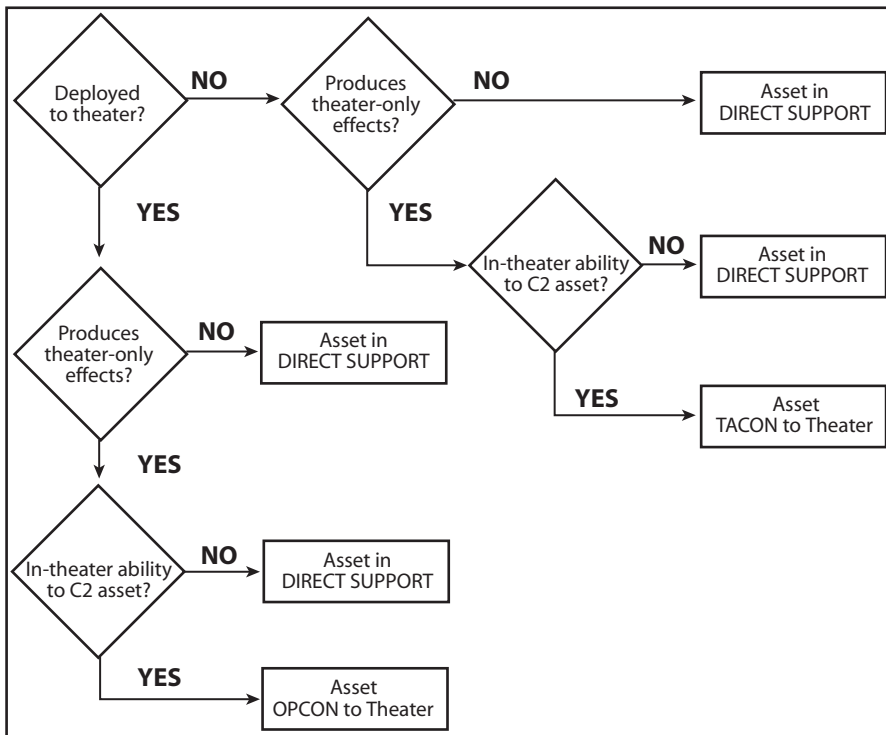
Figure 3.1. C2 decision tree for control of space assets in theater operations. (*Reprinted from* AFDD 2-2.1, *Counterspace Operations*, 2 August 2004, 16.)

The decision tree has three decision questions: (1) deployed to theater? (2) produces theater-only effects? and (3) in-theater ability to command and control assets? These questions are at the core of the debate over C2 of deployable space forces, and senior leaders in-theater and in the space community answer these questions differently based on their perspectives.

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Deployed to Theater? Based on the decision tree, if the asset is not in-theater, USSTRATCOM would not transfer OPCON. For instance, if the United States Central Command (USCENTCOM) required a counterspace asset and the asset deployed to the USEUCOM AOR to support USCENTCOM, USSTRATCOM would not transfer OPCON. However, this is not consistent with Air Force doctrine. As highlighted in Doctrine Watch #3 on OPCON, "Forces bedded down in one CINC's AOR but conducting operations in support of a different CINC should be OPCON to the CINC charged with the operational mission (the supported commander)."[38] This question should be removed from the decision tree.

Produces Theater-Only Effects? What should we consider as theater-only effects? Theater commanders can interpret this as producing required effects for an individual theater. Others interpret theater-only effects as no collateral, secondary, or tertiary effects in other theaters. However, space forces are far from unique in their ability to create effects that cross AOR boundaries. Does the kinetic destruction of a phone switch in Baghdad or a Marine killing an unarmed insurgent in Fallujah, on satellite TV, create effects outside USCENTCOM? Yes. In our global information age, it is almost impossible for the United States to conduct military operations without effects spilling across AOR boundaries.

Effects across AOR boundaries are not a space issue; they are a warfare issue. The other GCCs and the Joint Staff/OSD must be involved in coordination to ensure they are aware of possible effects in other AORs. This coordination applies to all joint forces, not just space forces. A better question for the decision tree would be: Is the asset producing required effects for an individual theater?

In-Theater Ability to Command and Control Assets? OEF and OIF have demonstrated the capability to C2 space forces in-theater. During these conflicts, operational-level planning and execution was conducted in the CENTAF PSAB CAOC. Theater space-integration efforts have increased dramatically over the past five years. Permanent-party space integration in the AOCs began with W13S (Space Weapons Officers [SWO]) and has expanded to include 13S (Space Operators) and 1C6 (Enlisted Space Technicians). In 2001 the United States Air

Forces in Europe (USAFE) AOC had two W13S, one 13S, and two 1C6 personnel. In 2004 the USAFE AOC had three W13S, six 13S, and five 1C6 personnel.[39] The Air Force has also focused on getting qualified and trained personnel in the Falconer AOCs. Great strides have been made at improving the training and experience of space operators assigned or attached to Falconer AOCs.[40] Prior to OIF, Maj Gen Franklin J. "Judd" Blaisdell, HQ USAF/XOS, stated, "The Air Force has very highly qualified personnel embedded in our various Air and Space Operations Centers and Combined Air and Space Operations Centers around the world. . . . So you've got great people, a weapons school, qualified individuals that are right there with your air component and space component commanders."[41] Air Force Space Command also has an air expeditionary force (AEF) augmentation program to provide theaters with qualified 13S and 1C6 space operators to meet requirements. W13Ss across the Air Force are postured to deploy, when required, to support contingency requirements.

Traditionally, Falconer AOC space personnel have been O-4 (Major) and below. During OEF and OIF, an SSO was deployed to the CAOC to advise the CFACC. This position has evolved into the DIRSPACEFOR position, which is outlined in AFDD 2.2-1. A responsibility of this position is to "direct and monitor, on behalf of the COMAFFOR/JFACC, space forces and capabilities assigned or attached to the COMAFFOR/JFACC."[42] However, should an advisor "direct" space forces? Space personnel in the AOC are not in the chain of command of the DIRSPACEFOR, and there is certainly potential for confusion regarding the roles and responsibilities of the DIRSPACEFOR. However, in OIF, the SSO (now DIRSPACEFOR) proved invaluable to the CFACC and the space personnel in the AOC, working big-picture issues for the CFACC, such as the SCA delegation. This relieved AOC space personnel of these issues and allowed them to execute their divisional responsibilities. Space personnel are key integrated pieces of the theater AOCs, but do they have the equipment to C2 space forces?

C2 obviously requires a means to communicate. During OEF, a combination of phone, fax, and SIPRNET was used to communicate with attached forces. In OIF, InfoWorkSpace, a key initiative from Joint Expeditionary Force Experiment (JEFX)

'02, provided another means of connectivity.[43] It also provided an additional avenue for *reachback* (behind frontline support) and collaboration. While theaters still lack tactical-planning equipment for deployable space forces, additional tools are in development to further enhance equipment in theater AOCs, including the single integrated space picture (SISP). However, while enhanced equipment will improve theater C2 capabilities, it will also threaten established roles and responsibilities. Col Dwight Miller, vice commander of Fourteenth Air Force, recently stated, "Some people might be tempted to think that if they have a SISP that they can do all of this in-theater with a couple of captains. But because space remains inherently global and supporting multiple theaters simultaneously, the full space effects will still be orchestrated here in the Space AOC."[44] A new operating concept may break the back of the "all space is global" dogma and provide expeditionary space capabilities from on-orbit, near-space, and deployable space forces.

Fork in the Road

A decision on the future of space-operations integration in joint warfare is upon us, and we find ourselves at the proverbial fork in the road. Should we treat space assets supporting the requirements of a single theater just like other assets and CHOP them to theater? Or, should we centrally control all space forces with global C2 through a direct support relationship with the theater(s)? The answer should be based on what best supports the requirements of JFCs.

Doctrine can guide us, as outlined in the *UNAAF*, "C2 of joint operations begins by establishing unity of command through the designation of a JFC with the requisite authority to accomplish assigned tasks using an uncomplicated chain of command."[45] The transfer of OPCON to the JFC, likely delegated to the COMAFFOR/JFACC, will provide the unity of command and unity of effort required for the most effective integration of deployable space forces. Roles and responsibilities are clear, and there is an uncomplicated chain of command for deployed unit planning and execution. AFDD 2-2 has it right, "The normal relationship will be OPCON."[46] The AFSPC *SMP FY06 and*

Beyond presents a vision for the future of deployable counter-space forces.

The *SMP* articulates three strategic goals for counterspace mission-area planners: (1) dominant counterspace capabilities, (2) a balanced mix between space-based or terrestrial (air and surface) forces, and (3) full-theater integration. Full-theater integration would resolve most, if not all, of the outstanding issues. The theater COMAFFOR would plan for counterspace effects, synchronize counterspace effects with joint forces, task counterspace forces directly from theater operations centers, adjust operations during execution, and integrate counterspace feedback into combat/operational assessment. In short, the theater COMAFFOR would plan, synchronize, task, execute, adjust, and assess counterspace operations.[47] While it does not specifically address the command relationship, this is consistent with OPCON/TACON to the theater COMAFFOR. Additionally, Gen Lance Lord, commander of AFSPC, recently said, "We want . . . space to be employed like any other theater asset."[48] General Lord and the AFSPC *SMP* have provided the vision, but the hard work is turning the vision into reality. The expansion of JWS, to include deployable space forces, is the right concept at the right time to place a robust complement of war-fighting capabilities under JFC control.

Joint Warfighting Space

The JWS concept developed by AFSPC is a visionary work, which seeks to make space an organic part of JTFs in-theater. It seeks to do this by "optimizing existing space capabilities and developing/employing improved space and near-space systems."[49] There are six attributes outlined in the JWS concept: (1) Responsive—trained, ready, and deployable space forces; (2) Integrated—integrates with air, land, sea, and information forces; (3) Dedicated—when JWS forces CHOP to a JFC, they become dedicated theater assets; (4) Expeditionary—rapidly deployable, employable, and sustainable; (5) Interoperable and Networked—compressed kill chains through networking; and (6) Precision—high level of precision required to produce precision effects.[50]

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While deployable space forces are not currently part of the JWS concept, these attributes apply to them as well.

JWS will operate an expeditionary space construct within our current AEF construct.[51] Since space is not so different, effective C2 of space forces can be conducted within existing command relationships and C2 constructs. However, because the current JWS concept fails to address deployable forces, it sets the stage for a scenario where a JFC may have OPCON of an on-orbit asset dedicated to supporting an operation but not have OPCON of a deployable asset sitting outside the command center, also dedicated to supporting operations.

JWS addresses a critical shortfall in the current space architecture by providing dedicated and responsive space forces. Currently, the JFC and JFACC compete against other theaters and national requirements for space assets. Gen John P. Jumper's white paper points out that JWS "takes operational and tactical level warfighting priorities out of competition with strategic priorities."[52] In the past, competition with strategic priorities led to some overall inefficiencies and duplication of efforts. For instance, a JFACC may request space support, which competes with other theaters or national requirements. Since the request may not have a high enough priority to guarantee support, a theater asset may also be tasked. In the future, with dedicated JWS assets, a JFC/JFACC will be able to select the optimal dedicated assets to produce the required effects. The optimal solution may be kinetic or nonkinetic; however, the JFC will have more tools at hand.

Expansion of Joint Warfighting Space

The AFSPC *SMP FY06 and Beyond* outlines a vision for counterspace, which includes full-theater integration.[53] However, given the varying interpretations of current space doctrine, it is difficult to picture how we will execute this vision. While JWS was born under a slightly different context, the overarching concept and key attributes facilitate rapid and effective incorporation of deployable space forces. This expansion would provide a JFC with a range of on-orbit, near-space, and deployable space

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forces that would be dedicated and responsive to theater requirements. There are clear benefits to expansion of the concept.

Unity of Command

Deployable space forces in an expanded JWS construct would CHOP to the JFC—likely delegated to the COMAFFOR/JFACC. They would be part of an AETF, in a space expeditionary wing (SEW) or space expeditionary group (SEG). For example, the SEG would be composed of a group command element and one or more squadrons. A key component of the SEG would be a mission planning cell (MPC), responsible for tactical-level mission planning based on the theater ATO/integrated tasking order (ITO). Operational- and tactical-level planning and execution would thus reside under a single chain of command, ensuring the unity of command of JWS forces under the JFC. This is a normalized presentation of forces and provides the uncomplicated chain of command outlined in the *UNAAF*.

Standardized Training and Execution of Forces

Resolving the command relationship issue and providing a normalized presentation of forces would allow long-standing training and execution issues to be resolved and standardized. Joint training is traditionally an OPCON function.[54] Prior to OIF, the CFACC conducted joint training events with attached deployable space forces to ensure they were prepared for operations. This training was beneficial and worked out many C2 procedural issues prior to combat operations. As we normalize to an OPCON presentation of forces, standardized AOC and unit training will help ensure forces are prepared for a baseline C2 architecture. An additional dividend will be ongoing training that should occur between JWS units and theater AOCs.

Out-of-cycle training exercises between JWS units and theater AOCs will be necessary to enhance unit and AOC effectiveness and readiness for combat operations. Additionally, AFSPC can effectively organize, train, and equip its forces for CHOP to theater, and provide invaluable assistance in developing training programs and leading attempts to standardize efforts between the theaters. JWS captures the importance of training. "The 'train as you fight' philosophy must be extended to rou-

tinely include JWS forces to operationalize space as core versus specialized capabilities."[55] InfoWorkSpace can facilitate training with CONUS-based units as part of quarterly AOC training events. CONUS-based space forces do not have to deploy to work through C2 scenarios, which are very important to the effective employment of space assets.

Dedicated Assets

Deployable space forces will be valuable contributors as an organic part of the JTF. When a JFACC requires the disruption of a critical military communications link, there may be several kinetic and nonkinetic options available. If the JFC/JFACC has OPCON/TACON of the various options, theater planners can find the optimal solution and have the ability to execute it directly with assigned or attached forces. In a direct support relationship, the supporting commander with TACON of counterspace assets may have other priorities and requirements within the assigned tasks, which could prevent the required support from occuring in a timely manner.[56] Thus, the JFACC may have to plan to use other kinetic or nonkinetic options to ensure the desired effects are achieved, even if a deployable counterspace system is the best solution. The proper execution of the JWS can ensure that space assets are optimally contributing to the JFC's efforts.

Trained Personnel to Augment Theater AOCs

Deployable forces, including counterspace forces, are almost certain to be critical components of future theater campaign plans. As discussed earlier, Falconer AOCs have dramatically increased the number of assigned space personnel. However, to effectively plan, task, and direct deployable forces for CHOP to the COMAFFOR/JFACC, additional trained and experienced personnel will be required. JWS can provide these qualified personnel to augment the Falconer AOCs, when required.

JWS personnel will not be liaisons; they will be working for the JFACC. One critique of the current JWS construct suggested—while it mentions permanent-party space personnel—it should address the integration of JWS personnel with permanent-party personnel. Policy should designate JWS per-

IT ISN'T SPACE, IT'S WARFARE!

sonnel to become integral parts of the various Falconer AOC teams, where they will work with permanent-party space personnel to ensure the optimal application of space-force capabilities to create war-fighting effects. Issues with JWS expansion also exist.

Increased Footprint In-Theater

The Air Force made a concerted effort over the past several years to reduce the forward *footprint* (amount of personnel and resources physically present) of AOCs during conflicts. One could certainly argue about the effectiveness of Air Force efforts—considering the more than 1,500-person CAOC during OIF. However, of those 1,500 Airmen, less than 20 were space operators. JWS will increase the space presence in the AOC at a time when the Air Force is attempting to reduce overall numbers. The CHOP of deployable space forces will further increase JWS numbers deploying into the AOC. Perhaps this is looking at the glass half empty.

The Air Force went to great lengths to be inclusive of space operations, and AOCs are now referred to as "air *and space* operations centers." To become true air and space operations centers—a more robust space presence—to support counterspace and overall space support is a move in the right direction for the Air Force and the space community. JWS will require increased AOC space manpower within limited manpower constraints, moving the Air Force beyond the "replace 'air' with 'air and space' mentality." This not only provides graphic evidence of the force-enhancement functions of space but also recognizes the new effects space forces will create on the twenty-first-century battlefield. Additionally, experience gained while working with joint military planners and operators will help build the warrior culture desired in the space community and aid the transition from AFSPC to Space Combat Command.

Expansion of JWS Will Likely Slow JWS Approval

"The Operating Concept for JWS" is currently in draft form, and the rewriting and restaffing required will likely slow the approval of the overall concept. Since the expansion includes the C2 of deployable space forces, the coordination process inside

and outside AFSPC could be lengthy. However, there is a positive to the concept still being in draft form.

The draft status of "JWS" provides the opportunity to expand the concept now and expedite resolution of this long-standing issue. Deployable space forces are more mature platforms than future JWS on-orbit and near-space capabilities and can lay a solid foundation for the C2 of future JWS forces. The concept also calls for JWS to provide immediate and near-term capabilities to support JFC needs, which deployable space forces can provide.[57]

USSTRATCOM Position Unknown

USSTRATCOM is currently undergoing a significant reorganization, to include the establishment of the joint space operations center (JSpOC). The Fourteenth Air Force commander has the lead in development of the JSpOC, and initial operational capability was targeted for 1 April 2005.[58] USSTRATCOM's position on how much control it should retain of JWS forces—in particular, deployable space forces—will have an impact on the overall viability of JWS expansion. JWS currently addresses USSTRATCOM Unified Command Plan responsibilities to provide day-to-day global support to unified commanders.[59] USSTRATCOM's position on the CHOP of forces to theater in the JWS concept is unknown.

USSTRATCOM and Components Remain Indispensable

While some on-orbit, near-space, and deployable space forces may CHOP to theater with JWS, USSTRATCOM and its components remain indispensable to the theater war fighter. Assistance with COA development, intelligence, deconfliction, and assessment will be key USSTRATCOM roles in an expanded JWS for deployable space forces. JWS does not seek to recreate the Space AOC/JSpOC in each individual theater. However, it does bring the required footprint forward to conduct operational- and tactical-level planning and execution of JWS forces. USSTRATCOM maintains its global space role and provides critical reachback support to theaters. Global centralized C2 through the JSpOC and national agencies will continue for the vast majority of space forces.

Conclusion

An expanded JWS concept has the potential to revolutionize the integration of space operations in-theater. Global space forces will remain essential to effective JTF operations, while JWS will provide a range of space capabilities dedicated and responsive to the specific requirements of the JFC. An expanded JWS will execute the AFSPC *SMP* as we move beyond the ambiguous doctrine and infinite loop of discussions on roles and responsibilities to execute a concept that recognizes the global and theater perspectives of space power employment.

This chapter examined the experiences of recent exercises and contingencies and illustrated a variety of relationships that have been used with deployable space forces. These included OPCON, TACON, split-TACON, and direct support. However, a shared belief on C2 relationships has been elusive. Unfortunately, the lessons learned have rarely been the same inside and outside the space community. All parties must work together to give future lessons-learned conferences a chance to succeed.

Two myths of space power employment were examined. The first myth asserted that space power was inherently global. While we often think of space forces as on-orbit satellites, there are also deployable space forces, which can deploy and support individual theaters. Thus, space cannot be pigeonholed with a one-size-fits-all "space is global or else" mentality. The current JWS concept is addressing this issue, and it recognizes the need to step back from the space is global dogma. The second myth, built upon the first, dictated that space power must be centrally controlled globally by a space professional. An asset deployed or launched for the specific purpose of supporting a theater JFC is not a global asset and is not being broken into inefficient penny packets. The JFACC can optimize use of dedicated space forces when the forces CHOP to the JFC.

The fork in the road is upon us, and a decision is essential that ensures space is not a different, difficult, and classified sideshow under the big tent of joint-force employment. We should not draw back into global operations centers due to the beliefs of some that "space is different" and "current C2 constructs won't work." The answer is to expand JWS to meet the

needs of JFCs by providing dedicated and responsive on-orbit, near-space, and deployable space forces as an organic part of JTFs. The benefits to our war-fighting effectiveness and emerging warrior culture will be immeasurable.

Notes

1. AFDD 2-2, *Space Operations*, 27 Nov 2001, 23.
2. Lt Col Brian E. Fredriksson, "Space Power in Joint Operations: Evolving Concepts," *Air and Space Power Journal* 18, no. 2 (Summer 2004): 86.
3. John A. Tirpak, "Securing the Space Arena," *Air Force Magazine* 87, no. 7 (July 2004): 34.
4. Col Steven R. Prebeck, "Operating Concept for Joint Warfighting Space (JWS)," Draft, HQ AFSPC/XO, 10 Nov 2004, 5.
5. Gen Lance W. Lord, briefing to Gen John P. Jumper, subject: Joint Warfighting Space Update, 21 December 2004.
6. AFSPC, *Strategic Master Plan FY06 and Beyond*, 1 Oct 2003, 25.
7. Ibid., 23.
8. In OEF the CFACC had TACON for execution, and COMSPACEAF had TACON for planning. This was called split-TACON.
9. AFDD 2-2, *Space Operations*, 52.
10. Maj Mark Main, "An Examination of Space Coordinating Authority and Command Relationships for Space Forces" (unpublished paper, Fourteenth Air Force Weapons and Tactics Division, Vandenberg AFB, CA), 7.
11. The personnel at CENTCOM Forward and in the CENTAF CAOC working deployable space force C2 were not invited/did not attend the STRATCOM and AFSPC/Fourteenth Air Force lessons-learned conferences. The CENTAF conference included representation from AFSPC/Fourteenth Air Force/deployed units. However, the representatives from Fourteenth Air Force were not the primary interfaces with CENTAF during OIF. The primary interfaces were the Fourteenth Air Force Strategy Division, Combat Plans Division, and Combat Operations Division chiefs who did not attend.
12. Main, "Examination of Space," 9.
13. There was not an establishing directive between CENTAF and SPACEAF during OIF. A memorandum of understanding was coordinated.
14. This synopsis is based on discussions with personnel assigned to the PSAB CAOC during OIF and discussions at the CENTAF lessons-learned conference.
15. Fredriksson, "Space Power in Joint Operations," 3.
16. AFDD 2-6, *Air Mobility Operations*, 16.
17. JP 0-2, *Unified Action Armed Forces* (*UNAAF*), 10 July 2001, III-9.
18. Ibid.
19. Ibid., III-10.
20. Prebeck, "Operating Concept for JWS," 3.
21. AFDD 2-2, *Space Operations*, 26.

22. Adam J. Hebert, "Toward Supremacy in Space," *Air Force Magazine* 88, no. 1 (January 2005): 26, http://www.afa.org/magazine/jan2005/0105space .asp.

23. Ibid.

24. Maj M. V. Smith, *Ten Propositions Regarding Spacepower*, Fairchild Paper (Maxwell AFB, AL: Air University Press, October 2002), 53.

25. Maj Samuel L. McNiel, "Proposed Tenets of Space Power: Six Enduring Truths," *Air and Space Power Journal* 18, no. 2 (Summer 2004): 76.

26. Prebeck, "Operating Concept for JWS," 4.

27. Smith, *Ten Propositions Regarding Spacepower*, 54.

28. Ibid. *Penny packets* is a term used to describe the almost worthless value of airpower when divided amongst ground units. Arthur Coningham, "Development of Tactical Air Forces," *RUSI Journal*, May 1946, 215. Within the space context, global space power advocates believe splitting space forces between theaters can cause space power to be used inefficiently.

29. Fredriksson, "Space Power in Joint Operations," 3.

30. Gen Richard B. Myers, *National Military Strategy of the United States of America, 2004*, 18. The numbers 1-4-2-1 stand for **1** defend the homeland, deter forward in and from **4** regions, conduct **2** overlapping "swift defeat" campaigns, and win **1** decisively.

31. AFDD 1, *Air Force Basic Doctrine*, 17 Nov 2003, 3.

32. Ibid.

33. AFDD 2-2, *Space Operations*, 24. The addition of requirements is based on the context of the preceding paragraph of the same section. "When the effect of employing space assets impacts national or multiple theater requirements, a centralized structure for C2, maintained by USCINCSPACE is best." (ibid.)

34. Brig Gen David A. Deptula, *Effects-Based Operations: Change in the Nature of Warfare* (Arlington, VA: Aerospace Education Foundation, 2001), 22.

35. AFDD 2-2, *Space Operations*, 28. The DOD merged USSPACECOM with USSTRATCOM on 1 October 2002.

36. Ambiguous and inconsistent language makes the coordination of command relationships more difficult rather than providing a guide that can help quickly establish the proper relationships.

37. AFDD 2-2.1, *Counterspace*, 2 Aug 2004, ii.

38. Doctrine Watch #3: *Operational Control (OPCON)*, 4 Nov 1999, https:// www.doctrine.af.mil.

39. The author was a USAFE space functional area manager.

40. *Falconer* is the designation for theater AOCs for USAFE, PACAF, CEN-TAF, SOUTHAF, and United States Forces in Korea. Fredriksson, "Space Power in Joint Operations," 90.

41. Scott R. Gourley, "Space Warriors," *Military Geospatial Technology* 2, no. 2 (22 Jul 2004), http://www.military-geospatial-technology.com/article .cfm?DocID=553.

42. AFDD 2-2.1, *Counterspace*, 14.

43. InfoWorkSpace is software that provides a collaborative tool. It makes available voice, chat, and file-sharing for authorized users on secure net-

works. This tool was used extensively during OIF, including with deployable space forces.

44. Gourley, "Space Warriors."

45. JP 0-2, *UNAAF*, xiii.

46. AFDD 2-2, *Space Operations*, 28.

47. AFSPC, *Strategic Master Plan*, 23.

48. MSgt Julie Briggs, "Near Space Enhances Joint Warfighting," *Air Force Print News*, 18 February 2005, https://www.af.mil/news/story.asp?storyID= 123009865.

49. Prebeck, "Operating Concept for JWS," 9.

50. Ibid., 10.

51. Ibid., 9.

52. Gen John P. Jumper, "White Paper on Joint Warfighting Space," 8 January 2004, 2.

53. AFSPC, *Strategic Master Plan*, 23.

54. JP 0-2, *UNAAF*, III-8.

55. Prebeck, "Operating Concept for JWS," 14.

56. JP 0-2, *UNAAF*, III-10.

57. Prebeck, "Operating Concept for JWS," 2.

58. Gen Lance W. Lord, AFSPC/CC, to distribution, memorandum, 2 March 2005.

59. Prebeck, "Operating Concept for JWS," 4.

Chapter 4

Space Expeditionary Power

A Polemic Strategy for
Space Forces Integration

Maj Patrick A. Brown, USAF, and
Maj John F. Duda, USAF

Tradition rests on a foundation of great deeds done together in the past. A keystone of Air Force tradition is the Aug. 1, 1943, bombing attack on oil refineries at Ploesti, about 30 miles north of Bucharest, Romania. That mission stands as a monument not only to the skill and courage of Air Force crews but also to the ability of our combat leaders to pull together strands of a broken plan and salvage limited success from the apparent certainty of disaster.

—John L. Frisbee

The 328th Weapons Squadron originates from the 328th Bombardment Squadron (Heavy), 93rd Bombardment Group, activated 1 March 1942. Known as the *Traveling Circus*, the 93rd "took the show on the road" with three major deployments outside of England during World War II.[1] Flying the B-24 Liberator, the most notable deployment for the 93rd and 328th was Operation Tidal Wave in 1943. Shortly after dawn on 1 August 1943, 177 US Army Air Forces (AAF) B-24s took off from bases in Libya and headed toward the heavily defended target, deep inside enemy territory a thousand miles away. The target was the Ploesti oil fields in Romania, estimated to be supplying 60 percent of Germany's crude oil requirements. Overall damage to the target was heavy; however, the cost was high. Of 177 planes and 1,726 men who took off on the mission, 54 planes and 532 men failed to return. Today the 328th continues its expeditionary mind-set by maintaining mobility status of all personnel, ready for short-notice deployments.

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The instructors at the 328th and the weapons school are some of the most sought-after air- and space-integration experts for major contingency and exercise deployments. The combined squadron expertise on theater combat air forces (CAF) C2, space control employment, and squadron-level operations sets it apart from most organizations. Collectively, squadron personnel have participated in dozens of operations, including OAF, OEF, and OIF; exercises Terminal Fury, Ulchi Focus Lens, Internal Look, and Austere Challenge; and numerous Blue Flags, to name but a few. Every member of the squadron is ready to deploy to a stateside or theater AOC and contribute in any combat operation, plan, or strategy division position with equal skill. The collective CAF expertise and expeditionary readiness of the 328th is the foundation of this chapter, which examines the expeditionary readiness of AFSPC forces.

AFSPC has made great strides in training personnel to fulfill expeditionary roles in command posts and AOCs around the world, and several deployable units were engaged during the most recent conflicts. Yet, AFSPC has not exhibited an expeditionary mind-set. This chapter analyzes these issues in an attempt to find a suitable framework to increase a "space expeditionary force" mind-set within AFSPC to prepare forces for the next major AEF deployment. Implementation of a space expeditionary force strengthens the bonds of AFSPC to the CAF; produces a more competent war fighter; significantly improves space force employment and support to CCDRs; and overall, resolves unity of effort and command issues plaguing the C2 of deployed space forces. Specifically, the proposed construct ensures deployable space assets continue to be led by AFSPC personnel in the deployed environment. It recommends a deputy COMAFFOR for space combining with the current DIR-SPACEFOR construct and an SEG or SEW with an MPC and space expeditionary squadrons attached to the AETF.

Onward from the Past

Some have likened the impetus for this study and attendant conference as the twenty-first-century equivalent of the Air Corps Tactical School at Maxwell Field during the interwar

years, whose motto *Proficimus More Irretenti* (We make progress unhindered by custom) might well describe space weapons officers. Instead of the "bomber mafia" advocating for the future of airpower and airpower doctrine, now the "space patch mafia" does the same within the space career field. Openly warned of certain career suicide, these officers continue to push the bounds of space integration to the CAF and are quietly "infecting" AFSPC from within. While the SWO will be the first to discount the "mafia" tag and this antagonistic label, the reality is the SWO sometimes thinks and acts in many ways diametrically opposed to the current AFSPC career-officer culture. Consequently, the clash of Carl von Clausewitz's fascinating trinity: a dynamic, inherently unstable interaction of the forces of violent emotion, chance, and rational calculation, is inevitable.[2] Enmity between theater space officers and AFSPC space officers over force-employment policy has built over time. The theater space officer employs a theater model, attempting to make new ideas work, breaking AFSPC Cold War–based strategic paradigms and making enemies in the process. At what cost though? Certainly, improved space integration at the theater level is a positive result. SWOs will continue to push the limits of space integration and employment; however, they must find more inclusive strategies. Breaking down the walls between theater space officers and leadership, and placing the correct emphasis on cohesion and effects-based decision making is the answer.

Space Integration in the Recent Past

The past four years provide a wealth of data to examine space integration. Space personnel and equipment deployed for OEF, Noble Eagle, and OIF. Numerous exercises, including Blue Flag, Enable Freedom, and Terminal Fury, represent major space-integration events, each yielding further lessons observed and keys to the future AFSPC expeditionary construct. In many cases, SWOs led the way in space integration at the theater level and were a major force for change and development of C2 tactics, techniques, and procedures. While most space assets are global in nature and rightly executed from in-place AFSPC

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units, several units deployed in support of OEF and OIF, with weapons officers providing tactical C2 for the CFACC. Despite all this, lessons learned from these same officers unabashedly reflect an unorganized force structure and missing layers of leadership within the deployed space forces and at the CAOC. For example, an SSO was deployed to the PSAB CAOC to serve as advisor to the CFACC. Although SWOs integrated successfully into CAOC divisions, they lacked a lieutenant colonel SWO or space officer within the divisions to interface with the SSO. The same can be said with deployable space forces. The deployed squadron commanders lacked a deployed wing- or group-level leader or wing/group planning element. All leadership functions were through reachback to AFSPC. This lack of structure posed many problems with communication and coordination of actions not argued in this chapter.

During OEF and OIF, direct integration between space and air operations was evident at every level in all operations. The CAOC combat operations space cell actively supported CSAR, TMD, and daily combat operations. Space personnel in combat plans and strategy ensured space was integrated into strategy at the inception and as attack plans were developed. Further, the concepts of operation and operations orders for deployable space forces were also developed in-theater. Space forces were directly supporting air and information operations throughout these conflicts. The same could be said for exercises. However, serious issues arose on how space should be integrated at the theater level. Who was the final authority? Who assumes inherent risks? What was the SSO's role in planning and execution? A space leader recently stated that the end state for supporting space operations "must be for planners to bring space to the fight, rather than integrate it into the fight."[3] Agreeing with this statement, SWOs have been integrating and fighting to bring space to the fight for some time. It is now time for AFSPC to resolve its issues with force presentation and command relationships in order to bring the rest of AFSPC to the fight and, overall, solve unity of command and effort issues. Once resolved, development of deploying forces can receive full consideration.

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Issues and Solutions to Command Relationships

Serious issues and challenges with command relationships of space forces arose during the planning for OEF. Shortly following 9/11, US Central Command Air Forces (USCENTAF) deployed to the PSAB CAOC, and space units deployed to support the contingency. When CFACC personnel presented expected command relationships, disagreement ensued over the proper structure. In the end, a split-TACON between planning and execution emerged. In after-action reports most agreed that split-TACON was doctrinally unsound and required a solution before the next engagement. During OIF planning, AFSPC argued for complete control of deployed space forces, while theater personnel argued for TACON to control the execution of units. This was an attempt to control unity of command through strict C2, with the units as the first order. Throughout 2002, debates continued until early November when senior AFSPC and USSTRATCOM leaders declared the theater air component commander would receive TACON. This decision allowed action officers to finalize plans and agreements for employment, resolving the question of who would direct employment.

Drawing on these lessons, the community must establish permanent solutions that all commanders can implement with equal vigor. The starting point in doing so should be an examination of the Air Force's AEF, followed by a discussion on how to organize space expeditionary forces, using basic joint and Air Force doctrine as a guide.

Structuring for a Space Expeditionary Force

The Culture of the . . . Air and Space Expeditionary Force is . . . everyone in the Air Force must understand that the day-to-day operation of the Air Force is absolutely set to the rhythm of the deploying AEF force packages.

—Gen John P. Jumper

As General Jumper stated in his June 2004 sight picture, "Every Airman is expeditionary, every Airman will know his/her place in the AEF system, and every Airman will be prepared to support the CCDR, whether deployed, in CONUS via reachback, or employed at home station. If you are wearing the uniform of the United States Air Force, you are a part of the AEF."[4] The AEF is the USAF methodology for organizing, training, equipping, and sustaining rapidly responsive air and space forces to meet defense-strategy requirements. Through the AEF, the Air Force supports defense-strategy requirements, using a combination of permanently assigned and rotational forces, and is the current construct for presenting AFFOR to the CCDR to meet specific theater requirements. Not only is the AEF concept a function of moving people and equipment to the right place at the right time, it also encompasses a cultural mind-set and fosters mission execution. The Air Force recognized some time ago that a shift in culture was required. Following the long tradition of expeditionary culture in other services, the Air Force embodies men and women with an "expeditionary and warrior mind-set," who understand that our mission is global and who excel in austere, volatile environments. The Air Force once held this mind-set, as evidenced by the 328th participation in the *Return to Ploesti* mission, but a cold-war, garrison mentality changed everything. Today that mentality is gone. A new culture exists that embraces the use of innovative approaches and new technologies, making the Air Force a light, lean, and lethal force anywhere in the world.

So where does AFSPC fit into the AEF concept? First and foremost, as General Jumper believes, every Airman is expeditionary ready. While AFSPC rightly does not maintain 100 percent mobility status on every person assigned to AFSPC, each wing is well versed in the training and deployment requirements of personnel. AFSPC deploys on average 600 to 1,200 personnel per AEF cycle, the majority being security forces. A limited number of operators deploy to AOCs, wing command posts, and task force headquarters, mostly in the USCENTCOM AOR, filling necessary controller, planner, combat operations, and administrative positions. During OEF and OIF, AFSPC deployed personnel within CONUS to cover manning shortfalls in critical positions and posted several squadrons overseas to

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support USCENTCOM. In the case of the former, these personnel fell under existing forward-deployed leadership for the duration of the deployment. However, the latter deployed as an independent squadron and did not fall under an existing or developed expeditionary group or wing. Further, the tactical-mission planning center that also provided some tactical-level planning for the space forces mission area was located stateside. USSTRATCOM maintained OPCON delegated to the AFSPC component throughout the deployment.

To further understand where AFSPC fits into the AEF, an examination of the AEF's key principles is required. The AEF's key principle is to provide capabilities, focused on effects, to accomplish the mission while balancing the commander's requirements. For our country, the AEF accomplishes **1**-**4**-**2**-**1** *NMS*. Homeland defense is the top priority. At the same time, a forward presence in four areas of the world must be sustainable. Further, within this construct the Air Force must be able to fight two contingencies simultaneously. In doing so the AEF construct will allow the US military to win decisively in one theater, then transition its forces to conclude operation in the second contingency. The concept is intended to instill predictability and stability during steady state and a planned and orderly transition in crisis state. Is AFSPC ready to support this construct with deployable space forces? A change in mind-set within AFSPC will advance this goal. An expeditionary culture is a way to build on this concept.

Space Expeditionary Forces Organized

In the summer of 2001, officers from the 21st Space Wing, Fourteenth Air Force, and the AFDC proposed a Space Expeditionary Concept. The concept was endorsed by the SWC commander, AFDC, AEF Center, and others, and briefed at the weapons school *reblue* that year.[5] When OEF occurred, the expeditionary concept was not employed as previously mentioned. The 21st Space Wing, which actively promoted the expeditionary concept, was told to cease discussing the topic. The space expeditionary concept proposed over four years ago was shelved.

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A space expeditionary force (SEF) can work for AFSPC. Implementation would strengthen the bonds of AFSPC to the Air Force, produce a more competent war fighter, and significantly improve space-force employment and support to CCDRs. This construct is intended to provide optimal employment of space forces to achieve the supported commander's objectives. SEFs will also begin to solve the unity of command and effort issues outlined earlier. Further, an SEF structure brings AFSPC forces in-theater with requisite C2 elements for AFSPC forces, and the SEF provides for the proper leadership of space personnel and forces throughout the theater construct. When AFSPC squadrons deploy today, they deploy with no linkage to the AETF structure. The authors' opinion is they should.

Air Force doctrine now defines a DIRSPACEFOR as a senior AFSPC officer serving as the JFACC/COMAFFOR's advisor. However, as the DIRSPACEFOR is currently constructed, the position does not actually direct forces but assists the JFACC in the SCA responsibility, ensuring space access across a theater is coordinated and efficient. Therefore, the DIRSPACEFOR, if so designated, could also be dual-hatted as the deputy COMAFFOR for space when space forces are deployed. Just as the AETF wings report to the COMAFFOR, who employs the forces for the CCDR, space forces could be employed in-theater by the COMAFFOR. Reporting to the COMAFFOR would be either a space group or wing, depending on the number of forces deployed. Using the SEG as the most likely example, the SEG would deploy to a location in-theater with another expeditionary group or wing at the same base as the AOC or with the deployed space units. Embedded with the SEG is a mission planning and operations center much like one at most air expeditionary wings and groups. The current AOC structure would remain unchanged, with the exception of a lieutenant colonel SWO or space officer holding deputy positions in AOC combat operations and plans and dedicated deployed AFSPC personnel supporting embedded SWOs. Collectively, this places the responsibility of planning and directing space forces in the hands of space personnel. Furthermore, an expeditionary construct with requisite C2 in place provides the correct emphasis on war fighting and shortens the coordination lines for all parties. It also provides the foundation for future deployments of space

superiority units of all kinds. This construct ensures space assets are managed by space personnel for the theater commander in the deployed environment.

Today, a theater commander's preferred C2 arrangement, deployable space forces, is from the AOC. Unfortunately, the strict employment of these forces violates the long-standing Air Force tenet of centralized control/decentralized execution. A construct that places more emphasis on units executing as tasked and less hands-on manipulation of the units' tactical employment from the AOC is desired. A team of personnel at the AOC would still be required to direct these assets during dynamic events, controlling in the same fashion as the AOC controls aircraft and redirects the fight in motion, retasking and rerolling aircraft, as appropriate. The point of departure presented here is the level of control provided to the units. A tasking order from the AOC consisting of intent, targets, and desired prioritized effects would be provided to the group for additional tactical planning. The current tasking order would become a fragmentary order of the AOC tasking order. The tactics and techniques selected would be the SEG's decision, provided they met the desired effect, previously approved options, and complied with theater constraints and restraints placed in in-theater special instructions (SPINS) and in a separate deconfliction space control order. This represents a significant change not only to how Air Force space forces are employed but also in the employment of these forces as understood by the joint community.

A further discussion on the proposed roles of the deputy COMAFFOR for Space is warranted. One principle issue to resolve with respect to deployable space forces is that of unity of command. The COMAFFOR, according to AFDD 2, "provides unity of command, one of the most widely recognized principles of war." With that said, the JFC normally delegates OPCON over all assigned and attached US Air Force forces (AFFOR), such as is possible with attached deployable space forces, to the COMAFFOR.[6] What advantages does this provide? AFDD 2 states, "The COMAFFOR has responsibility for overseeing the morale, welfare, safety, and security of assigned forces. Subordinate commanders will issue orders and direct actions in support of those responsibilities and will ensure these orders and directives are consistent with the policies and directives of the

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COMAFFOR exercising administrative control (ADCON) of those forces."[7] With respect to deployable space forces, they may be attached versus assigned. Accordingly, specified ADCON is given to the commander. As a review, figure 4.1 states the AFDD 2 COMAFFOR-specified ADCON responsibilities.

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1. Make recommendations to the JFC (or the JFACC, if the COMAFFOR is not the JFACC) on the proper employment of the forces of the US Air Force component.

2. Accomplish assigned tasks for operational missions.

3. Nominate specific units of the Air Force for assignment to theater forces.

4. Organize, train, equip, and sustain assigned and attached Air Force forces for in-theater missions.

5. Maintain reachback to the US Air Force component rear and supporting Air Force units including delineation of responsibilities between forward and rear staff elements.

6. Support operational and exercise plans as requested.

7. Inform the JFC (and the combatant commander, if affected) of planning for changes in logistics support that would significantly affect operational capability or sustainability sufficiently early in the planning process for the JFC to evaluate the proposals prior to final decision or implementation.

8. Provide lateral liaisons with Army, Navy, Marines, Special Operations Forces, and coalition partners.

9. Maintain discipline, including application of the *Uniform Code of Military Justice* (*UCMJ*).

10. Establish force protection requirements.

Figure 4.1. COMAFFOR-specified ADCON responsibilities. *(Adapted from* AFDD 2, *Organization and Employment of Aerospace Forces,* 17 Feb 2000, 52–53.)

In short, this concept is a paradigm shift from current practices. By placing AFSPC personnel in key theater positions, the proper assumption of these duties takes place with the appropriate commander to maintain unity of command and effort. Further, in recognition of past arguments, while it is true that most space forces are global in nature and TACON of those forces, such as the GPS or SBIRS, would never be transferred to theater, AFDD 2 does account for deployable or transient forces in-theater. If forces deploy into a theater to conduct operations, AFDD 2 states,

> To the maximum extent possible, specific elements of ADCON should also go forward. When cross AOR operations occur, OPCON of forces should go forward to the commander executing mission, and ADCON will depend on where the forces are based. When forces are forward deployed outside the AOR with the intent of conducting sustained operations in that theater, OPCON should normally go forward to the supported JFC, and ADCON is best transferred to the COMAFFOR for the geographic region in which they are beddown.[8]

Finally, the argument that deployable space forces are global functional forces is presented. AFDD 2 states that if the forces are deployed forward in support of a regional operation and they are "totally committed to that operation and unavailable for other missions, OPCON of these [forces] may go forward to the supported JFC."[9] Assuming deployable space forces are committed to only one operation, it would then make sense to move OPCON forward. The premise of this study's recommendation is that with implementation of space forces moving forward, the necessary AFSPC leadership is also moved forward.

This structure provides the correct leadership for space forces when they need it most. Putting this construct in place will facilitate the correct emphasis on war fighting and shorten coordination lines for all parties. The inherent risk of these operations is placed in the theater on theater commanders. The Space AOC maintains a significant theater reachback role. With AFSPC taking control of assets in-theater in a way never done before, they actually regain control of assets they believed were lost when the air component commander received TACON of the assets.

The final element to this proposed structure is the SEG's MPC. The next chapter outlines the MPC roles and responsi-

bilities and supports the overall argument of this study that planning and execution of "totally committed" deployable space forces *is* the right decision.

Mission Planning Cell Operations

The MPC's primary objectives are to determine optimum methods of accomplishing ATO tasking and then to provide this information to flight crews. MPC responsibilities begin upon receipt of unit tasking, before unit deployment or commencement of hostilities, and continue throughout the campaign.

—AFTTP 3-1.1, *General Planning and Employment Considerations,* 31 May 2004

    Detailed combat mission planning in the Air Force is performed by a wing's MPC. The Air Force chooses to perform combat mission planning at this command level because it places the responsibility of how the mission will be executed with the most current tactical expert weapon systems operators. Unfortunately, wing-level or squadron-level space forces within AFSPC do not combat-mission plan. The reasons range from political sensitivities to unit capabilities to today's operational reality that space operations are not conducted through mission-type orders. Due in part to this rationale and other decisions in the past, operational and tactical planning for these units is conducted at the operational war-fighting headquarters. As mentioned earlier, this violates one of the Air Force's central tenets: centralized control/decentralized execution. Overall, this is an ill-advised way to fight wars, as it creates a single point of failure for mission accomplishment at the operational level, while ignoring the expertise to effectively employ any weapon system at the tactical level. Further, deployable space forces' TTPs are not maturing because there is no authority or responsibility placed at the tactical level, arguably the most dynamic portion of war fighting. So in order to address these observations, this section will endorse the MPC construct, including responsibilities, and illustrate how combat mission planning for de-

ployable space forces can more effectively produce effects in support of theater objectives.

An MPC attached to the SEG in this construct is required to place an appropriate level of responsibility and authority at the lowest level of war, the tactical level. Operational planners in the theater AOC would define the boundaries based on JFC guidance and intent, as well as the JFACC's own guidance and intent, while the MPC develops a tactical combat mission plan, complying with the guidance and intent to satisfy the JFACC's air and space attack plan, developed tactical objectives, and tactical tasks. The JFACC's guidance is promulgated not only through a tasking order but also through SPINS and ROE. Political sensitivities and the potential for global effects occur with any employment of force by the United States. These possibilities are dealt with in defined constraints and restraints within the SPINS and ROE. The MPC must understand the theater SPINS and ROE to successfully combat-mission plan and avoid collateral effects much like any other MPC. Further, the MPC will be occupied by current system experts (tacticians and planners), mitigating the likelihood that collateral effects are produced due to inappropriate tasking. The MPC organization is presented in figure 4.2.

Each deployable space unit should provide at least one mission planning expert and one tactics expert to the MPC. Additionally, since space assets perform missions ranging from combat support to space superiority, the MPC gives the capability to plan a composite-force package of space capability and can easily interface with an established air-centric wing operations center's MPC. If the space MPC collaborates with a larger MPC, members will be assigned to applicable packages, such as suppression of enemy air defenses, electronic warfare, C2, and/or CSAR, to aid in tactical planning and integration.

In addition to presenting an SEG with an MPC attached, deployable space forces would need to assign mission commander or package commander responsibilities for the "space package." In designating a commander, it places authority to properly execute the mission at the tactical level with a senior operator, and, more importantly, it enables deployable space forces to execute their mission with the latitude required to be responsive to dynamic situations that typically arise within a
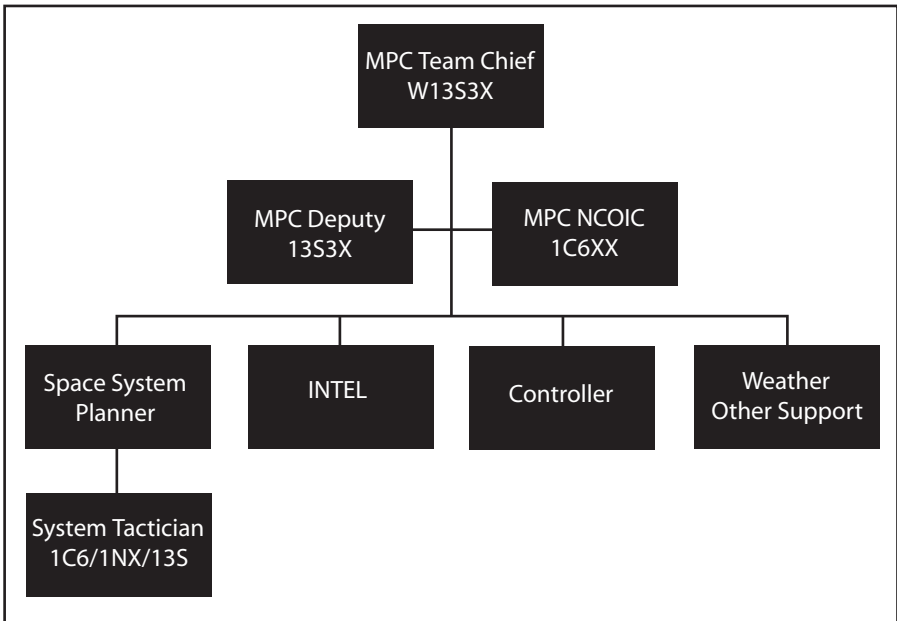
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Figure 4.2. Space mission-planning cell organization. (*Created from* Major Duda's collection of published and personal data.)

given vulnerability period. These are the same concepts employed by the remainder of the CAF that enable full-spectrum combat effects. Once the MPC is employed and a mission commander is appointed, determination of MPC and MC responsibilities must be accomplished.

MPC operations are addressed in chapter 3 of AFTTP 3-1.1, *General Planning and Employment Considerations.*[10] The MPC procedures provide an excellent template from which to derive space MPC tasks. A list of major steps to be accomplished by the MPC is included in figure 4.3.

Currently, JSpOC personnel at Vandenberg AFB, California, accomplish these tasks. So why is a change required? First, the Air Force emphasizes effects-based planning, centralized control with unity of command, and decentralized execution as axioms for employing forces. In the current construct, with JSpOC doing all tasks that should be accomplished by a wing-level or group mission-planning function, there is no unity of effort or theater centralized control for deployed space forces

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1. Assemble composite force planning team.

2. Perform MC/MPC chief responsibilities and assign responsibilities and deadlines for portions of combat mission plan.

3. Extract data from ATO.

4. Initiate coordination for mission particulars: who, what, when, where, why, how.

5. Compile planning materials, including: charts, imagery (if required), JMEM (space equivalent).

6. Obtain intelligence updates on specific order of battle "space package" is supporting as well as SOB. Represent on chart or map, as required.

7. Mission objective analysis.

8. Meet other package leads to formulate game plan and develop support asset objectives.

9. Identify and mitigate show stoppers.

10. Work with other MDS leads to perform simultaneous detailed mission planning.

11. Reconfirm tasking with AOC for last-minute changes.

12. MC/MPC chief finalize game plan with package lead.

13. MC/MPC chief makes sure materials are clear, concise, and usable by deployable space unit crews.

14. Assemble combat mission folders.

15. Disseminate combat-mission plan using most secure and expeditious means possible.

Figure 4.3. MPC procedures. (*Adapted from* AFTTP 3-1.1, *General Planning and Employment Considerations*, 31 May 04, tables 4-12 through 4-15. [Secret] Information extracted is unclassified.)

supporting a theater commander's plan. Furthermore, it is inappropriate for a Falconer or functional AOC to perform MPC tasks. It also removes the most qualified personnel from the decision loop on how best to achieve effects and could subse-

quently have negative impacts in the kill chain for space superiority, combat support, C2, and intelligence.

To reiterate, combat-mission planning for space can be performed by a wing- or group-level MPC. AFTTP 3-1.1 gives a reasonable template to follow. Allowing deployment of an SEG with an associated MPC presents space forces to the JFC in the same construct as other AFFORs. Additionally, utilizing the COMAFFOR space and populating the AOC with space personnel enable a repeatable, executable, consistent means for the JFACC to gain and maintain regional space superiority, act as the SCA, and satisfy JFC guidance and intent.

Roles and Responsibilities of Mission Partners

On the surface, this chapter tends to trivialize the complexity of this mission area. It is not done unknowingly. Numerous agencies at all levels of military and government contribute to the planning and execution of deployable space forces. The complexity of the approval process, politics at all levels, intelligence requirements, and overall immaturity in mission area equate to dozens of mission partners, each with a vital part of the puzzle. Therefore, the premise of this study is but one element on how to improve employment of space forces. The roles and responsibilities of all agencies must be categorized and assigned in great detail. It is hoped that the addition of the COMAFFOR roles and an SEG will simplify C2 channels for all agencies.

Joint Space Forces

Joint employment of space forces should also be addressed. Recently, USCENTAF took a bold step to make the DIRSPACEFOR position a joint billet. Titled the joint director of space forces (JDSF), this position calls for an Army or Air Force colonel. An opposite service deputy is also positioned. To the construct presented in this chapter, this will add additional complexity at the AOC to plan, integrate, and coordinate execution of forces. A joint MPC may also be warranted. However, the

premise of this chapter still holds true. AFSPC organizes and equips forces to operate in the joint environment, with the same competent leaders deployed to theater. The other services must see the value of in-theater commanders commanding forces and a joint space director assisting all mission partners in the coordination of efforts.

Conclusion

Today in the Combined Air Operations Center you have warriors standing around the table selecting targets, and some of those warriors are space warriors. They're face to face with the kinetic warriors, and they're doing whatever it takes to make sure that we figure out how to get bombs on targets. And more and more these space warriors are taking a bigger role in our minute-to-minute activities. None of this happens without the space warriors we have in all of our services.

—Gen John P. Jumper

Just as Capt John P. Jumper, in the *USAF Fighter Weapons Review*, Winter 1976, spoke of a culture of transformation in the art of training and combat capability, today a culture of transformation in the art and employment of space forces is taking hold in AFSPC.[11] This transformation has not been easy and continues on many levels. SWOs, while small in number compared to the entire command, are leading this transformation and have become very visible on the hotly contested issues of today. During World War II, differences in doctrine and employment perspectives between Army and AAF commanders existed in sharp contrast. Yet, members of the 328th Bombardment Squadron conducted the heroic mission of *Return to Ploesti*, showing airpower's versatility, strategic importance, and expeditionary mindset. That warrior spirit exists today in space officers.

The reality for space weapons officers is that they are charged with integrating, or more aptly bringing, their capability into the CAF. Therefore, a natural conflict exists between the SWOs

and AFSPC on how exactly space is employed outside of the global realm. Looking to the future, this divide must close.

Using basic doctrine and the Air Force's AEF construct, a path is ready for AFSPC to follow. AFSPC's endorsement and subsequent commitment to fulfill the obligation to position space forces in the expeditionary construct will enable the major command to best organize, train, equip, and acquire forces to fight and win the global war, while remaining postured to satisfy regional needs as directed by higher commands. This proposed construct will bring AFSPC closer to the fight with the control of deployed space forces, led by AFSPC officers working for the theater commander, and bring SWOs closer to their AFSPC roots.

Notes

1. Addison Earl Baker et al., *Ploesti: When Heroes Filled the Sky*, http://www.homeofheroes.com/wings/part2/09_ploesti.html.

2. Clausewitz speaks of a trinity in his magnum opus *On War*. Clausewitz defines the components of the trinity as (1) primordial violence, hatred, and enmity; (2) the play of chance and probability; and (3) war's element of subordination to rational policy. The trinity for this article is the interaction between the space officers, components, and Air Force/AFSPC policy, creating an adversarial relationship not unlike early airpower theorists within the US Army. Christopher Bassford, *Clausewitz and His Works* (Carlisle Barracks, PA: Army War College, 2002), http://www.clausewitz.com/CWZHOME/CWZSUMM/CWORKHOL.htm.

3. Adam J. Hebert, "Toward Supremacy in Space," *Air Force Magazine* 88, no. 1 (January 2005): 24, http://www.afa.org/magazine/jan2005/.

4. Gen John P. Jumper, "Adapting the AEF—Longer Deployment, More Forces," Chief's Sight Picture, June 2004, http://www.af.mil/library/policy/letters/pl2004_06.html.

5. *Reblue* is an active-duty term for getting back to basic roots. Tech Sgt Andrew Biscoe, "Deployed chief creates Air Force mural for dining-in," Patriot 32, no. 2 (February 2005): 6.

6. AFDD 2, *Organization and Employment of Aerospace Forces*, 17 Feb 2000, 51.

7. Ibid., 52–53.

8. Ibid., 45–46.

9. Ibid.

10. AFTTP 3-1.1, *General Planning and Employment Considerations*, 31 May 2004, chap. 4. (Secret) Information extracted is unclassified.

11. Capt John P. Jumper, "Training Toward Combat Capability (Part One)," *USAF Fighter Weapons Review* 24, no. 4 (Winter 1976): 2, https://www.mil.nellis.af.mil/usafws/wreview/winter76.pdf.

Abbreviations

1-4-2-1	*National Military Strategy*
9/11	11 September 2001
25th SCTS	25th Space Control Tactics Squadron
76th SPCS	76th Space Control Squadron
328th WPS	328th Weapons Squadron
AADP	area air defense plan
AAF	Army Air Forces
ACC	Air Combat Command
ACE	Advanced Composition Explorer
ACP	airspace control plan
ADCON	administrative control
AEF	air expeditionary forces
AETC	Air Education and Training Command
AETF	air and space expeditionary task force
AFC²TIG	Air Force Command and Control Training and Innovation Group
AFDC	Air Force Doctrine Center
AFDD	Air Force doctrine document
AFFOR	Air Force forces
AFI	Air Force instruction
AFPC	Air Force Personnel Center
AFSOC	Air Force Special Operations Command
AFSPC	Air Force Space Command
AFTTP	Air Force tactics, techniques, and procedures
ALFA	Air-Land Forces Application
AMC	Air Mobility Command
AMD	air mobility division
AMOCC	air mobility operations control center
AO	area of operations
AOC	air and space operations centers
AOG	air operations group
AOR	area of responsibility
ARS	advanced reconnaissance system
AST	advanced system training
A-staff	AFFOR staff
ATO	air tasking order

C2	command and control
CAF	combat air forces
CAOC	combined air operations center
CAP	crisis action planning
CAS	complex adaptive systems
CCDR	combatant commander
CCS	countercommunications system
CDRUSSTRATCOM	commander, United States Strategic Command
CENTAF	Central Command Air Forces
CENTCOM	US Central Command
CFACC	combined force air component commander
CGO	company grade officer
CHOP	change of operational control
CJCS	chairman of the Joint Chiefs of Staff
COA	course of action
COCOM	combatant command
COG	center of gravity
COMAFFOR	commander, Air Force forces
COMSPACEAF	commander, Space Air Forces
CONUS	continental United States
CSAR	combat search and rescue
CT	counterterrorism
DCS	defensive counterspace
DIRMOBFOR	director of mobility forces
DIRSPACEFOR	director of space forces
DMSP	Defense Meteorological Satellite Program
DOD	Department of Defense
DOTMLPF	doctrine, organization, training, materiel, leadership and education, personnel, and facilities
DP	deliberate planning
DSB	Defense Science Board
DSCS	Defense Satellite Communications System
DSCS III	Defense Satellite Communications System III
DSP	Defense Support Program
DT	developmental teams
EBO	effects-based operations

F2T2EA	find, fix, track, target, engage, and assess
FAM	functional area manager
FHA	foreign humanitarian assistance
FID	foreign internal defense
FOV	field of view
FRAGO	fragmentary order
FSST	forward space support teams
GBS	global broadcast service
GCC	geographic combatant commander
GMF	ground mobile forces
GPS	global positioning system
GSCA	global space coordinating authority
GWOT	global war on terror
HHQ	higher headquarters
HQ	headquarters
HS	homeland security
IMINT	imagery intelligence
IO	information operations
IQT	initial qualification training
ISR	intelligence, surveillance, and reconnaissance
ITO	integrated tasking order
JAOC	joint air operations center
JDSF	joint director of space forces
JFACC	joint force air component commander
JFC	joint force commander
JFCC–S&GS	joint functional component commander– space & global strike
JOA	joint operations area
JP	joint publication
JPRC	Joint Personnel Recovery Center
JSCA	joint space coordinating authority
JSCC	joint space control center
JSpOC	joint space operations center
JTCB	joint targeting coordination board
JTF	joint task force
JWS	Joint Warfighting Space
LNO	liaison officer

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MAAP	master air attack plan
MAJCOM	major command
MASINT	measurement and signature intelligence
MCO	major combat operations
MILSTAR	military strategic and tactical relay system
MIO	maritime intercept operations
MPC	mission planning center
MQT	mission qualification training
NAF	numbered air force
NEO	noncombatant evacuation operations
NMS	*National Military Strategy*
NRO	National Reconnaissance Office
NSSI	National Security Space Institute
OA	operational area
OAF	Operation Allied Force
OCS	offensive counterspace
OEF	Operation Enduring Freedom
OIF	Operation Iraqi Freedom
OODA	observe, orient, decide, and act
OPCON	operational control
OPLAN	operations plan
OPR	office of primary responsibility
OPT	operational planning teams
PACAF	Pacific Air Forces
PNT	positioning, navigation, and timing
PO	peace operations
POTUS	president of the United States
PR	personnel recovery
PRCC	personnel recovery coordination cell
PRETC	Personnel Recovery Education and Training Center
PSAB	Prince Sultan Air Base
RSTA	reconnaissance, surveillance, and target acquisition
RTIC	real-time information to the cockpit
SAMS	surface-to-air missile sites
SATCOM	satellite communications
SBIRS	space-based infrared system

SBMCS	Space Battle Management Core System
SCA	space coordinating authority
SCCC	space control coordination center
SCP	space coordinating plan
SD	Strategic Command Directive
SecDef	secretary of defense
SEF	space expeditionary force
SEG	space expeditionary group
SEW	space expeditionary wing
SIGINT	signals intelligence
SIOE	Space and Information Operations Element
SISP	single integrated space picture
SJFHQ	standing joint force headquarters
SMP	strategic master plan
SOCEUR	Special Operations Component, United States European Command
SOCPAC	Special Operations Component, United States Pacific Command
SPACEAF	space air forces
SPINS	special instructions
SSA	space situation awareness
SSO	senior space officer
SST	space support teams
STO	space tasking order
STS	Space Tactics School
SWC	Space Warfare Center
SWO	space weapons officer
TAC	Tactical Air Command
TACC	tanker airlift control center
TACON	tactical control
TAF	tactical air force
TENCAP	tactical exploitation of national capabilities program
TMD	theater missile defense
TO	theater of operations
TRADOC	Training and Doctrine Command
TTP	tactics, techniques, and procedures
UCP	Unified Command Plan
UFO	ultrahigh frequency follow-on

UN	United Nations
UNAAF	Unified Action Armed Forces
USAFE	United States Air Forces in Europe
USAFWS	United States Air Force Weapons School
USCENTAF	United States Central Command Air Forces
USCENTCOM	United States Central Command
USCINCSPACE	commander-in-chief, US Space Command
USEUCOM	United States European Command
USJFCOM	United States Joint Forces Command
USSOCOM	United States Special Operations Command
USSPACECOM	United States Space Command
USSTRATCOM	United States Strategic Command
USTRANSCOM	United States Transportation Command
VOA	Voice of America
WFHQ	warfighting headquarters
WS	weapon systems

Glossary

al-Qaeda	Sunni Islamist terrorist organization
Falconer	theater AOCs
Falun Gong	banned religious group in China
InfoWorkSpace	software for secure nets
Internet Café	terrorist C2 center
kill chain	(see F2T2EA)
penny packets	splitting space forces between theaters
Ploesti	oil fields in Rumania
Reblue	getting back to basic roots
space control	(joint community)
system-of-systems	satellite group
Traveling Circus	93rd Bombardment Group

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