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BY ORDER OF THE
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AIR FORCE DOCTRINE DOCUMENT 2–2
27 NOVEMBER 2001

SUMMARY OF REVISIONS

This version of Air Force Doctrine Document 2-2 (AFDD 2-2) updates Air Force space doctrine with current examples of space contributions to warfighting. We have added detailed discussion on how space operations fit into Joint Task Force (JTF) operations with special emphasis on space, air, and information synergy. Chapters on command and control, planning, and execution capture both the global and regional perspective, and introduce the construct of a Joint Force Air *and Space* Component Commander (JFASCC). We believe that renaming the Joint Force Air Component Commander (JFACC) to JFASCC more accurately reflects the emerging role of space in regional operations, and trends occurring in the Joint and Combined Air operations Centers. Finally, we address training and education within the context of developing future space warriors. We believe this doctrine better captures the warfighter's perspective.

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FOREWORD

Our progress in space over the last 50 years has made the world a much smaller place. We now take for granted the nearly instantaneous global telecommunication, precise navigation, environmental monitoring, and threat warning and assessment that space systems provide. As we continue to increase our reliance on these systems, space has become vital to our nation's strength and prosperity. **We must understand that while we promote the peaceful use of outer space, our nation expects our Air Force force to fully exploit and defend it.**

Today, we are witnessing the evolution of the space warrior, trained in the planning and execution of space operational concepts. These warriors are at work in our air and space operations centers, integrating space with air and surface forces—proving their worth in military operations.

This *Space Operations* doctrine document describes our shared beliefs about the contributions of space capabilities in achieving desired effects for the Joint Force Commander. Specifically, it addresses space war-fighting tenets and principles, gives guidance on employment concepts that integrate space capabilities into theater campaigns, and recommends a command structure for responsive space operations. **As a keystone doctrine document, it underscores the importance of the synergy created through the integrated employment of space, air, and information.**

JOHN P. JUMPER
General, USAF
Chief of Staff

27 November 2001

TABLE OF CONTENTS

INTRODUCTION v

FOUNDATIONAL DOCTRINE STATEMENTS vi

CHAPTER ONE—Space Operations Fundamentals 1
Overview 1
The Air, Space and Information Relationship 2
Effects-based Operations 4
Key Terms 6
Space Operations' Contribution to Air and Space Power 8
Principles of War 8
Tenets of Air and Space Power 8
The Air Force Functions 12
The Air Force Core Competencies 20

CHAPTER TWO—Command and Control of Space Assets 23
Overview 23
Global versus Theater Impact Considerations 24
Command and Control of Global Space Forces 25
Command and Control of Theater Space Forces 26
Integrating Global Space Forces 27
Deployable Space Forces 28
Theater Organic Space Forces 28
Presentation of Forces 29
Key Roles of the Joint Force Air and Space Component Commander (JFASCC) in Joint Task Force (JTF) Space Operations 29
JFASCC as the Coordinating Authority for Space 30
Responsibilities of the Coordinating Authority for Space 31
JFASCC as the Supported Component Commander for Joint Space Operations 33

CHAPTER THREE—Planning for Space Operations 35
Overview 35
Campaign Planning 35
Deliberate Planning 36
Crisis Action Planning 36
Air and Space Crisis Action Planning 37
Air and Space Estimate 38
Planning Factors 40
Phasing 40
Success Indicators and Measures of Merit (MoMs) 41
Deconfliction 41

Space Considerations for Joint Strategy 41
Adversary Space Strategy 43
Logistics 44
Legal Issues 45

CHAPTER FOUR—Executing Space Operations 47
Overview 47
Integrating Civil, Commercial, and Foreign Space Assets 47
Execution of Global Forces 49
Space Air Forces (SPACEAF) Operations Center Organization and Function 49
Tasking Order Development 50
Synchronizing Global Space Operations with Theater 50
Execution of Theater Space Forces 51
Target Development 52
Air and Space Tasking Order 53
Adversary in a Dynamic Environment 53

CHAPTER FIVE—Training and Education for Space Operations 55
Overview 55
Space Training and Evaluation 55
Accession Training 56
Space Qualification Training 56
Proficiency Training/Recurring Training 57
Advanced Training 57
Evaluation 57
Civilian and Contractor Forces Training and Evaluation 57
Professional Training 58
Exercises 58
Integrated Air, Space, and Information Test Range 60
Education 60
Professional Military Education (PME) 60
Graduate Education 60
War Games 61

Suggested Readings 63

Glossary 65

INTRODUCTION

PURPOSE

This document has been prepared under the direction of the Chief of Staff of the Air Force (CSAF). It refines general doctrinal guidance from AFDD 1, *Air Force Basic Doctrine*, and AFDD 2, *Organization and Employment of Aerospace Forces*, with specific principles for space operations. These principles form the foundation from which Air Force commanders plan and execute space forces, and integrate space capabilities into assigned missions.

APPLICATION

This AFDD applies to all active duty, Air Force Reserve, Air National Guard, and civilian Air Force personnel. **The doctrine in this document is authoritative but not directive; therefore, commanders need to consider doctrine's guidance in light of the particular situation they face.**

SCOPE

This doctrine expands upon basic Air Force beliefs and operating principles found in AFDD 1 and AFDD 2, providing further detail on employing space forces and assets in the joint environment.

Air and Space—Past To Present

Early use of the medium of air focused on reconnaissance and an airplane's ability to provide a broader perspective of the battle area to commanders. Early in World War I, air intelligence proved crucial to the outcome of the first battle of the Marne. Information supplied by air reconnaissance about German troop movements and location allowed French commanders to maneuver their troops to better engage the enemy. The resulting battle halted the German army advance short of Paris. For the remainder of World War I, and the interwar years, airpower grew from reconnaissance support to become a crucial ingredient for success in the modern warfare of World War II.

Space technology and capabilities developed following World War II. During the Cold War years, space systems were focused on supporting nuclear missions. As the threats have evolved since the fall of the Soviet Union, there is now an additional emphasis on operational-level space doctrine. The increasing importance of achieving space superiority and integrating space into theater operations reflects the current Air Force philosophy. This new emphasis blurs the lines between four traditional space mission areas of force application, force enhancement, space support, and space control.

Space now provides an improved theater and global perspective of the world for today's leaders. Also, like early airplane use, early space development focused on reconnaissance and intelligence. Today, space systems are maturing from the equivalent of the reconnaissance biplane in World War I, to becoming a fully integrated part of our Air Force capability. This capability is the ultimate high ground of US military operations.

FOUNDATIONAL DOCTRINE STATEMENTS

Foundational doctrine statements (FDS) are the basic principles and beliefs upon which AFDDs are built. Other information in the AFDD expands on or supports these statements.

- **Space forces bring enhanced global presence, perspective, precision, and flexibility to the Air Force and military operations.**
- **Space, air, and information platforms are mutually supporting and supported throughout the spectrun of conflict.**
- **Space forces make significant contributions to employing the traditional principles of war and the tenets of air and space power.**
- **Without capabilities to ensure the survivability and operational utility of friendly space forces as well as capabilities to deny the adversary use of space, space superiority cannot be achieved.**
- **Command relationships for space forces are normally determined by whether they will be used to fulfill individual theater, multiple theater, or national objectives.**
- **Forces that produce effects for national objectives or multiple theaters are best controlled centrally. Therefore, USCINCSPACE, through his components, will normally retain OPCON of USSPACECOM global forces, and produce effects for the theater commander via a support relationship.**
- **The COMAFFOR/JFASCC should normally hold key roles within the JTF for space operations: the coordinating authority for space operations and the supported commander for joint space operations assigned by the CJTF. Within the contraints of national policy, the JFASCC should be assigned counterspace operations and, when applicable, strategic attack from or through space.**
- **Space assets are force multipliers across the spectrum of conflict and must be integrated into deliberate and crisis action planning, as well as operations planning, combat operations, and time sensitive targeting (TST) to ensure timeliness of effects.**
- **The integration of civil, commercial and/or foreign space assets may become vital to mission accomplishment. However, these systems present integration challenges such as interoperability issues and leadership perspectives which may not mesh with US military objectives.**

- **Because the United States has yet to meet a space peer in conflict, war games continue to be a primary means of assessing the doctrinal implications of the use of space systems.**

CHAPTER ONE

SPACE OPERATIONS FUNDAMENTALS

> ***There is no division...between air and space. Air and space are an indivisible field of operations.***
>
> **General Thomas D. White**
> **USAF Chief of Staff, 1957**

OVERVIEW

Just as the advent of airpower greatly enhanced military operations of the time, space forces, likewise, greatly enhance modern military operations across the spectrum of conflict. Space assets have not only added to our defense capabilities but have also changed the way our military does business. Air Force doctrine views air, space, and information as key ingredients for dominating the battlespace and ensuring superiority. This section focuses on some characteristics of space that further enhance traditional war-fighting operations.

Space power bolsters US global presence. Effective use of space-based resources provides a continual and global presence over key areas of the world. Just as air power brought the ability to range vast distances in minimal time, satellites permanently "forward-deployed" add another dimension to our force's ability to quickly position themselves for employment. This global presence enables force-multiplying effects from instant global communications to persistent, rapid intelligence, surveillance, and reconnaissance (ISR). Additionally, space systems provide precision guidance for either navigation or weapons delivery 24 hours a day, 7 days a week. These effects can be provided within hours or even minutes of tasking, and are available for years. One distinct advantage of a satellite's global presence is that it isn't tied to tankers, transport, refueling, resupply, or contingency basing and other earth-based antiaccess concerns.

Perspective. Military forces have always viewed the "high ground" position as one of dominance and warfare advantage. With rare exception, whoever owned the high ground owned the fight. **Space forces, in combination with air and information capabilities, offer an ever-expanding view of the globe.** Operating high above the Earth's surface, satellites can "see" deep into an adversary's territory, with little risk

to humans and machine. Today, control of this high ground means superiority in information and significant force enhancement. Tomorrow, ownership may mean instant engagement anywhere in the world.

Precision. The ability to create accurate effects is crucial in military operations. **The integration of space-based navigation and timing systems with airborne platforms has enhanced military precision strike capability.** Targets that during the Vietnam War could only be destroyed by ground forces or multiple bombing runs, can now be neutralized more effectively by global positioning system (GPS)-guided munitions. Precise effects contribute to lower collateral damage, increased survivability for aircrews, and a more efficient use of air assets.

Precision is not only a space-enhanced benefit in weapons delivery, but is also useful in many other applications. For instance, space allows preciseness in mapping terrain and environmental conditions. We can collect detailed imagery and other technical characteristics of adversarial forces much smaller than a tank as well as detect and characterize an inbound missile, pinpoint its location, and predict its impact.

Synergistically applied with other forces, space provides added flexibility in military operations. Where wire cannot be strung, or when hampered by terrain and other line-of sight radio frequency (RF) limitations, space-based communications can make the difference in whether or not forward and rear echelons remain in contact. In denied areas of the world, space-based intelligence often fills critical gaps in strategic situational awareness and battlespace knowledge. Therefore, space capability today offers flexibility through exploitation of the "higher ground."

THE AIR, SPACE, AND INFORMATION RELATIONSHIP

Although physical differences exist between the atmosphere and space, no definitive line can be drawn between the two. This air-space domain stretches from the earth's surface to the outer reaches of space. Similarly, the information environment permeates both air and space domains without distinction in boundaries. *We leverage the strengths of our space, air, and information platforms throughout these realms to produce the exact effects our nation needs.*

Space, air, and information platforms are mutually supporting and supported throughout the spectrum of conflict. Our most modern air assets lose effectiveness if not able to leverage space; our space assets are unable to contribute if their uplinks and downlinks are interrupted or their ground control and receiving stations are disabled. Air superiority ensures the freedom from attack for our space-related ground facilities. Information superiority helps ensure the freedom from attack for our control and mission links that tie our space providers to our ground, air, or sea-based users. Space superiority is the freedom from attack that ensures our space platforms can continue to provide our air, sea, and land forces the space enhancement necessary for optimal force employment (see Figure 1.1). *Space, air, and information superiority are mutually supporting objectives. It is extremely difficult to maintain one without the others and the value of one is greatly enhanced when accompanied with the others.*

To fully exploit the air, space, and information realms across the full spectrum of engagement, airmen should understand how the synergistic application of space, air, and information can achieve rapid dominance in all three arenas, and victory over adversaries.

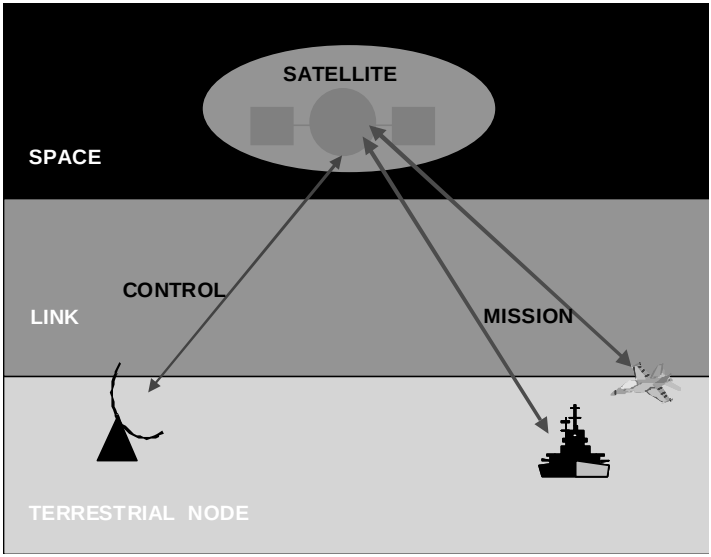


Figure 1.1. Elements of a Space System

There are two different, but not mutually exclusive perspectives as to the doctrinal view of space. First, space may be viewed as a physical environment—like land, sea, and air—within which space-centric activities are conducted to achieve objectives. This view is particularly relevant at the *tactical* (e.g., operation of specific platforms) and *strategic* (i.e., space as a domain that must be protected and controlled) levels of war. The tactical level focuses on execution of tactics, techniques, and procedures (TTP), which may be significantly different between air and space weapons systems. The strategic level, consistent with national policy, is where the National Command Authorities (NCA) and headquarters unified commands (specifically, HQ United States Space Command [USSPACECOM]) focus. Space is distinct in terms of the policies, treaties, and laws that govern the military's use of this medium.

The second doctrinal view of space is an "effects-centric" view, and is primarily relevant at the operational level of war—that level at which campaigns and major operations are planned, executed, and sustained to accomplish strategic objectives within theaters (AFDD 1). In terms of planning and executing forces, commanders are concerned with achieving effects, not whether those effects come from an air asset, space asset, information asset, or a combination of the three. The focus is on the end result, not the differences in how individual platforms operate to achieve that result.

An effects-centric view enables integrated air, space, and information planning to achieve operational effects beyond the traditional platform-centric, attrition-based view of warfare. The tactical and operational effects obtained from these capabilities complement each other to provide integrated air, space, and information effects. For instance, crucial intelligence about an adversary's operating location may be enabled by a combination of multispectral satellite imagery and detailed pictures from an air platform. The ability to produce these effects is air, space, and information synergy is key to Air Force doctrinal thought on operational warfare.

Effects-based Operations

Effects are the tactical, operational, and strategic level outcomes that a military action produces. At the operational level, effects-based operations focus on how the commander of Air Force forces (COMAFFOR) translates NCA and joint force commander (JFC) strategic

guidance into actions that meet campaign objectives. In short, effects-based operations are focused on outcomes, not simply targets or platforms.

Effects-based operations allow for NCA and JFC direction on strategic objectives while enabling war-fighting components to determine the best means of achieving those objectives. As a result, airmen should focus on commanding air, space, and information forces to achieve strategic and operational effects, not just target-list management. Recognizing the important role of the political sector in determining objectives, strategy, and rules of engagement, commanders must be prepared to correlate military objectives to political objectives and to advise civilian leaders on courses of action.

Effects are either direct or indirect, may be immediate or delayed, and can accumulate and/or cascade in a system. Direct effects are immediate results that occur due to weapon employment and are easily visible, like a dropped bridge span or bombed satellite C2 facility. Indirect effects are time-delayed outcomes on the system, often a cumulative result of multiple attacks and are normally difficult to recognize. A good example of indirect effects is the World War II attack on the German transportation system seeking to isolate western France from military reinforcements. The unseen and indirect effect at the time was the complete disorganization of the German economy. Similarly, the indirect effect of denying SPOT satellite imagery to Iraqi forces during DESERT STORM was the gradual degradation of Saddam Hussein's intelligence function.

Current space forces are primarily characterized by their contribution to direct and indirect effects at the strategic, operational, and tactical levels of war. For instance, GPS signal accuracy increases the lethality of the Joint Direct Attack Munition (JDAM), a weapon capable of producing direct effects. The *direct effects* may range from *tactical* destruction of an enemy air C2 facility to the *operational* disruption of that enemy's air campaign. The *indirect effect* may include the *strategic* culmination of that adversary's offensive. Thus, the effect of JDAM employment, enhanced by GPS accuracy, has directly destroyed a vital enemy C2 facility while indirectly halting the enemy advance.

Historically, the United States has enjoyed an asymmetric advantage in employing space capabilities; no single power or entity possessed space capabilities to match that ability. *However, today, potential*

adversaries are increasing their access to space capability through organic and third party resources, and may achieve similar effects to the detriment of US forces.

Key Terms

Space assets, space forces, and space systems are terms used to describe different categories of space capabilities. Space assets available to our nation include military, civil, commercial, and foreign space systems, their supporting infrastructure, terrestrial elements with the primary mission of affecting space systems, and the personnel who operate them. For the purpose of this document, space forces refer to military space assets, normally organized as units.

Space systems are comprised of nodes and links. There are two types of nodes: terrestrial and space. The space node includes satellites, space stations, or reusable space-transportation systems like the space shuttle. The terrestrial node includes any land, sea, or airborne equipment used to interact with a space node. These nodes are tied together by information conduits called links. These also are classified under two types: control and mission. Control links enable force multiplication through dissemination of mission data (see Figure 1.1). For example, the 2d Space Operations Squadron is a terrestrial node that operates the GPS constellation via the control link. Simultaneously, a pilot in the cockpit, with a GPS receiver, is a terrestrial node of a GPS space system. The data stream between the receiver and the GPS satellite in orbit is the mission link. *An adversary can attack any of the nodes or links to degrade our ability to conduct operations.*

US space activities are planned and conducted to achieve effects to fulfill individual theater, multiple theater, and national objectives. Those space forces that primarily support multiple theater and/or national objectives are referred to as global forces and are normally controlled by the Commander in Chief, United States Space Command (USCINCSPACE). *Global space forces as defined in this document are military forces and do not include space assets controlled by such agencies as National Aeronautics and Space Administration (NASA) or the National Reconnaissance Office (NRO).* USCINCSPACE's control function includes the capability, authority, responsibility, and accountability to execute those forces. Some

forces' effects are primarily focused on a single theater with little or no impact outside the designated area of responsibility (AOR). These *theater space forces generally fall under the control of geographic commanders in chief (CINCs), and are executed by theater component forces.* Although commanders are responsible for producing effects, their decisions on how to do that are greatly influenced by policy, strategy, and doctrine.

Space policy, strategy, and doctrine greatly influence space operations. All three are distinct and have the potential to change dramatically. Therefore, a thorough understanding of both the interaction and differences between policy, strategy, and doctrine is important.

Policy answers the question: "What decisions will the US ultimately make with regard to the fielding and employment of military resources?" Our national interests will determine the policies we pursue, and may not necessarily be in accordance with military doctrine. *Policies may change depending on the leadership at the time, but will always dictate how the military instrument is used.* Policy may be directed by the NCA down through the CINC and CJTF, but should remain congruent through all levels of command.

Strategy pertains to the path chosen by commanders to achieve victory. It relates to how forces will be employed in a specific instance to achieve an end. **Strategy is the art of meshing doctrine and policy to gain a desired end state.** Strategy originates in doctrine but is governed by policy.

Air Force doctrine answers the question: "How should the Air Force organize and operate?" Air Force doctrine is based on the sanctioned best practices and principles supported by history, exercises, experiments, war games, and analysis. Taken together, doctrine guides how operations *should be* conducted to achieve military objectives, while strategy guides how operations *will be* conducted to achieve national objectives. Doctrine is not dependent on policy, but may be influenced by policy decisions. Force employment, ultimately, will be in accordance with policy direction, but, whenever possible should follow doctrinal principles. *Space doctrine generally remains constant despite changing policy, and is primarily affected by innovative advances in technology and organization.*

SPACE OPERATIONS' CONTRIBUTION TO AIR AND SPACE POWER

Air and space power involves the synergistic application of air, information, and space capabilities to achieve desired effects. It is important for airmen to understand the characteristics of space forces and how the characteristics factor into the principles of war, tenets of air and space power, Air Force functions, and Air Force core competencies.

Principles Of War

Although space operations often involve assets not located in the traditional war-fighting environments of air, land, and sea, the basic principles of war still apply. Unity of command, objective, offensive, mass, maneuver, economy of force, security, surprise, and simplicity are equally relevant to the conduct of space operations. Furthermore, space forces enhance the ability of terrestrial forces to apply the principles of war in combat.

Tenets of Air and Space Power

The Air Force tenets of air and space power are the fundamental guiding truths that set air and space power apart from surface force capabilities. *Airmen, however, should not assume airpower and space power are interchangeable. Applying the operational art of war requires an understanding of the similarities and unique qualities of each, and combining these capabilities in the right mix for desired effect.* The following discussion articulates how space fits within the tenets of air and space power.

Tenet 1: Centralized Control and Decentralized Execution

Space capabilities enhance operations across the globe. Space assets available to our nation include military, intelligence, commercial, civil, and foreign. For this reason, space operations are generally best planned and controlled in a centralized manner. **Centralized control/decentralized execution provides the necessary CINC oversight and ability to direct and coordinate component space forces through mission-type orders, while allowing component forces the flexibility to determine how they will employ their resources to achieve the mission.** Centralized control/decentralized execution

also provides the component commander the centralized oversight and control over service forces via a daily tasking order, while allowing wings and squadrons the flexibility to determine which tactics, techniques, and procedures to use for a given space system and operation.

Tenet 2: Flexibility and Versatility

Flexibility is the ability of air and space forces to exploit mass and maneuver simultaneously to a far greater extent than surface forces. Versatility is the ability of air and space forces to be equally effective when employed at the strategic, operational, and tactical levels of warfare. Another facet of versatility is the innovative manipulation and use of the data and information provided. In the future, additional versatility may come from space systems with adaptive, reprogrammable or reconfigurable sensors or other payloads. In certain instances, reconfigurable constellations may also be able to adapt and optimize for different missions (i.e., future microsat constellations).

Traditionally, most satellites have had reduced flexibility due to limitations in size, weight, power, cost, and accessibility. Although able to transition between support for both theater and global missions, satellites tend to host single missions such as photo reconnaissance, communications, navigation, etc. Few satellites support more than one type of mission. Furthermore, space-based assets are costly to maneuver and are not serviced in orbit. Once certain satellites are placed in orbit, it can be prohibitively expensive in terms of on-board fuel to move them far out of that orbit. For example, it may not be practical to move a single geosynchronous early warning satellite out of one orbit and into another so we can gain a better opportunity to image a particular area. However, increased flexibility can be obtained by either satellite constellations as a whole or by designing new satellite systems capable of providing multiple services.

Despite these limitations, satellites do offer increased options for the joint force commander. The synergistic application of both air and space-based platforms increases the flexibility of the total force. For instance, traditionally, communications were limited to land-lines or aircraft relays. Navigation was primarily derived from ground-station antennas, beacons, and transponders. Intelligence, surveillance, and reconnaissance (ISR) were provided mainly by aircraft. Today, space-based capabilities allow for additional

means of communications, navigation, environmental monitoring, and ISR. *Space-based sensors along with air-breathing counterparts bring increased flexibility in force employment.*

Space forces, like air forces, operate simultaneously at the strategic, operational, and tactical levels of war, increasing their versatility across the range of military operations. Missile warning satellites, for example, traditionally have been used for detecting intercontinental ballistic missile (ICBM) attacks on North America. Yet, they can also be used for detecting short-range ballistic missile (SRBM) and intermediate range ballistic missile (IRBM) launches for theaters. The Defense Meteorological Satellite Program (DMSP) constellation not only provides weather information directly to theater for the tactical movement of special operations forces, but also provides weather information for planning campaigns and determining the types of munitions utilized. At the same time, downlinked DMSP data is used to update national weather forecast models for supporting the strategic national-level activities. Communications satellites also offer versatility as they support strategic direction and information between the NCA and combatant commanders down to operational and tactical-level users of imagery.

Tenet 3: Synergistic Effects

Space forces enable synergistic effects that increase the capability of our forces. For example, GPS receivers fitted on munitions transform "dumb bombs" into precision-guided munitions (PGM) such as the Joint Direct Attack Munition (JDAM), Joint Standoff Weapon (JSOW), and Joint Air to Surface Standoff Munition (JASSM). Although precision-guided munitions using optical or laser-guided packages have been used for many years, their major limitation has been that they are easily defeated by inclement weather or smoke in the target area. While GPS-aided munitions are not applicable to every mission, through the acquisition of GPS-aided munitions and aircraft capable of delivering them, airmen now have an all-weather, accurate capability. Operation ALLIED FORCE proved the value of these new "space-aided" weapons as poor target area weather no longer provided sanctuary for the enemy.

Tenet 4: Persistence

Space-based forces hold the ultimate high ground, offering the potential for permanent presence over any part of the globe. Sunsynchronous earth-orbiting satellites such as DMSP, Land Remote Sensing Satellite (LANDSAT), and certain reconnaissance satellites offer continuous revisits over the same locations for detecting changes in the atmosphere and Earth surface due to natural and man-made conditions. In the future, a constellation of space-based radars will offer a constant deep-look capability for ground and air-mobile targeting that complements today's airborne platforms. Persistence is accomplished by a combination of methods. One such method involves the use of satellites in geosynchronous orbits that allow constant presence over a given area of the Earth. Another method includes the use of constellations of satellites positioned in sunsynchronous, polar, semisynchronous, and elliptical orbits enabling recurring coverage over particular areas of the earth during a given period of time. *The use of satellite constellations coupled with networked ground facilities allows persistent collection and distribution of information.*

The advantages of satellite persistence are partially offset by the limitation of predictability. Because of the predictability imposed by orbital dynamics, a major limitation of satellites is that adversary forces may know when to respond to such overflights with either passive or active defensive measures. Another limitation involves the cost of fielding and maintaining a space-based capability. Satellites, today, are expensive to build and operate, relying on an extensive infrastructure of ground facilities, the satellites themselves, launch support, and communications connectivity.

Tenet 5: Concentration

Space forces contribute to the military's ability to concentrate effects. Space-based ISR and information systems, combined with PGMs, have eliminated the need, as in past conflicts, for many aircraft to attack a single target. Today a single aircraft can strike several targets. For example, during Operation ALLIED FORCE, B–2s were a force multiplier because they struck an average of five individual targets per sortie. Similar to low density/high demand (LD/HD) assets, satellites, launch systems, and other infrastructure for space operations require

careful prioritization and balance. This strict attention helps ensure concentration of purpose.

Tenet 6: Priority

The use of space forces must be prioritized because the assets are finite and are exceeded by requirements. Space forces need to be employed where they can make the greatest contribution to satisfying critical national and theater requirements. For example, secure space-based communications bandwidth derived from space-based assets is limited, yet the demand continues to rise.

Tenet 7: Balance

Space forces must be balanced against competing priorities. Because most space forces have global capability/coverage, responsibility for commanding and controlling them must reside with those who have a global view and the means to execute this responsibility. USCINCSPACE is the centralized authority for coordinating and prioritizing the use of global space forces, while the National Reconnaissance Office (NRO) is responsible for prioritizing global ISR space systems.

The Air Force Functions

Counterspace

Counterspace operations consist of those operations conducted to attain and maintain a desired degree of space superiority by allowing friendly forces to exploit space capabilities while negating an adversary's ability to do the same. Counterspace operations include two elements—offensive and defensive counterspace, both predicated on space surveillance and other intelligence. Air, space, land, sea, information, or special operations can perform counterspace functions.

Offensive Counterspace (OCS) operations preclude an adversary from exploiting space to his advantage. Should policy allow, OCS actions may target an adversary's space system, forces, and information links, or third-party space capabilities supporting those forces, using lethal or nonlethal means. Possible methods include the use of deception, disruption, denial, degradation, and destruction of space capabilities. The "Five Ds" represent a continuum of options, from spoofing the enemy

to hard-kill of a space asset. However, there are tradeoffs along the continuum. At the destruction end of the continuum, airmen can be confident that an adversary's space asset and the effect it produced have been eliminated. However, there may be undesirable collateral effects, such as added debris threats in orbit, or negative world opinion. At the deception end of the continuum, airmen may have less confidence in achieving the desired effect, but have more confidence in not producing any adverse collateral effects.

- **Deception employs manipulation, distortion, or falsification of information to induce adversaries to react in a manner contrary to their interests.**
- **Disruption is the temporary impairment of some or all of a space system's capability to produce effects, usually without physical damage.**
- **Denial is the temporary elimination of some or all of a space system's capability to produce effects, usually without physical damage.**
- **Degradation is the permanent impairment of some or all of a space system's capability to produce effects, usually with physical damage.**
- **Destruction is the permanent elimination of all of a space system's capabilities to produce effects, usually with physical damage.**

Assets designed for the OCS mission may be used to conduct or support counterair, countersea, counterland, counterinformation, or strategic attack missions by performing offensive counterspace actions where the adversary's vulnerable node is a space system.

Defensive Counterspace (DCS) operations preserve US/allied ability to exploit space to its advantage via active and passive actions to protect friendly space-related capabilities from enemy attack or interference. Although focused on responding to man-made hostile intent, DCS actions may also safeguard assets from unintentional hazards such as space debris, (RF) interference, and other natural occurring events. Defensive counterinformation (DCI) operations and force protection measures may be employed in support of DCS.

- **Active defense seeks to detect, track, identify, characterize, intercept, or negate adversary threats and unintentional hazards to friendly space capabilities.**
- **Passive defense seeks to ensure the survivivability of friendly space assets, and the information they provide.**

Space situational awareness (SSA) forms the foundation for all counterspace and other space actions. It includes traditional space surveillance, detailed reconnaissance of specific space assets, collection and processing of space intelligence data, and analysis of the space environment. It also encompasses the use of traditional intelligence sources to provide insight into adversary space operations.

Spacelift

Spacelift projects power by delivering satellites, payloads, and materiel to or through space. The Air Force has three strategies and one emerging strategy for spacelift.

Launch to deploy achieves a satellite system's designed initial operational capability. This strategy uses a launch-on-schedule approach where launches are planned in advance and executed in accordance with the current launch schedule.

Launch to sustain replaces satellites nearing the end of their useful life, predicted to fail, or that have failed.

Launch to augment increases operational capability above the designed operational capability in response to war, crisis, or contingency.

Launch to operate is an emerging strategy to increase the useful life of space assets through

Delta II Rocket
This system launches military, civil, and commercial payloads into orbit.

scheduled or on-demand launches providing space support such as refueling or repair.

Ultimately, a multi-based all-weather spacelift capability, responsive within days or hours, will be essential to meet future war-fighting needs. This "launch-on-demand" may also be leveraged to increase the useful life of assets already deployed by providing on-orbit servicing.

Counterinformation

Counterinformation seeks to establish information superiority through control of the information realm (see AFDD 2-5, *Information Operations*). Space operations may be an enabler of counterinformation effects. For instance, conducting offensive and defensive counterspace operations could involve the active denial or disruption of space-derived information. *The protection of space-based information from enemy exploitation may be part of the counterinformation effort yet be accomplished via counterspace activities.* However, counterinformation operations also involve activities not tied to space.

Command and Control (C2)

Today, space is integral to the command and control of forces. C2 includes both the *process* by which the commander decides actions to be taken and the associated people and systems that implement the decision. These work together, enabling a commander to plan, direct, coordinate, and control forces and operations (see AFDD 2-8, *Command and Control*). Satellite communications via the Military Strategic and Tactical Relay System (MILSTAR) constellation provide survivable communications for passing NCA strategic direction to subordinate forces. The Defense Satellite Communications System (DSCS) constellation provides communications flow between military tactical units and operational-level commanders. The Ultra High Frequency (UHF) follow-on constellation provides secure communications for naval operations. Also, space-based imaging and other ISR collection capability provide commanders and operational planners with vital intelligence for the command and control of military forces. For force protection, Defense Support Program (DSP) satellites characterize the strategic and tactical missile threat for rapid commander assessments and subsequent counterattack decision making.

Intelligence

Intelligence provides clear, relevant, and timely analysis of foreign capabilities and intention for the purpose of planning and conducting military operations. The overall objective of intelligence is to enable commanders and combat forces to know the enemy. *Space assets support intelligence collection and dissemination efforts by collecting and processing information on adversaries and subsequent dissemination to forces. Space-based systems are generally unobtrusive, and are an internationally accepted means of gathering peacetime information without violating national sovereignty.*

Surveillance

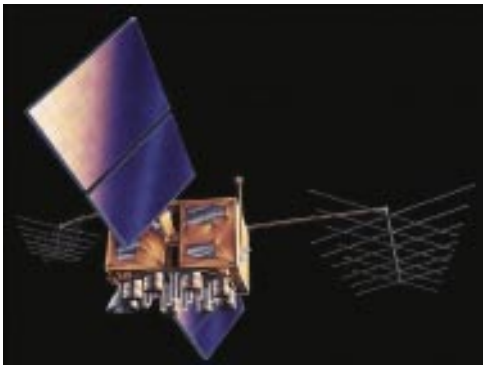
Surveillance is the function of systematically observing air, space, surface, or subsurface areas, places, persons, or things, by aural, electronic, photographic, or other means. For example, the Space Surveillance Network (SSN) allows the United States to maintain awareness of the position, track, and characteristics of man-made objects in Earth orbit. In the future, surveillance can also be achieved through over-head non-imaging infrared (ONIR) satellites placed in geosynchronous orbit providing theater ballistic missile (TBM) detection, enabling increased theater force protection.

Reconnaissance

Reconnaissance complements surveillance in obtaining, by visual observation or other detection methods, specific information about the activities and resources of an adversary or potential adversary. In addition, reconnaissance may focus on securing data concerning the meteorological, hydrographic, or geographic characteristics of a particular area. Multispectral and, in the future, hyperspectral imagery obtained from space assets provides a new dimension to imaging the battlespace.

Space assets, including national systems, are a critical provider of intelligence, surveillance, and reconnaissance to the operational user. Operational commanders, planners, space system operators and developers must work to make space ISR capabilities as flexible, responsive, and accessible to the warfighter as possible. Protecting these high value space assets and the information they provide is also of critical importance.

Navigation and Timing



Global Positioning System (GPS) Satellite

The GPS constellation allows forces to navigate anywhere in the world. In addition, this system enables increased accuracy for many modern weapons.

The function of navigation and timing is to provide accurate location and time of reference in support of strategic, operational, and tactical operations. Navigation and timing help all military forces to precisely maneuver, synchronize actions, locate and attack targets, locate and recover downed aircrew, and perform many other tasks. Space assets are becoming the foundation upon which the US military navigates. However, potential adversaries can exploit GPS navigation for their own operations, as well as field their own indigenous space-based navigation and timing systems.

Weather Services

Space assets supply timely and accurate environmental information, serving commanders' needs for space and atmospheric weather forecasting. *Space-based systems such as the DMSP and civilian weather constellations provide data on global and regional weather characteristics that enhance weather forecasting for operational level plans.* Weather forecasting affects warfare from the timing and tempo of troop maneuver to the weaponeering phase of the air tasking order (ATO) process.

Understanding the space environment and how it impacts surface, air, and space-based forces allows proactive measures to mitigate space weather effects. Space phenomena such as solar flares and ionic scintillation can disrupt communications, block radar transmissions, and damage satellites. Predicting these occurrences allows timely preparation of alternatives ranging from alternate communications, to satellite protection measures, to adjusting weapons loads and sortie times.

Combat Search and Rescue (CSAR)

CSAR consists of those operations conducted to recover distressed personnel during wartime or contingency. It is a key element in sustaining the morale, cohesion, and fighting capability of friendly forces. Space assets are critical supporting elements for these operations by providing communications, threat and survivor location, weather data, and navigation and timing.

Counterair

Counterair consists of operations to attain and maintain a desired degree of air superiority by neutralizing enemy forces. Space assets support the joint force air and space component commander's (JFASCC's) counterair effort through communications, ISR, C2, navigation and timing, and weather services. Satellites collect intelligence on enemy aircraft under certain flight conditions, provide detailed layout on airfields and runways, and help locate the positions and readiness states of enemy tactical and strategic rocket launch systems. The DSP satellite constellation, in particular, was key to detecting, tracking, and warning of Iraqi SCUD launches, and provided the required vector for US Patriot missile interceptions. GPS provided precise navigation to aid air interception of enemy aircraft as well as the precision required for stand-off munitions selection.

Counterland

Counterland involves those operations conducted to attain and maintain a desired degree of superiority over ground operations by neutralizing enemy ground forces. For air interdiction (AI) and close air support (CAS) missions, space assets provide battlespace situational awareness. Space-based C2 assets are a key means by which commanders communicate, direct, and control their AI and CAS missions.

Countersea

Countersea is a collateral function that extends the application of air and space power into the maritime environment. Currently, space ISR assets make their greatest contribution to countersea in the realm of sea surveillance. Future OCS assets may play an important role in countersea operations. For example, they may degrade or eliminate

adversaries' abilities to observe the numbers, locations, or activities of friendly sea forces.

Special Operations

Air Force special operations forces (AFSOF) conduct the following primary missions: precision employment/strike, information operations, AFSOF mobility, shaping the battlespace, and agile combat support. Space assets for C2, ISR, navigation and timing, and weather are key enhancers of special operations. For example, space assets are used for monitoring treaty compliance to aid counterproliferation efforts. GPS satellites provide the timing and signal for portable and hand-held navigation tools. The Combat Survivable Evader Locator (CSEL) assists friendly forces in locating their special forces for CSAR and extraction. Small Tactical Terminals (STT) offer special forces a highly transportable weather forecasting capability only made available through the use of polar and geostationary weather satellites. Frequency bandwidth for the passing of detailed mapping imagery and critical communications is enabled through the use of ever-present and multichannel communications satellites. Space assets can also provide threat information, blue force tracking, and secure, covert communications for special operations forces.

Strategic Attack

Strategic attack is the function of military action carried out against an enemy's center of gravity (COG) or other vital target sets. Geolocation and identification of strategic targets by space-based assets are critical today. Satellites provide imagery and other intelligence collection, are used in target geolocation and weaponeering efforts, and contribute to mapping geographical terrain and environmental constraints for aircraft maneuver. ICBMs also conduct strategic attack operations through the use of space and are discussed in AFDD 2-1.2, *Strategic Attack*, and AFDD 2-1.5, *Nuclear Operations*. In the future, national policy may allow the Air Force to conduct strategic attack through space.

Airlift and Air Refueling

Airlift is the transportation of personnel and materiel through the air and can be applied across the entire range of military operations. Air refueling, along with airlift, fulfills the Air Force contribution to the role of joint mobility. Space assets providing weather, navigation and

timing, and communications assist airlift and air refueling operations by enhancing timely rendezvous between aircraft and enhancing transit to deployment airfields and drop zones. Airlift forces routinely operate in high threat environments with little organic support. Space capabilities can help meet mobility forces needs for threat warning, surveying of remote operating locations, deploying quickly, and operating in environments with no support infrastructure.

The Air Force Core Competencies

Air and Space Superiority

Counterspace is the means by which the Air Force gains and maintains space superiority just as *counterair* is the means by which the Air Force gains and maintains air superiority. To achieve space superiority, counterspace operations must be integrated with counterair efforts by leveraging information operations, C2, ISR, navigation and timing, and weather services. **Without capabilities to ensure the survivability and operational utility of friendly space forces as well as capabilities to deny the adversary use of space, *space superiority* cannot be achieved.**

Precision Engagement

Precision engagement derives from the ability to command, control, and employ forces to cause discriminate strategic, operational, or tactical effects with fewer resources than previously required for the same mission. *The keys to precision engagement are superior situational awareness and the ability to concentrate force to attack any facet of the enemy's power.*

Employing space assets for C2 allows for efficient battlespace management, including planning, directing, coordinating, and controlling forces. Space assets provide intelligence assessments of enemy capabilities and intentions. Space-based surveillance assets can offer warning of enemy initiatives and threats and detect changes in enemy activities. Space-based reconnaissance offers specific information about the activities and resources of an enemy. Space-based weather services provide unmatched timely and accurate terrestrial and space weather information, thereby influencing the selection of targets, routes, weapon systems and delivery tactics. Space-based navigation and timing assets

provide accurate location and time of reference in support of all levels of operations.

Information Superiority

Information superiority is dependent upon collecting, controlling, exploiting, disseminating, and protecting friendly information while denying an adversary the ability to do the same. In the same way space assets enhance precision engagement through C2, ISR, navigation and timing, and weather service, they also enhance information superiority. An example is when counterspace operations are used to produce information attack effects.

Global Attack

Global attack centers on the Air Force's ability to attack rapidly and persistently with a wide range of munitions anywhere on the globe. From the Air Force perspective, the key pillar of global attack is the function of strategic attack. Yet, the United States' first concern is to deter war. It may do this by continuously observing an adversary's actions through ISR from air and space and then, when provoked, have the capability to swiftly respond. In practical terms, deterrence is often achieved by causing the adversary to fear the consequences of challenging a credible threat.

Rapid Global Mobility

Rapid global mobility refers to the timely movement, positioning, and sustainment of military forces and capabilities through air and space, across the range of military operations. Space-based ISR, C2, weather services, spacelift, and navigation and timing assets contribute significantly to rapid global mobility, enhancing aircraft ability to rapidly deploy, sustain, and redeploy forces and equipment.

Agile Combat Support

Agile combat support is how the Air Force sustains the forces it deploys forward. As with rapid global mobility, space-based C2, weather services, and navigation and timing assets enhance agile combat support.

CHAPTER TWO

COMMAND AND CONTROL OF SPACE ASSETS

> ***Nothing is more important in war than unity of command.***
>
> **Napoleon Bonaparte**

OVERVIEW

Command and control of space assets at the operational level of war is complex. **Space assets supporting military interests come from a variety of organizations, sometimes outside of the Department of Defense (DOD), and often with nontraditional chains of command. Interagency responsibilities with authority split between organizations further complicate space C2.** One example of multiagency responsibilities in C2 of space capability involves missile warning and defense. During Operation DESERT STORM, theater missile warning and defense was performed through the cooperative use of Air Force's Defense Support Program (DSP) for SCUD launch notification to Army Patriot missile defense batteries. Today, these assets are combined with the Army-Navy Joint Tactical Ground Station (JTAGS) and Air Force ALERT facility to provide for prompt and effective theater missile defense. In essence, space C2 in support of the counterair mission resides in part with SPACEAF (Fourteenth Air Force), the regional JFASCC, corps commander, and in some cases at NCA level.

Other challenges occur when one organization owns an asset while another agency performs the actual operations, or, when one organization operates the platform while another has responsibility over the sensors on board. DMSP weather satellites, provided specifically by and for DOD and limited national-level operations, currently fall under the combatant command of USCINCSPACE, but are controlled on a daily basis by the National Oceanographic and Atmospheric Administration (NOAA) under the Department of Commerce (DOC). Yet, requirements for on-board sensor tasking are provided by the Air Force Weather Agency, a direct reporting unit to the Chief of Staff, United States Air Force (CSAF). Similarly, the DSCS satellites are flown and maintained by the Air Force, while the Army retains

responsibility for the multitude of satellite communications frequency and bandwidth adjustments.

Global versus Theater Impact Considerations

Many space assets such as satellites, satellite ground stations, space surveillance sensors, launch capability, and missile warning capability support air, land, and sea forces. **Space assets may be used to fulfill individual theater, multiple theater, or national objectives. The command and control structure established for space forces depends on which of those three will be impacted.** When the effect of employing space assets impacts national or multiple theater requirements, a centralized structure for command and control, maintained by USCINCSPACE, is best. Such may be considered similar to LD/HD assets and are prioritized and employed via a support relationship similar to USTRANSCOM mobility assets.

When the effects are focused primarily on an individual theater, space forces are normally the responsibility of the theater CINC. These forces can produce strategic, operational, or tactical effects for a theater. If needed by a JTF, operational control (OPCON) of theater space forces should be delegated to a commander, joint task force (CJTF), who should then delegate that authority to the appropriate component commander. Normally, this component commander should be the COMAFFOR/JFASCC. The COMAFFOR/JFASCC is best suited to play key roles regarding space within the JTF.

These key roles include the coordinating authority for space and the supported commander for joint space operations assigned by the CJTF. Within the constraints of national policy, the COMAFFOR/JFASCC should be assigned counterspace operations and, when applicable, strategic attack from or through space.

Although not operated or controlled by USCINCSPACE, nonmilitary space assets can also provide critical space capabilities for commanders. These assets belong to national agencies such as NASA, NRO, NOAA, or are owned by civilian corporations and international consortiums such as the International Telecommunications Satellite Organization (INTELSAT) and the International Maritime Satellite Organization (INMARSAT). Some nonmilitary organizations have established

coordination channels through USSPACECOM as well as the theater staffs (including liaison officers in theater).

JFCs may request USSPACECOM assistance in coordinating with these nonmilitary organizations for optimal utilization of their capabilities. The NCA and the CINCs should develop interagency/interconsortia processes to streamline discussions, policies, procedures, and rules of engagement for interacting with nonnation state space actors. These assets will play an increasing role in the "balance of power" that affects global and theater operations.

COMMAND AND CONTROL OF GLOBAL SPACE FORCES

The Unified Command Plan (UCP) established USSPACECOM as the functional unified command for space. *USCINCSPACE has combatant command (command authority) (COCOM) of all space forces as assigned to him by the Secretary of Defense's Force for Unified Commands memorandum.* Therefore, with the exception of activities authorized by the previous transfer or delegation of OPCON/TACON, any activity that affects these forces must be coordinated with USSPACECOM. USSPACECOM operates assigned military space forces through its service component commands—Army Space Command (ARSPACE), Naval Space Command (NAVSPACE) and Space Air Forces (SPACEAF). The mission of SPACEAF is to employ space forces for ballistic missile warning, navigation, communications, spacelift, and counterspace operations, as well as to provide satellite operations capabilities.

USCINCSPACE normally delegates OPCON of assigned forces to the Service components. **Therefore, the Commander, Space Air Force Forces (COMSPACEAF) would normally have OPCON of Air Force space forces assigned to USCINCSPACE.** As illustrated in Figure 2.1, the operational chain of command extends from USSPACECOM to SPACEAF to the space wings. COMSPACEAF exercises OPCON of assigned Air Force space forces through the SPACEAF operations center. When used for reachback, the SPACEAF operations center is the interface for the theater to gain access to Air Force space capabilities. It has the ability to expand during contingency support using augmentation. Finally, the space wings operate assets that produce effects for the nation and the various theaters.

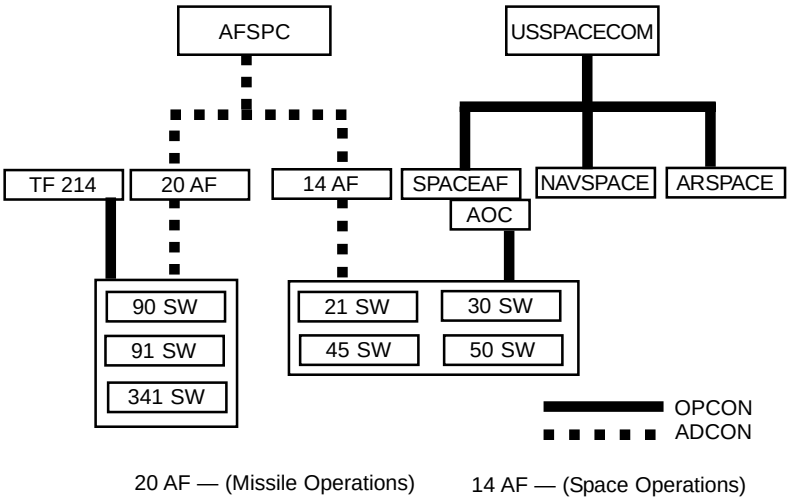


Figure 2.1. C2 for Global Space Forces

The Commander, Air Force Space Command (AFSPC/CC) exercises administrative control (ADCON) as the Air Force major command (MAJCOM) commander responsible for organizing, training, and equipping Air Force space forces. This relationship exists between Air Force Space Command (AFSPC), its numbered Air Forces (NAFs), and the associated wings. The space forces are presented through Fourteenth Air Force (14 AF) for employment by COMSPACEAF. The Commander, Fourteenth Air Force (14 AF/CC) serves as the Air Force's senior war-fighting commander to USSPACECOM and is dual-hatted as COMSPACEAF. The 14 AF's A-staff is responsible for monitoring readiness and "care and feeding" of its forces. In times of contingency, SPACEAF receives augmentation from 14 AF's A-staff and AFSPC units. Command relationships are illustrated in Figure 2.1.

COMMAND AND CONTROL OF THEATER SPACE FORCES

During contingency operations, theater commanders will integrate space into their campaign. Space support to the theater can be achieved through global space forces, deployable space forces, and theater organic space forces. Global space forces are military space assets that normally support national objectives and multiple theaters. Deployable space forces are space forces that can move forward to a theater to support operations. Organic space forces are those that are embedded in theater in anticipation of their use in theater operations. **Global space forces, deployable**

space forces, and theater organic space forces require different command relationships and levels of coordination to achieve effects within the theater.

Space experts available to theater staffs facilitate space integration. The Air Force has embedded space expertise within its wing, AOC, NAF, and MAJCOM staffs. The other Services provide their JTF components space support teams (SSTs) when requested. At the theater level, USSPACECOM provides a liaison officer (LNO) to the CINC staff and a joint space support team (JSST) to the geographic CINC when requested.

Integrating Global Space Forces

When global space forces are requested to produce effects within a theater, the NCA will establish a command relationship between USCINCSPACE and the theater CINC—normally a supporting/supported relationship. This will be employed at appropriate levels within both the supporting and supported commands. These support relationships usually fall into two categories: general support and direct support. General support is used when the support is given to the supported force as a whole. Direct support is used when a mission requires a force to directly support another specific force. Direct support authorizes a force to answer directly to the supported force's request for assistance. For example, during Operation ALLIED FORCE a direct support relationship was established between the Combined Force Air Component Commander (CFACC) in Italy and the Eleventh Space Warning Squadron (11 SWS) in Colorado. This relationship allowed the combined air operations center (CAOC) to use real-time information from the DSP for time-critical actions.

To facilitate a support relationship, a direct liaison authorized (DIRLAUTH) relationship should be established between appropriate theater and space commanders. This enables integration and synchronization of space forces and effects with theater operations, and enables theater warfighters to coordinate directly, at either the same or differing organizational levels. For example, the SPACEAF operations center had DIRLAUTH with the CAOC during Operation ALLIED FORCE.

Theater commanders may be given tactical control (TACON) over global space forces producing theater-only effects when a greater

command authority is required beyond a support relationship and the capability to exercise this C2 exists in theater. However, OPCON will usually remain under USSPACECOM component command. For example, COMAFFOR/JFASCC may hold TACON over future CONUS-based missile warning or laser facilities in order to rapidly employ those forces for JOA effects. In such instances, TACON should be specified, and routine coordination between forces should occur.

Deployable Space Forces

USCINCSPACE has COCOM of deployable forces that can support national, multitheater, or individual theater requirements. **USCINCSPACE 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 may direct USCINCSPACE to transfer the space forces to the geographic CINC. The command relationship the gaining commander will exercise is specified by the Secretary of Defense. *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.*

When feasible, the geographic CINC should delegate OPCON of deployed space forces to the CJTF that requires those effects. The CJTF should likewise delegate OPCON of the deployed space force to the appropriate Service component commander. *Space forces in excess of that component's direct support requirements should be provided to the CJTF for tasking through the JFASCC for the support of other components of the joint force or the joint force as a whole.*

Theater Organic Space Forces

Geographic CINCs may have COCOM of theater space forces. Service component commanders would then exercise OPCON of those organic space forces. During times of contingency, these forces may be incorporated into a JTF. *Within the JTF, the appropriate functional component commander should exercise TACON of forces made available by other Services, and OPCON of its own Service's forces. For space forces, this component commander should normally be the JFASCC if one is designated.* Figure 2.2 depicts the command relationships for Air Force space forces depending on the type of space force and the desired effect.

	GLOBAL	DEPLOYABLE	THEATER ORGANIC
IMPACT (Span of)	Global or Theater	Global or Theater (AOR/JOA)	Theater (AOR/JOA)
COCOM	USCINCSPACE	USCINCSPACE	Geographic CINC
OPCON	COMSPACEAF	*COMAFFOR or USSPACECOM Component Commanders	COMAFFOR
TACON	COMSPACEAF or JFASCC	*JFASCC (if COMAFFOR has OPCON)	JFASCC
SUPPORT RELATIONSHIP	JFASCC	*JFASCC (if SPACEAF retains OPCON)	N/A
TASKING TOOL	space tasking order (STO)	ATO or STO	ATO

NOTE:

* The JFC normally delegates OPCON over all assigned and attached US Air Forces to the COMAFFOR. The COMAFFOR normally maintains OPCON of assigned and attached US Air Forces and when designated the JFASCC, normally receives TACON of forces from other components as directed by the JFC. By definition, the JFASCC must be capable of controlling and executing space forces of other Services. If another Service provides the JFASCC, the COMAFFOR will relinquish TACON of nonorganic forces to the JFASCC as directed by the JFC.

Figure 2.2. C2 of Air Force Space Forces

Presentation of Forces

If a contingency operation requires a JTF, Air Force forces will be presented as an Aerospace Expeditionary Task Force (AETF). AFSPC is responsible for providing Air Force space forces as part of the AETF structure, as required. Within the AETF, space forces may attach to an air and space expeditionary wing, group, or squadron.

When the JTF is formed under a geographic CINC, attached space forces should be commanded by the COMAFFOR, under the AETF structure through the AOC. The AOC works through the SPACEAF operations center for tasking of space forces.

KEY ROLES OF THE JOINT FORCE AIR AND SPACE COMPONENT COMMANDER (JFASCC) IN JTF SPACE OPERATIONS

The COMAFFOR/JFASCC should normally hold key roles within the JTF for space operations: the coordinating authority

for space and the supported commander for joint space operations assigned by the CJTF. For the purposes of the following sections, the COMAFFOR is assumed to be dual-hatted as the JFASCC. In the cases where the JFASCC is other than an Air Force officer, the COMAFFOR will fill designated billets within the JFASCC staff and joint air operations center (JAOC) to ensure proper employment of air, space, and information assets. If a JFASCC is not appointed, the JFC may assign the COMAFFOR certain JFASCC-related duties.

JFASCC as the Coordinating Authority for Space

During times of conflict or large-scale contingencies it is important to have a coordinating authority for space within the JTF structure to appropriately represent the space requirements of the CJTF. With each JTF component and many allies having their own organic space capability, there is the possibility of interference between the various space operations, redundant efforts, and conflicting support requests reaching USSPACECOM. **To prevent such occurrences, the CJTF should appoint a JTF coordinating authority for space operations.**

Coordinating authority is the authority delegated to a commander or individual for coordinating specific functions and activities involving forces of two or more military departments, functional components, or two or more forces of the same Service. The commander or individual has the authority to require consultation between the agencies involved but does not have the authority to compel agreement. The common task to be coordinated will be specified in the establishing directive without disturbing the normal organizational relationships in other matters. Coordinating authority is a consultation relationship between commanders, not an authority by which command may be exercised (JP 1-02). Assignment of coordinating authority is based on the mission and capabilities of the command or organizations involved. Coordinating authority is not in any way tied to force assignment and is separate and distinct from command and control of space assets.

The CJTF should appoint a coordinating authority for space at the component commander level. Coordination should be done at the operational level because requirements are being prioritized to support the operational-level campaigns of the component commanders. *The JTF coordinating authority for space should have*

a theater-wide perspective and a thorough understanding of integrating space operations with all other military activities.

There are important reasons the CJTF should assign the JFASCC the responsibility of coordinating authority for space operations. For instance, normally the COMAFFOR is the JFASCC and brings with him the preponderance of space capability and expertise. Also, unlike the other Service or functional component commanders who are assigned specific areas of operations (AO) within a theater, by definition the JFASCC is tasked with theaterwide operations. This perspective is essential for coordinating space operations that also support the JFC throughout the theater.

Responsibilities of the Coordinating Authority for Space

The coordinating authority serves as the focal point for gathering space requirements within the JTF from the J-staff and each component commander. These requirements include requests for space forces (i.e., Naval Space Support Team), requests for effects achieved via space systems (i.e., denial of adversary access to satellite communications [SATCOM]), and requests for implementation of specific command relationships (i.e., a direct support relationship between the JFASCC and 11 SWS for theater missile warning). The coordinating authority develops a recommended prioritized list of space requirements for the CJTF based on JFC objectives. The coordinating authority's sphere of influence and focus is the JTF. *While the coordinating authority can facilitate nontraditional uses of space assets, JTF planning staffs should utilize the established processes for fulfilling intelligence and communications requirements.*

A JFASCC may require a space officer dedicated to carry out the detailed responsibilities associated with the coordination role. For this staff option, the JFASCC retains the coordinating authority, but employs a designated space officer to work the day-to-day issues. Space experts already embedded within the AOC structure may not have the time or seniority necessary to fulfill this role. Because of the need to coordinate with other Services and possibly coalition partners, this officer may need to have extensive leadership and staff experience. Although the space officer may not be a permanent member of the JFASCC's staff, he or she should undergo training and participate in major theater exercises to get to know the organization's personnel, processes, and working environment.

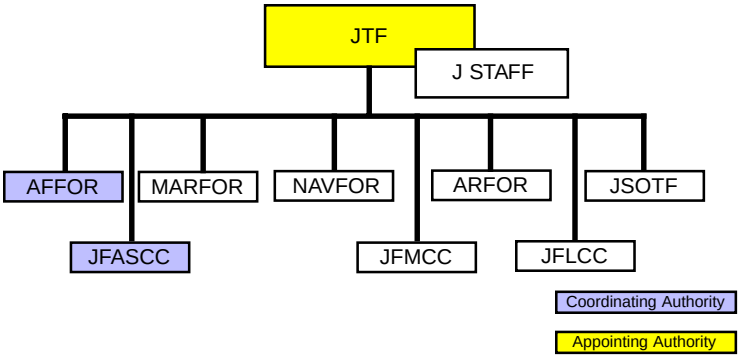


Figure 2.3. Coordinating Authority for Space within the JTF

Responsibilities of Coordinating Authority for Space

- ✪ Deconflict/prioritize military space requirements for the JTF
- ✪ Recommend appropriate command relationships for space to the JFC
- ✪ Help facilitate space target nominations
- ✪ Maintain space situational awareness
- ✪ Request space inputs from J-staff and components during planning
- ✪ Ensure optimum interoperability of space assets with coalition forces
- ✪ Recommend JTF military space requirement priorities to JFC

It will be necessary to coordinate the requirements within the theater at the CINC level if there are multiple JTFs or other theater priorities (figure 2.4). Early on, the coordinating authority must determine whom the CINC's desired staff point of contact (POC) is for coordinating JTF requirements. As a matter of practice, the CINC will not change the JTF requirements but will integrate the requirements with other JTFs and theater needs. The geographic CINC would provide the theater prioritization of space requirements to USCINCSPACE. After USCINCSPACE determines how to meet the requirements, USCINCSPACE will provide feedback on how, or if, those requirements will be met to support the geographic CINC. *USCINCSPACE and the geographic CINC will determine the command relationships necessary to meet the requirements.* As new requirements are generated within the JTF, the coordinating authority will reprioritize the JTF requirements as necessary and follow the same process outlined above.

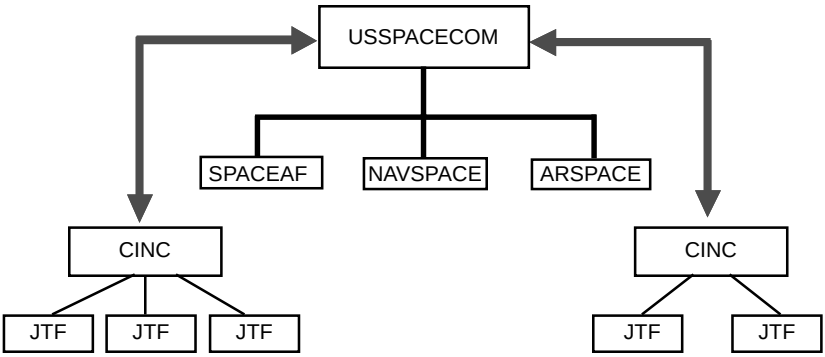


Figure 2.4. Theater Prioritization Coordination Process (illustrating multiple JTFs, theater CINCs, and USSPACECOM feedback)

JFASCC as a Supported Component Commander for Joint Space Operations

The JFASCC should be the supported commander for joint space operations assigned by the CJTF. As capability to command and control space forces in theater matures, more assets will likely be assigned to the theater. It will be critical to have a single functional component commander responsible for integrating space capabilities into the JTF campaign.

Although the CJTF will designate specific space responsibilities for the JFASCC, normally these should include joint counterspace operations and, when the capability and need exists, strategic attack from or through space. The JFASCC will incorporate space objectives and goals, and employ the appropriate assets to meet those objectives.

The COMAFFOR serving as the JFASCC, is well suited to execute counterspace operations for the JFC as part of the overall air, space, and information campaign for several reasons. First, the Air Force has the overwhelming majority of satellite development, launch operation, maintenance, and C2 experience, making it especially qualified to plan for offensive and defensive space activities. Second, the Air Force, through its long involvement with space operations, understands the treaty, legal, and policy considerations associated with counterspace operations. Third, theater counterspace activities often involve transiting the air medium to reach intended targets, necessitating coordination with the JFASCC to prevent fratricide of air forces. Finally, the Air Force will typically provide a

preponderance of the theater counterspace forces and the means to control them. The AOC Strategy Division will develop a prioritized list of OCS targets for inclusion in the joint integrated prioritized target list (JIPTL).

In future operations and consistent with treaty obligations, assigning theater activities for strategic attack from or through space to the JFASCC would enhance unity of command and effort by combining the theater's offensive and defensive space operations under a single command. Similar to today's operations where one commander serves as JFACC, airspace control authority (ACA), and area air defense commander (AADC), such arrangement would ensure full battlespace integration. *All forms of Air Force capability (air, information, and space) performing strategic attack should be synergistically integrated for desired effect.*

CHAPTER THREE

PLANNING FOR SPACE OPERATIONS

When blows are planned, whoever contrives them with the greatest appreciation of their consequences will have a great advantage.

Frederick the Great

OVERVIEW

Space assets are force multipliers across the spectrum of conflict and must be considered at every level of planning. Effects-based operations are enhanced when space is integrated into the JFC's deliberate and crisis action planning processes and is consistent with space-specific operations plans (OPLANs) and operations orders (OPORDs) developed by USSPACECOM.

Annex N of supported commander OPLANs and campaign plans contains space contributions to the overall regional effort. Development of Annex N is the supported commander's responsibility but requires coordinated effort between regionally-based JFC and component staffs and USSPACECOM staffs at joint and Service component levels.

At the operational level of warfare, AOC activities ensure space capabilities for the theater by integrating space expertise throughout the AOC organization. Space expertise should be embedded in the Strategy, Combat Plans, and Combat Operations functions of the AOC.

CAMPAIGN PLANNING

CINCs use campaign planning to ensure orderly transition from peace to crisis and to facilitate deployment and employment of military forces. Campaign planning is completed during a crisis, but the basis and framework of a successful campaign is laid by peacetime analysis and planning. Campaign planning may begin with deliberate planning and continue through crisis action planning. Wartime campaigns integrate air, information, space, land, sea, and special operations effects to attain national and coalition objectives. The campaign plan embodies the CINC's strategic vision of synchronized operations required to achieve theater objectives. **As such, space assets should be integrated into the CINC's campaign planning to ensure their optimal use.**

Deliberate Planning

The OPLAN serves as the foundational employment concept for a theater of operations. It provides the CINC's vision and intent by articulating broad operational and sustainment concepts for the duration of conflict. The resulting plan provides strategic military objectives and operational direction, organizes and tasks subordinate forces, identifies external support requirements, and designates command relationships, additional responsibilities, and objectives.

The COMAFFOR supports the CINC's deliberate planning process through integrated theater air, space, and information planning. This effort should be conducted as a single process rather than as separate air, space, and information processes. Theater planners normally incorporate space planning into theater OPLAN annexes. However, space requirements should be considered as part of the overall campaign, not simply limited to an OPLAN space annex. Space planning should be embedded into the deliberate planning process so that space forces and capabilities are appropriately integrated into each phase of the CINC's campaign.

Because much of theater space support involves forces controlled by USSPACECOM, they need to be consulted when building plans. Reachback support may be requested to USCINCSPACE or components to provide specific expertise or information to augment theater planning as needed. Through this cooperation, theater-developed OPLANS should designate, organize, and task theater space forces and also provide realistic external support requirements for global space assets. USSPACECOM also supports theater-developed OPLANs through standing 3500-series plans that cover contingencies. In addition, space requirements and considerations should be included in any non-USSPACECOM plans supporting theater operations.

Crisis Action Planning

Unlike deliberate planning, crisis action planning (CAP) is based on current events and conducted in time-sensitive situations. CAP planners base their plans on the actual circumstances that exist at the time planning occurs. Deliberate planning supports crisis action planning by anticipating potential crises and developing joint operation plans to facilitate the rapid development and selection of a course of action (COA). This is especially crucial for certain space operations that may need substantial prior

coordination due to their political sensitivity or because they are controlled by USSPACECOM, civil, national, or commercial entities. The result of CAP is an OPORD that is, if needed, directed by the NCA to put military forces into action.

Space assets should be fully integrated into the development of all COAs. A COA is a broad statement of possible ways a COMAFFOR/JFASCC can accomplish his mission. During COA development, as with deliberate planning, planners should identify direct and indirect tasks for space forces in support of theater objectives. *Military planners need to identify those space forces and space capabilities that may be COGs.*

In addition, planners need to examine the role and contributions of space forces in the various phases of the campaign. During COA selection, space forces and capabilities should be reviewed along with air, information, land, sea, and special forces to allow the CINC to make an informed decision on COA selection.

The final product of the crisis action planning process is an NCA-approved OPORD that is a complete description of the JFC's operation that includes the role of space forces. **As a minimum, space assets should be integrated into the following sections of the OPORD:**

- ✪ **Situation:** Include space assets in both adversary and friendly COG analysis (adversary COGs may include neutral party space assets).
- ✪ **Execution:** Articulate how space assets contribute to the accomplishments of objectives in each phase of the operation.
- ✪ **Command and Control:** Consider the role of military, civil, and commercial space assets in command and control of the forces.

Air and Space Crisis Action Planning

Theater planning for integrated air, space, and information operations is also a crucial aspect to crisis action planning. It is *accomplished by the COMAFFOR/JFASCC through an air and space estimate process* that combines the mission activities and desired effects of air, space, and information platforms into a coherent plan to support the JFC's campaign. The result is the joint air and space operations plan (JAOP). *The JAOP should include the tasking of all allocated and assigned space forces and all requests for theater support from global space assets.* Planned space applications for effects in theater are captured in the JAOP.

Theater space tasking and effects derived from deployed and organic space assets should be implemented through the ATO.

Air and Space Estimate

Mission Analysis. Mission analysis begins with intelligence preparation of the battlespace (IPB) and ends with a JFASCC mission statement. This step is focused on gaining information about friendly and adversary capabilities and intentions, doctrine, and the environment in which the operations will take place. *Key space elements include: (1) using space surveillance for awareness of adversary satellite activity, (2) obtaining intelligence on any adversary counterspace assets, and (3) understanding the importance and vulnerabilities of the links and nodes of the adversary's space assets.* These may include the use of third party, commercial, and consortium space assets. Space-based ISR is a key enabler to mission analysis by allowing the collection of vital intelligence, particularly in remote and denied areas of the world. The IPB is then used to identify those strategic, operational, and tactical COGs whose destruction or disruption will achieve JFC objectives. COGs are those characteristics, capabilities, or localities from which a military force derives its freedom of action, physical strength, or will to fight. *A concerted effort should be made to identify both adversary and friendly space COGs and space assets that are vulnerable nodes for terrestrial COGs. Nodal analysis is a useful method to determine space COGs.*

Space COGs may be attacked by targeting the terrestrial nodes, space nodes, or the mission and control links in accordance with national policy. Political considerations, military risks, laws of armed conflict (LOACs), and rules of engagement (ROEs) may restrict actions against specific COGs. Regardless of how a space COG may be attacked, all OCS targeting, should be included on the JIPTL to ensure proper coordination of theater and global efforts. If the CJTF decides to convene a Joint Targeting Coordination Board (JTCB), then that body will provide additional broad targeting guidance.

COA Development. A COA is a broad statement of possible ways a COMAFFOR/JFASCC can accomplish his mission. Each COA should include five elements: what, when, where, why, and how. The first four are usually evident from the CINC/JTF guidance and JFASCC intent. *COA development focuses on the "how." The first step is to determine the air, space, and information objectives that will accomplish the COMAFFOR mission. Joint space objectives and*

supporting objectives should be derived from the CJTF's objectives and should be identified by listing them at each level of war. The sources for planning objectives are the CJTF's initial planning guidance and the OPLAN/OPORD for that region or the campaign plan. The objectives of each level should support the objectives of the next higher level to ensure unity of effort.

COA Analysis/Comparison/Selection. Two or three valid COAs normally emerge from COA development. The next step is to take each strategy/plan and assess its merit against the enemy's most likely and dangerous COAs. Then various techniques are used for final selection of a preferred COA. These may include comparing COAs via a weighted decision matrix or plotting operational objectives and significant events against a timeline to analyze desired objectives against potential risks.

JAOP Development. The final joint air and space operations plan should detail how theater air and space employment will support the CJTF's operation or campaign plan. The JAOP developed during this process should:

- Integrate theater space forces to achieve the JTF's objectives.
- Identify space objectives, effects, and targets by priority order.
  - Describe in what order they should be attacked or dealt with
  - Describe the desired end-state
  - Plan for branches and sequels
  - Define the weight of effort required to achieve the desired end-state
  - Define measures of effectiveness (MOE) to focus combat assessment (CA)
- Account for current and potential offensive and defensive counterspace threats.
- Indicate the phasing of joint space operations in relation to the CJTF's operation or campaign plan.

Air Force Space Operations Plan (AFSOP) Development. In concert with theater planning efforts, USSPACECOM and Service components plan internally for space support to the theater and to meet global space requirements. *Air Force space planning in support of*

the regional or functional supported JFC's requirements occurs through the SPACEAF operations center.

The AFSOP is COMSPACEAF's equivalent to the JFASCC's JAOP. The AFSOP details how Air Force space operations will support both USCINCSPACE's global missions and theater requirements. There are two types of AFSOPs: (1) The global, which prioritizes effects across all AORs and functions based on geographic/functional CINCs' requests and USCINCSPACE's priorities, and (2) the regional, which outlines effects for specific AORs. Regional AFSOPs do not supersede the global AFSOP but provide clarification in support of theater operations. Each plan should contain a sustainability assessment and delineate specific procedures for allocating and exercising C2 of Air Force global space forces. In doing so, the AFSOP allows for optimum integration of global forces supporting theater operations. *SPACEAF will use the AFSOPs to guide the development of the daily space tasking order (STO).*

The final SPACEAF operations plan should complement USSPACECOM OPLANs and detail how employment of global space forces support the theater's campaign. The AFSOP developed during this process should:

- Integrate the effects of Air Force space to achieve theater and global objectives.
- Identify space objectives in the order they should be dealt with, the desired effects, and the weight of effort required to achieve the desired results in support of the theater's objectives.
- Indicate the phasing of space forces in relation to the theater's campaign plan.
- Identify and nominate targets that can prevent or delay space superiority attainment.

PLANNING FACTORS

The following are some critical factors to consider in planning military space operations. This list is not exhaustive but serves as a starting point for Air Force planners.

Phasing

Phasing provides an orderly schedule of military decisions and indicates preplanned shifts in priorities and intent. Phasing may be used to

modify the prioritization of limited space support to theater operations. Space operations often occur simultaneously and can be continuous throughout the campaign, sometimes leading to a sense that phasing is less relevant to space operations. *Phasing remains a useful tool to communicate the CJTF's concept of operations and the shifting of emphasis between on-going space operations.* For instance, counterspace operations may be emphasized early in an operation and be de-emphasized once a degree of superiority has been firmly established. **Some level of regional or temporal space superiority is likely to be a prerequisite to effective pursuit of other objectives.**

Success Indicators and Measures of Merit (MoMs)

Success indicators and MoMs are required to determine whether or not individual effects achieved via space platforms, phases of a campaign, or a campaign in general are meeting objectives. Assessment of such indicators should take place at the operational and strategic levels of war and focus on effects rather than counting raw numbers. The key is to determine when the predetermined conditions that effect operational employment or overall strategy have been met. Continuing intelligence analysis helps to ensure that proper measurements take place.

Deconfliction

Deconfliction for theater space requirements should include both a global and a theater perspective. Global deconfliction is the responsibility of USCINCSPACE. Theater deconfliction is the responsibility of the geographic CINC, or if delegated, the CJTF's JFASCC. The geographic CINC will authorize DIRLAUTH between the JFASCC and USSPACECOM to ensure proper integration and deconfliction of space assets and their effects.

Space Considerations for Joint Strategy

During recent warfare, from Operation DESERT SHIELD/DESERT STORM to Operation ALLIED FORCE, several space-related considerations have surfaced that directly impact US military success.

✪ *Planners should consider what theater missile warning asset is needed and when and how it will be used.* This will determine the support requirements of missile warning assets. Decisions

on timeliness, tolerance of false reports, coverage, and data distribution may drive configuration changes in missile warning constellation alignment and possibly in the communications allocation for transmitting the reports to the theater.

Defense Support Program (DSP) Satellite

DSP has provided global missile warning coverage for the United States since the early 1970's. It will soon be replaced by the improved Space Based Infrared System (SBIRS).

- *Planners should consider GPS accuracy windows when planning strikes with GPS-aided munitions.* Since GPS accuracy is not constant, planners should plan precision strikes in a manner to alleviate degraded GPS accuracy times.

- *Planners should consider the satellite bandwidth available and prospects for increasing bandwidth through arrangements with commercial providers for voice and data communications.* Bandwidth will be directly dependent on the amount of US access to space-based satellite communications. In Operation DESERT STORM, despite US asymmetric advantage in collecting high resolution imagery, limitations in satellite bandwidth prevented timely dissemination of target intelligence data for strike planning and post-strike battle damage assessment. Bandwidth could not support the transmittal of the ATO from the JAOC to Naval forces at sea. Bandwidth throughout 1990's warfare was a limiting factor and may continue to be limiting as information expands exponentially.

- Planners should consider the Defense Meteorological Satellite Program combined with meteorological information from US civil geostationary and polar-orbiting satellites to provide combat weather forces with the capability to forecast environmental conditions. Such forecast information affects military operations from timing of maneuvers to selection of targets and weapons systems. *Planners should consider the effects of weather on operations, and understand the sources, capabilities, and limitations in obtaining timely environmental data and forecasts for theater campaigns.*

- *Planners should consider characterizing the battlespace to include full understanding of the space threat.* As with any operation, appropriate knowledge of the battlespace is essential to conducting military operations. Battlespace characterization, for the space arena affecting the theater, should be accomplished by the theater A-2, in coordination with the USSPACECOM J-2 and SPACEAF A-2.

- *Planners should consider space situational awareness* which plays an important role supporting the theater, in concert with USCINCSPACE, allowing assessment of the enemy's space capabilities and determining the impact they might have on the theater campaign.

- Planners should consider integrating future development capabilities, such as the capability to deliver attacks from space, into the campaign plan when determining how best to strike adversary COGs. Space force application systems would have the advantages of rapid global access and the ability to effectively bypass adversary defenses.

Adversary Space Strategy

Theater planners must consider the vulnerability of the space assets they use and any OCS assets in the adversary's order of battle. Theater planners are responsible for planning strikes on adversary OCS assets or preparing alternatives for the possible loss of friendly space assets and effects where strikes are neither appropriate nor feasible.

- **Planners should review adversary counterspace assets in and out of theater. They should ensure that units controlling possible targets are alerted to the potential threat. They also should consider available countermeasures.** An essential part of this effort will be attack detection and reporting. Operators and planners must know as quickly as possible the origin of any anomaly and be able to identify and geolocate the threat in a timely manner. Whether an event is the result of intentional attack, unintentional interference, or space weather, is crucial in determining a course of action.

- **Potential adversaries have access to a range of space systems and services that parallel that of the United States.** This includes fielding of potential OCS assets (some commercially available) against US space assets. *Even an adversary with no indigenous space assets may use space through US, allied, commercial or consortium space*

services. These services could potentially include precision navigation, high-resolution imagery, environmental monitoring, and satellite communications. For example, during Operation ALLIED FORCE, the Serbian government used a leased transponder on European Telecommunication Satellite (EUTELSAT), an international consortium-owned communications satellite, to broadcast propaganda.

- **Planners should consider targeting adversary space assets, to include third party systems if allowed by the rules of engagement, using all instruments of national power.** This should be done through nodal analysis to find the optimal target set. Adversary space targets may include data links, launch sites, booster storage facilities, satellite storage and assembly facilities, mission data processing facilities, communications links, TT&C nodes, satellites, research and development facilities, and launch vehicles. Planners should consider the potential impact of allowing an adversary unrestricted or unlimited use of a space asset. If the potential impact is sufficient enough to require action, then the desired level of negation (deceive, deny, disrupt, degrade, or destroy) should be considered. For example, if the objective is to prevent an adversary from using space imagery to observe preparations for a counteroffensive in a specific area, then temporary denial of the asset may be appropriate. If, however, the objective is to permanently cut off the adversary's C2 with his fielded forces, permanent destruction of assets may be warranted. Planners must continuously mesh appropriate actions with respect to a target's intelligence value, the action's impact on conflict escalation, and collateral effect management.

Logistics

- **Beddown of Forces.** As forces deploy into or near the JOA, deconflicting beddown of forces is a high priority. Theater space forces will have additional requirements and require a robust infrastructure to effectively utilize space resources. These requirements may conflict with other asset requirements.

- **Spacelift.** Space requirements may dictate the need for additional assets on orbit. Planners should be aware of the limitations on spacelift capabilities. Today, space launches require extensive prelaunch preparation and checkout. Multiple launches in rapid succession, or rapid changes of a planned launch's payload or trajectory currently are not available. *Thus, any spacelift requirements should be*

identified well ahead of time in order to provide the necessary lead-time. For short-notice contingencies, military planners may have only on-orbit assets for use. If in the future, the Air Force fields launch-on-demand assets, this may change.

Legal Issues

US policy, domestic and international law, treaties, commercial contracts, and agreements influence military actions in space. *Beyond the standard general laws of armed conflict, several space-specific treaties have legal and policy provisions that must be considered, particularly for counterspace and space-based strategic attack missions.* Although the current legal and policy framework is conducive to most military space operations, there are some significant restrictions.

Unlike operations in airspace, where state sovereignty must be respected, military space operations are conducted with complete freedom of flight and without the approval of any subjacent state. The 1967 Outer Space Treaty requires activities in outer space be carried out in accordance with international law and recognizes that it is in the common interest of all mankind to use space for "peaceful purposes." The Treaty specifically requires that the moon and other celestial bodies be used exclusively for peaceful purposes. Pursuant to US National Space Policy, the US is committed to the exploration and use of space for peaceful purposes. The US has interpreted "peaceful purposes" to mean "non-aggressive or non-hostile." Under National Space Policy "peaceful purposes" allow defense and intelligence-related activities in pursuit of national security and other goals. Permitted is the use of offensive space forces, either in a counterspace or space-to-ground role, in national or collective self-defense under Article 51 of the United Nations Charter or when the use of force is authorized by the United Nations Security Council.

Current US Space policy preserves the right of self-defense in space. There are no laws or formal US policies expressly preventing the deployment of counterspace assets or conventional weapons in space. With a few major exceptions, there is no legal prohibition against developing, deploying, or employing weapons in, from, or into space. The Outer Space Treaty prohibits the placement of nuclear weapons and other weapons of mass destruction in space. The Treaty also prohibits the placement of any type of weapon on the moon and other celestial bodies. However,

the placement of conventional weapons in space (e.g., in Earth orbit) appears permissible, provided such use is nonaggressive.

Peacetime interference with satellite operations is prohibited by both international and domestic law. The Strategic Arms Reduction Treaty (START) and the AntiBallistic Missile (ABM) Treaty prohibit "interference with National Technical Means of Verification." The ABM Treaty also prohibits the development, testing and deployment of space-based ballistic missile defense components and interceptor missiles. Furthermore, the Limited Test Ban Treaty prohibits nuclear explosions in outer space. This means that space assets involved solely in monitoring nuclear forces may not be targeted.

The majority of the aforementioned treaties may be suspended between belligerents in time of armed conflict. However, until that time, they will remain in effect and must be taken into consideration when conducting space operations. Moreover, the Judge Advocate General's Department should be consulted when considering counterspace and space force application operations to ensure compliance with domestic and international legal norms.

CHAPTER FOUR

EXECUTING SPACE OPERATIONS

. . . as we showed and proved during DESERT STORM, and proved again during the air campaign over the Balkans, space is an integral part of everything we do to accomplish our mission. Today, the ultimate high ground is space.

General Lester P. Lyles

OVERVIEW

During force employment, a variety of organizations will bring space assets to be integrated into the campaign. The execution of space forces is accomplished through tasking orders. **There are three basic types of space organizations that can be integrated to support military operations: (1) nonmilitary space organizations, (2) global space forces and (3) theater space forces.** During operations, the adversary's use, exploitation, and ability to disrupt friendly access to space will impact employment of space power.

INTEGRATING CIVIL, COMMERCIAL, AND FOREIGN SPACE ASSETS

Today, many civil, commercial, and foreign organizations can bring space assets to the fight. Some organizations, such as those within the communications and intelligence communities, have established processes for military forces to request services or levy requirements. These space assets provide alternatives to meet the military's needs.

Military resources will be stressed during large-scale contingencies and combat operations. In these situations, the military normally will use civil, commercial, and/or foreign space assets to support military objectives. **The integration of civil, commercial, and/or foreign space assets may become vital to mission accomplishment.** Military capabilities may be augmented with these assets or the assets may, by themselves, meet the military's needs. In most cases, the geographic CINC's staff will determine the appropriate avenue for meeting war-fighter needs using these assets.

Civil, commercial, and foreign space assets can be leveraged either through preestablished agreements, but are often requested on an ad hoc basis. For example, for support requested from a civil agency such as NASA, the military may request NASA to redirect mission focus from a scientific to a military operation. For commercial assets, there are DOD organizations like the National Imagery and Mapping Agency (NIMA) and Defense Information Systems Agency (DISA) designated to contract with commercial entities for services. Preestablished agreements enhance effectiveness.

When dealing with commercial entities, military commanders may not expect the same level of support as with civil agencies. Corporations are market driven and concerned with their long-term success. There may be situations where commercial entities conclude it is not in their best interest to support certain military operations.

Examples of Civil/Commercial Space Assets in the Fight

Vietnam War—During the Vietnam War, the military used a NASA communications satellite, the Synchronous Communications Satellite, to provide communications between Saigon and Hawaii. Also, the military leased commercial satellite communications circuits to connect Saigon and Hawaii to meet administrative and logistical needs. Satellite usage during the Vietnam conflict established the military practice of relying on civil and commercial space systems for routine support.

Operation DESERT STORM—Civil remote sensing satellites played a key role in the Gulf War in providing wide-area information in the theater. The Pentagon spent up to $6M on data from the US-owned Land Remote Sensing Satellite (LANDSAT) and French-owned SPOT imaging satellites. These satellites were used to provide wide-area surveillance to augment and complement the fine-resolution of the US intelligence satellites.

Operation ALLIED FORCE—During the later stages of the Kosovo campaign, 60 percent of the satellite communications used was provided by commercial entities. This is a significant change from DESERT STORM where 85 percent of communications was provided by military satellites. As requirements for increased communications bandwith continue to rise, the US military will continue to seek commercial satellite alternatives to augment our capabilities.

Operation ATLAS RESPONSE—An Air Force-led JTF was deployed in March 2000 to Mozambique and South Africa to conduct humanitarian assistance/disaster relief for flooding in the region. During initial deployment and setup in the region, the JTF staff discovered overhead imagery from a NASA experimental satellite posted on the NASA web site. The images showed the difference in saturation of the land following the flooding. The JTF had no formal relationship with NASA, but used the images to build situational awareness on the task before them.

Foreign space assets, even those provided by our allies, may not be easily integrated into military operations. Civil, commercial, and/or foreign space assets may be specialized and not have sufficient flexibility for dynamic retasking.

EXECUTION OF GLOBAL FORCES

USSPACECOM executes a strategy based on requests from multiple theaters, requirements for national defense, and maintenance of on-orbit space assets. USSPACECOM uses the Space Operations Center (SPOC) to publish mission-type orders in the format of operations orders (OPORDs) and Fragmentary Orders (FRAGOs) for its components to execute to meet space requirements. **SPACEAF uses its standing operations center to translate that OPORD into its version of a daily ATO, the STO, for the execution of Air Force global space forces.**

Space Air Forces (SPACEAF) Operations Center Organization and Function

SPACEAF operations center functions include tracking space force status, planning and executing SPACEAF assets, and providing reachback support to organic theater space personnel. Organized along the structure of an air operations center, the SPACEAF operations center consists of four divisions that focus primarily on global space operations:

- **Strategy Division.** The Strategy Division concentrates on long-range planning of space operations to achieve USSPACECOM and theater objectives by developing, refining, disseminating, and assessing COMSPACEAF's strategy. This is normally presented through the Air Force Space Operations Plan (AFSOP). The AFSOP will be used to guide tasking order development, and during crisis action planning, will be expanded or modified to meet the crisis situation.
- **Combat Plans Division.** The Combat Plans Division applies operational art to develop execution orders for SPACEAF operations. The Combat Plans Division publishes and disseminates a daily tasking order. This document applies specific space capabilities and assets to accomplish tasks in fulfillment of global USCINCSPACE and/or theater missions.

- **Combat Operations Division.** The Combat Operations Division monitors the execution of the current tasking order and publishes any required changes. Changes in adversary and friendly capabilities, locations, and intent, along with weather and political conditions, may impact planned operations and ultimately drive changes to the tasking order. Timely coordination between the Combat Operations Division and each tasked wing operations center (WOC) is essential to effective, efficient tasking order execution. WOCs are the focal point for each space wing. Wing commanders and their squadrons receive orders, directives, and other guidance from the AOC through the WOC. WOCs manage resources, plan missions, and direct operations for their respective wings.
- **ISR Division.** The ISR Division is focused on providing ISR support to air, space, and information planning and execution activities. The ISR Division contributes to both global and theater IPB.

The SPACEAF operations center has the ability to produce certain space products used to support theater planning and operations. Examples of these products are GPS navigation accuracy windows, summaries of adversary space capabilities, and reports indicating times of friendly force vulnerability due to satellite overflight.

Tasking Order Development

SPACEAF translates the USCINCSPACE OPORD into its main product, the daily space tasking order. The production cycle is based on the six-step targeting cycle described in joint doctrine. The cycle is designed around the joint standard of 72 hours (48 hours for planning and 24 hours for execution). However, the cycle is flexible and can be lengthened or shortened to meet battle rhythm requirements.

Synchronizing Global Space Operations with Theater

There are many situations where control of military space forces will be retained within USSPACECOM due to the global nature of certain forces. Command relationships are established to ensure theater military space requirements are met. These command relationships allow theaters to coordinate with the space force provider to synchronize battle rhythms (schedules) and maximize the effects of space tactics employed. *DIRLAUTH is the normal method used to synchronize USSPACECOM operations with theater operations.*

Examples of Global Space Forces in Support of Theater Operations

Operation DESERT STORM, Missile Warning—Prior to DESERT STORM, the Defense Support Program (DSP) had been used to support missile warning for ICBM launches against North America. During DESERT STORM, command relationships were established between US Space Command and US Central Command so that US Space Command provided missile warning to the theater via military satellite communications. During the operation, DSP detected 87 SCUD launches. A warning sent to the theater generally allowed time for the Saudis, US forces, and the allied forces to seek shelter from incoming SCUDs. The data was also used for attack operations (SCUD hunting) and Patriot operations (SCUD inflight destruction). Based on the lessons learned from DESERT STORM, new space units were created to improve warning operations to the theater.

Operation ALLIED FORCE, Munitions Guidance—Munitions using GPS for guidance became a requirement for what Admiral James O. Ellis (CINC, US Naval Forces Europe; Commander of Allied Forces Southern Europe; and former Commander, JTF Noble Anvil) calls 'A War of Weather.' Precision-guided munitions are no longer "good enough." In this operation, pilots experienced a greater than 50 percent cloud cover more than 70 percent of the time, and it wasn't the worst part of the year. Laser and electro-optical (EO)-guided munitions simply cannot hit what the pilots could not see. Reliance on those alone allows poor weather to create sanctuaries and operational lulls. GPS-guided munitions allowed allied forces to own the night and to own any foul weather.

Operation ALLIED FORCE, Battle Damage Assessment(BDA)—The DSP constellation achieved new success in Kosovo. Through a "direct support" relationship between a squadron (CONUS) and the CFACC (Italy), real-time information from DSP was fed to the CAOC. With this information, coupled with data from unmanned aerial vehicles (UAVs) and imaging satellites, commanders were given the BDA information needed to tailor follow-on strike packages. This innovation reduced the need to put additional flight crews in harm's way for damage assessment or for unnecessary restrike missions.

The SPACEAF operations center should synchronize its battle rhythm with the theaters. Theater operations drive SPACEAF's schedule requirements. By adjusting its operational schedule, SPACEAF will maximize support to the theater. If more than one theater is being supported, an operational schedule will be adjusted to maximize support to all theaters.

EXECUTION OF THEATER SPACE FORCES

Today, there are multi-Service space forces that can deploy to support operations. Some of these forces are space support teams designed to integrate into various levels of command within the JTF. Other deployable space forces possess capabilities that must be integrated into the overall military campaign. Depending on theater requirements and the global situation, USSPACECOM will present these forces to

geographic CINCs conducting contingency operations. Chapter two, in the section on presentation of forces, discusses the ways USSPACECOM can present these forces. In all cases, the effects must be integrated into the overall military campaign.

When deployed, Air Force space forces are normally attached to an AETF under the OPCON of the COMAFFOR. When the COMAFFOR is also the JFASCC, he may be given TACON of other Service space forces in excess of their organic requirements. The JFASCC should integrate these forces into operations via the JAOC and the ATO process. Air Force space experts are integrated into the AOC, ensuring the following areas are integrated into the JAOC.

Target Development

Each theater develops a detailed list of targets that will be attacked. This target development takes place in the C/JAOC, normally as part of the Strategy Division. All potential targets, including counterspace targets (as approved by policy), are prioritized and selected for inclusion on the JIPTL. The JFASCC is the major advocate within the JTF for counterspace targets. All components and agencies involved in, or supported by, JFASCC operations have an input to the JIPTL. The key

Examples of Theater Space Forces in Operations

Vietnam War—Even though USSPACECOM, AFSPC, and SPACEAF were decades from formation, there is a significant example of forces using space deploying to support theater operations. Two Defense Meteorological Support Program (DMSP) ground stations were deployed to theater. One went to Vietnam and the other went to Thailand to support military operations with weather data. Weather was a major concern during Vietnam. The DMSP satellites became the primary short-term forecasting tool for tactical military operations. The impact was profound. The commander of Air Force operations in Southeast Asia stated: *"As far as I am concerned, this [satellite] weather picture is probably the greatest innovation of the war."* Today, weather personnel have integrated the necessary equipment in their deployment kits to access satellite weather data.

Air Force Space Support Teams (AFSSTs) (1993-2000)—The AFSSTs deployed to several operations, supporting the JFACC in the AOC by providing space education and expertise. Due to the success of the AFSST, the Air Force recognized the need to integrate space expertise into theater staffs. By the end of 2000, the Air Force had successfully completed its integration and deactivated the AFSSTs.

Korea—Currently, the air component commander uses a deployable DSP data downlink station operated by the Army and Navy to integrate an in-theater capability to support theater missile warning operations. The Joint Tactical Ground Station (JTAGS) provides data for warning and combat operations against ballistic missile attack.

to including a target on the JIPTL is a demonstrated link between that target's destruction and the achievement of component, CJTF, and NCA military objectives.

The CJTF can convene a JTCB to provide additional guidance to ensure consistency of targeting with overall theater strategy. *Deconfliction of counterspace targets occurs at the Joint Targeting Working Group (JTWG) during creation of the JIPTL.* The JFASCC or his delegated appointee should normally facilitate deconfliction of counterspace targets between the JTF, theater, and USSPACECOM.

Air and Space Tasking Order

When given forces to employ, the JFASCC should use the ATO to task the theater space forces. When working in a coalition environment, the ATO may not be able to provide detailed tasking to space forces due to security classification issues. In these cases, the tasking should appear on the ATO but should associate few details. This method allows the JFASCC to have visibility of the tasking. The detailed information can be passed to the theater space forces through secure channels for their mission planning.

ADVERSARY IN A DYNAMIC ENVIRONMENT

It is extremely rare that the adversary reacts exactly as planned. The United States is the most space-dependent country in the world. Today, most adversaries will not be able to overcome the United States or its allies' dominance in space. However, some adversaries have a limited ability to attack links or nodes of our space systems. For example, there are commercial companies that sell small, inexpensive GPS jammers. If an adversary employed these jammers properly, they could interfere with weapons employment against a selected target or region. Military operators need to be prepared for this dynamic effect during execution.

Decision makers within the AOC must understand that time-sensitive requirements necessitate a relationship with reachback agencies that anticipate possible situations and establish procedures to meet them. Normally, for emerging military space requirements, a space support request is submitted through the coordinating authority, up the chain of command to the supported theater CINC and across to USSPACECOM as a supporting CINC. There may be situations where this process is not timely enough to meet warfighter needs. In cases where

DIRLAUTH has been established, and with prior approval, certain support requests may be sent directly from the supported JFASCC to the SPACEAF operations center as the air component in support. *Success depends on setting up streamlined command relationships that enable the efficient prioritization,communication, and coordination of time-sensitive mission requirements.*

CHAPTER FIVE

TRAINING AND EDUCATION FOR SPACE OPERATIONS

While education and training are linked in application, thay are distinct in purpose, with each producing markedly different results. In essence, education teaches broad concepts and communicates information upon which to base decisions, whereas as training teaches skills necessary to accomplish a task. An Air Force member's education emphasizes critical thought, enabling sound decision making regardless of the situation, while the airman's training provides the skills necessary to master Air Force core competencies.

Maj Gen Ronald E. Keys, USAF

OVERVIEW

The future of the Air Force and the security of the US depend on a cadre of highly trained and educated air, space, and information operations professionals. Air Force forces should be trained and educated in the manner they intend to fight. This should include training and exercise scenarios that simulate potential real world situations, and education and war games that consider the broader implications of future conflict.

SPACE TRAINING AND EVALUATION

Space operators should be trained throughout their careers to integrate space through all levels of crisis. Continual training is crucial to maintaining an operator's proficiency because space forces and their tactics, techniques, and procedures are constantly evolving. Stringent standards of performance should be established to ensure space operators attain and maintain the high degree of proficiency required for mission success. Commanders, at all levels, should be involved with the training of their personnel and should be satisfied they meet minimum standards before being certified mission ready.

Space operators initially become specialists in a specific area or system. However, the diverse nature of space operations dictates that, over time, they should gain knowledge and understanding of the broad

spectrum of space operations. As their careers progress, space operators should move beyond technical knowledge of their core specialty areas and gain a more operational-level focus. Ultimately, the Air Force needs space professionals that understand how space operations integrate throughout military operations.

Accession Training

Accession training establishes the basis for all future learning. Training for officer space operators should begin in precommissioning programs as the prospective officers gain knowledge and appreciation for space applications in the context of overall Air Force operations. Accession training for enlisted space operators should begin during basic training. Both enlisted and officer space operators learn their basic operating skills through initial space qualification training.

Space Qualification Training

Space qualification training (SQT) encompasses both initial and unit qualification training. Together they produce mission ready space operators.

Initial qualification training (IQT), conducted by Air Education and Training Command (AETC), should provide trainees the primary skills necessary to operate the designated space system. All IQT should include classroom and proficiency training using high fidelity simulators and/or emulators to ensure the graduates report to their operational units with the prerequisite levels of knowledge and proficiency agreed upon by AETC and AFSPC. Following IQT, all space operators move to their operational units for continued qualification training.

Unit qualification training (UQT) prepares operators for mission ready certification. UQT should include training by unit instructors on both operational systems and high fidelity simulators. It should include any unit-specific policies or procedures not taught in IQT. The ultimate purpose of UQT should be to prepare the operators to accomplish all tasks associated with their particular mission and to ready them for their mission ready evaluation and certification.

Proficiency Training/Recurring Training

Proficiency or recurring training ensures space operators remain adept in their skills and current in their knowledge. To maintain proficiency, they receive recurring training on all tasks required to perform their jobs, even those that may only be required on a periodic basis. If operators fail to demonstrate a required level of proficiency, they may receive individual training to correct any deficient areas. Additionally, supplemental training may be required when warranted by new procedures, hardware or software affecting operational equipment. All categories of proficiency training (recurring, individual, and supplemental) may include classroom instruction, training on high fidelity simulators, or hands-on training with an operational space system.

Advanced Training

Advanced training covers any specific training in unique aspects of the operational mission. Once space operators are declared mission ready they may receive advanced training to assure their proficiency in activities involving instruction, evaluation, or special mission requirements. The Space Division of the USAF Weapons School also provides advanced training to select space personnel on the operational employment of space capabilities in support of theater operations.

Evaluation

Evaluation determines individual and crew proficiency. Upon completion of IQT, UQT, and periodically thereafter, space operators should demonstrate their proficiency in an evaluation. Ideally, these evaluations should validate the effectiveness of individual training as well as assess overall space operator crew force readiness to perform the assigned mission.

Civilian And Contractor Forces Training And Evaluation

Department of the Air Force civilians and contractors are also valuable contributors to space operations. An increased emphasis on outsourcing indicates Department of the Air Force civilians and contractors may be used in increasing numbers in traditionally military space operations positions. While these two groups are expected to have

an initial level of training when hired, they should receive proficiency training to maintain their expertise over time and as new capabilities are developed. Additionally, civilians or contractors filling crew positions must meet the same training and evaluation criteria as military crews. These standards must be written into any contract involving these services.

Professional Training

Space training for Air Force professionals extends from a simple appreciation of space capabilities and what space brings to the battlespace to a full understanding of the application of existing space systems, new systems and concepts for their employment. The personnel to be trained include joint space support team members, theater space operations personnel, contingency planners and space augmentees to Aerospace Expeditionary Forces (AEF). Additionally, senior staff members such as commanders of Combat Air Forces, their staffs and personnel may require training to accomplish their specific missions. One of the best training opportunities for real-world operations is through exercises.

EXERCISES

Exercise—A military maneuver or simulated wartime operation involving planning, preparation, and execution. It is carried out for the purpose of training and evaluation. It may be a combined, joint, or single-Service exercise, depending on participating organizations.

JP 1–02, *DOD Dictionary of Military and Associated Terms*

Exercises are conducted to achieve training objectives. For training to best prepare participants for actual requirements, exercises should be planned and conducted as close to real operations as possible. Space forces are no exception and should be exercised to the fullest extent possible consistent with operational requirements. To improve readiness, space forces should participate as a full partner with air and information assets in large-scale exercises overseas and in CONUS. Joint exercises in overseas locations provide realistic training for in-theater and deployable Air Force forces and also allow other Services and allied military forces to gain valuable experience in integrating space

systems. When it is impossible to meet mission requirements and take part in an exercise, high fidelity simulators should be used to present the correct "space picture" to other participants in the exercise. Space employment is demonstrated in over 50 major exercises per year. Some of these key exercises are listed in Figure 5.1.

ULCHI FOCUS LENS (UFL)/APOLLO LENS
Sponsoring Organization: USCINCPAC, USFK, 7 AF & USSPACECOM
Purpose: UFL is an annual ROK-US combined forces command post exercise (CPX) designed to provide the theater, component commanders and Army Corps commanders/staffs with an advanced training environment to improve their warfighting skills.

NORTHERN EDGE/COPE THUNDER
Sponsoring Organization: ALCOM
Purpose: These are interdiction exercises hosted by the 354 FW at Eielson AFB and the 3 WG at Elmendorf AFB. All PACAF flying units are required to attend at least one of the four COPE THUNDERs each year. Space members will be integrated into the AOC to create the ATO.

COBRA GOLD
Sponsoring Organization: PACOM/USCINCPAC
Purpose: COBRA GOLD is designed to train a combined Thai/USPACOM joint and combined commanders/staffs on task force operations. It is a three part exercise; CPX, field training exercise (FTX), and combined arms live fire exercise (CALFEX).

UNION FLASH
Sponsoring Organization: USAFE
Purpose: The USAFE Warrior Preparation Center conducts UNION FLASH to train combat leaders and support battle staff in command, control and intelligence procedures for different theaters of operation. Space members are exposed to theater AOC operations and participate in formulating the ATO.

INTERNAL LOOK
Sponsoring Organization: USCENTCOM
Purpose: INTERNAL LOOK is a battle staff exercise to train JTF staffs on command, control, communications, computers, and intelligence (C4I).

BLUE FLAG
Sponsoring Organization: ACC & 8 AF, 9 AF or 12 AF
Purpose: BLUE FLAG is an Air Force-directed and sponsored, multi-Service, joint air operations center (JAOC) training exercises conducted at the operational level of war. BLUE FLAG includes multinational forces and takes place in the JTF-SWA AOR. BLUE FLAGs emphasize theater battle management training in a joint/combined air operations center setting incorporating constructive simulations and a generic scenario set in a fictitious AOR.

ROVING SANDS
Sponsoring Organization: USJFCOM/ACC
Purpose: ROVING SANDS is an annual joint tactical air operations (JTAO)/theater missile defense (TMD) exercise employing US Army, USAF, USN, USMC and allied air defense.

Figure 5.1. Key Exercise Events

Integrated Air, Space, and Information Test Range

Within CONUS, there are several ranges and exercises that prepare Air Force forces for contingency operations. As new space capabilities are developed, test ranges need to be used to evaluate assets prior to operational fielding. An advanced step would be the development of an integrated air, space, and information test range integrating air, space, and information assets, enabling the Air Force to conduct enhanced testing, training, and exercises against potential adversary space force capabilities. This allows for the full effects produced by air, information, and space forces to be melded into integrated operations training. With such training, Air Force commanders will develop the ability to more effectively integrate air, information, and space forces to produce enhanced operational effects.

EDUCATION

Education broadens operators' understanding of space's overall contribution to military operations and gives them an appreciation of how their specific area of expertise impacts global and theater operations. Education is necessary to move space professionals beyond the tactical and technical focus of their day-to-day jobs.

Professional Military Education (PME)

PME provides broad education appropriate for different points in a space operator's career. These programs provide the space operator a perspective on the role of space power in military operations through study of such subjects as Air Force and joint doctrine. An understanding of these areas is critical for Air Force personnel to effectively employ space power within a joint environment. Sequential levels of PME provide space operators an ever-broader understanding of space power, appropriate to the specific stage of their career. PME also provides the opportunity for all Air Force professionals to learn about the application of space in military operations.

Graduate Education

Graduate education programs, both military and civilian, provide knowledge and expertise from a more advanced perspective. Liberal arts programs such as military history or international relations help space operators understand the context in which military space

operations will be conducted. Technical programs such as engineering or the physical sciences help space operators develop new tools that match the tenets of air and space power with emerging technologies.

WAR GAMES

> **War game—A simulation, by whatever means, of a military operation involving two or more opposing forces, using rules, data, and procedures designed to depict an actual or assumed real-life situation.**
>
> **JP 1–02, *DOD Dictionary of Military and Associated Terms***

War games are used by both the Air Force and the military in general for educating personnel through the testing of new concepts of employment and organization. Because the United States has yet to meet a "space peer" in conflict, war games continue to be a primary means of assessing the potential doctrinal implications of the use of space systems. War gaming generates insights into the current and future use of space in war fighting. This avenue allows the United States to anticipate potential courses of action adversaries may take to negate our future capabilities and also demonstrates unanticipated capabilities or vulnerabilities of our future space systems. Even for those war games where space is not the focus, space capabilities should be realistically presented to illustrate their impact within the total force. Although there are many similarities between space and other forces, they sometimes require a different application and should be modeled accordingly. Figure 5.2 lists key war games for applying space power.

Aerospace Future Capabilities War Game (AFCW) — Title 10 Air Force Future Wargame Series
Sponsoring Organization: HQ USAF/XPX
Purpose: Explore alternate paths leading to AF Vision.

Focused Logistics War Game
Sponsoring Organization: HQ USAF/ILX
Purpose: Assess Service logistic support capability.

Global Engagement (GE) War Game — Title 10 Air Force Operational War Gaming Series
Sponsoring Organization: HQ USAF/XOC
Purpose: Focus on future operational issues.

Schriever 200X War Game
Sponsoring Organization: AFSPC
Purpose: Explore air, space andiInformation operations integration, looking to enable future space doctrine, strategy, force structures, and war-fighting capabilities.

Figure 5.2. Key Wargame Events

Army Transformation War game (ATWG) — Title 10 Army War Game Series
Sponsoring Organization: USA TRADOC
Purpose: Army War College seminar war games, current focus is for strategic/global deployment and conflict termination and operational/tactical-level operations of the Objective Force in one CJTF.

Navy Global War game — Title 10 Navy War Game Series
Sponsoring Organization: Chief of Naval Operations
Purpose: Focus on future Navy issues.

Joint Land, Aerospace, and Sea Simulation (JLASS) War Game
Sponsoring Organization: Six Senior Service Colleges
Purpose: JLASS promotes the joint professional military education of all participants by addressing key issues at the strategic and operational levels of war.

Technology Seminar War Game (TSW)
Sponsoring Organization: HQ USAF/XPX and AFRL/XPZ
Purpose: Focus on concept generation and assessment using "near-peer" scenarios and vignettes for specific war-fighter issues. The use of both offensive and defensive space assets is thoroughly assessed.

Figure 5.2.—continued

At the very heart of warfare lies doctrine . . .

Suggested Reading

Cleary, Mark C., *The Cape: Military Space Operations, 1971–1992* (45th Space Wing, History Office). 1994.

Gorn, Michael H., *Harnessing the Genie, Science and Technology Forecasting for the Air Force 1944-1986* (Office of Air Force History). 1988.

Goure, Daniel, and Christopher M. Szara, *Air and Space Power in the New Millennium* (Center for Strategic and International Studies). 1997.

Hayes, Peter, *Space Power for the Next Millenium* (Air University Press). 2000.

Johnson-Freese, Joan, and Roger Handberg, *Space, the Dormant Frontier: Changing the Paradigm for the 21st Century* (Praeger). 1997.

Lupton, David, *On Space Warfare* (Air University Press). 1988.

Mantz, Michael R., *The New Sword: A Theory of Space Combat Power* (Air University Press). 1995.

Muolo, Michael J., and ed. Richard Hand, Bonnie Houchen, Lou Larson, Jeff Walters, *Space Handbook* (Air University Press). 1993.

Oberg, James E., *Space Power Theory* (US Air Force Academy). 1999

Peebles, Curtis, *High Frontier: The U.S. Air Force and the Military Space Program* (Air Force History and Museums Program). 1997.

Preston, Bob, *Plowshares and Power: The Military Use of Civil Space* (National Defense University Press). 1994.

Rife, Shawn P., Major, USAF, "On Space Power Separatism," *Airpower Journal*, Spring 1999.

Spires, David N., *Beyond Horizons: A Half Century of Air Force Space Leadership* (Air Force Space Command). 1997.

United Nations, *United Nations Treaties and Principles on Outer Space: text and status of treaties and principles governing the activities of states*

in the exploration and use of outer space, adopted by the United Nations General Assembly (Office for Outer Space Affairs, United Nations). 1994.

Glossary

Abbreviations and Acronyms

AADC	area air defense commander
ABM	antiballistic missile
ACA	airspace control authority
ACC	Air Combat Command
ADCON	administrative control
AFDD	Air Force Doctrine Document
AEF	Aerospace Expeditionary Force
AETC	Air Education and Training Command
AETF	Aerospace Expeditionary Task Force
AFCW	Aerospace Future Capabilities Wargame
AFFOR	Air Force forces
AFRL	Air Force Research Lab
AFSOP	Air Force Space Operations Plan
AFSPC	Air Force Space Command
AFSST	Air Force Space Support Team
AI	air interdiction
AO	area of operations
AOC	air operations center
AOR	area of responsibility
ARFOR	Army forces
ARSPACE	Army Space Command
ASAT	anti-satellite
ATO	air tasking order
ATWG	Army Transformation War Game
AWACS	Airborne Warning and Control System
BDA	battle damage assessment
C2	command and control
C4I	command, control, communications, computers, and intelligence
CA	combat effectiveness
CALFEX	Combined Arms Live Fire Exercise
CAOC	combined air operations center
CAP	crisis action planning
CAS	close air support
CFACC	Combined Force Air Component Commander
CINC	commander in chief

CJTF	Commander, Joint Task Force
COA	course of action
COCOM	combatant command (command authority)
COG	center of gravity
COMAFFOR	commander, Air Force forces
COMSPACEAF	Commander, Space Air Force Forces
CONUS	Continental United States
CPX	command post exercise
CSAF	Chief of Staff, United States Air Force
CSAR	combat search and rescue
CSEL	Combat Survivable Evader Locator
DCI	defensive counterinformation
DCS	defensive counterspace
DIRLAUTH	direct liaison authorized
DISA	Defense Information Systems Agency
DMSP	Defense Meteorological Satellite Program
DOC	Department of Commerce
DOD	Department of Defense
DSCS	Defense Satellite Communications System
DSP	Defense Support Program
EO	electro-optical
EUTELSAT	European Telecommunication Satellite
FDS	foundational doctrine statement
FTX	field training exercise
GE	Global Engagement (war game)
GEODSS	ground based electro-optical deep space surveillance
GPS	Global Positioning System
ICBM	intercontinental ballistic missile
INMARSAT	International Maritime Satellite
INTELSAT	International Telecommunication Satellite
IPB	intelligence preparation of the battlespace
IQT	initial qualification training
IRMB	intermediate range ballistic missile
ISR	intelligence, surveillance, and reconnaissance
JAOC	joint air operations center
JAOP	joint air operations plan

JASSM	joint air-to-surface standoff munition
JDAM	joint direct attack munition
JFASCC	joint force air and space component commander
JFC	joint force commander
JFLCC	Joint Force Land Component Commander
JFMCC	Joint Force Maritime Component Commander
JIPTL	joint integrated prioritized target list
JLASS	Joint Land, Aerospace, and Sea Simulation (war game)
JOA	joint operations area
JSOTF	joint special operations task force
JSOW	joint standoff weapon
JSST	joint space support team
JSTARS	joint surveillance, target attack radar system
JTAGS	Joint Tactical Ground Station
JTAO	joint tactical air operation
JTCB	Joint Targeting Coordination Board
JTF	joint task force
JTWG	Joint Targeting Working Group
LANDSAT	Land Remote Sensing Satellite
LD/HD	low density/high demand
LNO	liaison officer
LOAC	law of armed conflict
MAJCOM	major command
MARFOR	Marine Corp forces
MILSTAR	military strategic and tactical relay system
MOE	measure of effectiveness
MoM	measure of merit
NAF	numbered air force
NASA	National Aeronautics and Space Administration
NATO	North Atlantic Treaty Organization
NAVFOR	Navy forces
NAVSPACE	Naval Space Command
NCA	National Command Authorities
NIMA	National Imagery and Mapping Agency
NOAA	National Oceanic and Atmospheric Administration
NRO	National Reconnaissance Office

OCS	offensive counterspace
ONIR	overhead non-imaging infrared
OOS	on-orbit servicing
OPCON	operational control
OPLAN	operation plan
OPORD	operational order
PACAF	Pacific Air Forces
PGM	precision-guided munitions
PME	professional military education
POC	point of contact
PSYOP	psychological operation
RF	radio frequency
ROE	rules of engagement
ROK	Republic of Korea
SECDEF	Secretary of Defense
SOF	special operations forces
SPACEAF	Air Force Space Component [14 AF]
SPOC	Space Operations Center
SPOT	Satellite Probatore d'Observation de la Terre
SRBM	short-range ballistic missile
SQT	space qualification training
SSA	space situational awareness
SSN	Space Surveillance Network
SST	space support team
START	Strategic Arms Reduction Treaty
STO	space tasking order
SWA	Southwest Asia
SWS	space warning squadron
TACON	tactical control
TBM	theater ballistic missile
TMD	theater missile defense
TST	time-sensitive target
TSW	Technology Seminar Wargame
TT&C	telemetry, tracking, and commanding
TTP	tactics, techniques, and procedures
UAV	unmanned aerial vehicle
UCP	Unified Command Plan

UHF	ultra high frequency
UQT	unit qualification training
USA	United States Army
USAF	United States Air Force
USAFE	United States Air Forces in Europe
USEUCOM	United States European Command
USCENTCOM	United States Central Command
USCINCSPACE	Commander in Chief, United States Space Command
USFK	United States Forces Korea
USJFCOM	United States Joint Forces Command
USMC	United States Marine Corps
USN	United States Navy
USPACOM	United States Pacific Command
USSPACECOM	United States Space Command
WOC	wing operations center
WMD	weapons of mass destruction

Definitions

coordinating authority. A commander or individual assigned responsibility for coordinating specific functions or activities involving forces of two or more military departments or two or more forces of the same Service. The commander or individual has the authority to require consultation between agencies involved, but does not have the authority to compel agreement. In the event that essential agreement cannot be obtained, the matter shall be referred to the appointing authority. Coordinating authority is a consultation relationship, not an authority through which command may be exercised. Coordinating authority is more applicable to planning and similar activities than to operations. (JP 1-02)

joint force air and space component commander. Derives authority from the joint force commander (JFC) who has the authority to exercise operational control, assign missions, direct coordination among subordinate commanders, redirect and organize forces to ensure unity of effort in the accomplishment of the overall mission. The JFC will normally designate a joint force air and space component commander. The JFASCC responsibilities will be assigned by the JFC (normally these would include, but not be limited to, planning, coordination, allocation, and tasking based on the JFC apportionment decision). Using the JFC guidance and authority, and in coordination with other Service component commanders and other assigned or supporting commanders, the JFASCC will

recommend to the joint force commander apportionment of air sorties and use of space assets to accomplish various missions or to geographic areas. The JFASCC will serve as the JFC's designee for ensuring prompt and sustained offensive and defensive space operations and ensuring the integration of those operations into JTF activities in support of the JFC objectives and strategy.

link element. The electromagnetic energy used to convey data and information between the space element and the terrestrial element and between terrestrial-based elements.

space assets. A generic term which may refer to any of the following individually or in combination: space systems, individual parts of a space system, space personnel, or supporting infrastructure.

space capability. The ability of a space asset or system to accomplish a mission.

space element. A platform in which astrodynamics is the primary principle governing its movement through its environment. (AFDD 1-2)

space forces. Operational military units which consist of some combination of space assets such as space-based and terrestrial equipment, facilities, organizations, and personnel used to exploit space for national security.

space power. a. The capability to exploit space forces to support national security strategy and achieve national security objectives. (AFDD 1) b. The capability to exploit civil, commercial, intelligence, and national security space systems and associated infrastructure to support national security strategy and national objectives from peacetime through combat operations. (AFDD 1-2) c. The total strength of a nation's capabilities to conduct and influence activities, to, in, through, and from space to achieve its objectives.

space superiority. Degree of control necessary to employ, maneuver, and engage space forces while denying the same capability to an adversary. (AFDD 1-2)

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

terrestrial element. (AFDD 1-2) However, a space system may also consist of components that travel between space nodes, space to ground, ground to space, or ground to ground through space.

terrestrial element. The land-, sea-, or air-based equipment and personnel used to receive, transmit, and process data from, or to control, the space element of a space system. (AFDD 1-2)