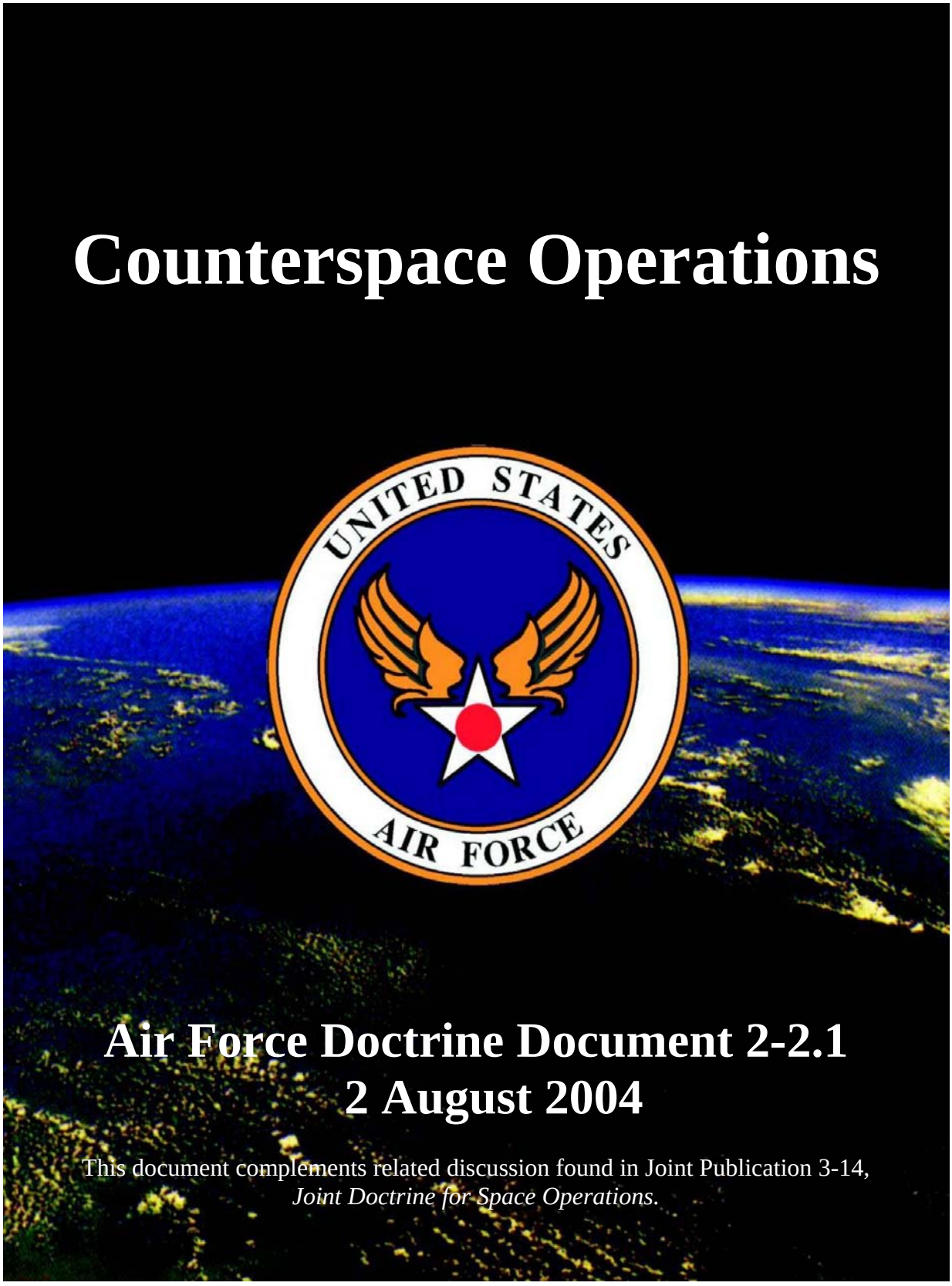
Counterspace Operations



Air Force Doctrine Document 2-2.1
2 August 2004

This document complements related discussion found in Joint Publication 3-14, *Joint Doctrine for Space Operations.*

BY ORDER OF THE SECRETARY OF THE AIR FORCE

AIR FORCE DOCTRINE DOCUMENT 2-2.1
2 AUGUST 2004

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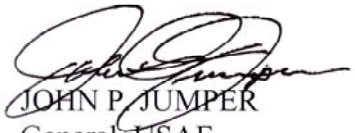
FOREWORD

Counterspace operations are critical to success in modern warfare. The rapid maturation of space capabilities and the evolution of contingency operations have greatly enhanced the effectiveness of air and space power. Combatant commanders leverage space capabilities such as communication; position, navigation, and timing; missile warning; environmental sensing; and reconnaissance to maintain a combat advantage over our adversaries. As demonstrated by the Iraqi deployment of global positioning system (GPS) jammers during Operation IRAQI FREEDOM, adversaries will target space capabilities in an attempt to deny that combat advantage. We must also be prepared to deprive an adversary of the benefits of space capabilities when American interests and lives are at stake. Space superiority ensures the freedom to operate in the space medium while denying the same to an adversary and, like air superiority, cannot be taken for granted. The development of offensive counterspace capabilities provides combatant commanders with new tools for counterspace operations. Air Force doctrine, likewise, is evolving to reflect technical and operational innovations. Air Force Doctrine Document (AFDD) 2-2.1, the Air Force's first doctrine publication on counterspace operations, provides operational guidance in the use of air and space power to ensure space superiority.

Space superiority is gained and maintained through counterspace operations which is one of the Air Force's air and space power functions**. Counterspace operations have defensive and offensive elements, both of which depend on robust space situation awareness.** These operations may be utilized throughout the spectrum of conflict and may achieve a variety of effects from temporary denial to complete destruction of the adversary's space capability.

This publication codifies United States Air Force (USAF) beliefs and practices on the use of counterspace operations in planning and executing military operations. It is useful to the tactician, operational-level planner, and strategist in formulating and carrying out an effective plan for defending United States (US) access to space and denying hostile exploitation of that medium.



JOHN P. JUMPER
General, USAF
Chief of Staff

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INTRODUCTION

PURPOSE

This document is prepared by the United States Air Force to guide the application of counterspace operations, the ways and means by which the Air Force achieves and maintains space superiority. It provides greater depth to warfighting doctrine as articulated in AFDD 1, *Air Force Basic Doctrine*, AFDD 2, *Organization and Employment of Aerospace Forces*, and AFDD 2-2, *Space Operations*.

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 the contents of this AFDD and the particular situation when accomplishing their missions. Airmen should read it, discuss it, and practice it.

SCOPE

This doctrine expands upon Air Force basic beliefs and concepts on space operations doctrine, codifying beliefs, principles, and practices for the application of the counterspace function. It provides commanders, planners, and operators with considerations and advice on conducting counterspace operations with a variety of capabilities as part of a joint or coalition action. This doctrine establishes unclassified operational-level guidance for tactics, techniques, and procedures described in Air Force Tactics, Techniques, and Procedures (AFTTP) and Air Force Operational Tactics, Techniques, and Procedures (AFOTTP).

FOUNDATIONAL DOCTRINE STATEMENTS

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

- US Air Force counterspace operations are the ways and means by which the Air Force achieves and maintains space superiority.
- The Air Force executes the counterspace function to protect US military and friendly space capability while denying space capability to the adversary, as situations require.
- Space superiority is a distinctive capability of the Air Force.
- The Air Force brings space expertise across the spectrum of military operations, whether as a single Service or in conjunction with other Services in joint operations.
- Counterspace operations have defensive and offensive elements, both of which depend on robust space situation awareness (SSA).
- SSA is the result of sufficient knowledge about space-related conditions, constraints, capabilities, and activities—both current and planned—in, from, toward, or through space.
- Achieving SSA supports all levels of planners, decision makers, and operators across the spectrum of terrestrial and space operations.
- Defensive counterspace (DCS) operations preserve US/friendly ability to exploit space to its advantage via active and passive actions to protect friendly space-related capabilities from enemy attack or interference.
- Offensive counterspace (OCS) operations preclude an adversary from exploiting space to their advantage.
- Counterspace operations are conducted across the tactical, operational, and strategic levels of war by the entire joint force (air, space, land, sea, information, or special operations forces).
- Within the counterspace construct, any action taken to achieve space superiority is a counterspace operation.
- Air Force counterspace operations, underpinned by space situation awareness, support both the space control mission of US Strategic Command (USSTRATCOM) and theater military operations.
- The theater commander, Air Force forces (COMAFFOR), assisted by the director of space forces (DIRSPACEFOR), ensures unity of effort within theater and with global space operations.

The first principle that should guide air and space professionals is the imperative to control the high ground. This has been a rule of warfare ever since the dawn of time. But as war fighting moved from Earth surfaces into the air, the military advantages of control of the high ground became even more pronounced. We've traditionally kept air supremacy because we have a very rigorous and aggressive doctrine of control of the air. The first thing we do in any military campaign or combat operations is to gain mastery of the skies and deny the skies to the adversary....

How must we apply this principle to space? Look at what we've been able to accomplish using space: collection of all kinds of intelligence, precision navigation and using it for weapons delivery, communication and transmission of information to users worldwide. How long before an adversary realizing the tremendous benefit that we gain from our space capabilities, across the spectrum of warfighting, will seize an opportunity to deprive us the use of them? How long will we continue to assume zero percent losses to our space systems during hostilities? The need to continue our thinking about space control is not just doctrinal rhetoric, but military reality.

Controlling the high ground of space is not limited simply to protection of our own capabilities. It will also require us to think about denying the high ground to our adversaries. We are paving the road of 21st century warfare now. And others will soon follow. What will we do five years from now when American lives are put at risk because an adversary uses space-borne imagery collectors, commercial or homegrown, to identify and target American forces? What will we do ten years from now when American lives are put at risk because an adversary chooses to leverage the global positioning system or perhaps the Galileo constellation to attack American forces with precision?

The mission of space control has not been at the forefront of military thinking because our people haven't yet been put at risk by an adversary using space capabilities. That will change. It is these sorts of events that the Space Commission members had in mind when they warned about the possibilities of a space Pearl Harbor. I believe we not only need to think about the mission and implications of space control—it is fundamentally irresponsible for us not to do so. Space is the ultimate high ground. Our military advantage there must remain ahead of our adversaries' capabilities. And our own doctrine and capabilities must keep pace to meet that challenge.

—The Honorable Peter B. Teets
Undersecretary of the Air Force
AFA symposium
15 November 2002

CHAPTER ONE

COUNTERSPACE OPERATIONS

The United States relies on space operations for its security, and this reliance may make us vulnerable in some areas. Identifying vulnerabilities will allow us to apply our full range of capabilities to ensure space superiority and continued support to joint military operations across the spectrum of conflict. Space superiority is as much about protecting our space assets as it is about preparing to counter an enemy's space or anti-space assets. Counterspace operations, both defensive and offensive, supported by situation awareness, will ensure we maintain our superiority in space. We must protect our space assets.

—General John P. Jumper
Chief of Staff

GENERAL

US Air Force counterspace operations are the ways and means by which the Air Force achieves and maintains space superiority. Space superiority provides freedom *to* attack as well as freedom *from* attack [AFDD 1]. **The Air Force executes the counterspace function to protect US military and friendly space capability while denying space capability to the adversary, as situations require.**

The US military is dependent on the use of space capabilities in all types of warfare to maintain a combat advantage over our adversaries. With rare exception, today's space infrastructure is largely unprotected. Space capabilities, as a center of gravity, could be prime targets for hostile exploitation and attack.

Adversaries, likewise, are using space to their advantage. Space capabilities, at one time limited to a few space-faring nations, are now commercially available to any adversary. Today, we must assume that an adversary has access to the benefits of space and plan accordingly.

Space and air superiority are crucial first steps in any military operation. Space superiority is a distinctive capability of the Air Force. The Air Force brings space expertise across the spectrum of military operations, whether as a single Service or in conjunction with other Services in joint operations. Air Force counterspace operations are evolving rapidly given our reliance on space and indications that potential adversaries are beginning to exploit space both for their benefit and for purposes harmful to our national interests. This AFDD

addresses how the Air Force organizes and employs counterspace operations to achieve space superiority.

COUNTERSPACE OPERATIONS

Counterspace has offensive and defensive operations, which are dependent on robust space situation awareness (SSA). Counterspace operations are conducted across the tactical, operational, and strategic levels of war by the entire joint force (air, space, land, sea, information, or special operations forces). Within the counterspace construct, any action taken to achieve space superiority is a counterspace operation.

Examples of counterspace operations include:

- ✪ Improving the commander's situational awareness and view of the battlespace. Find, fix, track, target, engage, and assess space capabilities.
- ✪ Instituting appropriate protective and defensive measures to ensure friendly forces can continuously conduct space operations across the entire spectrum of conflict.
- ✪ Operations to deceive, disrupt, deny, degrade, or destroy adversary space capabilities.

Space Situation Awareness (SSA)

SSA is the result of sufficient knowledge about space-related conditions, constraints, capabilities, and activities—both current and planned—in, from, toward, or through space. Achieving SSA supports all levels of planners, decision makers, and operators across the spectrum of terrestrial and space operations. SSA involves characterizing, as completely as possible, the space capabilities operating within the terrestrial and space environments. SSA information enables defensive and offensive counterspace operations and forms the foundation for all space activities. It includes space surveillance, detailed reconnaissance of specific space assets, collection and processing of intelligence data on space systems, and monitoring the space environment. It also involves the use of traditional intelligence sources to provide insight into adversary space and counterspace operations.

There are over 8,000 cataloged man-made objects in space

Defensive Counterspace (DCS) Operations

DCS operations preserve US/friendly ability to exploit space to its advantage via active and passive actions to protect friendly space-related capabilities from enemy attack or interference. Friendly space-related capabilities include space systems such as satellites, terrestrial systems such as ground stations, and communication links. DCS operations are key to enabling continued exploitation of space by the US and its allies by protecting, preserving, recovering, and reconstituting friendly space-related capabilities before, during, and after an adversary attack. DCS operations may target an adversary's counterspace capability to ensure access to space capabilities (e.g., an air strike against an active GPS jammer) and freedom of operations in space.

Counterspace operations can provide a deterrent against attacks on US space assets. Robust counterspace capabilities send the message that potential adversaries cannot act upon space assets with impunity. SSA capabilities can convince an adversary it is impossible to hide use of space systems or attacks against friendly space systems. Demonstrated DCS capabilities may convince adversaries that an attack against a space system will be ineffective and will not significantly impair warfighting capabilities.

Offensive Counterspace (OCS) Operations

OCS operations preclude an adversary from exploiting space to their advantage. OCS operations may target an adversary's space capability (space systems, terrestrial systems, links, or third party space capability), using a variety of permanent and/or reversible means. The "Five Ds" —deception, disruption, denial, degradation, and destruction—describe the range of desired effects when targeting an adversary's space systems.

As adversaries become more dependent on space capabilities, counterspace operations have the ability to produce effects that directly impact their ability and will to wage war at the strategic, operational and tactical levels. Denying adversary space capabilities may hinder their ability to effectively organize, coordinate, and orchestrate a military campaign. For example, if adversaries reconstitute their command and control (C2) capabilities via satellite communications (SATCOM) after their ground-based communications network has been destroyed by precision bombing, offensive counterspace operations may be employed in conjunction to reduce or eliminate their ability to communicate with their forces.

AIR FORCE COUNTERSPACE OPERATIONS

Air Force counterspace operations, underpinned by space situation awareness, support both the space control mission of USSTRATCOM and theater military operations.

USSTRATCOM's space control mission includes: surveillance of space; protection of US and friendly space systems; prevention of an adversary's ability to use space systems for hostile purposes; negation of adversarial capability, if necessary. Within the negation mission,

one may deceive, disrupt, deny, degrade, or destroy adversary space capability [JP 3-14, *Joint Doctrine for Space Operations]*

Theater military operations require space superiority to ensure US and friendly forces have the freedom to operate in the space medium while denying the same to the adversary.

THREATS

The US's space advantage is threatened by the growth in adversary counterspace capability and the adversary's increased use of space. In the past, the US has enjoyed space superiority through our technology development and exploitation, advanced information systems, and robust space infrastructure. The ability to sustain this advantage is challenging and may be eroding as our adversaries close the gap through technology sharing, materiel acquisition, and purchase of space services.

Adversaries can conduct attacks against our space capabilities using various methods both symmetric and asymmetric. Adversaries may have the capacity to develop counterspace capabilities but, in many cases, may simply acquire them from a third party. Near and far-term threats may include the following:

- ✪ Ground system attack and sabotage using conventional and unconventional means against terrestrial nodes and supporting infrastructure.
- ✪ Radio frequency (RF) jamming equipment capable of interfering with space system links.
- ✪ Laser systems capable of temporarily or permanently degrading or destroying satellite subsystems, thus interfering with satellite mission performance.
- ✪ Electromagnetic pulse (EMP) weapons capable of degrading or destroying satellite and/or ground system electronics.
- ✪ Kinetic antisatellite (ASAT) weapons capable of destroying spacecraft or degrading their ability to perform their missions.
- ✪ Information operations (IO) capabilities capable of corrupting space-based and terrestrial-based computer systems utilized to control satellite functions and to collect, process, and disseminate mission data.

Adversaries do not need to be space-faring nations to exploit the benefits of space. Adversaries can purchase space products and services, such as imagery and communications, which often rival those available to US military forces. Adversaries may leverage US or friendly systems to their advantage as well. For example, an adversary may use the NAVSTAR GPS constellation for navigation. In conflict, adversary access to space decreases US advantage and increases the threat to friendly military forces.

POLICY

National space policy governs our conduct with regard to military operations in, through, or toward space. The 1996 National Space Policy charges the Department of Defense to maintain the capability to execute the mission area of space control. It further specifies: "Consistent with treaty obligations, the United States will develop, operate, and maintain space control capabilities to ensure freedom of action in space and, if directed, deny such freedom of action to adversaries."

DODD 3100.10, *Department of Defense Space Policy*, states:

- "Space is a medium like the land, sea, and air within which military activities shall be conducted to achieve US national security objectives.
- Ensuring the freedom of space and protecting US national security interests in the medium are priorities for space and space-related activities.
- Purposeful interference with US space systems will be viewed as an infringement on our sovereign rights. The US may take all appropriate self-defense measures, including, if directed by the [President and/or SecDef], the use of force, to respond to such an infringement on US rights.
- Space activities shall contribute to the achievement of US national security objectives by countering, if necessary, space systems and services used for hostile purposes."

CHAPTER TWO

COMMAND AND CONTROL OF COUNTERSPACE OPERATIONS

Whereas those who have the capability to control the air, control the land and sea beneath it, so in the future it is likely that those who have the capability to control space will likewise control the earth's surface.

—General Thomas D White
Chief of Staff
United States Air Force, 1957

GENERAL

The need for space superiority can exist simultaneously for both global (supporting multiple theater and/or national level objectives) operations and theater joint task force (JTF) operations. Commander, US Strategic Command (CDRUSSTRATCOM), charged with the mission of space control, ensures space superiority for global operations. The joint force commander (JFC) ensures space superiority in the theater area of responsibility (AOR). Depending on the number of joint operations, multiple commanders may have the responsibility to establish space superiority. While some theater counterspace operations are independent (an air strike to destroy a GPS jammer that is impacting local operations only), many are interdependent with other theater or global counterspace operations (jamming a signal in one AOR may impact operations in another AOR). Unity of command and unity of effort within global and theater operations and unity of effort between global and theater operations are crucial to ensure space superiority for all US military forces. Command relationships for counterspace operations continue to evolve and each situation can dictate a unique arrangement. Therefore, flexibility is paramount at all levels of command, whether supporting global or theater operations.

COMMAND RELATIONSHIPS

Command relationships for counterspace are in accordance with JP 0-2, *Unified Action Armed Forces (UNAAF);* JP 3-14*;* and AFDD 2-2.

There are four basic forms of command relationships: combatant command (command authority) (COCOM), operational control (OPCON), tactical control (TACON), and support. These “warfighting” authorities flow from the Secretary of Defense (SecDef) to the combatant commanders. The SecDef assigns forces under the COCOM of the appropriate combatant commander via the Forces For Memorandum. Forces that are assigned to one combatant commander may be transferred and temporarily attached to a different combatant commander when deployed via a SecDef approved Deployment Order. The SecDef will specify the command relationship that the gaining combatant commander will exercise over the forces attached (usually OPCON). The combatant commander(s) will provide assigned and attached

forces to subordinate JFCs with specification of OPCON, TACON, or in support. The JFC in turn delegates appropriate authorities to the various component commanders, who in turn delegate appropriate authority to their subordinate commanders.

Other authorities, outside the command relationships delineated above, include coordinating authority and direct liaison authorized (DIRLAUTH). According to JP 0-2, 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, two or more joint force 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. [JP 0-2] Coordinating authority, according to JP 0-2, is "not an authority by which command may be exercised" and is "more applicable to planning and similar activities than to operations." DIRLAUTH, according to JP 0-2, is "that authority granted by a commander (any level) to a subordinate to directly consult or coordinate an action with a command or agency within or outside of the granting command." DIRLAUTH is a "coordinating relationship, not an authority through which command may be exercised" and is "more applicable to planning than operations and always carries with it the requirement of keeping the commander granting DIRLAUTH informed." [JP 0-2]

Unity of command "ensures the concentration of effort for every objective under one responsible commander." [AFDD 1] The principle of unity of command emphasizes that all efforts should be directed and coordinated toward a common objective. While coordination may be achieved by cooperation, it is best achieved by vesting a single commander with the authority to direct all force employment in pursuit of a common objective. Unity of command ensures unity of effort. The command relationships, OPCON, TACON, or support, ensure unity of command.

Unity of effort ensures a coordinated and cooperative effort toward a commonly understood objective. Unity of effort becomes crucial when unity of command is not feasible. Military operations are often supported by non-DOD space capabilities (civil, national, and commercial). Given these space capabilities are not assigned to the DOD, a command relationship is not possible. Many of these non-DOD space capabilities are managed via an interagency coordination process. The combatant commander staff or JTF staff normally interfaces with these interagency processes. Per JP 3-14, requests for intelligence, surveillance, and reconnaissance (ISR) support derived from on-orbit satellites, whether national or commercial systems, normally goes through the combatant commander or JTF J-2 and the collection manager. Similarly, all SATCOM requirements (military and commercial) are managed by the Joint Staff.

Given the nature of space support, provided by both DOD and non-DOD assets, **there should normally be a unity of command of DOD space assets and a unity of effort with non-DOD space assets.** Unity of command can be provided via OPCON, TACON, or support. Unity of effort can be facilitated by the designation of a coordinating authority. The unity of command and unity of effort for both global and theater counterspace operations, and the unity of effort between global and theater counterspace operations, are discussed below.

Unity of Command in Global Counterspace Operations

CDRUSSTRATCOM is assigned COCOM of DOD space forces and normally exercises command through component commanders. Commander, Air Force Space Command (AFSPC/CC) has OPCON of assigned and attached Air Force space forces. Commander, Fourteenth Air Force (14 AF/CC) plans and executes Air Force space operations on behalf of AFSPC/CC. In accordance with JP 3-14, CDRUSSTRATCOM "may designate a subordinate to manage space operations." Clear command relationships must be established to ensure unity of command should a subordinate, such as AFSPC/CC, be assigned the mission of global counterspace operations.

Unity of Command in Theater Counterspace Operations

Unity of command is ensured when space forces are presented to a theater via OPCON, TACON, or support. At SecDef direction, CDRUSSTRATCOM will transfer space forces or capabilities to another combatant commander. For example, a joint tactical ground station (JTAGS) detachment could be deployed and attached, normally with OPCON, to another combatant commander. If needed by a JFC, OPCON of those forces is normally delegated to the JFC, who then delegates that authority to the appropriate Service component commander. The JFC normally delegates OPCON of assigned and attached Air Force space forces to the COMAFFOR. To ensure unity of command of theater DOD space forces, a JFC may designate a supported commander for joint theater space operations. The appropriate Service or functional component commander should exercise TACON of theater space forces made available by the Services. The Service with the preponderance of space capability and the capability to command and control should normally be designated supported commander for joint theater space operations. This normally is the COMAFFOR, or COMAFFOR/ joint force air and space component commander (JFACC) (COMAFFOR dual-hatted as the JFACC), if established. Unity of command should be given to the theater to perform offensive counterspace operations in support of theater objectives.

Unity of Effort in Global Counterspace Operations

Military space capabilities are often augmented by civil, commercial, and national space systems. As unity of command over these space systems is problematic, unity of effort is crucial. USSTRATCOM has established agreements and working relationships with several of the non-DOD support providers to help ensure unity of effort.

Unity of Effort in Theater Counterspace Operations

To facilitate unity of effort within theater space operations, a JFC may designate a space coordinating authority (SCA) [JP 3-14, *Joint Doctrine for Space Operations*, uses "space authority"]. The commander with SCA is the single authority to coordinate joint theater space operations and integrate space capabilities. The JFC can either retain authority or designate a component commander as the SCA. The JFC should designate the COMAFFOR or COMAFFOR/JFACC as the SCA, given they normally provide the JFC with the preponderance of military space capabilities, space expertise, and C2 capabilities.

Unity of Effort Between Global and Theater Counterspace Operations

Global and theater counterspace operations must be coordinated, deconflicted, integrated, and synchronized to ensure space superiority for all US military forces. Unity of effort is vital given multiple commanders may have the responsibility to carry out counterspace operations. Unity of effort between global and theater counterspace operations is facilitated by the SCA. The SCA, normally authorized DIRLAUTH with Service components of USSTRATCOM, can assist the JFC in coordinating, deconflicting, integrating, and synchronizing theater counterspace operations with USSTRATCOM global counterspace operations. If CDRUSSTRATCOM assigns the mission of global counterspace operations to a Service component, such as AFSPC/CC, the theater SCA should be authorized DIRLAUTH with that component.

ROLES AND RESPONSIBILITIES

Space superiority for all US military forces requires unity of command and unity of effort within global and theater counterspace operations and unity of effort between global and theater counterspace operations (Figure 2.1).

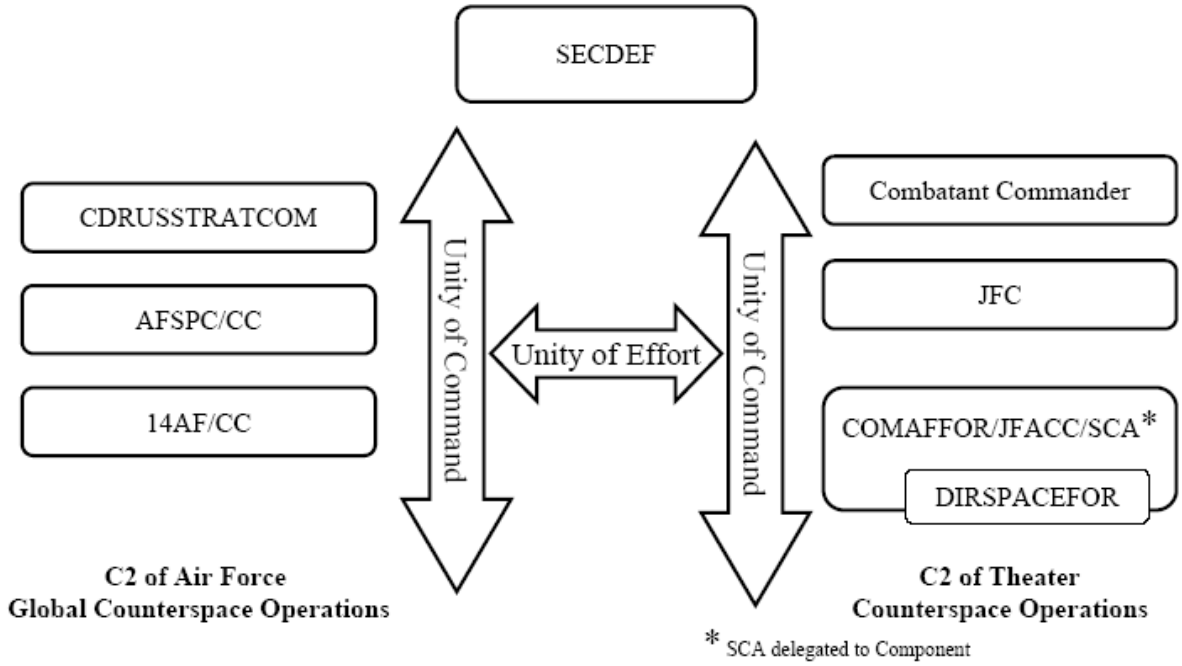

Figure 2.1. Notional Overview of Counterspace Roles and Responsibilities

Secretary of Defense (SecDef)

The SecDef assigns military forces to combatant commanders by the "Forces for Unified Commands" memorandum. The SecDef is the approval authority for transfer of military space forces from CDRUSSTRATCOM to a geographic combatant commander and will specify the command relationships the gaining commander will exercise. Upon receipt of attached or reassigned forces, the geographic combatant commander may further delegate command relationships to a subordinate commander or JFC as appropriate. As the establishing authority for a support relationship between CDRUSSTRATCOM and other combatant commanders, the SecDef decides on the solution for the supported commander's needs that cannot be fulfilled by the supporting commander. The SecDef may retain approval authority of individual counterspace operations.

Commander, US Strategic Command (CDRUSSTRATCOM)

CDRUSSTRATCOM has COCOM of all DOD space forces assigned by the SecDef's "Forces for Unified Commands" memorandum. CDRUSSTRATCOM deconflicts, prioritizes, and synchronizes space capabilities in support of other combatant commanders and the SecDef. CDRUSSTRATCOM, with the combatant commanders, determines the command relationships necessary to meet respective theater space requirements. Global counterspace operations, both defensive and offensive, are part of CDRUSSTRATCOM's assigned space control mission area.

Commander, Air Force Space Command (AFSPC/CC)

AFSPC/CC serves as the COMAFFOR for USSTRATCOM for assigned Air Force space forces. AFSPC/CC exercises OPCON over all assigned Air Force space forces and, with guidance from CDRUSSTRATCOM, directs Air Force space forces. AFSPC/CC is responsible for Air Force global counterspace operations supporting USSTRATCOM's space control mission. If designated by CDRUSSTRATCOM, AFSPC/CC may serve as the supported commander for joint global counterspace operations. AFSPC plans for and develops tactics, techniques, and procedures for offensive and defensive counterspace operations.

Commander, Fourteenth Air Force (14 AF/CC)

Commander, Fourteenth Air Force (14 AF/CC) plans and executes Air Force space operations on behalf of AFSPC/CC. 14 AF/CC exercises command through the 14 AF air and space operations center (AOC), referred to as the "space AOC." 14 AF/CC is responsible to AFSPC/CC for planning and execution of Air Force global counterspace operations in support of CDRUSSTRATCOM. 14 AF/CC is responsible to the COMAFFOR/JFACC, when in direct support, for integration of Air Force global space forces into theater counterspace operations. 14 AF/CC is normally authorized DIRLAUTH with the supported theater commander, normally the COMAFFOR/JFACC.

Commander, Geographic Combatant Command

The geographic combatant commander provides prioritized theater space requirements to CDRUSSTRATCOM. The combatant commander coordinates requirements within the theater if there are multiple JTFs or other theater priorities. The combatant commander, with CDRUSSTRATCOM, determines the command relationships necessary to meet those requirements. At the SecDef's direction, CDRUSSTRATCOM transfers space forces or capabilities to a geographic combatant commander.

Joint Force Commander (JFC)

The JFC is responsible for space superiority in the specified AOR/joint operations area (JOA). OPCON of theater space forces is normally delegated to the JFC, who then delegates that authority to the appropriate Service component commander. The JFC normally exercises command of assigned and attached Air Force space forces through the COMAFFOR.

Commander, Air Force Forces (COMAFFOR)

The COMAFFOR commands all assigned or attached Air Force space forces on behalf of the JFC. The COMAFFOR normally exercises command through the air and space operations center. The COMAFFOR is responsible to the JFC, or the designated supported commander for counterspace operations, for planning and execution of Air Force theater counterspace operations. The COMAFFOR is responsible to the JFC, or the designated supported commander for counterspace operations, for integration of Air Force theater space forces into global counterspace operations. **The COMAFFOR, assisted by the DIRSPACEFOR, ensures unity of effort within theater and with global space operations.** The JFC may designate the COMAFFOR as the SCA. The COMAFFOR normally serves as the joint force air and space component commander (JFACC).

Joint Force Air and Space Component Commander (JFACC)

The JFACC, when designated by the JFC, plans, coordinates, allocates, tasks, executes, and assesses air and space operations to accomplish assigned operational missions. [AFDD 2] The JFACC should be assigned the responsibility for space superiority in the theater AOR. To ensure unity of command in theater space operations, the JFC may designate the JFACC as the supported commander for theater space operations. If designated as the supported commander, the JFACC should exercise TACON of theater space forces made available by the Services. To facilitate unity of effort within theater space operations and with global DOD forces and non-DOD space capabilities, the JFC should designate the JFACC as SCA.

Space Coordinating Authority (SCA)

The SCA is the single authority to coordinate joint theater space operations and integrate space capabilities. The **JFC may retain SCA or designate a component commander** to carry out the responsibilities of the SCA. The JFC should designate a component commander as SCA,

given coordination and integration is focused on operational-level operations. According to JP 3-14, the JFC "considers the mission, nature and duration of the operation, preponderance of space force capabilities, and the C2 capabilities (including reachback) in selecting the appropriate option."

The **JFC should designate the COMAFFOR or COMAFFOR/JFACC as the SCA,** given they normally provide the JFC with the preponderance of military space capabilities, space expertise, and C2 capabilities.

Responsibilities of the SCA include:

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

The **SCA facilitates unity of effort within theater** by coordinating joint theater space operations to support integration of space capabilities and having primary responsibility for in-theater joint space operations planning. The SCA can require consultation between agencies involved but does not have the authority to compel agreement. The SCA coordinates with theater components (Army and Navy space support teams, space support teams assigned to special operations forces [SOF]) and the Air Force's DIRSPACEFOR. The SCA also coordinates with other deployed DOD and national agency theater support teams, to include the national intelligence support team (NIST). The NIST may include teams from the Defense Intelligence Agency (DIA), National Security Agency (NSA), Central Intelligence Agency (CIA), National Geospatial-Intelligence Agency (NGA), National Reconnaissance Office (NRO), and other intelligence community agencies as required. If the JFC does not designate a supported commander for theater counterspace operations, unity of effort between theater forces executing counterspace operations will be crucial to ensure space superiority in the theater AOR.

Operation IRAQI FREEDOM
The combined forces air and space component commander (CFACC) was designated space coordinating authority for the first time

The **SCA facilitates unity of effort between global and theater** space operations. The SCA gathers military space requirements throughout the joint force and provides the JFC a prioritized list of recommended military space requirements. Upon JFC approval, the list is provided to CDRUSSTRATCOM. The SCA is normally authorized DIRLAUTH with Service components of USSTRATCOM and can assist the JFC, or designated supported commander for theater counterspace operations, in coordinating, deconflicting, integrating, and synchronizing theater counterspace operations with USSTRATCOM counterspace operations. If CDRUSSTRATCOM assigns the mission of global counterspace operations to a Service component, such as AFSPC/CC, the SCA should be authorized direct liaison with that component.

Director of Space Forces (DIRSPACEFOR)

The DIRSPACEFOR serves as the **senior space advisor to the COMAFFOR or COMAFFOR/JFACC.** The DIRSPACEFOR conducts coordination, integration, and staffing activities to tailor space support for the COMAFFOR/JFACC. The DIRSPACEFOR is a senior Air Force officer with space expertise and theater familiarity, nominated by AFSPC/CC and appointed by the theater COMAFFOR. The DIRSPACEFOR is attached to the COMAFFOR, and should be part of the COMAFFOR's or COMAFFOR/JFACC's special staff.

Responsibilities of the DIRSPACEFOR include:

- Recommend appropriate command relationships for space to the COMAFFOR/JFACC
- Provide assistance to COMAFFOR/JFACC in establishing and prioritizing military space requirements required by the JFC and the policies for employing those space capabilities
- Provide senior space perspective for strategy and daily COMAFFOR/JFACC guidance development, target selection, and force enhancement to terrestrial operations
- Direct and monitor, on behalf of the COMAFFOR/JFACC, space forces and capabilities assigned or attached to the COMAFFOR/JFACC, including space-related special technical operations; includes space forces made available for tasking with specification of TACON to the COMAFFOR/JFACC
- Facilitate and coordinate AFSPC, USSTRATCOM, Service, and agency support to the COMAFFOR/JFACC—coordinate vertical, horizontal, and reachback activities with the space AOC and other component space support teams and liaisons as necessary; assist/recommend DIRLAUTH relationships to execute time-sensitive requests for space support
- Execute day-to-day SCA responsibilities, on behalf of the COMAFFOR/JFACC, as directed
- Act as COMAFFOR/JFACC's representative to the SCA if the authority resides with the JFC or another component
- Accomplish other duties as assigned by the COMAFFOR/JFACC

14 AF Air and Space Operations Center [Space AOC]

The 14 AF/CC exercises C2 of assigned and attached space forces through the 14 AF's space AOC. The space AOC uses the space tasking cycle to translate both CDRUSSTRATCOM and JFC objectives, priorities, and intent into a coherent, synchronized plan. The space tasking order (STO), a key product of the space tasking cycle, is used to task and execute AFSPC assigned and attached space forces. Synchronization of the STO with theater operations is discussed in Chapter Six, "Planning and Executing Counterspace Operations."

Air and Space Operations Center (AOC)

The COMAFFOR exercises command through the AOC. The AOC uses the air tasking cycle to plan, coordinate, allocate, task, execute and assess air and space operations to accomplish assigned operational missions. The air tasking order (ATO), a key product of the air tasking cycle, is used to task and execute theater air and space operations. Details on the AOC can be found in AFDD 2.

COMMAND AND CONTROL OF SPACE FORCES

The C2 structure established for Air Force space forces depends on the effect to be produced by that force (global or theater) and the ability of a theater combatant commander to command and control that force (Figure 2.2). If a space asset produces global effects (supporting multiple theater and/or national level objectives) then a centralized structure commanded by CDRUSSTRATCOM is usually best. If a space asset produces theater-only effects (effects focused primarily on an individual theater), and that asset can be commanded and controlled by the theater, then it is the responsibility of that theater combatant commander to command/employ that space asset.

Categories of Space Forces

AFDD 2 describes three categories of space forces that can provide space support to a campaign: global space forces, deployable space forces, and theater organic space forces. Global space forces are military space assets, normally assigned to USSTRATCOM, that support national objectives and multiple theaters. For example, GPS is a space-based radionavigation system nominally consisting of a constellation of 24 orbiting satellites that provide position, navigation, and timing information to military and civilian users worldwide. Deployable space assets are space forces that can or must move forward to a theater to support operations. For example, JTAGS is a deployable system providing combatant commanders with direct downlinked, in-theater early warning of ballistic missile launches. Organic space forces, normally OPCON to the JFC, are those that are embedded in theater in anticipation of their use in theater operations. For example, EAGLE VISION provides in-theater, real-time acquisition and processing of commercial satellite imagery. Space assets supporting counterspace operations may come from any of the three categories.

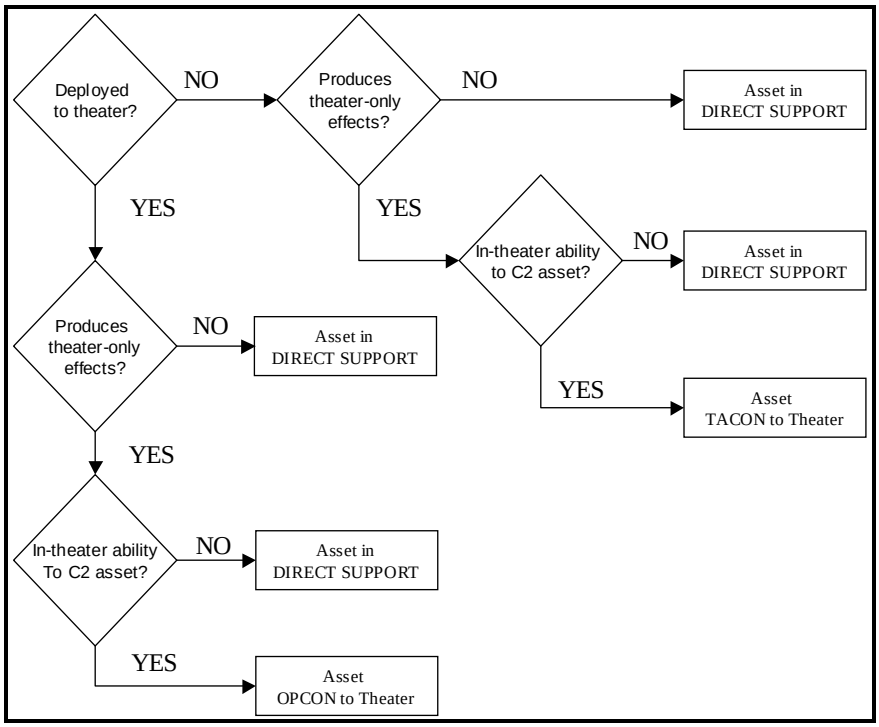

Figure 2.2. C2 Decision Tree for Control of Space Assets in Theater Operations

Control of Global Space Forces in Theater Counterspace Operations

When **global space forces are requested to produce effects within a theater,** the SecDef will normally establish a command relationship between CDRUSSTRATCOM and the requesting combatant commander. As with other functional forces, such as mobility, "the functional combatant commander will normally retain OPCON of assigned forces and provide either TACON or a direct support relationship with the supported combatant commander/JTF." [AFDD 2] Per AFDD 2-2, the **litmus test for providing theater TACON of global space assets is 1) asset produces theater-only effects and 2) in-theater capability to command and control the asset.**

AFSPC/CC normally retains OPCON of global Air Force space forces and provides them via a support relationship. Unity of command in theater counterspace operations is ensured as the commander responsible for theater counterspace operations, normally the COMAFFOR or COMAFFOR/JFACC, can direct "designation and prioritization of targets or objectives, timing and duration of the supporting action, and other instructions necessary for coordination and efficiency" [JP 0-2]. Direct support, specifying the COMAFFOR or COMAFFOR/JFACC as the supported commander, allows AFSPC/CC to directly answer the supported commander's requests for assistance. This command relationship is parallel to the close air support (CAS) mission, where the COMAFFOR or JFACC retain OPCON/TACON of air assets, centrally control them, and provide CAS via a support relationship.

The JFC may be given TACON of a global space force given it produces theater-only effects and the theater can command and control the asset. Such a space force, regardless of physical location, is a de facto theater space force and should be integrated into theater counterspace operations like other theater space forces. While current global space systems including on-orbit assets, do not meet the litmus test for transfer of TACON, future global space forces may offer theater-only effects that can be commanded and controlled in-theater.

Control of Deployable Space Forces in Theater Counterspace Operations

CDRUSSTRATCOM has COCOM of deployable space forces. The SecDef may transfer OPCON of deployable spaces force to a geographic combatant commander. The **litmus test for providing theater OPCON of deployable space assets is 1) asset produces theater-only effects and 2) there is an in-theater capability to command and control the asset.**

If the space force's operation only impacts that individual theater, the SecDef may direct USSTRATCOM to transfer the space forces to the geographic combatant commander. The command relationship the gaining commander will exercise is specified by the SecDef. 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.

Control of Theater Organic Forces in Theater Counterspace Operations

Geographic combatant commanders may have COCOM of theater organic space forces. COMAFFOR normally exercises OPCON of Air Force theater organic space forces. A JFC may designate a supported commander for joint theater space operations. The appropriate Service or functional component commander should exercise TACON of theater space forces made available by the Services. The Service with the preponderance of capability and the capability to command and control should normally be designated supported commander for joint theater space operations. This normally is the COMAFFOR, or COMAFFOR/JFACC, if established.

CHAPTER THREE

SPACE SITUATION AWARENESS

Space superiority is our imperative – it requires the same sense of urgency that we place on gaining and maintaining air superiority over enemy air space in times of conflict. This imperative requires a full understanding of the medium of space, and we will pursue robust space situation awareness leading to space superiority.

—General Lance Lord
Commander, Air Force Space Command

GENERAL

The foundation for counterspace operations is an understanding of friendly space capabilities, adversaries' space capabilities, threats to space systems, the terrestrial and space environment, and how these factors affect friendly and adversary operations. The forces and assets that provide space capabilities operate as links and nodes in a variety of mediums, including space, air, land, sea, and IO.

Space situation awareness provides the battlespace awareness required for planning, executing, and assessing DCS and OCS operations. SSA is the result of sufficient knowledge about space-related conditions, constraints, capabilities, and activities—both current and planned—in, from, toward or through space. Achieving SSA supports all levels of planners, decision makers, and operators across the spectrum of terrestrial and space operations. SSA involves characterizing, as completely as possible, the space capabilities operating within the terrestrial and space environments. SSA forms the foundation for all space activities, but has its most stringent requirements derived from counterspace operations.

SSA provides knowledge of the space medium, intelligence on space systems, and the ability to correlate effects, all crucial for protection of Air Force space systems and effective operations against adversary space capabilities. For example, the space medium is a hostile one. Prediction of space environmental activity allows protective action, such as turning solar arrays parallel to an oncoming meteor shower, to minimize damage to a satellite. Analysis of SSA information on space systems, such as a satellite's orbit, helps prevent inadvertent collisions between man-made objects. Space system information, combined with the ability to correlate effects, allows operators to predict and avoid radio frequency interference and unintentional fratricide against friendly space systems. Likewise, SSA is necessary to predict and defend Air Force space systems from adversary attack. SSA is crucial to accurate determination of the space system failure, whether from environmental effects, unintentional interference, or an adversary

attack, allowing decision makers to determine the appropriate response. Finally, SSA provides detailed intelligence on adversary space capabilities and on-going space operations, enabling Air Force counterspace planning, execution, and assessment.

COMPONENTS OF SPACE SITUATION AWARENESS

Intelligence

Intelligence is "the product resulting from the collection, processing, integration, analysis, evaluation, and interpretation of available information concerning foreign countries or areas." [AFDD 1] For SSA, **intelligence provides the characterization and assessment of foreign (adversary and third party) space capabilities.** Characterization includes, but is not limited to, how forces and assets operate, their impact to friendly and adversary military operations, and their vulnerabilities and strengths. Intelligence analysis of all elements of space systems is required to determine threats and vulnerabilities of foreign space capabilities. Intelligence must be timely to support OCS and DCS operations. It primarily supports the characterization and assessment of space capabilities in preparation for targeting or defending against them. Reliable, timely, and accurate intelligence also supports battle damage assessment (BDA).

Surveillance

Surveillance is "the function of systematically observing air, space, surface, or subsurface areas, places, persons, or things, by visual, aural, electronic, photographic, or other means." [AFDD 1] **Space surveillance is the systematic and continuous observation and information collection on space systems operating in the space environment.** Surveillance contributes to orbital safety, indications and warning of space events, initial indications where threats may be located, and battle damage assessment. Space events include satellite maneuvers, anticipated and unanticipated launches, reentries into the atmosphere, laser emanations, solar events, and electromagnetic conflicts such as radio frequency interference (RFI).

20th Space Control Squadron tracks objects through phased array radar technology.

Surveillance data, for example, is used to produce the satellite catalog—the fused product that provides the location of on-orbit satellites. Information from the satellite catalog is used by predictive orbital analysis tools to anticipate satellite threats and collection opportunities for friendly, adversary, and third party assets.

Reconnaissance

Reconnaissance is "obtaining, by visual observation or other detection methods, specific information about the activities and resources of an enemy or potential enemy; or in securing data concerning the meteorological, hydrographic, or geographic characteristics of a particular area. Reconnaissance generally has a time constraint associated with the tasking." [AFDD 1] Assets that perform reconnaissance may also conduct surveillance. Reconnaissance provides the detailed characterization needed to assess the battlespace. **Space reconnaissance supports satellite anomaly (i.e., on-board problem) resolution, targeting, and post-strike assessment.**

Reconnaissance data, for example, may come from a remotely piloted aircraft (RPA) providing visual images of a mobile satellite ground station to aid in the planning of a strike against that ground station.

Environmental Monitoring

Environmental monitoring includes the characterization and assessment of space weather (i.e., solar conditions) on satellites and links, terrestrial weather near important ground nodes, and natural and man-made phenomena in outer space (i.e. orbital debris). This environmental information must be accurate, timely, and predictive to protect space systems and to support counterspace planning and execution. Predictions of natural environmental effects should be synchronized with military commanders' courses of action to enhance military effects.

Environmental monitoring can be critical in counterspace operations. Natural phenomena, such as solar flares and lightning, can interfere with space systems. **Operators must be able to differentiate between natural phenomena interference and an intentional attack on a space system in order to formulate an appropriate response.**

Command and Control

Command and control is "the battlespace management process of planning, directing, coordinating, and controlling forces and operations." [AFDD 1] SSA provides the knowledge and intelligence needed in the planning, execution, and assessment cycles. Combining multiple sources of information into a single integrated space picture (SISP) is essential for SSA. Likewise, C2 processes enhance SSA by providing feedback on the status/readiness of forces and insight on how integrated space capabilities are contributing to military operations. Fusion of SSA information occurs at several levels, but is crucial at the C2 nodes. **Multiple C2 nodes will often require SSA information, making unity of effort for SSA activities essential.**

SSA REQUIREMENTS AND TASKS

Space situation awareness is more than surveillance of space. SSA is the command and control, computers, intelligence, surveillance, and reconnaissance (C3ISR) and environmental data required for all space operations. Recent studies (Space Control Broad Area Review, 2000, and the Space Situation Awareness Task Force, 2001) have highlighted the need for synergy

between the intelligence and the surveillance of space activities, improved force structure for 'situational awareness,' and other improvements to advance the understanding of the battlespace with respect to space operations. SSA requires:

- Use of *intelligence* sources to provide insight into adversary space doctrine, strategy, tactics, and operations
- *Surveillance* of all space objects, activities, and terrestrial support systems
- Detailed *reconnaissance* of specific space objects
- Monitoring and analysis of the space *environment*
- Monitoring and status of friendly, neutral, and adversary *space assets, capabilities, and operations*
- Command, control and communications (C3), processing, analysis, dissemination, and archival capabilities used to accomplish these activities

The **tasks of SSA include find, fix, track, target, engage, and assess.** Accomplishing these tasks ensures coherent battlespace awareness for planners, operators, and commanders.

Find, Fix, and Track

The ability to find, fix, and track space objects, signals, and terrestrial nodes is fundamental to either attack the adversary, defend/preserve friendly space capabilities, assess collateral effects on third party space assets, or understand the operational environment. Similar to an air operation, such as airborne warning and control system (AWACS), which tries to find, fix, and track all airborne objects within their area of interest, radar and optical sensors worldwide focus to find, fix, and track objects in space. An important aspect of find, fix, and track includes the ability to characterize space systems, signals, environment, and threats. Characterization builds knowledge of how systems operate, the signals they use, how they react to changes in conditions, the threats they pose to friendly/adversary operations, and many other important factors. Understanding our own space systems and the threats to them enhances our ability to preserve, withstand, or respond to an attack.

Target and Engage

Characterization data enhances our ability to target a space capability, often providing greater flexibility to achieve the desired effect. If we understand how the space system works, the decision and the trade-offs on how to affect the target will be easier. Deconfliction is just as important in counterspace operations as it is in other military operations. Electromagnetic spectrum and physical deconfliction must be accomplished to avoid "blue-on-blue" impacts and unintentional interference with other parties.

Assess

Assessment of the results of OCS or DCS operations is critical. The ability to assess whether the environment or a threat is producing an effect, like interference, is key to ensuring proper response. Effective ISR planning and execution are essential for accurate assessment. Today, our ability to characterize and assess a potential threat or target may be limited. Close cooperation with appropriate DOD and non-DOD agencies is critical to improve the ability to access the intelligence required to characterize and assess space systems, signals, environment, and threats.

BATTLESPACE AWARENESS

Space situation awareness provides the battlespace awareness needed by all levels of planners, decision makers, and operators across the spectrum of terrestrial and space operations. SSA contributes to the development of the space intelligence preparation of the battlespace (SIPB) and predictive battlespace awareness (PBA).

Space Intelligence Preparation of the Battlespace (SIPB)

SIPB is a systematic, continuous process of analyzing the threat and environment to support military decision making across the spectrum of space operations. It is a framework for analyzing the full spectrum of adversary space capabilities and potential courses of action, as affected by the environment, both natural and man-made. SIPB's primary purpose is to support the commander's planning and decision-making process by identifying, assessing, and estimating the adversary's space-related centers of gravity (COG), vulnerabilities, capabilities, limitations, and intentions. Characterizing and assessing space systems, signals, environment, and threats can be difficult and time consuming but critical to counterspace operations. SIPB for counterspace operations should be accomplished early, often in the planning process, to ensure availability of intelligence needed for planning and execution of operations. Space orders of battle are an important part of SIPB.

Blue, red, and gray space orders of battle are based on operational reporting and intelligence, surveillance, and reconnaissance data. Each provides insight into the space systems of friendly forces (blue), adversary forces (red), and third party (gray) space forces, respectively.

Operation IRAQI FREEDOM
Commercial satellites provided over 80% of all satellite communications used by the US military.

The **blue space order of battle,** regarding military and government space systems, may be maintained through a combination of up-channel reporting of military space forces, formal arrangements, and frequent coordination with other government agencies.

The **red space order of battle,** regarding a potential adversary's military and government space systems, may be developed through a comprehensive network of intelligence resources. However, insight into adversary use of third party space systems is difficult due to the need to track contractual and other arrangements between these vendors and potential adversaries.

The **gray space order of battle,** regarding US commercial and neutral foreign (commercial and government) space systems, can be difficult to develop and maintain. Status on US commercial providers requires their voluntary participation, as US law and policy strictly limit the ability of US intelligence agencies to collect, retain, or disseminate information concerning US persons and corporations. The importance of third party providers must not be understated as they provide space capabilities to numerous clients, including friendly and adversary military operations.

SIPB will generally require dedicated support from multiple agencies as well as sufficient infrastructure and processes. For example, developing and maintaining space orders of battle can be challenging. While provisions exist to require the registration of new launches and objects placed in orbit, along with communication frequencies used, they are difficult to enforce and do not always account for subsequent satellite movements or frequency changes. Furthermore, provisions do not exist for commercial vendors to report service arrangements/contracts made with customers. Intelligence officers with a space background, both in the AOC and space AOC, can help provide the space situation awareness essential for successful counterspace operations.

Predictive Battlespace Awareness (PBA)

PBA is multidimensional understanding of the operational and natural battlespace in time, space, and effect, regardless of the adversary, location, weather, or time of day. It is continuous and achieved by the commanders through possession of relevant, comprehensive knowledge, including an accurate forecast of pertinent influences that affect the battlespace. This knowledge of the operational and natural environment, in concert with C2, permits commanders to anticipate future conditions, establish priorities, exploit emerging opportunities, and act with a degree of speed and certainty not matched by our adversaries.

SSA contributes to PBA by providing enabling information on space, a key portion of the battlespace. A predictive awareness of space allows commanders and their staffs to accurately anticipate changing conditions, establish priorities, and exploit emerging opportunities while minimizing the impact of unexpected consequences.

CHAPTER FOUR

DEFENSIVE COUNTERSPACE OPERATIONS

The proverbial first shot of space warfare has already been fired with the advent of jammers designed to defeat the capabilities our airmen derive from space.

—The Honorable James G. Roche
Secretary of the Air Force

GENERAL

Potential adversaries have access to capabilities, some commercially available, that can deceive, deny, disrupt, degrade, or destroy US space capability. DCS operations preserve US and friendly ability to exploit space to its advantage via active and passive actions to protect friendly space-related capabilities from enemy attack or interference.

DCS operations provide the means to deter and defend against attacks and to continue operations by limiting the effectiveness of hostile action against US space assets and forces. DCS operations include deterrence of attacks against our space system, defense of our space systems as they come under attack, and where necessary, recovery of our space forces and assets. Given the distributed nature of space systems, a variety of forces and assets are employed to deter, defend, and recover our space capabilities from attack.

DETERRENCE

Deterrence, with an emphasis on a demonstrated national policy of appropriate response to threats or attacks and the national will to respond to such threats or attacks, remains at the forefront in protection of our space system assets and forces.

DEFENSE

If deterrence fails, defense of US and friendly space capabilities from deception, denial, disruption, degradation, or destruction by an adversary is crucial to maintain space superiority. While many defensive measures are passive in nature, the ability to detect and characterize an attack on friendly space capabilities is critical for the initiation of most active measures.

Passive Measures

Passive measures limit the effectiveness of hostile action against US and friendly space systems and are employed to counter adversary attacks. Passive techniques for DCS operations include the use of camouflage, concealment, and deception, hardening of systems, and the use of dispersal. The objective of passive survivability is to provide a layered defense and to withstand attack without warning.

- **Camouflage, Concealment, and Deception (CC&D).** CC&D is most effective with terrestrial-based nodes. Certain types of ground-based components of space systems may operate under camouflage or be concealed within larger structures. These measures complicate adversary identification and targeting.

- **System Hardening.** Hardening of space system links and nodes allow them to operate through attacks. Techniques such as filtering, shielding, and spread spectrum help to protect capabilities from radiation and electromagnetic pulse. Physical hardening of structures mitigates the impact of kinetic effects, but is generally more applicable to ground-based facilities than to space-based systems due to launch-weight considerations. Robust networks, hardened by equipment redundancy and the ability to reroute, ensure operation during and after information operations attack.

- **Dispersal of Space Systems.** For space nodes, dispersal could involve deploying satellites into various orbital altitudes and planes. For terrestrial nodes, dispersal could involve deploying mobile ground stations to new locations.

Attack Detection and Characterization

Effective attack detection and characterization rely on robust space situation awareness. Detecting and characterizing an attack on space systems and assessing the impact of these attacks enable active defense measures and provide post-attack indications and warning for other space forces.

- **Detection.** The process of attack detection confirms that a space system is under attack. The ability to quickly and accurately distinguish between hostile, unintentional, and natural events is critical to the ability to detect attacks on space systems. Without such confirmation, operations in retaliation should not be undertaken. Given today's capabilities, attack detection involves the support of multiple organizations.

- **Characterization.** Identifying the nature of the attack and the type of attacking system enables locating the attacker and initiating one or more courses of action in response. Ideally, analysis should take place as close to the tactical level as possible, thus decreasing the amount of time between detection and identification. Analysis may often take time due to the number of organizations involved, the need for certainty, and technological limitations. Detailed analysis may require the support of both DOD and non-DOD agencies.

- **Impact assessment.** Impact assessment begins when an attack is detected. It provides an understanding of the impact an adversary attack is having on the targeted asset and any

associated systems. Accurate assessment is important, as it provides a basis for determining the appropriate response to the attack.

- **Location.** The location of an attacker must be known to suppress an attack. Various capabilities must be brought into support in a synergistic fashion to provide geographic location and confirmation of the location.

Active Measures

Active measures for DCS may involve actions to avoid or remove hostile effects. Physical adjustments to the nodes and links of space systems, such as a maneuver or frequency change, may avoid hostile effects. Use of conventional or special operations forces may stop an adversary's counterspace attack. The key to these active measures is early detection and characterization of the threat in order to determine the most effective countermeasure.

- **Maneuver/Mobility.** Satellites may be capable of maneuvering in orbit to deny the adversary the opportunity to track and target them. They may be repositioned to avoid directed energy attacks, electromagnetic jamming, or kinetic attacks from antisatellite weapons (ASATs). Today, maneuver capability is limited by on-board fuel constraints, orbital mechanics, and advanced warning of an impending attack. Furthermore, repositioning satellites generally degrades or interrupts their mission. The use of mobile terrestrial nodes complicates adversarial attempts to locate and target command and mission data processing centers. However, movement of these nodes may also impact the system's capability, as they must still retain line of sight with their associated space-based systems. Though the use of mobile technology is expanding, many of today's ground-based systems are not mobile, making physical security measures essential.

- **System Configuration Changes.** Space-based and terrestrial nodes may use different modes of operation to enhance survivability against attacks. Examples include changing RF amplitude and employing frequency-hopping techniques to complicate jamming and encrypting data to prevent exploitation by unauthorized users.

- **Suppression of Adversary Counterspace Capabilities (SACC).** SACC neutralizes or negates an adversary offensive counterspace system through deception, denial, disruption, degradation, and/or destruction. SACC operations can target air, land, sea, space, special operations, or information operations in response to an attack or threat of attack. Examples of SACC operations include (but are not limited to) attacks against adversary antisatellite weapons (before, during, or after employment), intercept of antisatellite systems, and destruction of RF jammers or laser blinders.

RECOVERY

Recovery operations focus on restoring a disrupted space capability. Two techniques that apply to recovery operations are redundancy and reconstitution.

Redundancy

Redundancy may be incorporated into space-based or terrestrial capabilities, or within a link itself. Redundancy in equipment components allows continued operations of specific platforms in the event of onboard hardware or software malfunction. Full systems may have redundancy through the use of on-orbit satellite spares, or use of alternate commanding, tracking, and relay stations. Link redundancy can be achieved through the use of alternate frequencies for command or mission information along with data multiplexing techniques.

Reconstitution

Reconstitution involves actions to restore operations after an attack. Reconstitution may involve repairing equipment that has been degraded or it may entail deploying new space and terrestrial platforms to replace combat losses. Reconstitution of satellite constellations requires responsive spacelift, availability of replacement spacecraft, and properly trained personnel to launch and operate the systems.

DCS RESOURCES AND FORCES

The following are some of the forces and weapon systems that could be used, if and when available, to support DCS operations:

- **Single integrated space picture** would provide an accessible picture of global and theater space capabilities, threats and operations to commanders, planners, and combat forces, covering the full spectrum of friendly, adversary, and third party space systems. This would provide a comprehensive peacetime and wartime situation awareness capability, fusing information collected on all space systems, their ground, air, and space links and nodes to include their capabilities, status, vulnerability, and users.

- **Physical security systems** provide security and force protection for critical ground facilities and equipment. A complementary mix of technology and security forces can effectively and efficiently mitigate specific threats in an ever-changing environment. When properly deployed and utilized, physical security systems can represent an effective deterrent and provide aggressive defense against terrestrial node attack and sabotage.

- **Air defense assets** are capable of protecting launch and terrestrial nodes from air or missile attack. If threatened, commanders should consider deploying air defense assets such as fighter aircraft, surface-to-air missiles, and/or antiaircraft artillery to protect critical space assets (e.g., facilities and infrastructure). A sound air defense may deter an adversary and most certainly will be instrumental in defending our forces and assets if an attack is attempted.

- **Attack detection and characterization systems** detect space system attacks and provide information on the characteristics of the attack, especially if the source and/or capability of the attack is unknown or unexpected. These systems will support locating the source of the attack and the type of weapon used in the attack. They may be ground-, air- or space-based

and either integrated with systems they protect or used in a stand-alone capacity. Having our adversaries aware of these capabilities may influence their decision and act as an effective deterrent.

- **Survivability** countermeasures ensure critical space systems continue to operate both during and after attack. Examples include (but are not limited to): spacecraft system hardening, redundant systems (both on spacecraft and in ground stations), spacecraft maneuverability, ground station mobility, and jam-resistant communication links. Known survivability measures may deter an adversary from attacking our space capabilities.

- **Operations security (OPSEC) and information assurance (IA)** protect our space systems by limiting the availability of information on their operations, capabilities, and limitations to our adversaries. IA protects critical computer systems from intrusion and exploitation. Guiding adversaries' actions can successfully deter effects on our space services, but OPSEC and IA operations are primarily focused on defending our assets from attack.

- **Conventional and special operations forces** conduct defensive counterspace operations through their ability to attack adversary counterspace capabilities. A demonstrated capability and willingness to counter their counterspace capabilities may deter an adversary from attacking US/friendly space capabilities

CHAPTER FIVE

OFFENSIVE COUNTERSPACE OPERATIONS

Our dependence on operations in space, however, makes us somewhat vulnerable to new challenges. It's only logical to conclude that we must be attentive to these vulnerabilities and pay careful attention to protecting and promoting our interest in space.

—The Honorable Donald H. Rumsfeld
Secretary of Defense

GENERAL

Potential adversaries have access to a range of space systems and services that could threaten our forces and national interests. Even an adversary without indigenous space assets may use space through US, allied, commercial, or consortium space services. These services include precision navigation, high-resolution imagery, environmental monitoring, and satellite communications. Denying adversary access to space capability and protecting US and friendly space capability may require taking the initiative to preempt or otherwise impede an adversary.

Offensive counterspace operations preclude an adversary from exploiting space to their advantage. OCS operations may target an adversary's space capability (space system, forces, information links, or third party space capability), using a variety of permanent and/or reversible means. The "Five D's"—deception, disruption, denial, degradation, and destruction—are the possible desired effects when targeting an adversary's space capability.

- **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 results, usually with physical damage.

- **Destruction** is the permanent elimination of all of a space system's capabilities to produce effects, usually with physical damage.

OCS TARGETS

OCS operations seek and attack targets in three general categories: space nodes, terrestrial nodes, and links. Space nodes may include satellites, space stations, or other spacecraft. Terrestrial nodes include land, sea, or airborne equipment and resources used to deploy, enable, interact with, or otherwise affect the space node. Communication links tie nodes together, and pass information between them. Understanding space capability as a system of nodes and links enables one to determine the best ways and means for affecting adversarial capability. The following are examples of OCS target sets:

- **On-orbit Satellites.** Satellites are on-orbit assets consisting of a mission sensor and a satellite bus. The mission sensor provides raw data, which is usually sent to a ground station for processing. The satellite bus carries the mission sensor and provides it power, thermal control, and communications. OCS operations may target the mission sensor or the satellite bus. For example, a laser may deny, disrupt, degrade, or destroy certain types of sensors. Kinetic antisatellite weapons, on the other hand, usually target the satellite bus for physical destruction.

- **Communication Links.** Space systems are dependent on RF and/or laser links to provide communication between space and terrestrial nodes (satellite to ground station or satellite to user), between terrestrial nodes (ground station to users), and between satellites (satellite to satellite). On-orbit satellites and ground-based satellite control stations/users send data up and down the link. In the up-link, command and control data tasks satellite mission payloads and subsystems. In the downlink, mission payload and satellite state-of-health data are sent to a ground station for processing. The ground station, after processing, often sends the mission data to the users via SATCOM for exploitation. In the case of SATCOM systems, data may be directly up-linked and then down-linked between users. Most space systems are ineffective without communication links.

- **Ground Stations.** Ground-based systems perform satellite command and control and mission data processing. Ground stations are normally permanent structures that may represent a single point of failure in a space system. Mobile ground stations can also be used to command and control a satellite, but may have no ability, or a limited capacity, for processing satellite mission data.

Defense Support Program (DSP) Ground Station

- **Launch Facilities.** The ability to place satellites into orbit is the first step to space access; fundamental to the ability to operate and maintain space-based capability. Whether this capability is indigenous, or provided by a third party, it is the only means to deploy satellites to space and represents a primary choke-point for interdicting an adversary's efforts to augment or reconstitute space forces.

- **Command, Control, Communication, Computer, Intelligence, Surveillance, and Reconnaissance (C4ISR) Systems.** C4ISR systems are critical to the effective employment of forces and assets. Destruction of such systems would substantially reduce the enemy's capability to detect, react, and bring forces to bear against friendly forces. Attacking C4ISR systems may contribute to OCS operations but may also contribute to strategic attack or counterair operations, depending on the intended effects.

- **Third Party Providers.** An adversary may gain significant space capabilities by using third party space systems. Using diplomatic or economic means to deny an adversary access to these third party (commercial or foreign) space capabilities will generally require the assistance of other US governmental agencies.

OCS RESOURCES AND FORCES

The effectiveness of OCS operations to affect the array of targets previously listed depends on the availability and capabilities of certain resources and systems. The choice of system depends upon the situation, threats, weather, and available intelligence. Whenever possible, use systems and methods which minimize risk to friendly forces. For example, an aircraft employing standoff weapons may provide the same effect as an inserted SOF team on a direct mission, with less risk to friendly forces. The following are some of the forces and weapon systems that could be used, if and when available, to conduct OCS:

- **Aircraft.** Friendly aircraft provide nonkinetic and kinetic capabilities against surface targets associated with an adversary's space capabilities. For example, electronic attack platforms (manned and remotely piloted aircraft) could affect the links of an adversary's space system employing stand-off and stand-in techniques. By attacking terrestrial nodes, aircraft may disrupt, deny, degrade or destroy an adversary's ability to control their satellites or deliver space effects.

- **Missiles.** Missiles may be employed against a variety of an adversary's space capabilities including launch facilities, ground stations, and space nodes.

- **Special Operations Forces (SOF).** SOF can conduct direct attacks against terrestrial nodes or provide terminal guidance for attacks against those nodes. Additionally, SOF may be used to provide localized jamming of an adversary's links.

- **Offensive Counterspace Systems.** These systems are designed specifically for OCS operations, such as a counter satellite communications capability, designed to disrupt satellite-based communications used by an adversary or a counter surveillance reconnaissance capability, designed to impair an adversary's ability to obtain targeting, battle damage assessment, and information by denying their use of satellite imagery with reversible, nondamaging effects.

- **Antisatellite Weapons (ASATs).** ASATs include direct ascent and co-orbital systems that employ various mechanisms to affect or destroy an on-orbit spacecraft.

- **Directed Energy Weapons (DEWs).** DEWs, such as lasers, may be land, sea, air, or space based. Depending on the power level used, DEWs are capable of a wide range of effects against on-orbit spacecraft, including: heating, blinding optics, degradation, and destruction. Under certain circumstances, lasers may also be effective against space launch vehicles while in-flight.

- **Network Warfare Operations.** Many OCS targets, particularly elements of the terrestrial node, may be affected by various IO techniques such as malicious codes, electronic warfare, or EMP generators. Some IO techniques afford access to targets that may be inaccessible by other means.

- **Electronic Warfare Weapons.** RF jammers may be used to disrupt links.

- **C4ISR Systems.** These systems include early warning and surveillance systems, satellites, radar, identification systems, communications systems, and surface-, air-, and space-based sensors**.** These systems enhance OCS operations by providing early warning, intelligence, targeting, and assessment data, as well as C2 of friendly forces.

- **Surface Forces.** The ability to occupy and secure key areas, as well as the lethality of supporting surface fires, can achieve significant counterspace effects. For example, surface forces can attack a satellite control station in order to disrupt, degrade, or destroy an adversary's space capability.

CHAPTER SIX

PLANNING AND EXECUTING COUNTERSPACE OPERATIONS

… we've got in excess of 50 satellites that we're working as part of my quiver in the air and space applications; the satellites have been just unbelievably capable, not just the global positioning system, but all of the others in being able to support both conventional surface forces, the naval forces, special ops forces, and the air forces themselves.

—Lt Gen Michael Moseley
CFACC / SCA
Operation IRAQI FREEDOM

GENERAL

Counterspace operations entail the planning and executing of various forces that can contribute to space superiority (air, land, sea, space, special operations, or information operations). Strengths and limitations exist within each of the mediums that often make one type of force better suited to accomplish an objective than another. More often than not, the combination of capabilities creates the greatest effect on the adversary. The key is picking the right forces and combining them to create synergy, exerting the greatest pressure on the adversary. Air Force counterspace operations, given the potential for interdependence between theater and global space operations, requires a planning and execution process that synchronizes theater and global space operations to ensure space superiority for all US military forces. This chapter provides guidance pertaining to planning and execution of counterspace operations.

PLANNING AND EXECUTION OF SPACE FORCES

Distributed Operations/Reachback

Air Force space operations are integrated through the 14 AF's space AOC and the theater air and space operations center. Depending on the situation and forces involved, counterspace operations planning and execution may be accomplished via distributed operations, reachback, or a combination of the two.

Distributed operations occur when independent or interdependent nodes or locations participate in the operational planning and/or operational decision-making process to accomplish goals/missions for engaged commanders [AFDD 2-8, *Command and Control]*. Although distributed operations are similar to reachback, there is one major difference. Reachback provides ongoing combat support to the operation from the rear while a distributed operation

indicates actual involvement in the operational planning and/or operational decision making. The goal of effective distributed operations is to support the operational commander in the field; it is not a method of command from the rear.

Reachback is a generic term for obtaining forces, material, or information support from Air Force organizations not forward-deployed [AFDD 2-8]. Communications and information systems should provide a seamless information flow of prioritized data to and from forward and rear locations. Reachback command and control is normally provided from a supporting/supported relationship. This relationship gives the forward-deployed COMAFFOR the support necessary to conduct operations while maintaining a smaller deployed footprint.

Air Tasking Cycle

The air tasking cycle is the process the theater AOC uses to translate theater joint force commander's objectives, priorities, and intent into a coherent, executable plan for assigned and attached Air Force air and space forces. The air tasking order, a key product of the space tasking cycle, is used to task and execute assigned and attached air and space forces.

The air tasking cycle is an iterative process for planning, coordinating, apportioning, allocating, executing, and assessing the effectiveness of air and space operations. The cycle is typically a 72-hour development process followed by 24 hours of execution, but can be lengthened or shortened to meet the theater battle rhythm. The 72-hour horizon accommodates longer-range planning, allowing planners to anticipate the enemy and assess friendly actions, which enables them to get inside the enemy's decision cycle. It includes continuous collection, correlation, and prioritization of many inputs to meet theater JFC's intent and objectives.

The joint air and space operations plan (JAOP) reflects the integrated air, space, and information operations plan to support the JFC's campaign. It should include the tasking of all assigned or attached space forces and all requests for theater support from global space forces. Air Force space forces that are OPCON or TACON to a theater COMAFFOR or COMAFFOR/JFACC will be integrated into operations via the air tasking cycle and tasked via the ATO. Further details on planning and execution of theater space forces can be found in AFDD 2-2.

Space Tasking Cycle

The space tasking cycle is the process the space AOC uses to translate CDRUSSTRATCOM and theater joint force commander's objectives, priorities, and intent into a coherent, executable plan for Air Force space forces. The STO, a key product of the space tasking cycle, is used to task and execute AFSPC assigned and attached space forces.

The space tasking cycle, based on the air tasking cycle, is an iterative process for planning, coordinating, apportioning, allocating, executing, and assessing the effectiveness of space operations. The cycle is typically a 72-hour development process followed by 24 hours of execution, but can be lengthened or shortened to meet the theater battle rhythm. The 72-hour

horizon accommodates longer-range planning, allowing planners to anticipate the enemy and assess friendly actions, which enables them to get inside the enemy's decision cycle. It includes continuous collection, correlation, and prioritization of many inputs to meet both CDRUSSTRATCOM and theater JFC's intent and objectives.

The STO is derived from CDRUSSTRATCOM orders and, when supported, JFC's orders. It tasks and executes AFSPC assigned and attached space forces, provides guidance for synchronization of global and theater joint air and space operations, and provides special instructions (SPINS) for the 24-hour period it covers. Every space operation during that period should be on the STO for situation awareness and deconfliction purposes. Further details on planning and execution of global space forces can be found in AFDD 2-2.

Synchronization of Theater and Global Operations

When the space AOC is supporting a theater operation, the STO is synchronized with the theater ATO throughout the tasking cycle (Figure 6.1), with theater operators working closely with those at the space AOC. The space tasking cycle is synchronized with the air tasking cycle to optimize space support to the theater. The theater AOC and space AOC run parallel processes, such as guidance, apportionment, and targeting (GAT) and master air and space attack plan (MAAP) teams, on the same battle rhythm. The space AOC, using guidance from the COMAFFOR/JFACC, helps develop space courses of action in support of theater operations. During the planning phase, the space AOC uses JFACC guidance, rules of engagement (ROE), the joint integrated prioritized target list (JIPTL), the target nomination list (TNL), and the approved MAAP, to finalize the STO. After the ATO is finalized, the theater AOC forwards it to all required users to include the space AOC. The 14 AF/CC approves the STO, ensuring it reflects theater taskings, and disseminates it to all required users to include the theater AOC. The STO, normally disseminated 6 hours prior to implementation, tasks AFSPC assigned and attached space forces to meet theater and global requirements for the next 24-hour period. Furthermore, within the 24-hour period of execution, space tasking can occur dynamically to meet the supported commander's requests.