

AIR FORCE DOCTRINE PUBLICATION 3-14

COUNTERSPACE OPERATIONS



U.S. AIR FORCE

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CURTIS E. LEMAY CENTER

FOR DOCTRINE DEVELOPMENT AND EDUCATION



AIR FORCE DOCTRINE PUBLICATION (AFDP) 3-14 COUNTERSPACE OPERATIONS

INTRODUCTION TO COUNTERSPACE OPERATIONS

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Historically, militaries have viewed the "high ground" as essential to maintaining the advantage in warfare. With rare exception, whichever force controlled the high ground gained superior ability to maneuver and maintain visibility of the operational environment to effectively "own the fight." In that tradition, space assets orbiting high above our planet's surface offer a superior position and an expansive view of the Earth. Space capabilities allow terrestrial forces (on the land and sea, and in the air) to cover more area with a smaller force; provide indications and warning of strategic, operational, and tactical threats; identify targets with precision without putting humans in harm's way; synchronize communications worldwide; increase effectiveness by making weapons highly accurate; enable expeditionary operations with light and lethal forces forward and reachback stateside; and enable combat sorties worldwide to be flown stateside with unprecedented persistence.

The Air Force uses four space operations functions to clearly delineate the capabilities required for successful global joint operations and supersede the space mission areas listed in previous versions of this publication: [space situational awareness](#) (SSA); [counterspace operations](#); [space support to operations](#); and [space service support](#). Taken together, these functions provide the ability to *understand*, operate and *exploit* the space domain. It is necessary to *understand the domain* (SSA) to conduct effective command and control, in turn enabling friendly forces to *operate effectively in the domain* (counterspace). These actions permit the conduct of operations at a given time and place without prohibitive interference by opposing forces, and are the basis of [space superiority](#), a necessary step to enable *exploitation of the domain* (space support to operations) in order to provide battlefield advantages to joint warfighters. Space service support and SSA capabilities enable space operations across each of the space operations functions.

The focus of this publication is counterspace operations and each of the space operations functions are separate and distinct. However, this publication discusses each function, in the order above, to provide the context of how each space operations function contributes to and benefits from the counterspace mission.

Control of the air is historically one of the first priorities of the joint force. This is especially so whenever the enemy is capable of threatening friendly forces from the air or inhibiting a joint force commander's (JFC's) ability to conduct operations. Potential adversaries have now expanded their reach beyond the air domain to threaten space forces and operations as well. Therefore, the military necessity for the desired level of control of space is also a high priority for the joint force, helping ensure success in all domains. Counterspace is a mission that

integrates offensive and defensive operations to attain and maintain the desired level of control and protection in and through space.

For decades, the United States experienced unimpeded freedom of action in the space domain. This freedom allowed the delivery of space capabilities essential to the global operations of the US Armed Forces with unmatched speed, agility, and lethality. However, peer and near-peer competitors understand the competitive advantage the US derives from space capabilities, and view this reliance as a vulnerability. To exploit this perceived vulnerability, adversaries are developing capabilities to negate (deceive, deny, disrupt, degrade, and destroy) our space systems and capabilities. Additionally, adversaries see the benefit gained from space capabilities and are pursuing space capabilities through acquisition of new systems, partnering with other space-faring entities, and/or purchasing space products and services in order to enhance their own operations. As a result, the 2017 National Security Strategy recognizes the benefits that space provides and the potential threats to US space capabilities by stating: “The United States considers unfettered access to and freedom to operate in space to be a vital interest. Any harmful interference with or attack upon critical components of our space architecture that directly affects this vital US interest will be met with a deliberate response at a time, place, manner, and domain of our choosing.”

Hostile acts against US space systems will likely generate effects beyond the space domain, to include disrupting worldwide services upon which the military, civil, and commercial sectors depend. Therefore, Airmen must prepare to defeat attacks on the US space enterprise should they occur. The United States retains the right to respond in self-defense, should [deterrence](#) fail, in a manner that is consistent with longstanding principles of international law and treaties to which the US is a party.

The Air Force integrates offensive and defensive counterspace capabilities across the range of military operations, whether as a single Service or in conjunction with other Services in joint operations. Effective joint operations, in all domains, require the ability to gain and maintain space superiority, providing space mission assurance across the conflict continuum and countering the advantages space capabilities provide to adversaries, ultimately contributing to the achievement of JFC operational objectives.





THREATS TO SPACE OPERATIONS

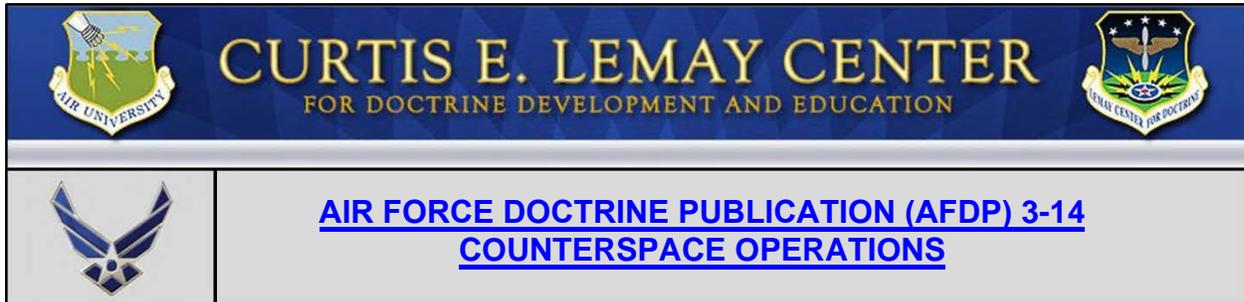
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Potential adversaries see increasing value in the ability to attack US and allied space capabilities. Adversaries may employ multiple means, developed organically or acquired from third parties. Near- and long-term threats include the following:

- ✦ **Terrestrial Attack.** Kinetic attack or sabotage against terrestrial nodes and supporting infrastructure. Examples of terrestrial nodes include operations centers, command and control nodes, and communications relays.
- ✦ **Electromagnetic Attack (EA).** Electromagnetic (EM) energy used to attack a link segment, to include uplink, downlink, and crosslink signals.
- ✦ **Directed Energy (DE).** Directed-energy threats include laser, radio frequency (RF), and particle-beam weapons. Laser systems may be used to temporarily disrupt or deny capabilities or to permanently degrade or destroy satellite subsystems. RF weapons concepts include ground and space-based RF emitters that fire high-power bursts of EM energy at a satellite, imparting disruptive EM fields into the wiring and electrical components in order to upset and possibly damage the computer processing subsystems. Particle-beam weapons could be used to fire beams of charged particles at a satellite, superheating and destroying structural materials and mission components.
- ✦ **High Altitude Nuclear Detonation.** A nuclear explosion can potentially affect all three segments of several space systems at the same time. Since the effects of nuclear detonation move out rapidly and permeate all space, no satellites have to be targeted directly. An electromagnetic pulse will induce damaging voltages and currents into unprotected electronic circuits and components of affected satellites and terrestrial nodes. The radiation generated by the detonation could damage satellite components and shorten their effective operational lives from years to days.
- ✦ **Anti-Satellite (ASAT) Weapons.** Weapons capable of destroying or degrading spacecraft and spacecraft components and/or denying or disrupting their capabilities. There are two basic types. Direct ascent systems are best visualized as being “surface-to-space missiles,” while on-orbit ASAT systems are also possible. ASATs may cause structural damage by impacting the target. Even small projectiles can inflict substantial damage or destroy a satellite. More advanced ASAT weapons could employ proximity operations and robotic arms to seize target satellites or use stand-off capabilities such as EA and DE.

- ★ **Offensive Cyberspace Operations.** Cyberspace attacks may disrupt or deny space-based or terrestrial-based computing functions used to conduct or support satellite operations and to collect, process, and disseminate mission data.
 - ★ **Environment.** Neutral and environmental threats include weather, space debris, and unintentional EM interference. While not intended to do harm, this category of neutral and environmental threats causes increasing concern due to the potential impact to space operations.
 - ★ **Weather.** Just as [weather](#) affects air operations, space and terrestrial weather can impact satellites, their communications links, and ground segments. For example, solar storms can have a direct impact on the functioning and survivability of satellites, while thunderstorms and cloud cover may impact the functionality of the ground and link segments.
 - ★ **Debris.** The space domain is becoming more congested with active satellites and debris. This congestion increases the satellite collision probability, which could damage satellites and even result in additional debris. The resulting debris would likely continue to accumulate and congest the most valuable orbits for the foreseeable future.
 - ★ **Electromagnetic Interference.** The demand placed on the electromagnetic spectrum continues to grow as the number of satellites, satellite services, and users increases. Increased congestion limits the available spectrum and increases the potential for unintentional interference on friendly signals. To complicate the issue further, international spectrum management practices create uncertainty in gaining access to the required spectrum and impose strict limitations on power, bandwidth, and coverage.
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SPACE SUPERIORITY / SUPREMACY

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Achieving space superiority is of primary concern to Airmen as it enables the continuous provision and advantages of space-enabled capabilities to joint warfighting operations. Space superiority is, “the degree of control in space of one force over any others that permits the conduct of its operations at a given time and place without **prohibitive** interference from terrestrial or space-based threats” (Joint Publication 3-14, [Space Operations](#); emphasis added).

Space supremacy is the degree of control in space by one force over another that permits the conduct of operations at a given time and place without effective interference from opposing forces. The concept of space superiority / supremacy is similar to air superiority / supremacy; however, the desired control may not always be achievable, particularly against a peer or near-peer adversary. Additionally, “place” does not refer to controlling physical space. It refers to specific terrestrial areas that may be impacted by space operations. Space superiority / supremacy may be localized in time and space, or it may be broad and enduring.

The concept of space superiority hinges on the idea of preventing **prohibitive** interference to space capabilities from adversary forces. Prohibitive interference would prevent space capabilities from creating desired effects. Space supremacy prevents **effective** interference, which does not mean that no interference exists, but that any attempted interference can be countered or will have little or no effect on operations. Space superiority provides sufficient freedom of action to create desired effects. Additionally, when achieving either space superiority or supremacy, the operational objectives may require the negation of adversary space capabilities to achieve the desired control. Therefore, commanders should determine the appropriate control of space required to accomplish their mission and assign an appropriate level of effort to achieve it.

The Commander, United States Space Command (CDRUSSPACECOM) establishes the desired global level of control of space on a day-to-day basis. Supported Joint Force Commanders (JFCs) will coordinate with CDRUSSPACECOM at the commencement of joint operations and space superiority will typically be an initial priority objective.

The ability to achieve space superiority or supremacy is impacted by the laws of physics, international law, and existing policy. Additionally, it may not be in the US’ best interest to fully deny space capabilities to adversaries. Finally, capabilities such as [satellite communications](#) may be provided by commercial entities or through multinational partnerships. Negating these capabilities may cause collateral effects to friendly forces or third party users.



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SPACE SITUATIONAL AWARENESS

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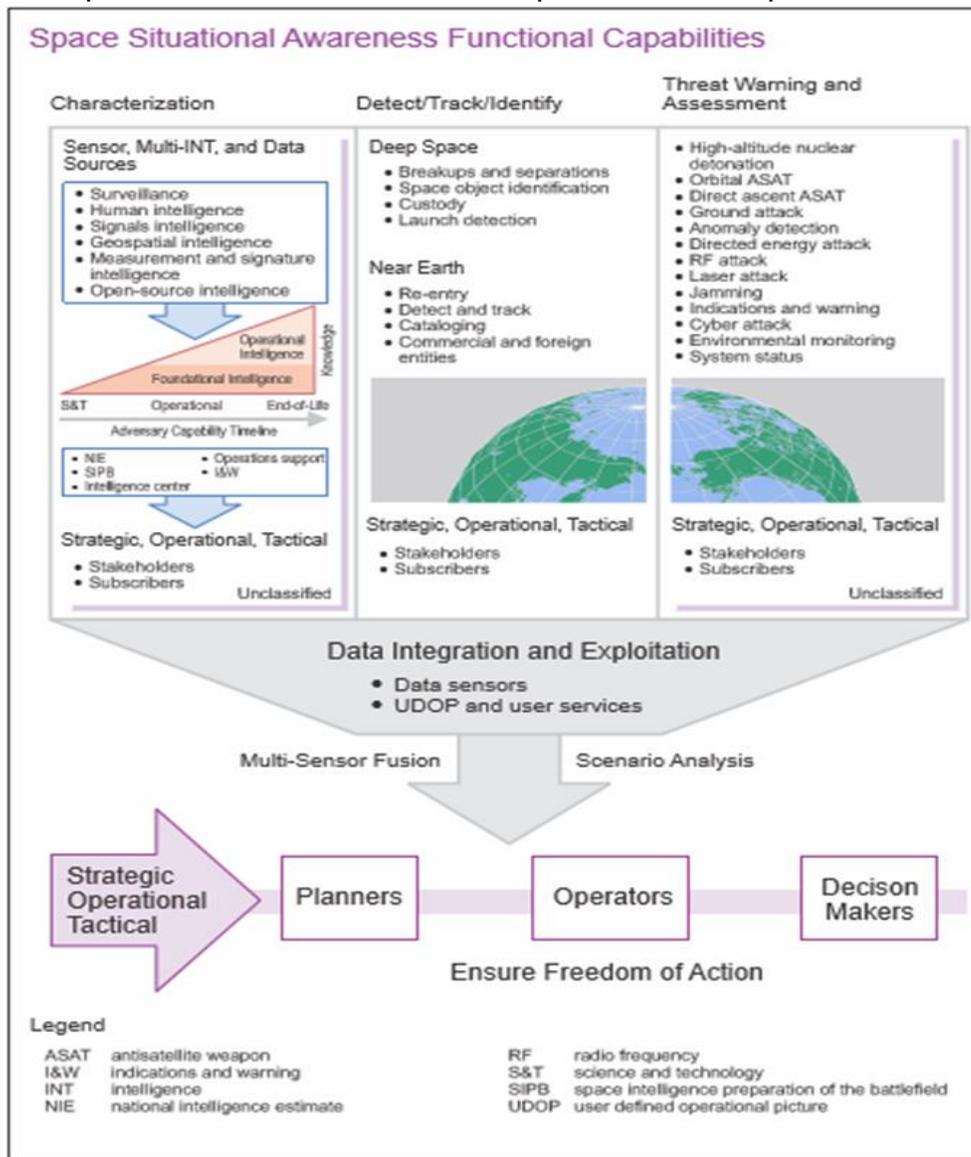
Space situational awareness (SSA) is foundational and fundamental to the conduct of all space operations functions and is especially critical to the effective conduct of counterspace operations. Joint Publication 3-14, Space Operations, defines SSA as “the requisite foundational, current, and predictive knowledge and characterization of space objects and the operational environment upon which space operations depend – including physical, virtual, information, and human dimensions – as well as all factors, activities, and events of all entities conducting, or preparing to conduct, space operations.” SSA makes it possible to understand the space domain, allowing effective command and control of counterspace missions, leading to the desired control of space.

SSA is divided into four functional capabilities (see figure, ***Space Situational Awareness Functional Capabilities***):

- ★ **Detect / Track / Identify.** Detect / track / identify (D/T/ID) is the ability to search, discover, and track space objects in order to maintain custody of objects and events; distinguish objects from others; and recognize objects as belonging to certain types, missions, etc. D/T/ID’s primary role is in support of safety of flight and support of offensive counterspace (OCS) and defensive counterspace (DCS) missions. This capability is required to provide the data for creation of a user-defined operational picture (UDOP) and presentation to the decision makers. Joint force commanders (JFCs) benefit from a comprehensive knowledge of the inventory of space objects, events, and status that may affect the users’ missions.
- ★ **Threat Warning and Assessment.** Threat warning and assessment (TW&A) is the ability to predict and differentiate between potential or actual attacks, space weather environment effects, and space system anomalies, as well as provide timely friendly force status. TW&A’s primary role is in direct support of OCS and DCS and relies heavily on D/T/ID, characterization, and data integration and exploitation (DI&E). This capability is required to provide the JFC with an assessment of events related to space capabilities (all segments—space, link, and ground) and advanced warning of potential events or threats and their impacts to space capabilities or other capabilities dependent on space. These threat warnings and assessments may also contribute to or serve as indications and warnings of other potential events or threats, which might affect non-space capabilities and/or non-Department of Defense capabilities and services.
- ★ **Characterization.** Characterization is the ability to determine strategy, tactics, intent, and activity, including characteristics and operating parameters of all space

capabilities (ground, link, and space segments) and threats posed by those capabilities. This provides the JFC, and other decision makers, with the knowledge and confidence to make assessments of space capabilities, objects, and events that may affect the mission. Characterization of friendly assets is necessary to support blue system anomaly resolution, establish baselines for evaluating adversary space object surveillance and identification capabilities and CONOPS, and supports indications and warning development.

★ **Data Integration and Exploitation.** DI&E is the ability to fuse, correlate and integrate multi-source data into a UDOP and enable decision-making for space operations. This capability enhances the other three functional capabilities of SSA and provides the ability to identify, correlate, and integrate multiple sources of data and information and to provide SSA services. These enhancements support the JFC and other decision makers by facilitating decision-making (with earlier predictions at higher confidence) and more responsive courses of action for space and non-space forces.





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COUNTERSPACE OPERATIONS

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Counterspace is a mission, like counterair, that integrates offensive and defensive operations to attain and maintain the desired control and protection in and through space. These operations may be conducted across the tactical, operational, and strategic levels in all domains (air, space, land, maritime, and cyberspace), and are dependent on robust [space situational awareness](#) (SSA) and timely [command and control](#) (C2). Counterspace operations include both offensive counterspace (OCS) and defensive counterspace (DCS) operations.

Offensive Counterspace

OCS operations are undertaken to negate an adversary's use of space capabilities, reducing the effectiveness of adversary forces in all domains. These operations target an adversary's space capabilities (space, link, and ground segments, or services provided by third parties), using a variety of reversible and non-reversible means. These actions may include strikes against adversary counterspace capabilities before they are used against friendly forces. OCS operations may occur in multiple domains and may result in a variety of desired effects including deception, disruption, denial, degradation, or destruction.

- ★ **Deceive.** Measures designed to mislead an adversary by manipulation, distortion, or falsification of evidence or information into a system to induce the adversary to react in a manner prejudicial to their interests.
- ★ **Disrupt.** Measures designed to **temporarily impair** an adversary's use or access of a system for a period of time, usually without physical damage to the affected system.
- ★ **Deny.** Measures designed to **temporarily eliminate** an adversary's use, access, or operation of a system for a period of time, usually without physical damage to the affected system.
- ★ **Degrade.** Measures designed to **permanently impair** (either partially or totally) the adversary's use of a system, usually with some physical damage to the affected system.
- ★ **Destroy.** Measures designed to **permanently eliminate** the adversary's use of a system, usually with physical damage to the affected system.

Adversaries have access to a range of space capabilities that enhance the effectiveness

* Counterspace is referred to as "space control" in Joint Publication 3-14, [Space Operations](#).

of their military forces in all domains and increase the threat to US and allied forces and national interests. Even an adversary without indigenous space assets may exploit space through US, allied, commercial, or consortium provided space services. These services include precise [positioning, navigation and timing](#) (PNT); [intelligence, surveillance and reconnaissance](#); [environmental monitoring](#); [missile warning](#); and [satellite communications](#).

As adversaries become more reliant on space capabilities, counterspace operations have greater opportunity to reduce an adversary's ability and will to wage war effectively. Negating adversary space capabilities may hinder their ability to effectively organize, coordinate, and orchestrate a military campaign. For example, multi-domain offensive counterspace operations may be employed against an enemy's satellite communications capabilities, in conjunction with attacks on the enemy ground-based communications network (e.g., electronic attack, air strikes, long-range artillery combined with offensive cyberspace operations), could synergistically reduce or eliminate communication with and C2 of enemy fielded forces.

Defensive Counterspace

DCS operations protect friendly space capabilities from attack, interference, and unintentional hazards, in order to preserve US and friendly ability to exploit space for military advantage. Space capabilities include the space segment (e.g., on-orbit satellites), ground segment (e.g., space operations centers and telemetry, tracking, and commanding stations), and the link segment (the electromagnetic spectrum).

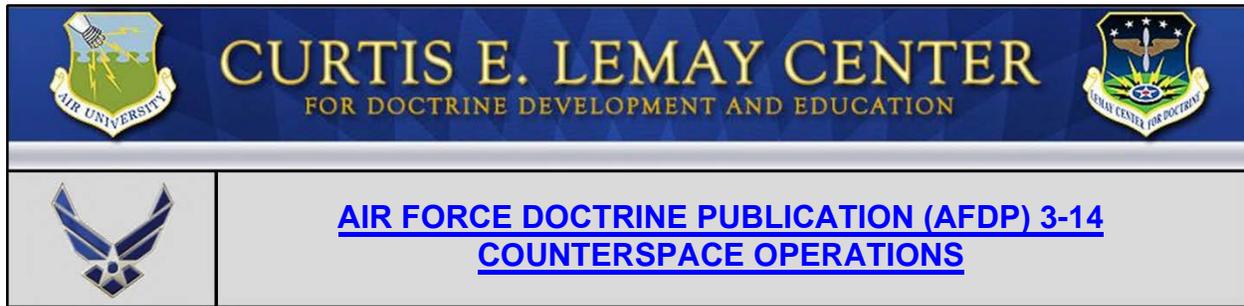
DCS operations protect and preserve friendly space capabilities before, during, and after an attack. When exercising self-defense, DCS operations may include the use of force in response to a hostile act or demonstrated hostile intent. DCS operations also safeguard space assets and capabilities from unintentional hazards such as space debris, radio frequency interference, and naturally occurring phenomenon such as radiation.

DCS operations also contribute to deterrence by demonstrating the ability to limit the anticipated advantages of hostile action against US and allied space capabilities. When incorporating international partner capabilities into an architecture, deterrence may be communicated in two additional ways. Partner capabilities increase both resilience and the perceived cost to an adversary, when an attack on one partner is seen as an attack on all. Finally, deterrence is dependent on timely attribution – the ability to quickly and definitively identify the actor responsible for the attack.

If deterrence fails, defense of US and friendly space capabilities from adversary attack is crucial to maintaining space superiority. This is accomplished via a combination of active and passive actions.

Navigation Warfare

[NAVWAR](#) contributes to counterspace operations by preventing adversary use of PNT information while protecting the unimpeded use of the information by forces and preserving peaceful use of this information outside the area of operations.



SPACE SUPPORT TO OPERATIONS

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The space support to operations function provides capabilities to aid, protect, enhance and complement the activities of other military forces, as well as intelligence, civil, and commercial users. These capabilities improve the integration and availability of space capabilities to increase the effectiveness of military operations and achieve national and homeland security objectives.* Space support to operations capabilities contribute to counterspace operations, incorporate both active and passive measures for self-protection, and benefit from defensive counterspace (DCS) actions to suppress attacks, as required, in all domains.

Space support to operations capabilities include: [intelligence, surveillance and reconnaissance](#) (ISR); launch detection; missile tracking; [environmental monitoring](#); [satellite communications](#); and [positioning, navigation, and timing](#). Due to the significant impact on global military operations, space support to operations capabilities require robust, multi-layered DCS operations to protect them from attack, interference, and unintentional hazards, in order to preserve the US and friendly ability to exploit space for military advantage.

Intelligence, Surveillance and Reconnaissance

ISR is conducted in, from, and through all domains, across the range of military operations and in all phases of operations. Space-based sensors perform ISR that contribute to battlespace awareness in all domains. Detailed ISR contributes to support of all space operations. This is especially true for counterspace operations. ISR conducted from space also supports military operations in other domains.

ISR information can be collected, processed, exploited, analyzed, produced, and disseminated to provide indications and warnings of adversary offensive counterspace operations, counterspace targeting analysis, adversary course of action development, adversary capability assessment, battle damage assessment, and battlespace characterization.

Launch Detection

Launch detection is accomplished by space-based and ground-based sensors to provide real-time intelligence and post-launch analysis to determine orbital characteristics and potential conjunctions with other objects in space. Detection of space launches is accomplished for both domestic and foreign launches. Launch detection data is used to evaluate events that could

* Per Change 1 to Department of Defense Directive 3100.10, Space Policy, dated 4 Nov 16.

directly or indirectly threaten US or allied space assets. Similar to [missile warning](#), this information is analyzed to determine potential impacts on assets so that timely warnings and recommendations for suitable countermeasures can be made.

Missile Tracking

Missile tracking supports missile warning and missile defense functions using a combination of space-based and ground-based sensors. These systems provide tactical warning and attack assessment information to operational command centers regarding nuclear detonations or adversary use of ballistic missiles. These systems may contribute to [space situational awareness](#) (SSA) and provide warning of attack against ground and space-based space systems.

Environmental Monitoring

Environmental monitoring is conducted both for space and from space. Environmental monitoring provides data on meteorological, oceanographic, and space environmental factors that may affect military operations. Monitoring the space domain provides data that forms the basis for forecasts, alerts, and warnings on space environmental factors that may negatively affect space assets and space operations. The contribution of environmental monitoring data to SSA helps to determine if potential disruptions to space services may have been caused by environmental factors, system malfunctions, or adversary actions.

Satellite Communications

Satellite communication (SATCOM), whether it is military, commercial, foreign, or civil, provides global coverage, which affords the US and allied national and military leaders with a means to maintain strategic situational awareness and a means to convey their intent to the operational commander responsible for conducting joint operations in a specific area. SATCOM capability is a critical component of providing command and control to counterspace forces.

SATCOM, in a contested environment, benefits from a number of passive defense measures to provide uninterrupted service. Protected SATCOM negates or mitigates the purposeful disruption, denial, unauthorized access, or exploitation attempts of communication services by adversaries.

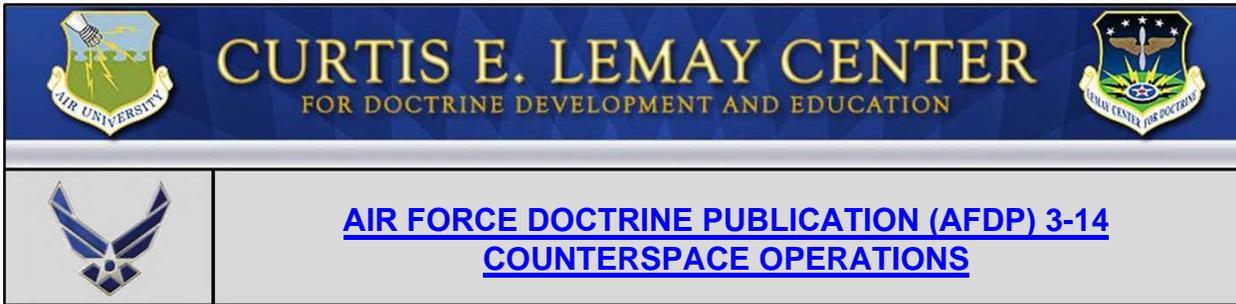
Commercial SATCOM services may be used to augment military capability, but there are additional planning considerations. Communications may not be protected to military standards; telemetry, tracking, and commanding links may be unencrypted; and vendors may lack the ability to identify, geolocate, and support the Department of Defense response to jamming or interference.

Positioning, Navigation, and Timing

Space-based positioning, navigation, and timing (PNT) is a global utility whose multi-use services are integral to US national security, economic growth, transportation safety, and homeland security and are an essential element of the worldwide economic infrastructure. When conducting joint military operations, it is essential that PNT services be available with the highest possible confidence.

Space-based PNT systems, in combination with user equipment, provide the joint force with precise three-dimensional positioning capability, navigation options, and a highly accurate time reference. Precision timing provides the joint force the capability to synchronize operations and enables communications capabilities such as frequency hopping and cryptologic synchronization to improve communications security and effectiveness.

PNT also provides exact positioning to other satellites to enable their “position autonomy.” PNT enables orbital rendezvous between space systems (e.g., space docking for the International Space Station) and precise timing to communications satellites and to systems in geosynchronous orbits.



SPACE SERVICE SUPPORT

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Space service support capabilities ensure access to, transport through, operations in, and, as appropriate, return from space through reliable, flexible, resilient, responsive, and safe launch and satellite operations.* Space service support consists of [spacelift](#), [range](#), and [satellite operations](#). Space service support capabilities contribute to counterspace operations, incorporate both active and passive measures for self-protection, reconstitute capabilities lost due to enemy attack, and benefit from defensive counterspace actions to suppress attacks, as required, in all domains.

Spacelift Operations

Spacelift operations provide the capability to move satellites, payloads, and materiel into space to sustain, augment, and reconstitute space-based capabilities. During contingency operations, reconstitution of satellite constellations may require responsive spacelift, ready availability of replacement spacecraft, and properly trained personnel to launch and operate the systems. Rapid reconstitution should increase overall space mission assurance by restoring functionality to an acceptable level for a particular mission, operation, or contingency after a severe degradation, but it may also introduce additional operational risk.

Range Operations

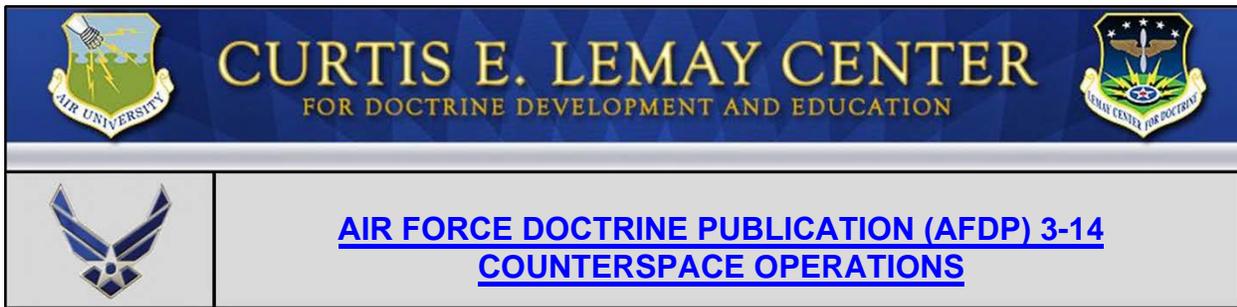
Range operations contribute to assured, responsive, safe and reliable access to space during government-sponsored spacelift operations and Department of Defense (DOD) test and evaluation flight test activities. However, the Federal Aviation Administration has responsibility for public safety during commercial space launches.

Satellite Operations

Satellite operations maneuver, configure, operate, and sustain on-orbit assets and are characterized as either spacecraft or payload operations. Satellite operations include monitoring the battlespace; updating potential schemes of maneuver; and maintaining defensive postures to ensure freedom of action and to provide continued space mission assurance to the warfighter as well as national, civil, and commercial users worldwide. Payload operations include monitoring and commanding the satellite mission payload. Air Force satellite operations include advanced tactics, techniques, and procedures to ensure continued access to space capabilities in a contested, degraded, and operationally-limited environment across the range of military operations.

* As described in Change 1 to DOD Directive 3100.10, Space Policy, dated 4 Nov 16.

- ★ **On-Orbit Reconstitution.** Reconstitution may be required to restore functionality following the degradation or loss of a capability. In the event of a system degradation or loss, satellite operations may satisfy or mitigate a capability gap through repositioning, reconfiguring or repurposing other assets, or by the satellite operators notifying command authorities of a degradation or loss that may require reconstitution with civil and commercial capabilities.
 - ★ **Disposal of Space Vehicles.** To minimize space debris and collision risk, spacecraft are properly disposed of at their end of life. Potential options include controlled or uncontrolled atmospheric re-entry, transfer to a disposal orbit, or direct retrieval. Planners must consider disposal options during life cycle development and on-orbit employment to ensure the viability of disposal at the spacecraft's end of life.
 - ★ **Rendezvous and Proximity Operations (RPO).** Rendezvous operations intentionally bring space objects close together. Proximity operations maintain a close separation between space objects for a specific purpose. RPO include the potential to support a wide range of future US space capabilities. Servicing of on-orbit space assets requires the capability to rendezvous, conduct close proximity operations, and/or dock with a space asset. On-orbit servicing capabilities enable inspection, repair, replacement, and/or upgrade of spacecraft subsystem components and replenishment of spacecraft consumables (e.g., fuels, fluids, cryogenics, etc.). RPO may also be used to provide information on spacecraft events to inform US and friendly SSA.
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ORGANIZATION AND COMMAND AND CONTROL

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Command and control (C2) of space forces ensures accurate, timely, and reliable operational synchronization of operations to enable effective integration of space planning and operations with joint and combined activities across all domains. C2 is fundamental to the conduct of all space operations and is especially critical to the effective conduct of counterspace operations in a contested, degraded, or operationally-limited (CDO) space environment.

The *Unified Command Plan* establishes US Space Command (USSPACECOM) as the combatant command with overall responsibility for military space operations. The Deputy Commander, Space Operations Command, coordinates, plans, integrates, synchronizes, executes, and assesses Air Force space operations and joint space operations when designated as the combined force space component commander (CFSCC).

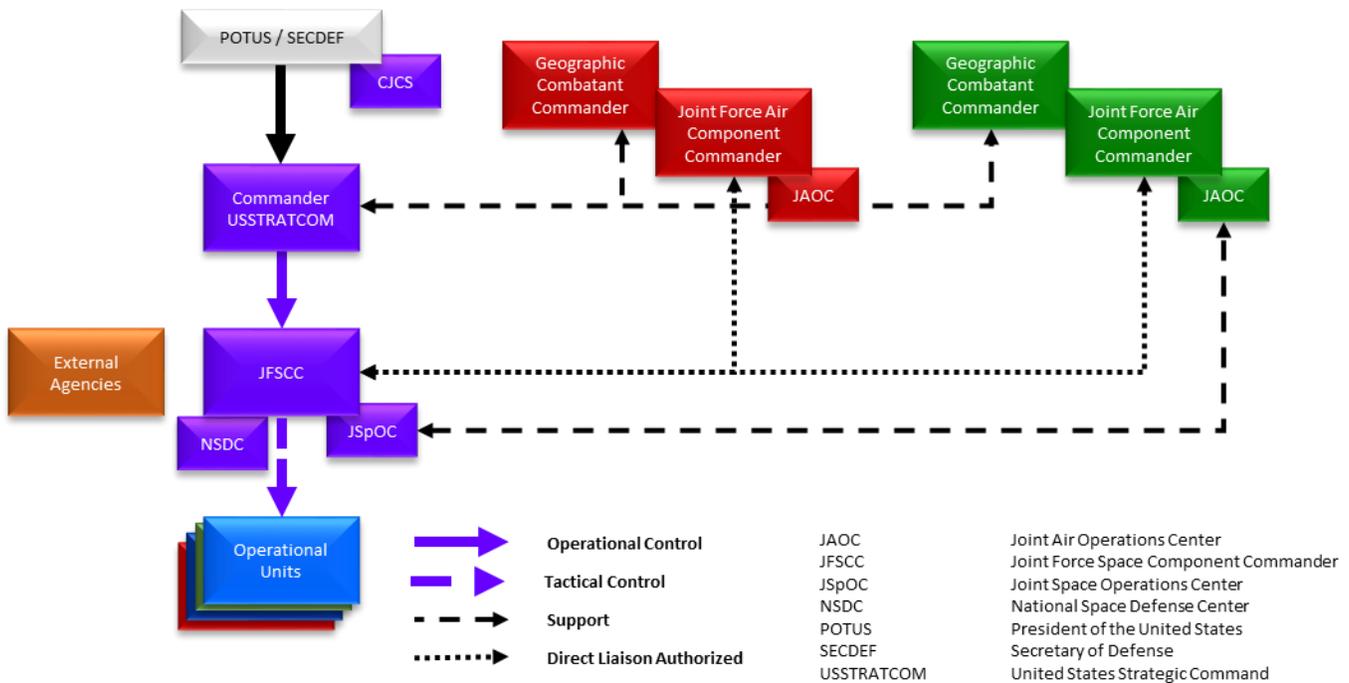
Assets from any domain may be used to conduct counterspace missions in support of joint operations in one, or more than one, geographic area. These assets may be used to fulfill single theater, multiple theater, or global objectives. Thus, the C2 structure established for integrating assets and forces must be robust enough to account for these various operating areas. Employing assets to meet global or multiple theater requirements normally requires a structure that bridges more than one theater and is capable of incorporating non-Department of Defense agencies.

The majority of Air Force space forces support operations in garrison and provide desired effects, regardless of the location of the contingencies they may be supporting. These Air Force forces are presented to CDRUSSPACECOM as a space mission task force (SMTF). The SMTF is part of a wider space mission force (SMF). The SMF is organized, trained, and equipped to successfully operate in an increasingly CDO environment. The SMF recognizes and reacts to adversary threats with advanced training scenarios that hone their warfighting skills and stimulate the development of tactics, techniques, and procedures that will allow our forces to maintain freedom of action across the spectrum of conflict. The SMF normalizes space training with the rest of the Air Force, provides high confidence in our readiness levels and mission capabilities, and ensures a consistent presentation of space forces to combatant commanders, whether operating from garrison or deployed locations.

Typically, CDRUSSPACECOM delegates operational control (OPCON) of assigned space forces to the respective Service component commanders and establishes direct support or direct liaison authorized (DIRLAUTH) relationships with other combatant commands and

external agencies. Exceptions can occur in situations where space forces are deployed in theater to enable localized effects. In these situations, the Secretary of Defense (SecDef) may attach the required forces with specification of OPCON to the geographic combatant commander (GCC).

Theater [air operations centers](#) (AOCs) coordinate integration of space-enabled effects with the Combined Space Operations Center (CSPOC) for execution of operations by assigned, attached, or supporting space forces. More detail on the CSPOC can be found in [Command and Control Resources and Requirements](#).



Command Relationships for Global and Multiple Theater Operations



COMMAND RELATIONSHIPS

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Airmen should expect most counterspace operations to be joint and combined efforts. Therefore, it is essential that Airmen understand what capabilities from other components of the joint force and participating allies may contribute to counterspace missions and how to integrate those capabilities with those of the US Air Force. These missions may occur at a global or theater level.

United States Space Command (USSPACECOM) is the only combatant command (CCMD) with a space component. The [combined force space component commander](#) (CFSCC) coordinates, plans, integrates, synchronizes, executes, and assesses space operations as directed by Commander, USSPACECOM (CDRUSSPACECOM) and facilitates unified action for joint space operations. Although assets capable of performing counterspace missions may be assigned to various components, the roles of [space coordinating authority](#) (SCA) and [director of space forces](#) (DIRSPACEFOR) ensure unity of effort.

Space Coordinating Authority

SCA is a specific type of coordinating authority delegated to a commander or a designated individual. SCA is the authority to plan, integrate, and coordinate space operations involving forces of two or more military departments, functional components, or two or more forces of the same Service. The individual with SCA has the authority to require consultation among the agencies involved but does not have the authority to compel agreement. The common task to be coordinated should be specified in the establishing directive without disturbing the normal organizational relationships in other matters. Coordinating authority is a consultation relationship between commanders, not an authority for the exercise of command. The individual executing SCA will facilitate counterspace targets through the joint targeting process.

CDRUSPACECOM normally delegates SCA for global missions to the CFSCC for planning of space operations in operational-level support of USSPACECOM's *Unified Command Plan* responsibilities. At a theater level, the [commander, Air Force forces](#) (COMAFFOR), who is also normally designated the [joint force air component commander](#) (JFACC), may be delegated SCA and designated the supported commander for space operations by the joint force commander (JFC). There are several reasons for this delegation. First, the COMAFFOR has space expertise embedded in its staff. Second, the COMAFFOR has the ability to command and control (C2) space forces via the [air operations center](#) (AOC),

including [reachback](#) to the [Combined Space Operations Center](#) (CSPOC). By virtue of its air, space, and cyberspace expertise, the COMAFFOR normally maintains a joint operations area (JOA), theater-wide, and global perspective. This multi-layer perspective is essential for coordinating space operations that also support the JFC throughout the theater.

In cases where the JFACC is other than an Air Force officer, the COMAFFOR will fill designated billets within the JFACC staff to ensure proper employment of space assets. If a JFACC is not appointed, the JFC may delegate SCA to the COMAFFOR or another component or Service commander, or opt to retain SCA.

For conflicts in the space domain (whether originating in space or extending from theater to space), the geographic combatant commander may serve as a supporting commander to the CDRUSSPACECOM. In this case, the SCA may be asked to coordinate theater support to the conflict.

The individual with SCA serves as the focal point for gathering space requirements from the JFC staff and each component commander. This coordination provides unity of effort for space operations in support of the JFC's campaign. Space requirements may include requests for space forces (e.g., deployed space forces), requests for space capabilities (e.g., support to personnel recovery operations), and requests for implementation of specific command relationships (e.g., a support relationship between the JFACC and the CFSCC). In theater, the JFACC staff then develops a prioritized list of space support requests, based on JFC objectives. Once approved by the JFC, the list is provided through the SCA for coordination with the CFSCC.

Because component commanders normally execute operations, the JFC normally delegates SCA to the component commander level. Coordination should be done at the operational level because that is where requirements are prioritized to support the operations of the component commanders, which in turn support the overall campaign. Moreover, the individual who is delegated SCA should have a theater-wide perspective and thorough understanding of integrating space operations with all other military activities.

Delegation of SCA is tied to force assignment, and it is normally delegated to the functional component commander with the preponderance of space forces, expertise in space operations, and the ability to C2 space assets, including reachback. Preponderance of space forces is based on a component's space capabilities supporting the JFC through the C2 of space forces assigned, attached, and supporting. Users of space capabilities are not a factor in the determination of preponderance. Preponderance is based solely on the ability to operate space capabilities and produce effects with space forces.

During contingencies, a coordinating authority for space is needed within the joint force structure to appropriately represent the space requirements of the joint force. With each component and many allies having their own organic space capability, it is necessary to integrate and deconflict among the space operations, redundant efforts, and conflicting support requests. By exercising SCA through a single commander, the JFC can optimize space operations in the JOA.

Director of Space Forces

Theater space operations personnel include senior leaders whose space operations

background enables them to lead and advise as DIRSPACEFORs. The DIRSPACEFOR is a senior Air Force officer with broad space expertise and theater familiarity, normally nominated by the Commander, Air Force Space Command (AFSPC/CC) and appointed by the theater COMAFFOR. In the preferred construct of a dual-hatted theater COMAFFOR / JFACC, the DIRSPACEFOR serves as the senior space advisor to the JFACC. The DIRSPACEFOR advises and facilitates coordination, planning, execution, and assessment of space operations and courses of action for the COMAFFOR. They may also oversee and facilitate tasks required for the execution of the JFC's SCA. This position normally requires a support staff to coordinate requirements specific to the JOA and ongoing military operations.

When the situation arises that there are no Air Force forces attached to a subordinate joint task force (JTF), the COMAFFOR to the theater JFC may be tasked in a supporting relationship to the JTF to integrate and provide space capabilities and effects. In the situation of multiple JTFs, the DIRSPACEFOR should support the commander with SCA, to provide space-enabled effects to the JTF based on JFC priorities.

For conflicts in the space domain (whether originating in space or extending from theater to space), the geographic combatant commander may serve as a supporting commander to the CDRUSSPACECOM. In these cases the DIRSPACEFOR will work with the combined force space component (CFSC) staff to coordinate theater support, as needed.

Support Relationships

For space forces providing effects via a [support relationship](#), it is important for both supported and supporting commanders to document their requirements in an "establishing directive." The establishing directive should specify the purpose of the support relationship, the effect desired, and the scope of the action to be taken.

Additional information includes:

- ★ The space forces and resources allocated to the supporting commander's effort.
- ★ The time, place, level, and duration of the supporting commander's effort.
- ★ The relative priority of the supported commander's effort.
- ★ The degree of authorities exercised by the supported and supporting commanders over the effort, to include processes for reconciling competing requirements and resolving emergency events expeditiously, as required.

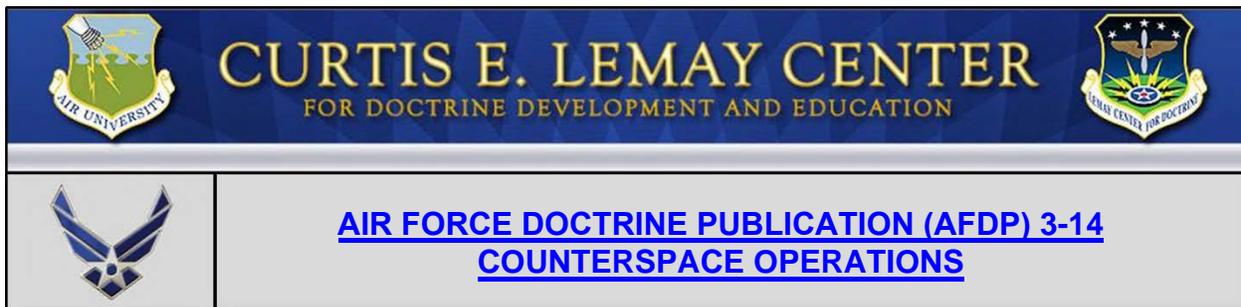
To facilitate a support relationship, an appropriate level of coordination should occur between the involved commanders. This facilitates planning the detailed integration of space capabilities and effects with theater operations, and enables theater warfighters to coordinate directly at either the same or differing organizational levels.

Examples of Support Relationships

General Support. During the major combat operations phase of Operation IRAQI FREEDOM (OIF), USSTRATCOM provided general support from space operations to the Iraqi theater of operations. This support relationship helped the joint force integrate space capabilities, such as positioning, navigation, and timing from GPS, and counterspace-enabled effects.

Mutual Support. During the counterinsurgency phase of OIF, the combatant commander assigned the JFACC the task of space superiority. For this objective, the JFC designated the JFACC as the supported commander, with other component commanders in a mutual support relationship for space operations.

Direct Support. During Operation ALLIED FORCE, a direct support relationship was established between the JFACC and 11th Space Warning Squadron. This relationship allowed the AOC to directly task 11 SWS personnel and exchange real-time information from the warning satellite for time-critical actions like personnel recovery after aircraft shoot downs.



COMMAND & CONTROL RESOURCES & REQUIREMENTS

Last Updated: 25 January 2021

The [combined force space component commander](#) (CFSCC) uses the following [command and control](#) (C2) resources to conduct and support counterspace operations:

Joint Space Operations Center

The [Combined Space Operations Center](#) (CSPOC) ensures optimization and availability of critical space services to support global users and serves as the lead integrator across all CFSCC operations centers. The CSPOC:

- ★ Conducts operational-level C2 for assigned missions on behalf of the CFSCC.
- ★ Plans, directs, controls, integrates, and assesses space operations.
- ★ Exercises global [space coordinating authority](#) (SCA) on behalf of the CFSCC, when delegated by Commander, United States Space Command (CDRUSSPACECOM).
- ★ Facilitates coordination and support to theater SCAs.
- ★ Conducts day-to-day operations, as directed by the CFSCC.

The Air Force's 614th [Air Operations Center](#) (AOC) forms the core of the CSPOC. It includes personnel, facilities, and equipment necessary to plan, execute, and assess space operations and integrate space capabilities. The 614 AOC/CSPOC tracks assigned and attached space forces and assets, and provides [reachback](#) support to organic theater space personnel. The 614 AOC/CSPOC translates CDRUSSPACECOM guidance into the [combined space tasking order](#) (CSTO), on behalf of the CFSCC. CSTOs task and direct space forces to fulfill theater and global mission requirements. The CSTO cycle is flexible and integrates with the theater's battle rhythm.

National Space Defense Center

On behalf of the CFSCC and the Director of the National Reconnaissance Office (NRO), the [National Space Defense Center](#) integrates Department of Defense, NRO, and intelligence community personnel and authorities to provide unity of effort and enable unified space defense.

Joint Navigation Warfare Center

On behalf of the CFSCC and in support of combatant commanders (CCDRs), the [Joint Navigation Warfare Center](#) plans, tasks, integrates worldwide [navigation warfare](#) for use as part of counterspace operations. Support is provided through reachback and deployable subject matter experts in support of CCDRs.

Missile Warning Center

The [Missile Warning Center](#) (MWC) coordinates, plans and executes worldwide missile, nuclear detonation, and space re-entry event detection to provide timely, accurate and unambiguous strategic warning in support of the US and Canada. CDRUSSPACECOM, through the MWC and a network of satellite and ground sensors, provides timely, accurate and continuous detection and warning of impending ballistic missile threats at the strategic and theater levels, and provides warning and attack assessment on space assets. The MWC also performs a backup role as sensor manager to the CSPOC.

Joint Overhead Persistent-Infrared Planning Center

The [Joint Overhead Persistent-Infrared \(OPIR\) Planning Center](#) is a joint endeavor between USSPACECOM and the National Geospatial-Intelligence Agency. This planning cell develops integrated OPIR collection and exploitation strategies and plans for OPIR Enterprise sensors. For counterspace operations, this provides essential battlespace awareness, feeding [space situational awareness](#) (SSA). In addition, the cell provides support to [missile warning](#), missile defense, technical intelligence, and civil / environmental mission areas.

Other Space Forces

In addition, the Commander, Air Force Space Command is responsible for presenting Air Force space forces to an [air expeditionary task force](#) (AETF) when they are tasked as part of a joint force or deployed to theater to conduct operations. Within the AETF, space forces may be attached to an air expeditionary wing, group, or squadron. Attached space forces are commanded by the theater [commander, Air Force forces](#) who commands the AETF through an A-staff and controls forces through an AOC.



PLANNING CONSIDERATIONS

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Counterspace planning may be conducted at every echelon of command and across the range of military operations. Counterspace planning should take into account the capabilities of all the Services, joint force components, and interagency, multinational and commercial partners. During all aspects and phases of planning counterspace operations, the Commander, United States Space Command (CDRUSSPACECOM) and the [combined force space component commander](#) (CFSCC) should coordinate with theater joint force commanders (JFCs) and [joint force air component commanders](#) (JFACCs), in accordance with established [support relationships](#).

Counterspace planning is conducted using the joint planning process. For details on this process, see AFDP 3-0, [Operations and Planning](#), and Joint Publication 3-30, [Command and Control of Joint Air Operations](#).

During [joint intelligence preparation of the operational environment](#) (JIPOE), planners should assess adversary reliance on space capabilities and the joint force's ability to negate those capabilities. Planners should pay particular attention to active and passive counterspace capabilities, as well as the commander's intent and ability to contest control of space with those capabilities. This assessment should inform the CDRUSSPACECOM and the CFSCC, in coordination with the theater JFCs and JFACCs, as necessary. The output from JIPOE will inform decision-making efforts during mission analysis and course of action development.

The CFSCC plans for simultaneous support to all theaters and to meet global space requirements through the [Combined Space Operations Center](#) (CSPOC). The CFSCC's first priority is to define—in both time and space—the level of control of space needed to achieve CDRUSSPACECOM's objectives. Once defined, the CFSCC should identify the actions required to reach the desired level of control. This determination will drive the priorities for CFSC planners. The CFSCC must advise CDRUSSPACECOM on what level of control is realistic given current capabilities and allocation of assets.

Counterspace planners must consider that satellites are constantly changing position and that on-board resources (e.g., fuel and batteries) and performance fluctuate over time. Therefore, these assets must be monitored and reassessed at the beginning of each phase of planning and again prior to execution to ensure the status is current.

Offensive Counterspace

Offensive counterspace (OCS) may be the highest-payoff space component mission when the enemy has the capability to threaten friendly forces, or provide significant support to adversary terrestrial forces, with space capabilities. Given finite resources, in all domains, the CFSCC should judiciously plan the allocation of forces and capabilities to meet CDRUSSPACECOM's and the supported Commanders' objectives. Successful OCS may result in greater freedom *from* attack, by negating enemy counterspace capabilities before they are used against friendly forces, enabling increased freedom of action. This, in turn, may free up assets for other operations against the enemy. Successful OCS also results in the ability to mitigate the adversary's use of space capabilities to support their fielded forces in all domains. In other words, the initial investment in OCS operations contributing to the achievement of the desired level of control of space may pay significant dividends toward overall mission accomplishment. Determining which enemy capabilities to target and the level of negation required is fundamental to successful OCS operations. For instance, it may not be necessary to completely destroy or degrade a given capability, but only temporarily disrupt or deny it in order to achieve desired effects. The latter may require less effort, thereby freeing up assets for other missions. This type of analysis varies from one operation to another, but results in an effective set of target priorities and more efficient use of assets to achieve desired effects.

The nature of airpower is such that offensive combat power can frequently be "massed" by distributing forces. There are no natural lateral boundaries to prevent air, space, and cyberspace capabilities from quickly concentrating their power (physically or in terms of delivered effects) at any point, even when starting from widely dispersed locations. From an Airman's perspective, mass is not based solely on the quantity of forces and materiel committed. In fact, airpower achieves mass most often through effectiveness of attack, not overwhelming numbers.

The most effective OCS efforts may be achieved as part of a broader, parallel attack on the adversary as a system-of-systems with all available assets, to include multi-domain capabilities. For instance, attacking electrical power and isolating national military leadership may aid the operation's overall OCS effort while also helping achieve other objectives. However, as with other operations, care must be taken not to dilute the OCS effort to the point where it is ineffective. The appropriate concentration of effort will ensure that direct effects are balanced with indirect effects that degrade the adversary system-of-systems and warfighting effectiveness over time. If the OCS effort is spread too thin, the CFSCC may lose the advantage of mass and risk losing the initiative and the benefits of airpower's offensive nature. When considering available assets, it is important to give full consideration to the assets and capabilities of other USSPACECOM and applicable theater components.

Planners must determine adversary capabilities and expect at a minimum that adversaries will use at least rudimentary active and passive defenses to protect their space, link, and ground segments. In all cases, planners should develop plans to negate the effectiveness of these defenses, in order to create a permissive environment at desired places and times. The following considerations are important considerations for counterspace (OCS and active defensive counterspace [DCS]) planning:

- ✪ **Threat.** The threat posed by specific enemy capabilities includes an assessment of the urgency or the need to negate that threat.

- ★ **Direct Effects.** First-order results of actions with no intervening effects between action and outcome. These are usually immediate and readily recognizable (e.g., weapon employment results). These are important in determining whether friendly tasks were accomplished. Planning for them must also consider such factors as the potential for collateral damage and rules of engagement restrictions.
- ★ **Indirect Effects.** Second-, third-, or higher-order effects created through intermediate effects or causal linkages following causal actions. These may be physical, psychological, functional, or systemic in nature. They may be created in a cumulative, cascading, sequential, or parallel manner. They are often delayed and typically are more difficult to recognize and assess than direct effects. Understanding these and the causal linkages between them may be vital for achieving objectives.
- ★ **Forces Available.** The forces available are assessed against the number, types, and priority of targets that can be attacked. Sufficient and capable forces should be provided to ensure the desired results are obtained.
- ★ **Time Available and Time Required.** Time constraints are integral to prioritization and planning. The time allowed to achieve the direct and indirect effects as well as the required duration of those effects will influence the number and type of forces needed. Counterspace operations may require substantial lead-time for approval due to political sensitivity or the involvement of or impact to non-Department of Defense organizations.
- ★ **Risk.** Risk calculation involves weighing the risk to friendly forces against expected gains from target attack. Risk calculation should also consider the risks entailed in *not* taking planned actions and the risk of unintended collateral effects. Different objectives and circumstances drive different acceptable levels of risk.
- ★ **Measures and Indicators.** These are the essential component parts of assessment; the means of evaluating progress toward creating effects and achieving objectives. They should be determined during planning.
- ★ **Phasing.** Phasing may be used to modify the prioritization of limited space capabilities to theater operations. Space operations often occur simultaneously and can be continuous throughout the OPLAN, sometimes leading to a sense that phasing is less relevant to space operations. Phasing remains a useful tool to communicate the JFC's concept of operations and the shifting of emphasis between ongoing space operations. For instance, counterspace operations may be emphasized early in an operation and be de-emphasized once space superiority is firmly established. The desired level of space superiority is likely to be a prerequisite to effective pursuit of other objectives.

To the greatest extent practicable, systems and methods should be employed that minimize risk to friendly forces, civilians, and civilian property. For example, an aircraft employing standoff weapons may provide the same effect as a special operations team, with less risk to friendly forces, however, it may increase the chance of collateral damage. In all cases, planners should consider the use of multi-domain capabilities to conduct counterspace operations.

The CSPOC, as the lead integrator, coordinates with the [National Space Defense Center](#) and

theater [air operations centers](#), as applicable, to plan counterspace operations. In early stages of planning, the CFSCC, in coordination with JFACCs, as applicable, will determine objectives, desired effects, and relative priorities. Planners will determine enemy systems, capabilities, and assets that can be used to contest the control of space. Planners will then match desired effects to targets and match targets with friendly forces to create tactical tasks. Planners should develop a prioritized target list before hostilities begin, continually updating it once the battle rhythm is established based on current intelligence and progress of the operation. Planners should also build procedures to handle higher priority re-taskings, such as diversions to strike time-sensitive targets (TSTs). Planners must be able to re-task counterspace missions rapidly in order to take appropriate action against TSTs and similar fleeting, emerging, or higher-priority counterspace targets.

The following considerations are important for determining counterspace (OCS and DCS) targeting priorities and methods:

- ★ **Find, Fix, and Track.** The ability to find, fix, and track space objects, signals, and terrestrial nodes is a fundamental pre-requisite to attacking the adversary, defending friendly space capabilities, assessing collateral effects on third party space assets, and understanding the operational environment. Radar and optical sensors find, fix, and track objects in space just as other sensors find, fix, and track airborne objects within an area of interest.
- ★ **Target Characterization.** Characterization provides the understanding of how systems operate, the signals used, the environment, how systems react to changes in conditions, and the threats posed to friendly and adversary operations. Characterization data enhances our ability to target a space capability, often providing greater flexibility to achieve the desired effect. If we understand how a space system works, the decision and trade-offs on how best to affect the target will be enhanced.
- ★ **Integration.** Integration of theater space requirements must consider both a global and theater perspective. Global integration is the responsibility of CDRUSSPACECOM. Theater integration requires close coordination with the applicable theater JFCs and JFACCs.
- ★ **Phase of Conflict.** Counterspace operations occur in every phase of conflict. However, priorities and [rules of engagement](#) (ROE) may vary greatly from one phase to the next and should be carefully considered.
- ★ **Rules of Engagement.** ROE (and related special instructions found in tasking orders, as well as rules for use of force, often used in situations such as homeland defense and civil support missions) may critically affect how missions are performed. All levels, from the CFSCC / JFACC down to individual crews, should understand the ROE that apply to the accomplishment of their missions.
- ★ **Weaponeering.** Assigning the correct weapons and platforms to target sets is critical to achieve the desired effects. Accurate weaponeering increases the chances of achieving desired effects.
- ★ **Deconfliction.** Electromagnetic spectrum and physical deconfliction must be undertaken to avoid “blue-on-blue” impacts and unintentional interference with third party space capabilities.

- ✦ **Environmental Conditions.** The significance of terrestrial and space environmental conditions on satellites and their communications links cannot be overstated. Weather can also limit sensor sensitivity and ultimately limit the planner's weapons and munitions selection. Planners should address the need for sufficient space situational awareness and counterspace assets to offset the loss of capability and desired effects due to environmental factors.

Defensive Counterspace

DCS operations protect friendly space capabilities from attack, interference, and unintentional hazards, in order to preserve the US and friendly ability to exploit space for military advantage. Effective OCS, prior to the threat coming to bear, may reduce the DCS requirement, freeing assets for more offensive operations, but some degree of DCS is normally necessary in every phase of every operation. DCS operations defend friendly lines of communication, restrict the ability of the enemy to carry out offensive attacks in all domains against friendly space forces and assets, and provide access to space capabilities for all elements of the joint force.

Just as in OCS operations, DCS planners prioritize which assets and capabilities to defend. Planners at all levels identify enemy targets and capabilities to defend against, while matching available forces against the threat. They use many of the same OCS planning considerations. Planners determine which mission-critical assets and capabilities to protect, which will vary from operation to operation. DCS operations are conducted in conjunction with or independent of OCS operations and generally fall into one of two categories: active or passive defense.

Active Space Defense. Active space defense consists of direct actions taken to negate or mitigate the effectiveness of threats against friendly space forces, assets, and capabilities through direct action. Active space defense operations are conducted using a mix of weapon and sensor systems, supported by secure and highly responsive C2 systems, to find, fix, track, target, and destroy or reduce the effectiveness of space threats. Upon a determination of a hostile act or demonstrated hostile intent, DCS operations authorized by an appropriate authority may take action in self-defense, including the use of force.

Integrated employment of multi-domain capabilities through coordinated detection, identification, engagement, and assessment of enemy forces is necessary to defeat enemy attacks and protect friendly forces. The efficient execution of space defense operations requires the ability to quickly detect, identify, target, track, and attack potential threats. Rapid, reliable, and secure means of detection and attribution are critical to an effective defense against enemy attacks. Agile intelligence, surveillance, and reconnaissance capability is essential to provide continuous surveillance and reporting of real-time and near-real-time target data. DCS engagements require careful deconfliction between blue, gray, and red assets and capabilities.

Near-real-time surveillance and threat analysis depends on the ability to fuse all-source multi-domain sensor data into an accurate theater attack assessment. As a threat is detected, it is identified and labeled; this information is then disseminated as rapidly as possible. The threat data provided should be sufficiently detailed and timely to permit the C2 system to evaluate the threat, determine the significance of the threat, and identify required defensive capabilities.

Active defenses include adjustments to the nodes and links of space systems, such as a satellite maneuver or frequency change, and the use of conventional or special operations forces to suppress enemy attacks. The key to effective employment of active measures is early detection and characterization of the threat in order to determine the most effective countermeasure. These actions are described in more detail in [Execution Considerations](#).

Passive Space Defense. Unlike active space defense measures, passive space defense does not involve the direct action in response to adversary, unintentional, or environmental threats. Passive defenses enhance the survivability of space systems by providing a layered defense to ensure space systems continue to operate both during and after attack. Passive measures include the use of camouflage, concealment, and deception; hardening of systems; and cybersecurity. Known survivability measures may even deter an adversary from attempting to attack our space systems. These measures are described in more detail in [Execution Considerations](#).



EXECUTION CONSIDERATIONS

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The Commander, United States Space Command (CDRUSSPACECOM) executes operations based on global requirements for national defense and requests from multiple theaters. Space forces are continuously employed and executing. This requires timely deconfliction and integration with theater operations. The [Combined Space Operations Center](#) (CSPOC) integrates space operations on behalf of the CDRUSSPACECOM through a deliberate coordination process with the applicable theater [air operations centers](#).

The effectiveness of counterspace operations depends on the availability and capability of specific resources and systems. System capabilities are influenced by the situation, threats, weather, and available intelligence. In all cases, planners should consider the use of multi-domain capabilities to conduct counterspace operations. The following are some of the resources and capabilities that may be used to conduct offensive counterspace (OCS) and active defensive counterspace (DCS) operations:

- ✦ **Aircraft.** Aircraft can be used to provide effects in support of OCS operations. For instance, by attacking ground stations with either electronic attack or kinetic weapons, aircraft may negate an adversary's ability to control their satellites and deliver space effects.
- ✦ **Surface Forces.** Surface forces may include conventional land, maritime forces, or special operations forces (SOF). Surface forces can achieve significant effects through the lethality of surface fires and the ability to occupy and secure key areas. For example, surface forces may attack a ground-based satellite control station in support of OCS operations. SOF may provide terminal guidance for conventional air strikes or provide localized jamming against an adversary's link segment.
- ✦ **Electromagnetic Warfare.** Electromagnetic warfare may be used to suppress enemy command and control (C2), integrated air defense systems, and other significant military use of the electromagnetic spectrum. Electromagnetic warfare weapons may include electromagnetic jammers and anti-radiation missiles. Jammers may be used to interfere with adversary link segments. Anti-radiation missiles passively hone in on a radiation source and may be used to strike ground-based space surveillance radars or satellite control stations. See AFDP 3-51, [Electromagnetic Warfare and Electromagnetic Spectrum Operations](#), for detailed discussion of all aspects of electromagnetic warfare.
- ✦ **Information Operations and Cyberspace Operations.** [Information operations](#) and

[cyberspace operations](#) can greatly enhance joint operations. All three segments of an adversary space system may be affected by offensive cyberspace operations. Some techniques afford access to targets that may be affected by information operations and cyberspace operations in support of OCS operations.

- ★ **Anti-Satellite Weapons.** Anti-satellite (ASAT) weapons include direct ascent and orbital systems that employ various tactics to affect or destroy on-orbit satellites or spacecraft.
- ★ **Missiles.** These weapons include surface-to-surface, air-to-surface, and air-to-air missiles, as well as air-, land-, and sea-launched cruise missiles. Many of these weapons have long ranges and some have very quick reaction times. Missiles may be employed against an array of adversary ground segment targets, such as launch facilities and ground stations.
- ★ **Directed Energy Weapons.** Directed energy weapons, such as lasers, may be land-, maritime-, air-, or space-based. Depending on the power level used, directed energy weapons could be capable of a wide range of effects against on-orbit satellites, including: heating, blinding optics, degradation, and destruction. Under certain circumstances, lasers could also be effective against space launch vehicles while in flight.

The targets for counterspace operations may include the adversary space, ground, or link segments. The space segment includes satellites and other spacecraft. The ground segment includes land-based, maritime-based, or airborne equipment and resources used to deploy, enable, or use space capabilities. The link segment connects the space and ground segments and enables the passing of information between them. Understanding that space capabilities are a combination of these segments increases the operational planners' ability to choose the correct target and the best ways and means to affect adversary space capability. The following paragraphs discuss examples of counterspace targets.

- ★ **Space Segment.** Satellites are on-orbit assets consisting of a payload and a satellite bus. The payload performs the operational function of the satellite. The satellite bus hosts the payload and provides it with power, thermal control, and communications. Counterspace operations may target the payload and/or the satellite bus. For example, a laser may deny, disrupt, degrade, or destroy certain types of sensors. Kinetic ASAT weapons, on the other hand, may target the satellite bus to achieve physical destruction.
- ★ **Ground Segment.** The ground segment may perform many functions, including satellite operations, counterspace operations, mission data processing, C2, or launch functions. The ground segment may consist of permanent structures that represent a single point of failure in a space system. However, space operations may also be conducted from mobile or deployable terrestrial platforms. Launch facilities, whether indigenous or third party, are critical for access to space and represent a critical node for interdicting efforts to augment or reconstitute adversary space capabilities.
- ★ **Link Segment.** Space systems are dependent on radio frequency (RF) and/or laser links to provide communication between the space and ground segments (satellite-to-ground station or satellite-to-user) and between satellites (satellite-to-satellite). Links between terrestrial nodes may include fiber-optic and traditional cable in addition to RF and laser links. On-orbit satellites and ground-based satellite control stations users exchange data across the link segment. The up-link may contain satellite commands used to task satellite payloads and buses. The down-link is used for sending payload and satellite telemetry data to a ground stations for processing. The ground station, after

processing the mission data, often distributes this data to users via [satellite communications](#) (SATCOM) for exploitation. In the case of SATCOM systems, data may be directly up-linked and down-linked between users.

- ★ **C2 Systems.** C2 capabilities are critical to the effective employment of forces and should be given a high priority during targeting. Countering C2 systems substantially reduces the enemy's capability to detect, defend, and attack friendly forces in all domains.
- ★ **Third-Party Providers.** An adversary may gain significant space capability by leveraging third-party space systems. Leveraging diplomatic or economic means to remove an adversary's access to third-party (commercial or foreign) space capabilities will generally require the support of other US Government departments.

Active Defense

Active defense includes any direct actions taken in response to an attack against friendly space forces, assets, or capabilities, as well as actions taken in response to unintentional or environmental threats. These actions include:

- ★ **Movement and Maneuver.** Satellites may be capable of maneuvering in orbit to deny the adversary the opportunity to track and target them. Maneuver capability is limited by on-board fuel constraints, orbital mechanics, and the time taken to plan and execute a maneuver. Furthermore, repositioning of 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 as well as deployable space capabilities. However, movement of these ground segment nodes may also impact the system's capability, as they must still retain line of sight with their associated space segment. Movement and maneuver in the link segment may include actions such as changing frequencies, shifting users to other satellites (whether commercial or military), and moving spot beams or altering beam shape. Movement and maneuver can also exploit alternate communications paths like fiber or theater communication architectures, such as line-of-sight or airborne relay.
- ★ **System Configuration Changes.** Satellites and ground segment nodes may use different modes of operation in the link segment to enhance survivability against attacks. Examples include changing RF amplitude and power to complicate jamming.
- ★ **Suppression.** Suppression of adversary threats to friendly space capabilities negates or mitigates the effects of those threats through deception, denial, disruption, degradation, or destruction. These operations may be conducted by friendly capabilities in any domain to negate adversary threats originating in any domain in response to a threat.

Passive Defense

Unlike active space defense measures, passive space defense does not involve direct action in response to adversary, unintentional, or environmental threats. Passive defense includes the following measures:

- ★ **Camouflage, Concealment, and Deception.** Certain 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 allows them to operate through attacks and environmental threats. Electromagnetic hardening 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.
 - ★ **Cybersecurity.** Cybersecurity protects and defends information within our network of space systems. Cybersecurity measures to prevent compromise of information include encryption and authentication of command links and encryption of communications signals. As with system hardening, cybersecurity measures include filtering, shielding, and spread spectrum techniques to prevent denial of information from electromagnetic jamming or interference.
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ASSESSMENT CONSIDERATIONS

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Commanders should continually evaluate employment and intelligence assessments to ensure the capabilities used during missions create the intended effects supporting the joint force commander's (JFC's) objectives. The ambiguities and limitations resident within the space operations environment require frequent adjustment of operational planning considerations to ensure desired effects are achieved while avoiding specifically designated or unintended negative consequences. The [commander, Air Force forces](#) (COMAFFOR) or [combined force space component commander](#) (CFSCC) will evaluate the results of global counterspace operations and will coordinate with the applicable theater COMAFFORs and [joint force air component commanders](#) to evaluate the results of counterspace operations supporting theater objectives and theater actions supporting global counterspace operations.

Assessing the degree of control of space is challenging. The inherent characteristics of [airpower](#)—speed, range, and flexibility—apply to enemy counterspace threats as well, which makes assessment of enemy actions and intent more difficult. As previously stated, the military necessity for the desired level of control of space is now one of the highest priorities for the joint force, a necessary condition for success in all domains. All subsequent planning and assessment is based on this determination. A thorough understanding of the enemy system and its components should logically drive the development of friendly objectives, effects, and tasks. The key to effective assessment is to develop measures and indicators *at the same time* as the objectives, effects, and tasks they measure—not after the fact. Measures and indicators should either be directly observable or something that can be reliably inferred from other data.

Measuring effects in the counterspace fight may seem daunting, but the very purpose of counterspace operations provides some guidance: Counterspace operations are conducted to ensure freedom of access to the advantages gained from space capabilities to joint forces in all domains, freedom to attack, and freedom from attack. The effects associated with counterspace will necessarily be related to these three items. It is possible to measure, directly, the number of successful friendly and enemy attacks as well as the space capabilities affected by enemy counterspace activity. The desired effects will also be based on the level of control of space required. Regardless of which effects are desired, or how they are measured, one important point should be understood: task performance and effect performance should be measured (and reported) independently.

Measuring task and effect performance separately provides the clearest picture of progress towards achieving the objective. The expected outcome of these measures and indicators is

a rough alignment between task, effect, and objective performance. Since tasks were designed to create effects—and desired effects lead to the achievement of objectives—this makes sense. When the levels of performance in task, effect, and objective do *not* align, it may have a profound effect on future actions in the offensive counterspace (OCS) or defensive counterspace (DCS) effort.

For example, if a large number of enemy satellite communication (SATCOM) antennas are assessed as degraded due to damage (high task performance), but the enemy continues to conduct C2 of fielded forces via SATCOM (low effect performance), then the OCS plan needs to be examined. How does the enemy continue to communicate? Are they rapidly repairing the antennas? Have they deployed mobile transmitters? Perhaps SATCOM antennas are not a critical node of the enemy system after all—and the focus should shift from air strikes against the antennas to electronic warfare capabilities. These are questions that never would have revealed themselves if task performance was the sole determinant of success in the objective.

Even more revealing is a high level of effect performance (objective met), accompanied by low task performance (few bombs on target). To use the example above, suppose that only a few enemy SATCOM antennas have been targeted, but the enemy ceases the use of SATCOM for C2. The enemy is clearly capable of communicating, but for some reason (as yet unknown) does not. Future actions, in this case, will depend on the amount of risk the JFC is willing to accept. If the acceptable level of risk is low—enemy antennas will continue to be attacked until the enemy's potential SATCOM capability is very low. In effect, the task performance will “catch up” to the effect performance. Conversely, if the JFC is willing to accept a higher risk, efforts may shift away from SATCOM antennas to other components of the enemy communications infrastructure—or to different objectives entirely.

OCS and DCS performance may be measured separately, or they may be combined depending on the course of action selected. In many cases, desired effects are applicable to both DCS and OCS. For example: OCS efforts to degrade or destroy enemy space launch facilities will necessarily have a positive impact on the DCS effort if the enemy has direct ascent anti-satellite (ASAT) weapon capability, since fewer enemy ASATs will be available to launch. Conversely, successful enemy attacks on friendly space capabilities (due to unsuccessful DCS efforts) will have a negative impact on the ability to provide necessary space capabilities to friendly forces in all domains—potentially affecting both DCS and OCS.

Effective assessment is a key feature of the effects-based approach to operations, and if done correctly should generate as many questions as answers. Warfare is a clash between living, thinking systems, which often react to one another in unexpected ways. By measuring friendly actions (tasks) and changes in the enemy system (effects) separately, critical review of actions, tasks, and effects becomes possible. The questions: why are my actions not producing results? Why is the enemy behaving in this manner? What changes should be made to the plan – and why? These are exactly the questions and answers the CFSCC needs to effectively prosecute counterspace missions.
