AIR FORCE DOCTRINE PUBLICATION 3-01

COUNTERAIR OPERATIONS

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"The Air Force organizes, trains, and equips forces to be an air component to a joint force commander (JFC). As part of the joint force's air component, our forces must be prepared to accomplish JFC objectives**.** The air component commander's administrative authorities are derived from Title 10, U.S. Code, and exercised as the commander, Air Force forces (COMAFFOR). The air component commander's operational authorities are delegated from the JFC and exercised as both the COMAFFOR, over Air Force forces, and as the functional joint force air component commander (JFACC), over joint air forces made available for tasking. Thus, the air component commander leads Air Force forces as the COMAFFOR and the JFC's joint air operations as the JFACC. This duality of authorities is expressed in the axiom: Airmen work for Airmen and the senior Airman works for the JFC."

--Air Force Doctrine Publication (AFDP) 1, *The Air Force*

Since the COMAFFOR and JFACC are nearly always the same individual, this AFDP will use the term "air component commander" when referring to duties or functions that could be carried out by either or both, unless explicit use of the term "COMAFFOR" or "JFACC" is necessary for clarity.

FOREWORD

Doctrine embodies the fundamental principles by which military forces guide their actions in support of national objectives. It is a body of carefully developed, authoritative ideas that have been officially approved and establishes a common frame of reference for solving military problems. However, to be an effective guide, the challenge for doctrine is to be simultaneously focused on the past, applicable in the present, and facing toward the future; all in equal measure.

The United States Air Force must prepare for a new reality, one in which decision advantage, freedom of maneuver, and freedom of action are increasingly challenged. To deter, compete, and win across the competition continuum, Airmen must advance solutions that allow us to conduct operations in highly contested environments. Broadly, the joint force's approach to meeting this challenge is encapsulated in joint all-domain operations (JADO). Together with joint all-domain command and control, JADO provides a JFC the means to integrate, synchronize, and deconflict the convergence of effects across all domains to achieve operational advantage.

AFDP-1, *The Air Force*, supports this effort by establishing mission command as the Airman's philosophy for the command and control of airpower. Despite our advances, adversaries will likely retain an ability to deny or degrade our communications. Therefore, decision makers at all echelons should have the ability to develop understanding, make decisions, and converge effects when disconnected from higher echelons. Mission command embraces centralized command, distributed control, and decentralized execution as the foundation for the responsiveness, flexibility, and initiative necessary to ensure capabilities continue to function, even when information is degraded or denied.

AFDP 3-01, *Counterair Operations*, though firmly rooted in the past, also looks to the future, adapting where needed to ensure continued utility and efficacy for the challenges to come. Properly planned and executed, counterair operations are a crucial element of the fires and protection joint functions that enable achievement of joint force commander objectives in cooperation, competition, and conflict. Airmen should be trained to plan and execute operations in a distributed and decentralized manner and execute missions when isolated from higher-level decision makers. Airmen at all levels should be comfortable making decisions and operating based on the commander's intent and the tenet of mission command.

Though not completely adapted to the challenges identified here, this doctrine represents what we believe based on the best evidence to date. As we continue to advance our capabilities, it is critical we continue to evolve our doctrine. Throughout history, innovative Airmen have developed methods of employment to meet operational challenges. We will continue to do so.

CHAPTER 1: COUNTERAIR OPERATIONS

Control of the air is normally one of the first priorities of the joint force. This is especially important 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. Whether directly in the air, or through advances in anti-access/area denial (A2AD) capabilities, peer and near-peer competitors are capable of challenging or denying control of the air. Potential adversaries have significant—and constantly improving—ballistic missile forces and continue to develop advanced aircraft, cruise and ballistic missiles, hypersonic glide vehicles, and sophisticated integrated air defense systems (IADS). These capabilities, supported by peer and near-peer cyberspace and space advancements, present growing challenges to the joint force's ability to achieve control of the air.

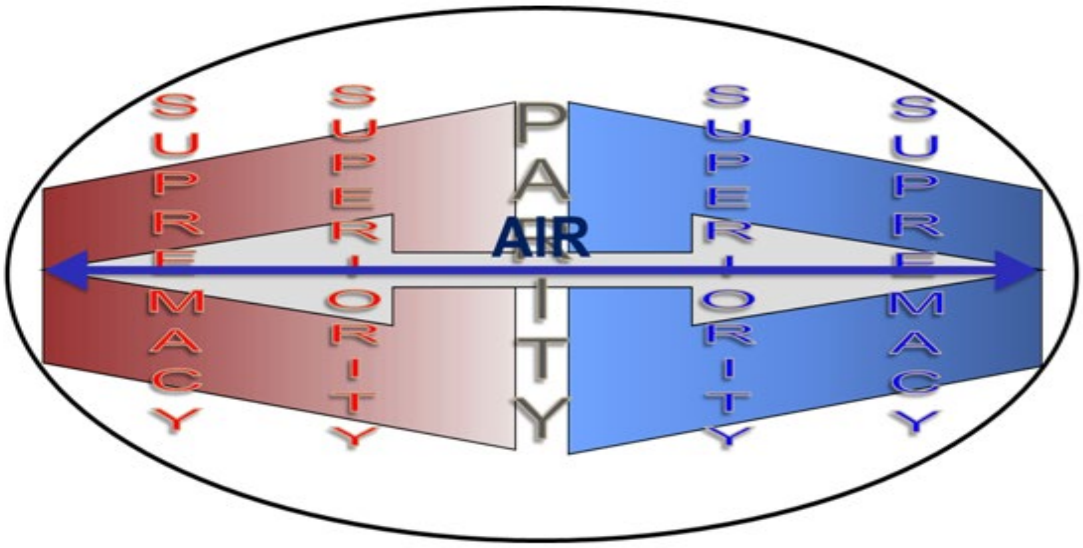
Counterair operations ensure freedom to maneuver, freedom to attack, and freedom from attack. Additionally, counterair capabilities can deter hostile adversary action by providing a credible military threat to enemy maneuver and attack capabilities. As one of its primary missions, the United States Air Force (USAF) brings resources, capabilities, and experience to the joint force to achieve counterair objectives.[1] The counterair mission integrates offensive and defensive operations to attain and maintain control of the air and protection of forces by neutralizing or destroying threats from all domains that directly or indirectly challenge control of the air. These forces may include, but are not limited to, aircraft, surface-to-air missiles (SAMs), ballistic missiles, airfields, fuel, command and control (C2) facilities and systems, and network links.

Airpower's inherent flexibility allows missions and aircraft to shift from defense to offense, adapting as needed to changing conditions in the operational environment. Operations may be conducted in and over enemy, friendly, and international airspace, land, and waters, as well as in space and cyberspace. Counterair missions may involve seeking out and destroying an enemy's aircraft and missiles (air-to-air, surface-to-air, cruise, and ballistic), through measures designed to minimize the effectiveness of those systems, or countering enemy efforts in other domains, such as space and cyberspace.

CONTROL OF THE AIR

Control of the air describes a level of influence in the air domain relative to that of an adversary. The relative degree of control is typically categorized within a spectrum ranging from **parity**, where neither adversary can claim control over the other, to **air superiority,** to **air supremacy**. To enable successful execution of joint operations such as strategic attack, interdiction, and close air support (CAS), the desired degree of control is typically air superiority. In a peer or near-peer conflict, air superiority may not be achievable in all places or at all times.

[1] Joint doctrine provides broad guidance for countering air and missile threats (see JP 3-01, *Countering Air and Missile Threats*), but does not describe the entire continuum of control of the air, as this publication does.



Control of the Air Continuum

Air parity is a condition **in which no force has control of the air**. It is a situation in which both friendly and adversary land, maritime, and air operations may encounter **significant interference** by the opposing force. Parity is not a standoff, nor does it mean aerial maneuver or ballistic missile operations have halted. On the contrary, parity may be typified by fleeting, intensely contested battles at critical points during an operation with maximum effort exerted between combatants in their attempt to achieve some level of favorable control.

Air superiority is that degree of control of the air by one force that **permits the conduct of its operations** at a given time and place **without prohibitive interference** from air and missile threats**.** Air superiority may be localized in space (horizontally and vertically) and in time, or it may be broad and enduring.

Air supremacy is that degree of control of the air wherein **the opposing force is incapable of effective interference** within the operational area using air and missile threats.[2] Air supremacy may be localized in space (horizontally and vertically) and in time, or it may be broad and enduring. This is the highest level of control of the air that air forces can pursue. Air supremacy may be difficult to achieve in a peer or near-peer conflict.

Control of the air hinges on preventing prohibitive or effective interference to friendly forces from enemy forces in the air domain. Air supremacy prevents *effective* interference. It does not imply that *no* interference exists. Rather, any attempted interference can be easily countered or should be so negligible as to have little or no effect. While air supremacy is most desirable, it may not be operationally feasible. Air superiority, even local or mission specific, may provide sufficient freedom of action to create desired effects. Commanders should determine the minimum level of control of the air required to accomplish their mission and assign an appropriate level of effort to achieve it.

[2] JP 3-01.

What Is Parity, Superiority, or Supremacy?

In modern warfare, parity is often not recognized when it exists. It is more easily identified retrospectively as the situation immediately preceding the point at which momentum swung in favor of one combatant over another.

During the 1973 Arab-Israeli War, Egyptian surface-to-air missile (SAM) batteries in the Sinai desert were employed so effectively that the Israeli Air Force—an otherwise effective force—could not accomplish its air interdiction or suppression of enemy air defenses mission. The Egyptian Air Force was similarly unable to interfere with Israeli maneuver, creating an air parity situation.

Both air and ground force maneuver came to a halt for 48 hours. The stalemate—the period of air parity—was not broken until the Israelis changed tactics by using direct infantry attacks on the Egyptian SAM system, an example of integrating capabilities of the joint force into counterair operations. Those attacks swung the momentum back to the Israeli side by allowing their Air Force to regain control of the air and eventually assert air superiority across the entire front.

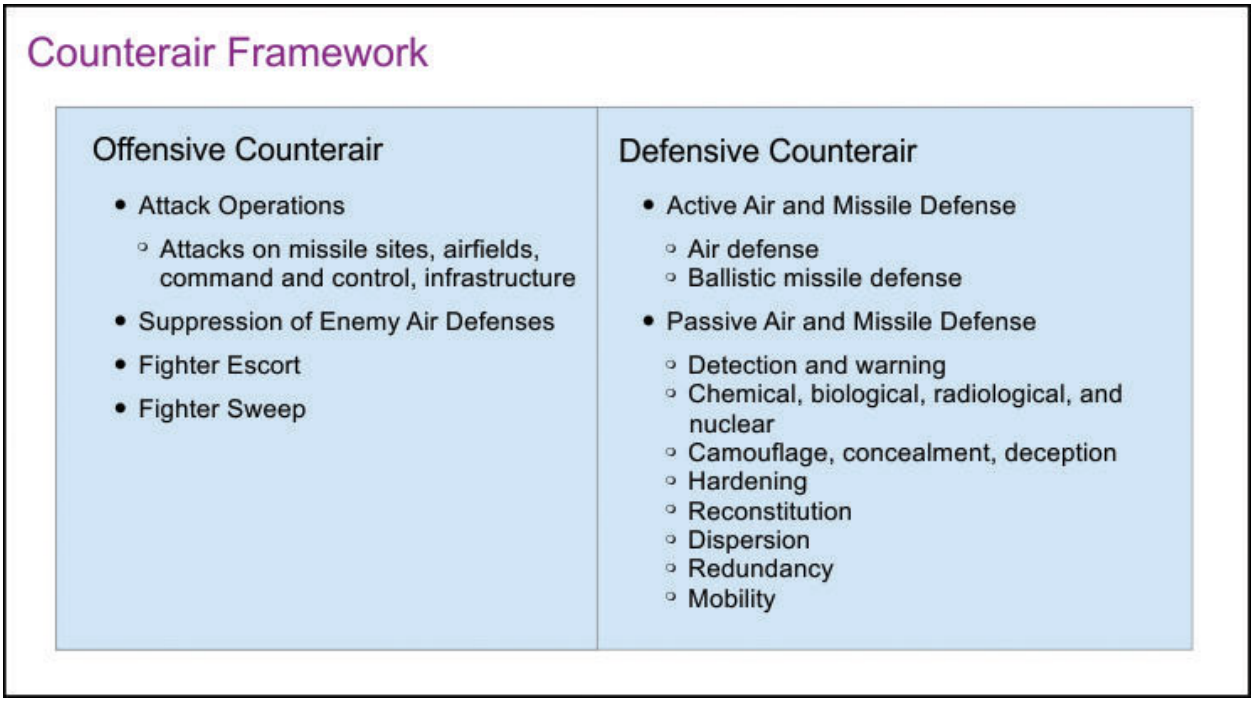
By war's end, the Israeli Air Force was virtually unchallenged in the sky.

EFFECTS BASED APPROACH TO COUNTERAIR

Like other air operations, counterair is fundamentally effects-based. This means that counterair operations are designed, planned, executed, assessed, and adapted to influence or change system behavior to achieve desired outcomes. Effective counterair operations should be part of a larger, coherent plan that logically ties the overall operation's end state to all objectives, effects, and tasks. This plan should guide execution and the means of gaining feedback. Measuring success should be planned for and evaluated throughout execution and assessment.

In an effects-based framework, effects fall into two broad categories: direct effects—the immediate outcomes created by friendly actions—and indirect effects—higher-order effects created on adversarial or neutral actors within the operational environment.

The counterair framework, illustrated in the figure "Counterair Framework," shows typical friendly actions taken to create effects in support of counterair operations. It lists and categorizes numerous distinct tasks or missions conducted within the larger framework. The finer distinctions do not substantially change the way operations are conducted but may help Airmen understand the elements of offensive counterair (OCA) and defensive counterair (DCA). Note that in many cases the distinctions between the categories may blur. For example, an attack on an enemy SAM site may be considered an attack operation or suppression of enemy air defenses (SEAD).



(Source: JP 3-01)

OFFENSIVE COUNTERAIR

OCA operations seek to dominate enemy airspace and prevent the launch of threats, resulting in greater freedom *from* attack and increased freedom of action. It includes four operations used to achieve specific counterair effects: **attack operations**, **SEAD**, **fighter escort**, and **fighter sweep**. Tasked units normally have decentralized execution authority and are given significant latitude to plan and coordinate tasks. OCA efforts should be properly planned for, directed, and integrated with other offensive operations.

- **Attack operations.** Attack operations are intended to destroy, disrupt, or degrade counterair targets on the ground and may be accomplished through kinetic or non-kinetic actions. These missions are directed against enemy air and missile threats, their C2, and their support infrastructure (e.g., airfields, launch sites, launchers, fuel, supplies, and runways). The main goal is to prevent enemy employment of air and missile capabilities.

- **SEAD.** SEAD operations aim to neutralize, destroy, or degrade enemy surface-based air defenses by destructive or disruptive means. SEAD requirements may vary according to mission requirements, system capabilities, and threat complexity. SEAD planners should coordinate with intelligence personnel to ensure collection and exploitation opportunities are considered prior to destroying or disrupting emitters. SEAD operations[3] fall into three categories:
  - **Area of responsibility (AOR) / joint operations area (JOA) air defense system suppression.** These operations target high-payoff air defense assets, resulting in the greatest degradation of the enemy's total system.
  - **Localized suppression.** These operations are normally confined to geographical areas associated with specific ground targets or friendly transit routes and contribute to local air superiority.
  - **Opportune suppression.** These operations are normally unplanned and include aircrew self-defense and attack against targets of opportunity. The JFC or joint forces air component commander (JFACC) normally establishes specific rules of engagement (ROE) to permit the conduct of opportune suppression.
- **Fighter escort.** Fighter escort provides dedicated protection sorties by air-to-air capable fighters in support of other air operations over enemy territory. Fighter escort may also be used in a DCA role to protect aircraft such as a high-value airborne asset (HVAA).
- **Fighter sweep.** Fighter sweep is an offensive mission by fighter aircraft to seek out and destroy enemy aircraft or targets of opportunity in a designated area. Normally, fighter sweeps are conducted to achieve local or JOA-wide air superiority. The nature of air and missile threat and JFC or JFACC objectives are the primary determinants regarding employment of fighter sweep missions versus attack operations.

DEFENSIVE COUNTERAIR

DCA operations defend friendly lines of communication, deny the enemy the freedom to carry out offensive attacks from the air, and provide a secure area from which all elements of the joint force can operate. DCA operations can be conducted in conjunction with, or independent of, OCA operations. Effective OCA greatly reduces the DCA requirement, freeing assets for more offensive operations. However, some degree of DCA is normally necessary in every operation. In some cases, DCA may be the only means to counter air and missile threats due to political constraints. Generally, DCA is classified into two categories: active and passive air and missile defense (AMD).

AMD—both **active** and **passive**—is direct defensive action taken to destroy, nullify, or reduce the effectiveness of hostile air and ballistic missile threats against friendly forces

[3] For additional information on SEAD, see AFTTP 3-2.28, *Multi-Service Tactics, Techniques, and Procedures (MTTP) for Joint Suppression of Enemy Air Defenses.*

and assets. It includes actions to counter enemy manned and unmanned aircraft (UA), aerodynamic missiles (cruise, air-to-surface, and air-to-air), and ballistic missiles. Several DCA tasks help provide a permissive environment for friendly air action.[4]

- **Active air and missile defense.** Active AMD consists of air defense (AD) and ballistic missile defense (BMD). The aggregation of these elements—a mix of weapon and sensor systems across the joint force—form an IADS, supported by secure and highly responsive C2 systems, to find, fix, track, target, and destroy or reduce the effectiveness of hostile airborne threats. The IADS is unique to each operational area and contributes to defense in depth, with the potential for multiple engagements that increase the probability for success.
  - **Air defense.** AD includes defensive measures designed to destroy attacking aircraft and aerodynamic missiles, or to nullify or reduce the effectiveness of such attack. It includes the use of aircraft, SAMs, antiaircraft artillery, electromagnetic warfare (EW) (including directed energy), multiple sensors, and other available weapons or capabilities.
  - **Ballistic missile defense.** BMD includes defensive measures designed to destroy attacking enemy ballistic missiles, or to nullify or reduce the effectiveness of such attacks.

These actions are closely integrated to form essential DCA capabilities, but may involve different defensive weapon systems or tactics, techniques, and procedures.

- **Passive air and missile defense.** Passive AMD includes all measures, other than active AMD, taken to minimize the effectiveness of hostile air and missile threats against friendly forces and assets. Passive AMD is often an additional means of defense should active AMD efforts fail. Passive AMD measures are considered the same for air and missile threats, with one exception: detection and warning of ballistic missile attack is normally provided by supporting assets from outside the theater in concert with deployed C2 systems and sensors. These are briefly summarized in the section on execution considerations for passive defense:
  - **Detection and warning.**
  - **Chemical, biological, radiological, and nuclear (CBRN) defenses.**
  - **Camouflage, concealment, and deception** (including countermeasures designed to reduce electronic and infrared signatures, and stealth technology).
  - **Hardening.**
  - **Reconstitution.**
  - **Dispersion.**

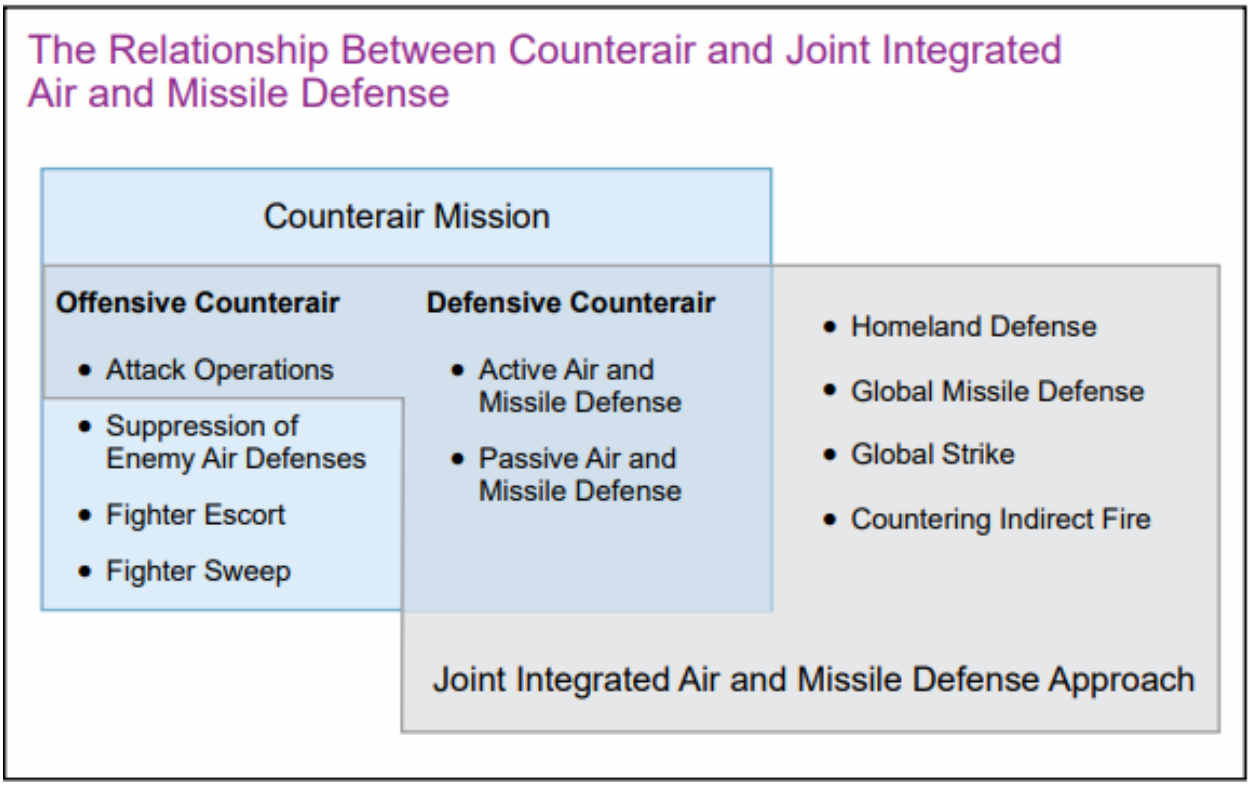
[4] For additional information on AMD, see AFTTP 3-2.31, *MTTP for Air and Missile Defense*.

✪✪ **Redundancy.**

✪✪ **Mobility.**

INTEGRATED AIR AND MISSILE DEFENSE

Integrated air and missile defense (IAMD) is an **approach** to counter some, but not all, air and missile threats. IAMD integrates capabilities and overlapping operations to defend the homeland and United States (US) national interests, protect the joint force, and enable freedom of action by negating an adversary's ability to create adverse effects from their air and missile capabilities.



(Source: JP 3-01)

At the theater level, IAMD combines OCA attack operations and DCA operations to achieve the JFC's desired effects. Within the IAMD approach, OCA attack operations are commanded by the JFACC and DCA is commanded by the area air defense commander (AADC). The JFACC is responsible for integration between the OCA and DCA components of IAMD. It is important to note that the OCA attack operations component of IAMD are not planned and executed in isolation but are part of a wider offensive effort against a variety of enemy targets. Additionally, OCA attack operations include missions that contribute to air superiority (e.g., attacks on enemy fighter airfields) which are not part of the IAMD approach. At the tactical level, IAMD incorporates counter rocket, artillery, and mortar activities. These tactical level activities are the responsibility of the ground commander; not the JFACC or AADC. Beyond the theater level, IAMD supports global missile defense, homeland defense, and global strike.

CHAPTER 2: COMMAND AND CONTROL

The Airman's philosophy for the C2 of airpower is mission command, executed through centralized command, distributed control, and decentralized execution (CC-DC-DE). Of CC-DC-DE's three components, decentralized execution is the most critical to maximize airpower's flexibility and lethality in combat. Guided by clear commander's intent and mission orders, decentralized execution allows subordinates to exploit fleeting opportunities in dynamic situations.[5] However, the capabilities of modern communication and near-real-time display technologies make centralized execution—i.e., direct control of missions from the air operations center (AOC)—possible. As a result, at various times in recent operations, senior commanders have attempted a degree of control approaching centralized execution. Such command arrangements degrade flexibility and may not be effective in a fully stressed, dynamic combat environment. Centralized execution is seldom, if ever, appropriate for counterair operations—especially OCA. Future conflicts involving operations in a contested, degraded, or operationally limited environment further emphasize the importance of mission command.

Centralized Execution During Operation ENDURING FREEDOM

The six months of major combat in Operation ENDURING FREEDOM in Afghanistan saw not only centralized planning, but also a degree of centralized execution that was unique in the US experience… [Technology] allowed sensor-to-shooter links to be shortened, in some cases, from hours to minutes. It also, however, resulted in an oversubscribed target-approval process that lengthened rather than compressed the kill chain. As a result, the human factor became the main constraint impeding more effective time-critical targeting…

This... close connectivity, however, cut both ways. Although it was helpful—and even essential—up to a point, it also often resulted in gridlock, in that it encouraged higher-level leaders and their staffs to try to micromanage the fighting. Senior leaders often intervened at the tactical level not because circumstances required it, but simply because they could. As a result, fast-moving targets sometimes were allowed to get away.

—Benjamin S. Lambeth

by permission, excerpted from *Air Power Against Terror: America's Conduct of Operation ENDURING FREEDOM*

Airmen should expect most counterair operations to be joint or combined efforts. As the supported commander for counterair operations, other component assets capable of performing counterair missions are normally made available to the JFACC for tasking. Therefore, it is essential Airmen understand other joint force components and participating allies' counterair capabilities and how to integrate them in joint and combined counterair operations.

[5] AFDP 1, *The Air Force*.

Effective counterair operations require a reliable C2 capability. C2 assets should be capable of exchanging information rapidly with other services, components, and multinational partners. The information flow supports the chain of command and should be as complete, secure, and near real-time as possible.

RULES OF ENGAGEMENT

Effective operations require the establishment and promulgation of easily understood ROE. ROE are established to convey national leadership and senior military commander intent and guidance regarding the use of force. They reflect legal constraints and political imperatives that may impact an operation's overall end state. Effective ROE should align with commander's intent and balance restrictions with risk and the imperative for success. When establishing the ROE, commanders and planners should obtain the legal advice of the supporting judge advocate. Furthermore, where supplemental measures restrict Secretary of Defense (SecDef) approved ROE, notification must be given to SecDef through the Chairman of the Joint Chiefs (CJCS).[6]

Overly restrictive ROE can be contrary to decentralized execution and may lead Airmen to rely on ever-increasing levels of oversight and approval, potentially leading to situations where Airmen hesitate to act. Such a scenario may increase risk, both to the mission and to Airmen. As such, commanders should be careful not to create ROE so restrictive that they place friendly forces at unnecessary risk or at an operational disadvantage. This could be a pitfall in a peer or near-peer, contested environment.

COUNTERAIR ROLES AND AUTHORITIES

As the JFACC, and the supported commander for counterair operations, the air component commander's responsibilities normally include planning, coordination, allocation, and tasking based on JFC priorities and guidance. Additional responsibilities include AMD and airspace control. As such, the air component commander is normally assigned the roles of AADC and airspace control authority (ACA). Assigning responsibility and authority to coordinate and integrate airspace control and counterair operations to one air commander greatly enhances unity of command.[7]

AREA AIR DEFENSE COMMANDER

Splitting C2 of AMD assets among multiple commanders reduces their effectiveness. Therefore, AADC is assigned to the component commander with the C2 capability to plan, execute, and assess AMD with other air operations. Likewise, separating BMD from the overall AMD structure has the potential to seriously degrade the overall AMD effort and increase the risk of friendly fire among multi-layered AMD assets. To facilitate AMD, the AADC establishes an IADS. The friendly IADS is a robust integration of the Services' AMD capabilities and comprises sensors, weapons, C2 systems, and personnel.

[6] For additional information on ROE, see JP 3-84, *Legal Support* and CJCS Instruction (CJCSI) 3121.01B, *Standing Rules of Engagement / Standing Rules for the Use of Force for US Forces*
[7] For additional information, see AFDP 3-30, *Command and Control*.

Effective integration of surface-to-air weapons into the DCA plan requires a reliable link with air operations and a reliable identification (ID) process. All available surface-to-air assets in the AOR should be incorporated into the DCA plan and are subject to the integrated procedures, ROE, and weapons control measures directed by the AADC. The AADC should be granted the necessary authority to deconflict and control engagements and to exercise real-time battle management when required.

Area air defense and airspace control plans. Together with service or functional component commanders, the AADC develops, integrates, and distributes the area air defense plan (AADP). Planners should strive to create a reliable and consistent common operational picture (i.e., a fused and correlated air, ground, maritime, space, and cyberspace picture) available to all supporting C2 facilities. The AADP should arrange a layered, overlapping defense to allow for multiple engagement opportunities, contain detailed weapons control and engagement procedures, and specify coordination measures required for AMD.[8]

Combat identification. One of the AADC's most critical responsibilities is to provide guidance and articulate combat identification (CID) procedures for counterair. CID is the process of achieving an accurate characterization of detected objects in the operational environment sufficient to support an engagement decision.[9] The objective of CID is to obtain the highest confidence positive identification (PID) possible. Lacking PID, the objective is to reach the level of confidence in an ID that can be supported by the ROE for an engagement authority to decide. ID can be accomplished through several recognized methods. The JFC approves the procedures used for ID and designates who may be delegated that authority in the AADP, special instructions (SPINS), and airspace control plan (ACP).

Accurate and timely ID enhances real-time tactical decisions by allowing timely, beyond-visual-range engagement of enemy aircraft and missiles while conserving resources and reducing the risk to friendly forces. CID information may be obtained from various land-, air-, and space-based systems, along with coordination measures documented in the ACP or the airspace control order (ACO). To be effective, this CID "system of systems" requires effective guidance from the AADC and a common data link architecture with the goal of near-real-time information sharing among platforms. To avoid a single point of failure, no single node acts as an exclusive conduit of all CID information. Electronic methods, which provide the most rapid and reliable means of ID, are normally used when available. Visual and procedural means of ID are not as practical but may be required in some situations. Some individual weapons systems retain an autonomous CID capability.[10]

AIRSPACE CONTROL AUTHORITY

The air component commander is normally designated as the ACA. The ACA is responsible for airspace control, coordinating airspace use, developing airspace control policies

[8] A detailed description of the AADP is available in AFTTP 3-2.31.
[9] JP 3-01.
[10] For additional information on CID, see AFTTP 3-2.31.

and procedures, and directing required coordination among theater airspace users. The ACA establishes an airspace control system for the JFC, integrates that system with host nations, and coordinates user requirements. A key responsibility of the ACA is to provide the flexibility needed within the airspace control system to rapidly employ forces.

The ACA incorporates these procedures into an ACP and, after JFC approval, promulgates it throughout the theater. The ACP should be integrated closely with the AADP and is implemented through the ACO. The ACO is published either as part of the air tasking order (ATO) or as a separate document to implement specific control procedures for established time periods. The ACO may include airspace coordinating measures, fire support coordinating measures, and AD measures such as minimum risk routes, combat air patrols, fire support coordination lines, fighter engagement zones, and missile engagement zones.[11]

REGIONAL AND SECTOR AIR DEFENSE COMMANDERS

During complex operations conducted in a large theater, the AADC may recommend, and the JFC may approve, the division of the operational area into separate AD regions. The AADC and regional air defense commander (RADC), as approved by the JFC, may choose to further divide regions into sectors, each with a sector air defense commander (SADC) with authorities appropriate for their responsibilities. Generally, regions and sectors are based on geographic size and terrestrial features. When RADCs/SADCs are employed in support of BMD operations, regional and sector boundaries are normally assigned according to predicted ballistic missile impact points.[12]

IDENTIFICATION, COMMIT, AND ENGAGEMENT AUTHORITIES

In counterair operations it is imperative that the command lines, engagement authorities, engagement procedures, ROE, and terminology be standardized, documented, clearly understood, and rehearsed (if possible) before an engagement decision is necessary.[13]

- **Identification authority.** ID authority is the authority to assign an identity classification to an unknown contact, if possible. The AADC establishes the policy for ID authority, with JFC approval. Execution of the ID policy is normally delegated to the tactical level, but care must be taken that the tactical commander is capable of performing the ID function in real time.

- **Commit authority.** The area defense echelon with commit authority is permitted to authorize assets to prepare to engage an entity (e.g., position a DCA fighter to intercept or direct an air defense artillery [ADA] unit to track and target). Commit authority does not imply engagement authority.

- **Engagement authority.** This authority may be delegated to a subordinate commander. The AMD entity with engagement authority is permitted to authorize engagement of an air or missile threat. For AMD engagements within the theater, the

[11] For more information see AFDP 3-52, *Airspace Control*, and AFTTP 3-2.78, *MTTP for Airspace Control*.
[12] For more information on RADC and SADC, see JP 3-01.
[13] For more information on these authorities, see JP 3-01.

authority is normally delegated to the AADC who may further delegate the engagement authority to tactical levels (e.g., RADC or SADC).

THEATER AIR CONTROL SYSTEM

The theater air control system (TACS) provides the air component commander with an overarching means to C2 counterair operations. It includes the personnel, procedures, and equipment necessary to plan, direct, control, coordinate, and assess air operations. The TACS can be tailored to support contingencies of any size. TACS elements may be employed in garrison, deployed for contingencies, or deployed to augment theater-specific systems.

The TACS is divided into ground and airborne elements based on the environment in which they operate, not on the portion of the operations for which they provide C2.[14] In joint operations, the TACS may be combined with other service or functional component C2 elements to form the theater air-ground system (TAGS).[15] All AMD elements should coordinate continuously to eliminate duplication of effort and ensure adequate commitment of assigned weapons against threats.

THEATER AIR CONTROL SYSTEM GROUND ELEMENTS

Air operations center. The AOC is the senior element of the TACS and is the principal entity to design, plan, direct, control and assess combat air operations. The AOC disseminates tasking orders; executes and directs execution of daily air and cyberspace operations; provides rapid reaction to immediate situations; and provides the capability to conduct deliberate and dynamic targeting. In joint or multi-national operations, the AOC is typically designated the joint or combined AOC (JAOC/CAOC) respectively.

Within the AOC, the airspace control management team integrates the use of airspace in theater. It provides the current air and surface situation and is responsible to the ACA for developing the ACP and coordinating airspace control activities. The AOC may perform certain airspace management and airspace control functions directly or delegate them to a control and reporting center (CRC) or other tactical C2 agency. The AOC may be assigned responsibility to manage data links for all components and participating nations (vital for CID and air battle management) and management of the overall AD effort. The AOC may also perform C2 liaison, mission control, combat search and rescue (CSAR) assistance, threat warning, and coordination of ADA unless delegated to the CRC, air support operations center (ASOC), or other tactical C2 elements.

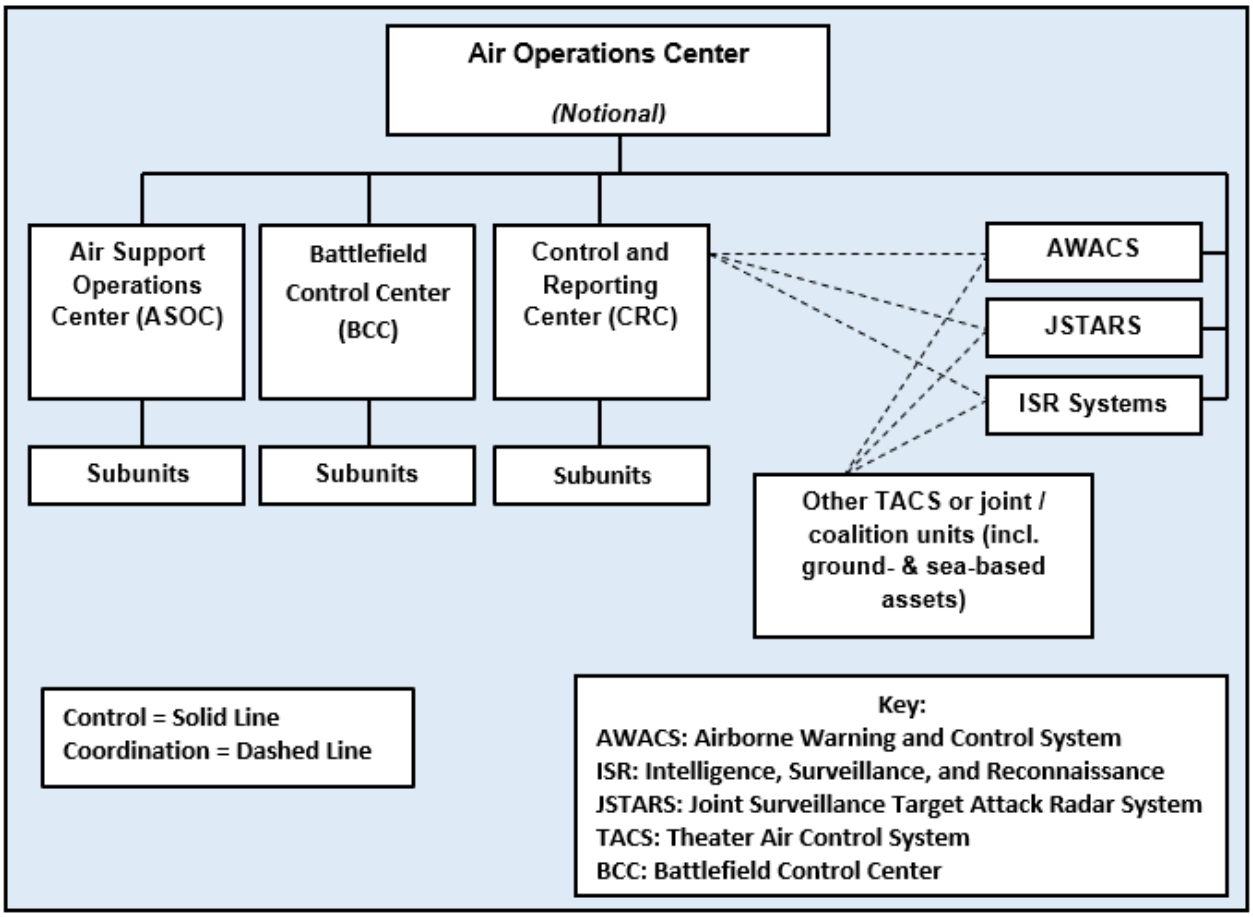
Control and reporting center. The CRC is the airspace control and surveillance radar facility directly subordinate to the AOC. The CRC may be assigned an airspace control sector by the ACA and manages the functions of all USAF surface radars deployed within that sector. The CRC's primary mission is to provide airspace management and airspace control, including aircraft detection, tracking, and ID. The CRC also issues scramble or

[14] For additional information on each TACS element, see AFDP 3-52; AFTTP 3-3.TACS and AFTTP 3-2.17*, MTTP for the Theater Air-Ground System.*

[15] Other service control systems include the Army air-ground system, the Navy tactical air control system, the Marine air command and control system, or the special operations air-ground system.

airborne orders, performs data link management functions, and manages AMD activities within its sector. Additionally, the CRC provides C2 liaison, mission control, CSAR support, aircraft threat warning, and coordinates ADA through a collocated ADA fire control officer. The CRC may further delegate control of surveillance areas to subordinate radar units or airborne warning and control system (AWACS) aircraft within its sector.

When assigned RADC or SADC roles, the CRC establishes operating procedures for initial assignment of airborne targets to ADA and fighters, ensuring defensive assets are employed in mutually supporting roles. The AADC may delegate engagement authority to the CRC as part of RADC or SADC responsibilities. In a CID-constrained environment, the CRC may be the lowest tactical level with engagement authority for enemy air and missile threats.



Notional Theater Air Control System

Air support operations center. As part of the TACS ground element, the ASOC is the functional air component responsible for planning, coordinating, controlling, and executing air operations that directly support ground combat forces. The ASOC can affect the counterair battle through coordination for SEAD missions, management of some airspace control measures, CAS, and others. The ASOC is usually collocated with the senior Army tactical echelon and coordinates operations with the permanently assigned tactical air control party, Army fires cell, and the AOC.

Battle control center. The battle control center (BCC) is a ground-based fixed element of the TACS, comprised of four major systems: a C2 processing and display system—Battle Control System-Fixed; primary and secondary radar capabilities; flight-plan processing and identification systems; and communication and data link connectivity. The BCC fuses all-source sensor and intelligence data into a common tactical picture and disseminates tactical warning and attack assessment information to the appropriate users and decision-makers. It can perform all tasks that facilitate the full spectrum of airpower including ATO execution, airspace management and integration, surveillance and CID, and data link management. The BCC can find, fix, track, and target airborne threats and exchange air picture data with other C2 systems and combat aircraft (to include aerospace control alert fighters on the ground in scramble status) through tactical data link (TDL) systems.

The USAF employs four BCCs as the primary tactical C2 nodes for homeland defense and defense support of civil authorities (DSCA) in support of the Commander, North American Aerospace Defense Command (NORAD) and US Northern Command (USNORTHCOM) and US Indo-Pacific Command (USINDOPACOM) Combatant Commanders (CCDRs). BCCs operate continuously to provide wide-area surveillance, early warning, battle management, target detection and tracking, and non-lethal warning and weapons control functions. In the event of lost connectivity, BCCs can operate autonomously and provide immediate mutual support and redundancy if another BCC becomes inoperative.

THEATER AIR CONTROL SYSTEM AIRBORNE ELEMENTS

Airborne Warning and Air Control System. The AWACS provides the TACS with a flexible and capable airborne radar platform. It provides battle management, C2, and is normally among the first systems to arrive in theater during contingency operations. Through voice and data connectivity, AWACS issues threat warnings, directs aircraft on counterair missions, manages air refueling, provides a common tactical picture, and coordinates CSAR efforts. AWACS can detect and identify hostile airborne and SAM threats and assign weapon systems to engage enemy targets.

AWACS may carry an airborne battle staff or airborne command element authorized to redirect forces under the authority of the JFACC and AADC. When employed with an airborne command element, AWACS can scramble and divert aircraft conducting counterair operations and recommend changes in AD warning conditions. The AWACS can perform many, but not all, CRC functions.

Joint Surveillance Target Attack Radar System. The Joint Surveillance Target Attack Radar System (JSTARS) is a long-range, airborne sensor system that provides real-time radar surveillance information on moving and stationary surface targets via secure data links to air and surface commanders. JSTARS information builds situational awareness for the JFC and JFACC to direct air operations, update target information, and provide real-time dynamic targeting. JSTARS can play an important role in the effort to gain control of the air. When combined with other intelligence, surveillance, and reconnaissance (ISR) sensors, JSTARS contributes to the commander's overall situational awareness by identifying and locating targets such as SAMs, launchers, radars, and

antiaircraft artillery sites. JSTARS provides updates on enemy force disposition and performs limited battle management functions, which may be important in managing the OCA effort.

CONTROL ELEMENT AUTHORITIES, ROLES, AND ORGANIZATIONAL ALIGNMENT

- **Common Control Authorities.** According to the nature of the operation and specific asset or organizational capabilities, the air component commander may delegate all or portions of ID, commit, engagement, and airspace control authorities to the CRC, AWACS, JSTARS, and BCC to dynamically execute commander's guidance and intent. These entities are not certified to perform ATC services.

  The BCC may be delegated data link control authority.

- **Common Roles and Alignment.** The CRC, AWACS, and JSTARS can accept delegated responsibility to execute missions and tasks for offensive and defensive air operations.

  The CRC and AWACS may be RADC or SADC responsibilities and are a key C2 element for DCA operations.

  The CRC, AWACS, JSTARS, and BCC are under the operational control of the air component commander and vertically integrated with the AOC. They may be employed alone or horizontally integrated with other C2 and surveillance and reconnaissance elements of the TAGS.

CHAPTER 3: COUNTERAIR PLANNING AND ASSESSMENT

Counterair planning is conducted using the joint planning process for air detailed in JP 3-30, *Joint Air Operations* and AFDP 3-0, *Operations and Planning.* During joint intelligence preparation of the operational environment (JIPOE), planners should determine the adversary's active and passive counterair capabilities, as well as their ability to contest control of the air. This, in turn, should inform JFACC and JFC decisions during mission analysis and course of action (COA) development.[16] Determining the desired and attainable level of control of the air necessary to achieve JFC objectives, along with the acceptable level of risk (ALR) for the effort, is one of the JFACC's top priorities, if not the highest. This guidance drives priorities for planning air operations. The JFACC should inform the JFC regarding the level of control that is realistic and achievable with provided capabilities and allocated assets.

Counterair planning should account for the capabilities of all Services, joint force components, interagency and multinational partners, and every instrument of national power that can be leveraged to achieve counterair objectives. Non-military instruments of national power can be critically important in certain circumstances, as when diplomatic efforts permit or deny basing or overflight rights.

OFFENSIVE COUNTERAIR PLANNING

The nature of airpower is such that offensive combat power can frequently be "massed" through effects rather than by massing forces. By applying an effects-based approach to operations (EBAO), a systematic view of the enemy is used to determine centers of gravity and associated critical vulnerabilities. Such targets are prioritized according to the ability for effects against them to generate synergy and cascade through second and third order effects across the entire system. OCA targets may include electrical infrastructure, key communications and C2 nodes, network infrastructure, national military leadership, and critical nodes within an enemy IADS. Attacks concentrated in time and space stand the greatest chance of causing systemic shock; similar to that in a human body wherein attacks at various points combine to overload the system and cause it to shut down. Improper planning risks spreading the OCA effort too thin. Doing so may cede the initiative and counteract airpower's strengths.[17]

Timely and accurate intelligence is key to determine the adversary's capabilities. Modern counterair capabilities—including US, North Atlantic Treaty Organization, Russian, and Chinese systems—have been proliferated worldwide. Even those nations that lack significant OCA capabilities are likely to maintain a significant, if not formidable IADS consisting of both active and passive defenses. IADS range from coordinated fire from small and medium caliber antiaircraft artillery, man-portable air defense systems (MANPADS) and small arms fires, up to complex, integrated, and highly redundant theater-level systems. In the case of the more complex IADS, employing parallel attacks

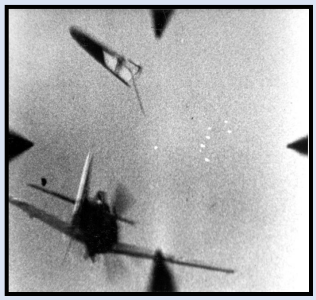
[16] For additional information on JIPOE, see Joint Guide, *Joint Intelligence Preparation of the Operational Environment.*

[17] For additional information on EBAO, Targeting, and parallel attacks, see AFDP 3-0, *Operations and Planning*, AFDP 3-60, *Targeting*, and AFDP 3-70, *Strategic Attack*.

against the larger enemy system will likely yield greater effects and may cause cascading failures within the IADS. However, significant threats to the OCA effort (aircraft, missiles, antiaircraft artillery, electromagnetic attack) may force the employment of sequential attacks (vice parallel) and necessitate substantial emphasis on neutralizing or disrupting them prior to striking other targets.

Offensive Counterair Example

To gain control of the air, friendly forces must counter enemy air and missile threats, not only to assure full force protection, but also to enable full flexibility to conduct parallel operations across the operational area. Airpower's flexibility may tempt commanders to divert it to other tasks; this must be guarded against. Control of the air is a prerequisite for subsequent theater operations. Relaxing pressure on the enemy's air forces may allow them to gain air superiority with disastrous results. For example, Hitler's decision during World War II to divert the Luftwaffe from direct attack on Royal Air Force (RAF) targets, to bombing cities instead, allowed the RAF to recover, reconstitute, and eventually win the Battle of Britain.



What the Luftwaffe failed to do was to destroy the fighter squadrons of the RAF, which were, indeed, stronger at the end of the battle than at the beginning.

-- Air Chief Marshal Sir Hugh C.T. Dowding Fighter Command, RAF

OBJECTIVES, DESIRED EFFECTS, AND CAPABILITIES

Objectives drive desired effects. Broadly, counterair operations aim to disrupt, degrade, or destroy enemy counterair capabilities. To achieve objectives, it may not be necessary to destroy a capability, but to degrade it temporarily instead. The latter may require less effort, thereby freeing assets for other missions. Though one method may be superior to another, there are likely numerous means to achieve a particular effect. When selecting the means to achieve a desired effect, planners and commanders should consider the full range of available assets and capabilities that conduct or contribute to OCA, along with the timing and tempo of operations, persistence of threats, and "opportunity costs" of using OCA assets for other purposes. This type of analysis may vary from one operation

to another but should provide effective target priorities and aid efficient use of assets. Consideration should be given to those most likely to generate second and third-order or cascading effects.

Against fixed, highly defended targets deep within enemy territory, employment of all-domain solutions (e.g., space, cyberspace, EW, information warfare, etc.) may achieve desired effects while minimizing risk to friendly forces. For instance, jamming communications and radars may achieve short term, localized suppression. Likewise, both kinetic and non-kinetic attacks against C2 nodes, communication channels, and networks used to integrate the enemy's AD system may force sites to operate independently, thereby reducing their effectiveness and threat to friendly forces.

TARGET PRIORITIZATION

In early operational phases, the number of OCA targets may likely exceed the capacity to engage them. Proper target prioritization is key to ensuring economy of force. The following considerations are important for determining OCA targeting priorities and methods:

- **Threat.** The threat posed by specific enemy capabilities (aircraft, missiles, etc.) includes an assessment of the urgency or the need to counter that threat. Systems capable of weapons of mass destruction delivery would normally merit prioritization over other immediate threats, such as a SAM site.

- **Direct effects**—the immediate, direct results of actions characterized by simple and clear cause and effect. Direct effects are typically physical and readily recognizable (e.g., weapon employment results). Planners should avoid a target servicing mindset. Targets should be chosen according to the potential for intended, direct effects against them to achieve desired objectives; whether directly or through intended, second and third-order effects.

- **Indirect effects**—second, third, or higher-order effects created through intermediate effects or causal linkages. 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 are typically more difficult to recognize and assess.

- **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 duration required of those effects, will influence the number and type of forces required.

- **Risk.** In determining the ALR, commanders consider the anticipated risk to friendly forces against expected gains from a given COA weighed against the cost of inaction

or failure. Different objectives and circumstances drive different acceptable levels of risk.

- **Measures and indicators.** Measures of effectiveness (MOE) and measures of performance (MOP) are essential components of assessment and must be planned for in advance.[18]

DETAILED PLANNING FOR OFFENSIVE COUNTERAIR

In early planning stages, the JFACC, along with the AOC's strategy and ISR divisions, determine objectives, desired effects, and relative priorities. Planners in the strategy, combat plans, and ISR divisions identify enemy systems, capabilities, and assets capable of contesting control of the air. Combat plans and combat operations personnel use this information to match desired effects to targets—provided by the ISR division—and create tactical tasks by matching targets to available assets and capabilities that can achieve those effects. To facilitate operations, a prioritized target list is developed before hostilities begin and continually updated based on current intelligence and progress of the operation.

- **On-call missions.** OCA operations are employed in a fast-moving, dynamically changing operational environment. Though many targets may be known and planned in advance, planners should establish procedures to handle real-time mission re-tasking enabling commanders to rapidly re-task OCA missions to attack time-sensitive targets and similar fleeting, emerging, or higher-priority OCA targets. A frequently used best practice is to task on-call aircraft. Armed appropriately, aircraft sit in alert status on the ground or loiter while airborne awaiting the call to strike a target. If no call comes, they may proceed to strike pre-planned OCA (or other) targets.

Offensive counterair mission planning. Attacks on fixed, highly defended targets, deep within enemy territory, require detailed, accurate, and timely intelligence, detailed and accurate target analysis, effective deconfliction of mission timing, and thorough awareness of enemy active and passive defenses. The following considerations are important for OCA planning at the AOC and unit mission planning levels.[19]

- **Enemy threat, location, and capabilities.** Highly detailed and accurate intelligence on regarding enemy threats is necessary to properly plan, position, and sequence (timing) OCA missions.

- **Friendly command and control capabilities.** Theater C2 assets such as AWACS and JSTARS, are tasked by numerous units and agencies. As such, OCA planners should verify the availability of C2 capabilities for each OCA mission.

- **ROE and SPINS.** These directives are authoritative and may critically affect how missions are performed. All levels, from the JFACC down to individual aircrews,

[18] For additional information on MOE and MOP, see JP 2-0, *Joint Intelligence* and AFDP 3-0.
[19] For more information on integrated planning considerations, see AFTTP 3-3.IPE, *Combat Aircraft Fundamentals—IPE*.

should understand the ROE that apply to the accomplishment of their missions and include both the ROE and SPINS in mission planning.

- **Weaponeering.** Effective target and weapon pairing is critical to achieve desired effects.

- **Deconfliction.** Airspace, mission routing, effects, timing, and numerous other aspects of OCA execution require deconfliction. The theater SPINS, ATO, ACO, and other operational guidance provide the primary means for doing so. However, deconfliction equally applies to individual missions and force packages. Thorough planning is key. However, procedures and C2 structures and mechanisms should be established to enable real-time deconfliction of all planned missions, including space, cyberspace, and information warfare.

- **Environmental conditions.** Environmental conditions and weather can limit sensor or seeker sensitivity, limiting available munitions. Likewise, varying terrain can be a challenge to pilots or offer refuge to an adversary. Terrain will often limit munitions selection. Adverse environmental factors may increase the weight of effort required to achieve OCA objectives. Planners should address the need for sufficient counterair assets to offset the loss of capability and desired effects due to environmental factors.

- **Distance, timing, and refueling.** Counterair assets typically require refueling support for sustained presence. Refueling coordination requires constant management by planners.[20]

DEFENSIVE COUNTERAIR PLANNING

Planning considerations for OCA apply equally to DCA. Generally, there will be insufficient DCA capabilities to defend all forces in theater. DCA planning typically begins by prioritizing which assets and capabilities to defend. To ensure available DCA is focused where needed most, the JFC directs establishment of a critical asset list (CAL) and a defended asset list (DAL).[21] This task is performed within the JFC's staff and relies on inputs from all components. The CAL is forwarded to the AADC, who then allocates available AMD capabilities to defend the prioritized assets listed as required. Planners then match available forces against threats to ensure assets on the CAL are defended. Mission-critical assets and capabilities requiring protection will vary from operation to operation and from phase to phase within a single operation. JFC and air component staffs continually evaluate the CAL and will shift the DCA effort as required to ensure DCA efforts are allocated and focused where needed.

ACTIVE AIR AND MISSILE DEFENSE

Effective AMD requires the integrated employment of air-to-air and surface-to-air defensive systems, supported by multi-domain detection, tracking and warning capabilities, to detect, identify, engage, and defeat enemy attacks from the air. Planners should keep in

[20] For additional information on refueling considerations, see AFDP 3-36, *Air Mobility Operations*.
[21] For additional information on critical and defended asset lists, see JP 3-01 and AFTTP 3-2.31.

mind the complexities of airspace control in a DCA environment. DCA engagements may occur inside friendly airspace, requiring deconfliction between friendly assets, such as fighters and SAMs. Airspace control in an active AMD environment is extremely difficult and further complicated by the proliferation of unmanned aerial systems (UAS). A rapid, reliable, and secure means of ID is critical. Continuous surveillance and reporting of real time and near real time target track data is required.

Thorough and detailed DCA planning is critical to ensure the establishment of procedures, C2 structures, and communication methods for air surveillance and track ID. To maximize engagement opportunities and optimize DCA employment, discrimination of friend from foe should be rapid and early. All-source sensor data (ground-, air-, sea-, and space-based sensors) should be fused into an accurate, accessible common tactical picture. Track data should provide sufficient detail to accurately evaluate the track and designate the appropriate AMD asset to engage it. This information should be disseminated as rapidly as possible via datalink, voice, and text as applicable.

To prevent friendly fire, great caution should be exercised when employing autonomous CID in DCA operations. If no IADS is established, procedural means should be established to permit the safe passage of friendly aircraft while still allowing for the use of available AMD weapons. Since many AMD assets are owned by different services and coalition partners, standardized integration, coordination, and airspace control procedures are required to enable or enhance the capabilities of the various systems.

An emerging threat to airbase operations arises from the proliferation of low, slow, and small UAS. These UAS pose a unique challenge to conventional DCA capabilities. As capabilities are developed to counter this threat, integration with existing DCA C2 systems must be a priority. Countering this threat is a shared responsibility between DCA operations and airbase defense.[22]

PASSIVE AIR AND MISSILE DEFENSE

Passive AMD is similar for air and ballistic missile threats, except for their respective detection and warning times. Passive AMD measures are designed to provide protection for friendly forces and assets by complicating the enemy's identification, surveillance, and targeting processes and by countering the enemy's planned effects. The first step of passive AMD is to hide valuable assets from the enemy or to encourage the enemy to attack decoys. Like active AMD, thorough passive AMD should include layered defense in depth. Passive measures can work concurrently to achieve this goal. Measures to reduce enemy targeting effectiveness include mobility; deception; EW; camouflage, concealment, and deception; hardening; reconstitution; dispersal; and electronic and infrared countermeasures.

Per JP 3-01, there are four principal considerations for planning passive AMD:

- **Detection and Warning Systems and Procedures.** Timely detection and warning of air and missile threats provide reaction time for friendly forces to seek shelter or take appropriate action. Reliable and redundant connectivity for communications and sen-

[22] For additional information on countering UAS threats, see AFTTP 3-2.31.

sor systems is vital for accurate and timely warning. To be effective, warning methods and procedures should be established, disseminated, and rehearsed down to the unit level.

- **Reduction of Enemy Targeting Effectiveness.** Certain measures can be taken to reduce the effectiveness of enemy targeting and attacks, to include mobility, deception, EW, and operations security.
- **Reducing Vulnerability.** Four measures that may enable friendly assets to survive enemy attacks by reducing their vulnerability are hardening, redundancy, dispersal, and CBRN defense.
- **Recovery and Reconstitution.** Following an air or missile attack, prior planning should aid the restoration of units to a desired level of combat effectiveness commensurate with mission requirements and available resources.

COUNTERAIR SUPPORT PLANNING

AIR REFUELING

Air refueling is an essential enabler of counterair operations. Many air assets that perform the counterair mission have relatively short on-station times or operate from bases far removed from their intended targets. These assets rely on air refueling to extend range, on-station time, tactical flexibility, and persistence. Fuel planning is determined by receiver requirements, tanker fuel capacity, and types of refueling booms or refueling drogues available. Planners must appropriately match refueling aircraft configurations to USAF, Navy, Marine, or coalition forces capabilities. Strategists and planners should build needed refueling support into the air component's planning products.

Advanced adversary capabilities may require refueling aircraft to operate in airspace contested by land, maritime, and air threats. This airspace is determined by the needs of the receiver aircraft, enemy threat capabilities, risk analysis and ALR, and political boundary consideration.

Refueling coordination requires constant management during both planning and execution. The deliberate nature of OCA allows for more predictable fuel planning but requires more tankers to provide fuel simultaneously prior to an OCA push. Refueling support to DCA operations may require fewer tankers but fuel planning and execution may be more dynamic. Complete refueling planning goes beyond fuel and compatibility requirements and must include: a robust C2 plan, sufficient battlespace situational awareness, expedient threat notification, and detailed retrograde planning.[23]

INTELLIGENCE, SURVEILLANCE, AND RECONNAISSANCE

Effective counterair operations planning and execution require timely, reliable, and accurate ISR from air-, land-, and space-based sensors that contribute to warning, situational awareness, targeting, and assessment. Though ISR consists of separate

[23] For additional information on air refueling, see AFDP 3-36.

elements, it should be addressed wholistically to provide optimized support to counterair operations throughout each phase of the targeting cycle. Timely target detection, development, geolocation, weapon selection, mission planning, and assessment all depend on integrated collection and analysis. Planning for ISR is a complex, multi-part process. Advance, detailed ISR planning ensures its ability to support operations. **Effective integration of ISR assets is often as crucial to successful counterair operations as are traditional lethal effects.**

Intelligence mission data. Well-defined intelligence mission data (IMD) is necessary to mitigate risks to friendly forces posed by enemy air and missile threats. Robust IMD planning includes the development, production, and sharing of information including, but not limited to signatures, EW-integrated reprogramming, order of battle, and system characteristics and performance. ISR may also provide important indications concerning how an adversary may use their own counterair capability. Strategy division targeteers use ISR products, to include target system analysis (TSA) products, to continuously update TSA assessment and to develop objectives, tasks, and MOE that form the foundation of combat assessment. Likewise, targeteers also provide combat assessment inputs (contributing to battle damage assessment, munitions effectiveness, and mission assessment), feeding the ATO cycle.[24]

COUNTERAIR ASSESSMENT

Planning and assessment are two sides of the same coin. Effective assessment depends on thorough planning. Once in execution, planning hinges on the ability to accurately assess the progress of operations. Assessment evaluates requirements for future action by addressing two questions: “Are we doing things right?” and “Are we doing the right things?”

OCA and DCA performance may be measured separately or combined depending on the course of action selected. In many cases, desired effects for control of the air are applicable to both DCA and OCA. For example, OCA efforts to shut down enemy sortie production can have a positive impact on the DCA effort since fewer enemy aircraft will be available to challenge friendly air defenses. Conversely, successful enemy air attacks on friendly airfields (due to unsuccessful DCA efforts) will have a negative impact on friendly sortie generation—affecting both DCA and OCA.

ALIGNMENT OF TASKS, EFFECTS, AND OBJECTIVES

Tasks are designed to create effects, and desired effects lead to the achievement of objectives. Selected indicators should align with that flow—from cause, to effect, towards the purpose. Effective assessment should generate as many questions as answers. By measuring friendly actions (tasks) and changes in the enemy system (effects) separately, critical review of actions and effects becomes possible, providing the clearest picture of progress towards achieving the objective. Planners should consider, “Why are my actions not producing results?”, “Why is the enemy behaving in this manner?”, and “What

[24] For additional information on ISR systems and requirements, see AFDP 2-0, *Intelligence*.

changes should be made to the plan – and why?" When the levels of performance in task, effect, and objective do *not* align, it may have a profound effect on future actions in the OCA or DCA effort.

For example, OCA missions may be tasked to destroy enemy runways, aiming to degrade the enemy's sortie generation capabilities. Though they may successfully achieve the intended, direct effects, if the enemy remains capable of generating sorties, then the OCA plan should be re-evaluated—How is the enemy continuing to generate sorties? Are they rapidly repairing the runways? Have they relocated to other airfields or highway strips? Perhaps airfield runways are not critical vulnerabilities after all. Targeting other capabilities, such as fuel or munitions storage, may yield better results.

INDICATORS, MEASURES OF PERFORMANCE, AND MEASURES OF EFFECTIVENESS

Assessing the degree of friendly control of the air is challenging. Similarly, the inherent characteristics of airpower—speed, range, and flexibility—apply to enemy air and missile threats as well, making assessment of adversary actions and intent more difficult. However, assessment should be guided by counterair objectives—ensuring freedom to maneuver, freedom to attack, and freedom from attack. Counterair tasks and desired effects should be logically tied to these three items. For effective assessment, indicators should be developed *at the same time* as the objectives, effects, and tasks they measure—not after the fact. Indicators should be either directly observable or be reliably inferred from other data.

Quantitative and qualitative indicators should be identified during planning according to the nature of tasks and desired effects. Planners should choose criteria that describe or establish when actions have been accomplished, desired effects have been created, and objectives have been achieved. Indicators are generally classified as either MOP or MOE.

- **Measures of performance.** MOPs are objective or quantitative measures used to assess task accomplishment. At the tactical level, MOPs are generally related to weapons effects on individual targets. Operational level tasks and MOPs are typically broader and system-based (e.g., the number of SAM sites neutralized versus number of SAM sites operational).

- **Measures of effectiveness.** MOEs are quantitative or qualitative measures used to evaluate progress of operations toward achieving objectives. MOEs help answer the question, "Are we generating the effects necessary to meet objectives?"

At the tactical level, MOPs feed combat assessment: Was the mission flown? Were weapons released as intended? Did they create the desired effect? Within the AOC, the ISR division's analysis, correlation, and fusion cell uses tactical data to determine the status of enemy air systems (operational status of airfields, enemy sorties flown, and SAM sites destroyed) and feeds the data to the strategy division's operational assessment team. Operational level tasks (e.g., neutralize enemy SAM systems) are also measured by MOPs and provide a big-picture report to the JFACC on task performance.

CHAPTER 4: EXECUTION CONSIDERATIONS

During the ongoing battle rhythm, weapon systems are matched to specific targets or missions based on their ability to achieve desired effects. There are numerous systems and capabilities available to conduct counterair missions. Each may be more or less capable than the next for a given mission or task. Similarly, employment methods may differ between OCA and DCA. Matching capable assets with intended tasks is critical to overall mission success.

OFFENSIVE COUNTERAIR

OFFENSIVE COUNTERAIR CAPABILITIES

The following are some of the resources and capabilities used to conduct OCA:

- **Aircraft.** Fighter, bomber, and attack aircraft provide the bulk of the weapon systems for OCA operations. Other types of aircraft and weapon systems are often critical enablers of counterair operations. Remotely piloted aircraft (RPA) may be used in counterair operations to provide ISR; communication relay; deception; jamming; harassment; or destruction of enemy forces and air defense systems when the situation permits.

- **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. These weapon systems may eliminate or reduce the risk of harm to friendly forces by destroying enemy systems in the air and on the ground.

- **Missile warning sensors.** A combination of air-, space-, and ground-based sensors may be used to provide missile launch detection and missile tracking functions. These systems provide tactical missile warning and attack assessment information to operational command centers.

- **Space operations.** Space provides several capabilities to support counterair operations. Planners should work closely with their space contacts at the AOC and US Space Command (USSPACECOM) to ensure effects are incorporated into the overall planning scheme. Considerations include enhanced position, navigation, and timing (PNT); Global Positioning System (GPS) product charts; electro-magnetic interference (EMI) detection and mitigation; space EW; missile warning; space weather; commercial satellite support, etc.

- **Special operations forces.** Special operations forces (SOF) can conduct direct action missions, special reconnaissance, and terminal guidance for attacks against valuable enemy targets. Planners in the AOC coordinate with the special operations liaison element (SOLE) to coordinate the use of special operations assets in support of counterair missions. Planners should coordinate with the SOLE to ensure OCA operations are deconflicted with SOF operations and activities.

- **Surface fire support.** Artillery and naval surface fire support may be employed in OCA operations. AOC planners should coordinate the use of these fires with the Army and Navy liaison elements early in the planning process.
- **Command and control systems.** C2 systems enhance OCA operations by providing early warning, intelligence, ID, and targeting data, as well as C2 of friendly forces.
- **Electronic warfare assets.** EW assets are frequently used to suppress enemy C2, IADS, and other significant military use of the electromagnetic spectrum.[25]
- **Cyberspace operations.** Cyberspace operations can enhance counterair operations and may reduce the demand for sorties. Offensive cyberspace operations (OCO) may be employed to target enemy C2 nodes, communications and network infrastructure, theater missiles and support infrastructure, IADS, and airfields or operating bases. To employ cyberspace operations, planners should address required authorities, ROE, availability of access, and time available to generate a desired effect.[26]
- **ISR systems.** ISR systems and resources provide intelligence, surveillance, reconnaissance, deception, and other effects against enemy forces and air defense systems. These activities include the use of air, space, cyberspace, and ground assets.
- **Land forces.** The ability to destroy, damage, secure, and occupy key OCA targets (such as SAM sites) can achieve vital counterair effects. Though the bulk of OCA operations are likely to occur before major ground operations, land forces should still be considered when their use is an option.

OFFENSIVE COUNTERAIR TARGETS

OCA targets are those that directly or indirectly challenge control of the air. OCA concentrates on degrading these capabilities as close to their source as possible. The following are representative OCA targets, and do not reflect the full array for OCA employment:

- **Aircraft.** This category includes enemy fixed-wing, rotary-wing, and UA. Enemy aircraft may be targeted while airborne or on the ground but are most vulnerable while on the ground. Precision weapons with penetration capabilities, combined with timely intelligence, may be required to counter enemy passive AMD, such as hardened shelters.
- **Airfields and operating bases.** Damaging runways or taxiways may prevent use of an airfield for short periods. Destruction of support facilities—hangars, shelters, maintenance facilities, and fuels—may degrade the enemy's ability to generate aircraft sorties over a longer period.

[25] For additional information on aspects of EW, see AFDP 3-51, *Electromagnetic Warfare and Electromagnetic Spectrum Operations*.
[26] For additional information on OCO, see AFDP 3-12, *Cyberspace Operations*.

- **Air defense systems.** Disruption or destruction of enemy IADS and the personnel who control, maintain, and operate them may render those systems ineffective against friendly forces.
- **Command and control systems.** C2 systems are critical to the effective employment of forces and integration of IADS and should be given a high priority during OCA targeting. The integral C2 components of an IADS includes intelligence-gathering, warning, and control systems (ground-controlled intercept, early warning, acquisition, and other sensors), and associated support facilities. Destruction or nonlethal disruption of such systems may substantially reduce the enemy's ability to detect and respond to attacks.
- **Electromagnetic warfare capabilities.** Early and persistent efforts should be aimed at defeating enemy EW capabilities that could otherwise create devastating effects on friendly systems.
- **Missiles and support infrastructure.** Destruction of ballistic, surface- and air-to-surface, and cruise missiles along with launch platforms, support facilities, and infrastructure greatly limits effective enemy missile attacks. OCA operations seek to destroy or disable these missiles pre-launch due to the increased resources required to engage them post-launch.

DEFENSIVE COUNTERAIR

DEFENSIVE COUNTERAIR CAPABILITIES

Layering mutually supporting defensive capabilities helps absorb and progressively weaken enemy attacks. The following are some of the resources and capabilities used to conduct DCA:

- **Fighter aircraft.** Fighter aircraft use combat air patrols, and may be positioned well ahead of forces being protected, to ensure rapid reaction to enemy attacks. Employed in this manner, fighters intercept and destroy hostile aircraft and/or missiles before they can reach their intended targets.
- **HVAA.** These aircraft provide unique capabilities such as surveillance, early warning, and electromagnetic attack. Importantly, airborne national assets are generally considered so important that the loss of even one could seriously impact United States warfighting capabilities or provide the enemy with significant propaganda value.
- **Surface-to-air weapons.** The bulk, if not all, joint surface-to-air capabilities are employed by other services. These systems include missiles (e.g., Patriot, Terminal High Altitude Air Defense [THAAD], or the Aegis BMD System), artillery (e.g., Phalanx or Counter-Rocket, Artillery, and Mortar [C-RAM] system), and MANPADS (e.g., Stinger). These systems provide theater, sector, area, and point defense to defend critical fixed sites, C2 nodes, and airfields as well as mobile naval surface forces and land component maneuver units.

ACTIVE AIR AND MISSILE DEFENSE MISSIONS

Units employed to create AMD effects usually have decentralized execution authority and the necessary latitude to conduct detailed planning and coordination of assigned DCA tasks. The following types of missions are most closely associated with active AMD:

- **Area Defense.** Area defense missions are conducted for the defense of a broad area. There can be more localized applications of area defense when friendly assets are dispersed over a large geographical area with defined threat boundaries.
- **Point Defense.** Point defense missions are conducted for the protection of a limited area, normally in defense of friendly forces and installations.
- **Self-Defense.** Self-defense is conducted by friendly forces to defend themselves against direct attack or threat of attack using organic weapons and systems. Inherent to all ROE and weapon control procedures is the right of self-defense. Importantly, employment in **self-defense may or may not extend to defense of others**. Such instructions are normally detailed in SPINS and other authoritative guidance.
- **HVAA Protection.** Fighter aircraft, surface, and naval fires may be employed to protect airborne HVAA assets.

PASSIVE AIR AND MISSILE DEFENSE

Passive AMD entails the following types of actions:

- **Detection and warning systems.** Timelines for detection and warning of enemy missile attacks are generally compressed. Timely detection and warning provides maximum reaction time for friendly forces to seek shelter or take other appropriate actions.
- **CBRN defensive elements.** CBRN defensive elements are made up of contamination avoidance, protection, and contamination control. Contamination avoidance measures include covering critical assets, remaining inside facilities during attacks, detecting and identifying contaminated areas, and avoiding those areas. Protection includes such things as collective protection facilities and individual protective equipment. Contamination control is standard disease prevention and control measures, contaminated waste management, and decontamination procedures.[27]
- **Camouflage, concealment, and deception.** Visual signature reduction measures "hide" or deny accuracy in locating friendly forces, systems, and capabilities. These measures may be conducted continuously or in response to specific warnings and may be coupled with deception measures to further complicate enemy attacks.

[27] For additional information on CBRN defense, see AFDP 3-40, *Counter-Weapons of Mass Destruction Operations*.

- **Emission Control/Communications Security.** Communications security and an emission control program for infrared, electromagnetic, and acoustic signature reduction can deny or hinder the enemy's ability to acquire and ID friendly target systems.
- **Hardening.** Valuable assets and their shelters are hardened to protect against hostile attacks: physical, electromagnetic pulse, and transient radiation. Hardening actions are usually accomplished during peacetime but may continue throughout operations.
- **Reconstitution.** This capability provides for the rapid repair of damage resulting from enemy attacks and the return of damaged units to a desired level of combat readiness. Reconstitution includes the ability to repair valuable assets such as airfields, communications, warning and surveillance systems, and to restore essential services such as power, water, and fuel.
- **Dispersion.** Dispersion complicates the enemy's ability to locate and target friendly assets. Combined with mobility and deception, dispersion increases uncertainty as to whether a location is occupied or will remain occupied. It forces the enemy to search more locations, requiring more resources and time.
- **Redundancy.** Duplication of critical capabilities keeps vital systems functioning even when critical nodes are destroyed or damaged. Redundancy includes dual, contingency, or back-up capabilities that can assume primary mission functions, in whole or in part, when the primary system is degraded or fails.
- **Mobility.** Mobility is the capability to move from one location to another and is facilitated by keeping a small footprint. Frequent movement of units, inside the enemy's decision cycle, can be of critical importance. Mobility reduces vulnerability and increases survivability of friendly assets by complicating enemy surveillance, reconnaissance, and targeting.[28]

[28] For additional information on dispersion and mobility, see AFDN 1-21, *Agile Combat Employment*.

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All websites accessed 05 April 2023.

Doctrine can be accessed through links provided at: https://www.doctrine.af.mil/

US AIR FORCE DOCTRINE: https://www.doctrine.af.mil/

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- AFDP 3-30, *Command and Control*
- AFDP 3-36, *Air Mobility Operations*
- AFDP 3-40, *Counter Weapons of Mass Destruction Operations*
- AFDP 3-51, *Electromagnetic Warfare and Electromagnetic Spectrum Operations*
- AFDP 3-52, *Airspace Control*
- AFDP 3-60, *Targeting*
- AFDP 3-70, *Strategic Attack*
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Joint Electronic Library (JEL): https://www.jcs.mil/Doctrine/

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