Command and Control

Air Force Doctrine Document 2–8
16 February 2001

This document complements related discussion found in Joint Publications 0–2, *Unified Action Armed Forces (UNAAF);* JP 3–30 (formerly JP 3–56.1), *Command and Control for Joint Air Operations;* and JP 6–0, *Doctrine for Command, Control, Communications, and Computer (C4) Systems Support to Joint Operations.*

BY ORDER OF THE
SECRETARY OF THE AIR FORCE

AIR FORCE DOCTRINE DOCUMENT 2–8
16 FEBRUARY 2001

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FOREWORD

Command and control (C2) operations represent the execution direction of the commander's warfighting intent. Leveraging the strength gained from air, space, and information operations demands responsive and robust command and control. With it we have decision dominance and without it we risk being out-maneuvered and potentially ineffective.

Effective C2 is central to delivering Air Force capability to the joint team. Increasingly, airmen are called upon to contribute their perspective, broad insight, and a distinct understanding of the global environment, theater battlespace, operational strategies, and tactical employment necessary to support joint force commanders. *It allows our forces to control what moves through air and space; engage adversary targets anywhere, anytime; control and exploit information to our nation's advantage; deliver desirable effects with acceptable risk and minimal collateral damage; rapidly position forces anywhere in the world; and sustain flexible and effective combat operations.* Understanding the contents of Air Force Doctrine Document 2-8, *Command and Control,* will assist airmen in planning and executing effective aerospace operations.

The seamless integration of air, space, and information operations is only feasible through well-planned and executed command and control. **Airmen must seize and maintain the initiative made possible by our nation's being a global aerospace power. Take time to read our doctrine, understand it, and use it—this is important.**

MICHAEL E. RYAN
General, USAF
Chief of Staff

16 February 2001

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INTRODUCTION

He who has the capability to control the forces, the battlespace, and the effects must inevitably command.

Michael E. Ryan, General, USAF Chief of Staff

PURPOSE

Air Force Doctrine Document (AFDD) 2-8, *Command and Control,* was prepared under the direction of the Chief of Staff of the Air Force (CSAF). It establishes doctrinal guidance for organizing and employing air, space, and informational capabilities at the operational level of conflict across the full range of military operations to produce the desired effects regardless of where the platforms reside, fly, or orbit. This integration provides the synergy needed for decision dominance. It is the essence of our nation's asymmetric advantage. Together, the keystone publications collectively form the foundation from which commanders plan and execute assigned aerospace missions.

APPLICATION

This AFDD applies to all Air Force military and civilian personnel (includes Air Force Reserve Command [AFRC] and Air National Guard [ANG] units and members). The doctrine in this document is authoritative but not directive. It provides guidance on how command and control is used to conduct aerospace operations in peace and war. Commanders should consider both the circumstances of the particular mission along with the contents of this doctrine document before making decisions.

SCOPE

The US Air Force provides aerospace forces that are used across the full range of military operations at the strategic, operational, and tactical levels and across the spectrum of engagement. **AFDD 2-8 discusses the principles and tenets of US Air Force command and control that are essential to planning and executing missions assigned by senior commanders.** More detailed guidance can be found in Air Force Tactics, Techniques, and Procedures (TTPs) documents and US Air Force Instructions (AFIs).

CHAPTER ONE

FOUNDATIONS OF COMMAND AND CONTROL FOR AEROSPACE OPERATIONS

The war in the air is the true war of movement, in which swift intuition, swifter decision, and still swifter execution are needed. It is the kind of warfare in which the outcome will be largely dependent upon the commander.

Giulio Douhet
The Command of the Air

Early twentieth century aerospace pioneers recognized that air warfare requires an intuitive and fast decision cycle. The Clausewitz concept of the "genius of the commanders" can be separated into human and operational aspects. This document details the operational aspects of command and control. AFDD 1-3, *Leadership* covers the human aspects. **The theme of this document is that command and control is an essential and integral part of warfighting that requires careful planning and execution to be effective.**

COMMAND AND CONTROL DEFINED

Understanding command and control (C2) requires examining the definition found in Joint Publication (JP) 1-02, *DOD Dictionary of Military and Associated Terms*:

> **Command and control is the exercise of authority and direction by a properly designated commander over assigned and attached forces in the accomplishment of the mission. Command and control functions are performed through an arrangement of personnel, equipment, communications, facilities, and procedures employed by a commander in planning, directing, coordinating, and controlling forces and operations in the accomplishment of the mission. Also called C2.**

This definition acknowledges **three predominant categories** by using the words "personnel, equipment, communications, facilities, and procedures." *The first category is personnel, which covers the human aspects of command and control. The second category is the technology element, which covers the equipment, communications, and facilities needed to overcome the war-fighting problems of integrating actions across space and time.* Technology elements tend to dominate command and control doctrine, because high technology characterizes American warfare. *The third category, labeled in this document as "processes," encompasses "procedures."* This AFDD extracts doctrine concepts from generalized command and control processes. The details of command and control processes and associated procedures are found in tactics, techniques, and procedures documents and other instructional publications. Personnel, technology, and processes must all come together to efficiently execute command and control functions.

COMMAND DEFINED

The definition of command is found in JP 1-02.

> **The authority that a commander in the Armed Forces lawfully exercises over subordinates by virtue of rank or assignment. Command includes the authority and responsibility for effectively using available resources and for planning the employment of, organizing, directing, coordinating, and controlling military forces for the accomplishment of assigned missions. It also includes responsibility for health, welfare, morale, and discipline of assigned personnel. [The Air Force also believes that force protection of personnel is the responsibility of its commanders. Today's full spectrum employment of aerospace forces requires command responsibility to also include force protection.]**

Although commanders may delegate authority to accomplish the mission, they cannot delegate the responsibility for the attainment of mission objectives. The various levels of authorities used by commanders include four command relationships (COCOM, OPCON, TACON, and Support) and three "other authorities" (ADCON, coordinating authority, and direct liaison authorized [DIRLAUTH]). A Service component commander, such as the Commander, Air Force Forces (COMAFFOR), normally has operational and administrative responsibilities and should have the proper levels of authority to

accomplish the mission. It is important to note that airmen command aerospace power, not just monitor an air tasking order. The command of aerospace power requires a keen understanding of the joint force commander's intent.

CONTROL DEFINED

Control as defined in JP 1-02 **is the process by which commanders plan and guide operations.**

The control process occurs before and during the operation. Control involves dynamic balances between commanders directing operations and allowing subordinates freedom of action. These processes require strong leadership and assessment/evaluation of follow-up actions. Often time and distance factors limit the direct control of subordinates. *Commanders should rely on delegation of authorities and "commander's intent" as methods to control forces. The commander's intent should specify the goals, priorities, acceptable risks, and limits of the operation.*

COMMAND AND CONTROL PRINCIPLES AND TENETS

Principles and tenets guide C2 operations just as in other aerospace operations. **Unity of command is a principle of C2 operations, which, in turn, assures unity of effort and is supported by the tenet of centralized control and decentralized execution. Another enduring tenet of C2 operations is informed decision making. Informed and timely decision making is the essence of decision dominance.** When the right information is flowing horizontally and vertically in a timely manner, the commander is able to fuse together the needed information to make the best possible decision—thus gaining and maintaining decision dominance. *The commander will never have all the information desired. Accepting and taking reasonable risks to achieve mission success is the norm in warfare—efficient and effective C2 minimizes that risk.*

Unity of Command

According to AFDD 1, *Air Force Basic Doctrine,* **"Unity of command ensures the concentration of effort for every objective under one responsible commander. This principle emphasizes that all efforts should be directed and coordinated toward a common objective."** *For example, the joint force air component commander (JFACC) should also be the area air defense commander (AADC) and the airspace control*

authority (ACA). For example, the JFACC normally functions as the supported commander for counterair operations, encompassing both the offensive and defensive counterair (DCA). Likewise, AADC responsibilities encompass DCA. A single airman responsible for unifying all air-related functions does more than allow deconfliction; it allows integration. Commanders are empowered by several command authorities to ensure unity of command. JP 0-2, *Unified Action Armed Forces (UNAAF),* covers the **four command authorities that are also command relationships—combatant command (command authority (COCOM)), operational control (OPCON), tactical control (TACON), and support.** A detailed discussion on these command authorities is found in AFDD 2, *Organization and Employment of Aerospace Power.*

The support command relationship warrants particular attention because, according to the UNAAF, it is a "somewhat vague, but very flexible arrangement." Modern information technology systems afford aerospace commanders with vastly improved information resources that improve situational awareness and help reduce forward-deployed footprints. The same information resources have an inherent capability to provide undue rear area influence in the engaged commander's C2 process. In light of this development, it is critical that supported/supporting relationships are clearly understood by commanders and their staffs.

Other UNAAF-covered command authorities critical to C2 operations are administrative control (ADCON), coordinating authority, and direct liaison authorized (DIRLAUTH). **Commanders must thoroughly understand command authorities and the concept of command relationships, as this area could well be a source of confusion.**

Some commanders may fulfill their responsibilities by personally directing units to engage in missions or tasks. However, as the breadth of command expands to include the full spectrum of operations, aerospace commanders are normally precluded from doing so. Thus, C2 operations normally include the assignment of responsibilities and the delegation of authorities between superior and subordinate commanders. A reluctance to delegate decisions to subordinate commanders slows down C2 operations and takes away the subordinate's initiative. **Senior commanders should provide the desired end-state, desired effects, rules of engagement, and required feedback on the progress of the operation without actually directing the tactical operations.**

As Supreme Allied Commander in Europe, General Eisenhower invoked new doctrine by insisting upon a single air commander reporting directly to him. The Allied campaign in North Africa during World War II began with airpower parceled out to various commanders, including ground commanders. The limitations of this arrangement quickly became apparent, particularly during the battle at Kasserine Pass. During the 1943 Casablanca Conference, Roosevelt and Churchill approved a new command structure that centralized control under an airman. This new concept quickly found its way into Army doctrine: "Control of available airpower must be centralized and command must be exercised through the air force commander if this inherent flexibility and ability to deliver a decisive blow are to be fully exploited."

***Parameters*, Summer 94**

Centralized Control and Decentralized Execution

Centralized control and decentralized execution provide commanders the ability to exploit the speed, flexibility, and versatility of global aerospace power. The unique vigilance, reach, and global power abilities of aerospace power to maneuver, to achieve strategic and theater effects, and to complement joint operations are inherently dependent on centralized control by an airman.

The fundamental concept of a functional component commander, as described in the UNAAF, embodies the Air Force's commitment to the tenet of centralized control of aerospace power. AFDD 2, *Organization and Employment of Aerospace Power* describes the joint air operations center (JAOC) where centralized planning, directing, controlling, and coordinating take place. A balance exists between too much and too little centralized control. Overcontrolling aerospace power robs it of flexibility, taking away initiative from operators. Undercontrolling aerospace power fails to capitalize on joint force integration and orchestration, thus reducing its effectiveness.

Centralized control of aerospace forces levies a major requirement on US Air Force C2 operations. *This requirement is to establish and maintain two-way information flow among commanders, operators, and combat support elements that must be effectively integrated to achieve the desired combat effects.* Using timely and available information, commanders make and communicate decisions. A good example is the air tasking order (ATO); it embodies command decisions that must be communicated to the operators.

The two-way information flow between commanders and operators is often depicted as a vertical or "up-and-down" flow. Commanders rely on vertical information flow to produce a common tactical picture of the battle. Senior commanders, like the JFC, may subsequently use several common tactical pictures to produce a common operational picture of the theater. **Vertical information flow is fundamental to centralized control.** Vertical flow is important for direction and feedback. Without this flow, commanders cannot give meaningful feedback when controlling operations.

Another type of information flow is horizontal or "peer-to-peer" communication, which normally occurs between operators and among combat support elements. **Horizontal information flow is essential for common situational awareness.** Both vertical and horizontal information flow exchange data that, when fused in a timely manner, becomes integrated information to provide the framework for making the best possible decision—enabling decision dominance. The dynamic fusion of vertical and horizontal information allows timely consideration and decisions by the aerospace commander—centralized control. At the tactical level, proper information fusion allows better situational awareness—enabling decentralized execution. Figure 1.1 depicts the interrelationship of vertical and horizontal information flow.

Decentralized execution by aerospace forces levies another major requirement on US Air Force C2 operations. *This requirement is to ensure the two-way horizontal information flow that reduces the uncertainty of the war.* Information such as battlespace observations should flow freely between operators. Horizontal flow of information enhances operator

Centralized control of airpower was the only feasible means by which each of the ground forces [U.S., Republic of Vietnam, Korean, Australian corps] could get air support when it needed it. By early 1967, there were hundreds of thousands of troops in country. The 7th Air Force was well established by this time to support the U.S., ARVN, Korean, and Australian ground forces in all of the four corps areas. If the air had been divided-up among these various forces, COMUSMACV would have been unable to concentrate the airpower of 7th AF where he wanted and needed it. With the control centralized, he was able to move around anywhere within his area of responsibility concentrating firepower as needed.

General William W. Momyer, USAF (Retired)
Airpower in Three Wars (WWII, Korea, Vietnam)

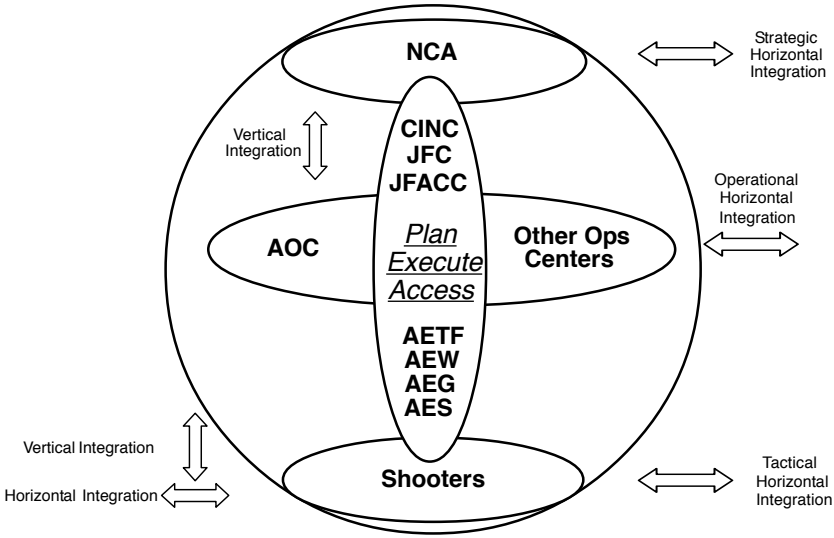

Figure 1.1. Information Integration

initiative. As the battlespace environment changes, operators are free to act within the guidelines of the commander's intent and rules of engagement. **The balance between vertical and horizontal information flows should be described in the C2 section of the operations plan.** Maintaining this balance across the full spectrum of aerospace employment is a job for C2 operators.

Work still needs to be done to integrate horizontal and vertical information flows. When the vertical flow dominates, subordinate commanders and operators may suffer as the initiative is passed to senior commanders. When the horizontal flow dominates, commanders may suffer because they do not have the information necessary to exercise focused control of present operations and to plan future operations. **Senior commanders making decisions about operations, combined with subordinates free to exercise initiative in executing those decisions, make up the heart of C2—centralized control and decentralized execution.** There may be times when the political leadership are involved in low-end to mid-level spectrum activities. This high-level political involvement tends to drive a higher level of centralized command. Decentralized execution in these instances may vary with the latitude granted by the NCA. Coalition unity and collateral damage are two common objectives that may challenge the optimal balance in centralized control and decentralized execution.

Failures in information flow lead to tragic losses. The accidental shoot down of two US Army Blackhawk helicopters by AWACS-vectored fighters can be traced to successive failures in information flow, vertically between commanders and operators and horizontally between operators.

Air Force Chief to Review Blackhawk Actions
OD News Release No. 414-95

Informed Decision Making

Command and control should support an informed and timely decision-making process at all levels of command. The process should be adapted to the circumstances presented by the mission and aerospace environment. The process should not be used blindly in a checklist fashion. *A key attribute of informed decision-making is choosing among competing courses of action. Time sensitive targeting decisions and sensor-to-shooter reactions are prime examples of competing courses of action that must be reconciled by the aerospace commander. Commanders preserve the flexibility of aerospace power by making informed and timely decisions. Deferring decisions by moving them up or down the chain of command sacrifices the initiative and limits the flexibility of alternatives.*

Commanders should access and accept risks necessary to accomplish the mission. Accepting risks also acknowledges the possibility of failure. Assessing risks may be a time-consuming process; however, not assessing risks turns the decision-making process into a dangerous gamble. Commanders should take advantage of vertical and horizontal information fusion efforts to optimize timely and informed decision-making. For a single consolidated reference on operational risk management, see AFTTP(I) 3–2.34, *Multiservice Tactics, Techniques and Procedures for Risk Management*.

Command and control processes are the structured basis of informed decision making. Technology either automates or accelerates these processes via advances in information technology like digital electronic communications, computers, and expert systems. Yet, there is no substitute for trained personnel using intuition and common sense in making the final decision. In the words of General Shaud (former Chief of Staff, Supreme Headquarters Allied Powers Europe), "Process is no substitute for careful thought." Airmen, schooled in the art of war, need good information as well as an efficient and effective process to make the best-informed decisions.

COMMAND AND CONTROL FUNCTIONS

JP 1-02 lists four command and control functions: planning, directing, coordinating, and controlling.

Planning is the process of examining the environment, relating objectives with resources, and deciding on a course of action (COA). Commanders make planning decisions through a rational analysis of costs, evaluation of benefits, and acceptance of residual risks approach.

Directing is giving specific instructions and guidance to subordinate units. Superior commanders often give specific instructions to subordinates on mission objectives, situation, resources, and acceptable risks. Commanders should also give their guidance or "intent" to subordinates as a way to encourage initiative and reduce the uncertainty throughout the spectrum of conflict.

Coordinating is sharing information to gain consensus, explain tasks, and optimize operations. Commanders should ensure the shared information (both vertical and horizontal) produces trusting relationships and gains agreements necessary for efficient multinational and joint operations. Sharing information is a way to minimize the risk of fratricide.

Controlling is a composite function that uses parts of the planning, directing, and coordinating processes to ensure efficient execution of operations. Controlling requires current information to produce feedback. Feedback is essential to correct errant results or to issue new orders that exploit advantages.

General Kenney, in the aftermath of WWII, gave some tips on controlling an organization (in his book "General Kenney Reports"). "It turned out to be another scrambled outfit of Australians and Americans, with so many lines of responsibility, control, and coordination on the organization chart that it resembled a can of worms as you looked at it. I made a note to tell Walker to take charge, tear up that chart, and have no one issue orders around there except himself. After he got things operating simply, quickly, and efficiently he could draw up a new chart if he wanted to."

General George C. Kenney
General Kenney Reports

THE AEROSPACE ENVIRONMENT

The aerospace environment and C2 are intimately related. With the advent of the airplane, a commander's area of focus grew into a hundred-fold larger "volume of responsibility" or battlespace. Today the United States, as a space-faring nation, conducts aerospace operations in a potential battlespace that is a billion-fold larger. The aerospace environment stretches from the earth's surface to the outer reaches of space in a seamless operational medium. The art of commanding aerospace power lies in integrating systems to produce the effects the nation needs. Information capabilities support operations across the entire aerospace domain. Airmen should think in terms of controlling and exploiting the full aerospace continuum on a regional and global scale to achieve effects both on earth and in flight regimes beyond the horizon. The aerospace operations centers are becoming more capable of gathering and fusing the full range of information, from national to tactical, in real time, and rapidly converting that information to knowledge and understanding—to assure decision dominance over adversaries. This brings into focus the driving issues that affect US Air Force command and control. The immense expanse of the global battlespace demands highly trained people, state of the art technology, and efficient processes for successful C2. **Modern conflicts demand fast and efficient C2 operations that are sufficiently flexible and adaptable to minimize the inevitable fog and friction of warfare.**

> ***In due course, planners decided to pursue NATO's objectives exclusively through an air campaign. What made aerospace power the relevant and compelling choice was the NAC's [North Atlantic Council's] careful consideration of its unique attributes and versatility. As well, NATO member nations had certain expectations about their employment. They accepted speed, range, and flexibility as the hallmark attributes of aerospace power in supporting theory and doctrine. Complementing these time-tested attributes were ones that contemporary experience had confirmed—lethality and precision. They also valued the airman's ability to deliver precision weapons—often from standoff distances—reducing the likelihood of unintended casualties and collateral damage. Sophisticated and integrated command, control, communications, computers, and intelligence, surveillance, and reconnaissance would enable timely adjustments to military operations in response to political events.***
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> ***Air War Over Serbia Report***

EXPEDITIONARY AEROSPACE FORCE (EAF)

The idea of expeditionary aerospace forces is not new. America began its air expeditionary operations prior to World War I by attaching aircraft to the ground forces pursuing Pancho Villa in Mexico. Today's expeditionary aerospace operations span the globe, with aerospace forces operating from forward bases in Southwest Asia, the Balkans, and many other locations. The US Air Force is an expeditionary aerospace force configured for the full spectrum of aerospace operations. This shift provides a unifying structure that brings all our people together in shared challenges, shared goals and shared successes. Airmen from all across the Air Force contribute to our expeditionary capabilities—from those who provide the deterrent umbrella under which we operate, to those who deploy, to those who operate the fixed facilities on which we depend when we reachback for support. AEFs provide joint force commanders with ready and complete aerospace force packages that can be tailored to meet the spectrum of contingencies—ensuring situational awareness, freedom from attack, freedom to maneuver and freedom to attack. AEFs fit into established theater-based command and control structures, when such are available, or bring their own command and control when needed. Equally important to expeditionary operations are the home bases that plan, surge, support, and supply these forward bases. Figure 1.2 depicts the central role C2 plays in making the EAF a dominant war-fighting force. In addition, expeditionary combat support

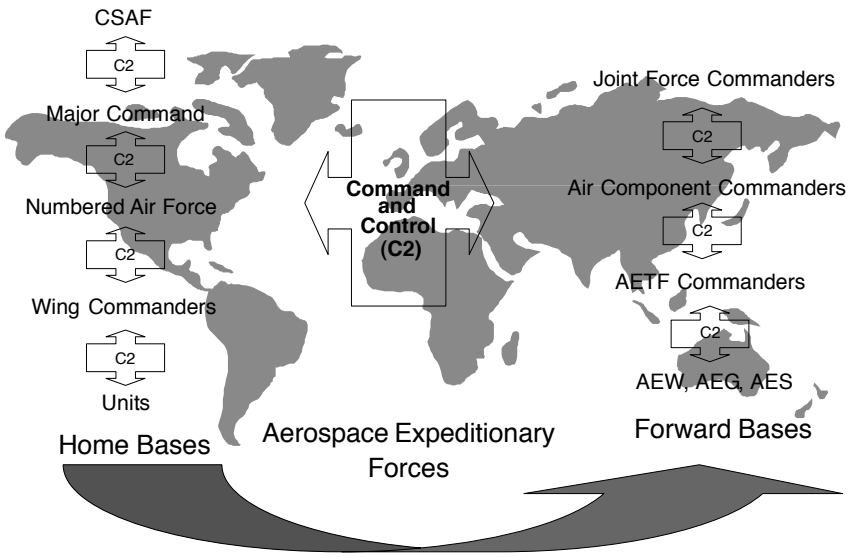

Figure 1.2. Command and Control links home bases with forward bases.

capabilities underpin the Air Force ability to operate anywhere in the world. Effective, efficient combat support is the key to sustaining expeditionary forces. The Air Force must continue to harness information technology, rapid transportation and the strengths of both to ensure responsive, dependable, precise support.

COMMAND AND CONTROL SYSTEMS

The term "command and control system" is often narrowly construed as the highly visible technological elements, such as satellite communication or computer systems. **JP 1-02 defines command and control system as the "facilities, equipment, communications, procedures, and personnel essential to a commander for planning, directing, and controlling operations of assigned forces pursuant to the missions assigned."** *An Air Force C2 weapon system includes; sensors, data processors, decision tools, operators, maintainers, and the interconnecting communications to enable commanders to conduct operations with unity of command and effort.* In addition, this C2 weapon system includes all of the personnel and equipment necessary for sustainment and survivability. **For aerospace forces, C2 systems consist of mission essential technology elements and processes needed by people to perform their assigned command and control functions.** The C2 operations section of this document describes how people and C2 systems work together.

The World War II Battle of Britain demonstrated the primacy of C2 systems in modern warfare. Although heroic aerial combat may be the

General Spaatz had a first-hand look at part of the British command and control system and formed his own opinions about the importance of C2 in operations. "Spaatz spent much of his time with Fighter Command, particularly with No. 12 Group under Air Vice-Marshal Trafford Leigh-Mallory. At that point he finally got a good look at radar, including its early warning, ground-controlled intercept, and identification friend or foe variants. This equipment enabled the RAF accurately to track and to intercept German raids, as well as to distinguish its aircraft from enemy aircraft. Spaatz … spent all of August 9 in the operations room at No. 12 Group getting a full explanation of night and day procedures."

Richard G. Davis
Carl A. Spaatz and the Air War in Europe

most memorable part of the battle, people using C2 systems comprised of then-modern equipment and efficient processes are often given credit for winning the Battle of Britain. A C2 system bought Fighter Command about ten minutes of warning time and vectoring information—enough timely information to be decisive.

US AIR FORCE COMMAND AND CONTROL OPERATIONS

US Air Force C2 operations enable commanders to lead missions within the contextual constraints of policies, resources, and environment. **C2 operations are vital "enablers" or "supporters" of war-fighting operations.**

Below are planning considerations required for well-planned C2 support:

- Coverage: surveillance and reconnaissance, weather and air traffic control, etc.
- Functionality: sufficient, redundant decentralized execution nodes for specific areas (CAS, airspace control, DCA, etc.).

In the air war over Serbia, command and control worked well at the tactical level. For example, the rapid re-targeting of attack aircraft against targets detected by the Predator unmanned aerial vehicle was innovative and quite successful. At the operational and strategic levels, however, Air Force leaders repeatedly noted two dominant problems. The first was that command and control structures and coordination procedures were overlapping and confusing. The principle of unity of command must be reinforced in future training, doctrine, and operations. The second problem was the perception that air campaign planning and execution were matters of managing the ATO production process, rather than commanding the air battle. Future training of combat leaders and their staffs must move beyond the current emphasis on learning the "process" of command and control. Rather, they need an understanding of the fundamental principles that serve as the basis for effects-based employment of aerospace power.

Air War Over Serbia Report

✪ Placement: political and geographic constraints will affect system construct.

Since the details of most C2 operations are not specified by superior commanders, the responsibilities for the details of implied tasks normally fall upon operational and tactical commanders. Commanders should describe their C2 objectives, intent, resources, acceptable risks, and strategies to subordinates. A centralized plan for C2 operations is developed through the iterative campaign planning process as detailed in US Air Force and joint publications. **The uncertainty of conflict throughout the spectrum of engagement make the C2 planning process just as important as the C2 section of the war plan itself.**

When American forces fight as part of a joint or multinational force, responsibility for C2 operations are by necessity shared among national, functional, and Service component commanders. It is up to the JFC or multinational force commander and staff to determine a workable theater C2 plan. A primary consideration is choosing between parallel, lead nation, or multinational command and control structures. See JP 3-0, *Doctrine for Joint Operations,* for details on these C2 structures.

In complex multinational operations, command and control often proves to be the essential mission-enabler, without which effective coalition operations would be impossible. The multinational 1948 Berlin Airlift serves as a good example.

Named 'Operation Vittles,' the airlift forced AACS [Airways and Air Communication Service] personnel to improvise new methods of air traffic control to handle the volume of traffic needed to bring the minimum 4,500 tons of coal and food into Berlin daily…. The area control operators kept in touch with the aircraft until they turned them over to the ground-controlled approach radar operators who talked them down to a safe landing. Airplanes that missed their first landing approach were dispatched back to their home base unless they could be later vectored back into the landing pattern. Flight plans, position reports, and clearance phraseology were streamlined to limit the length of radio transmissions and accelerate operations. Ground-controlled approach radar was the keystone upon which the airlift system was built.

Thomas S. Snyder, ed.
History of Air Force Communications Command

CHAPTER TWO
COMMAND AND CONTROL PLANNING, PROCESSES, AND SYSTEMS

Called 'Instant Thunder' this concept won Schwarzkopf's endorsement; its name was intended as a clear signal that any air campaign would be quick, overwhelming, and decisive—not a gradualist approach as had been the case with Vietnam's 'Rolling Thunder' 25 years before.

Richard P. Hallion
Storm Over Iraq

PLANNING AND DECIDING

Planning is the C2 function of examining the environment, matching objectives with resources, and deciding on the course of action. Successful planning focuses on future operations. The US Air Force recognizes the importance of the Joint Operation Planning and Execution System (JOPES) to the warfighter, as described in JP 5-0, *Doctrine for Planning Joint Operations*. The JOPES process includes threat identification, strategy determination, course of action development, detailed planning, and implementation. These broad steps are generally followed by each of the three categories of joint operational planning. These categories are deliberate, crisis action, and the overarching category of campaign planning, all of which are described in JOPES doctrine and procedural publications. **The key C2 component of these planning activities is the commander's estimate decision process.**

JP 1-02 defines the commander's estimate of the situation as "a logical process of reasoning by which a commander considers all the circumstances affecting the military situation and arrives at a decision as to a course of action (COA) to be taken to accomplish the mission." The air component assists in the development of the JFC's estimate process: assessing the mission, developing COAs that are responsive to the situation, analyzing adversary COAs (defend, reinforce, attack, withdraw, escalate, delay), comparing friendly COAs and selecting a COA. As detailed in AFDD 2, *Organization and Employment of Aerospace Power* **the US Air Force's estimate process integrates aerospace power into COAs that are presented to the JFC for a decision. The estimate process is the primary way for airmen to**

> ***One thing I cannot overemphasize is that DESERT SHIELD/STORM was a coordinated effort. My boss, General Schwarzkopf, approved the air war plan we developed and gave it his full backing. The commanders of the other US Central Command components cooperated with us to the fullest, as did the commanders of allied forces. Back at home, we knew that President Bush was committed to letting his military commanders run the war; the secretaries and the Joint Chiefs of Staff gave us their full support and cooperation. The Air Force led off the fighting, but in the end, every Defense Department and allied element contributed to the victory. It was truly a combined effort.***
>
> **General Charles Horner**
> ***Air Power History*, Fall 91**

influence the JFC's COA decision process. The time relationship between the JFC's and the US Air Force's estimate processes is critical. Both processes are interrelated and should be accomplished simultaneously. **A desired goal is to have one staff, one process, and one product.**

A JFC may also need to synthesize COAs from the ones recommended by subordinates in order to satisfy the criteria of adequacy, feasibility, variety, and completeness. The inputs of airmen are critical in this synthesis process. **Aerospace power requires early consideration when integrating aerospace missions into a campaign plan.** Planning based solely upon deconfliction and synchronization, either geographically or temporally, denies aerospace power its flexibility. *Planning should focus on integrating aerospace power into operations that will achieve specific objectives and effects.*

Once a COA decision is made, the aerospace commander produces the detailed plan to achieve assigned objectives. **The detailed planning process for airmen is the five-step joint aerospace operations planning process.** For more information on the process, see AFDD 2, *Organization and Employment of Aerospace Power*. The output of the process, the joint air operations plan (JAOP), forms the basis for the day-to-day tactical operations. Another important JFC decision is the apportionment of airpower to accomplish the JAOP and to satisfy joint objectives.

DECISION MODELS

Effective C2 decisions use a dynamic process that starts when the data are received from various sources and are processed to form information. This information is then used as the basis for making decisions. *Once the appropriate decisions are made, the commander ensures these decisions are communicated to subordinates for execution. Delegation of a decision is appropriate when time and information factors allow a subordinate to make a better decision. Making effective decisions is especially difficult during crisis operations due to the uncertainty created by the fog and friction of war. This uncertainty generates "noise."*

When applied to C2, noise serves as a metaphor for anything that interferes with people receiving, processing, and transmitting information during the decision-making process. Noise in this sense originates from human and technological sources. As the central receiver of information, commanders may face "information overload" with too much noise, hindering their decision making. *Commanders need to set filters by selecting mission-essential information and defer the rest.* Noise can be reduced by properly fusing data at appropriate horizontal and vertical fusion points in the aerospace commander's operation center. In the processing stage, noise often comes from preconceptions that limit commanders' abilities to analyze ambiguous information that contradicts the current view of the situation. *The development of and adherence to a systematic decision-making process reduce the effects of noise.*

The use of established decision-making processes does not entirely eliminate the uncertainty of war and the dynamics of the full spectrum engagement encountered by all commanders. However, it can guide commanders and their staffs through logical steps that lead to better decisions, given the available information. There are many decision-making models available for use such as the monitor, assess, plan, and execute (MAPE) model. (For more information on MAPE see AFDD 1-1, *The Air Force Task List*). Each model requires an awareness of the environment, an evaluation of the information received, a decision based on that information, and execution of orders or plans. These models can add detail to the commander's estimate process described earlier. **Aerospace power provides effects throughout the battlespace. Communicating aerospace options and COAs during the estimate process requires an understanding of C2 systems characteristics.**

Situational awareness is another key element of effective decision-making. It is important that **commanders immediately identify the individuals/units responsible to identify, collect, analyze, and archive all pertinent information during ongoing operations.** Keen situational awareness helps reduce the fog and friction of war by providing commanders with accurate and timely information so decisions can be optimized. Identifying, collecting, and analyzing information help commanders make better current and near-term decisions. Archiving information allows events to be studied after the operation has been conducted. This enables commanders to incorporate the results of lessons learned into future operations.

COMMAND AND CONTROL SYSTEM CHARACTERISTICS

The fundamental purpose of C2 systems is to ensure commanders receive mission-essential information, make informed and timely decisions, and communicate appropriate commands to subordinates throughout the operation. To achieve this purpose, *C2 systems must meet the cost, schedule, and performance criteria set during the requirements phase of the acquisition process.* **In establishing these requirements, users and developers must also ensure C2 systems are interoperable, sustainable, and survivable.** The interrelated C2 system characteristics of interoperability, sustainability, and survivability are shown in Figure 2.1. *These three*

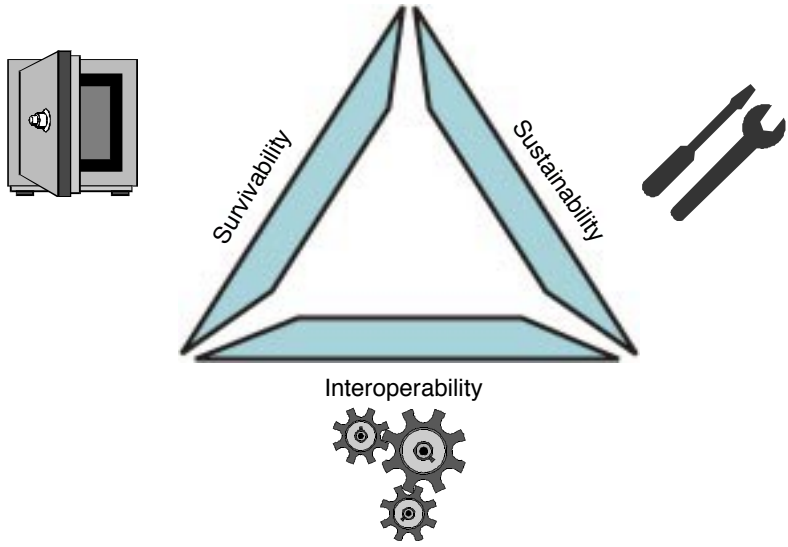

Figure 2.1. Interrelated C2 System Characteristics

characteristics are critical to ensuring future aerospace expeditionary forces have the C2 operational flexibility, sustained combat support, and full-dimensional protection required by the warfighter.

There has been a dramatic increase in the ability to conduct military operations at great distances and with great speed. Future C2 systems should feature interoperability and seamless integration of C2 and ISR assets across all operating domains. Bandwith and information fidelity must facilitate the conflicting demands of horizontal and vertical information flows. Information technology advances are accelerating the integration of C2 systems with intelligence, surveillance, and reconnaissance systems.

Interoperability

Interoperability is the ability of C2 systems to exchange information, allowing warfighters to operate effectively together. *Interoperability is best achieved by adhering to technology and process standards that allow information flow.* Unity of command is difficult, if not impossible, to achieve when C2 systems do not work together. In the past, most C2 systems were designed strictly to meet the needs of a particular Service or functional commander. This is changing. However, the focus on multinational operations will continue to challenge us particularly in security issues and technology gaps. Every effort should be made to share the needed information efficiently among the multinational forces participating in the operation.

Numerous directives require the Services to migrate existing Service or function specific C2 systems and applications to a standard defense information infrastructure (DII). This infrastructure is not a C2 system, but provides a common operating environment or a foundation for building where functionality is added or removed in small, manageable segments. To achieve interoperability, the DOD established the Joint Technical Architecture (JTA) and the Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR) Architectural Framework. The framework provides for the implementation of a standard DOD architecture that provides the needed structure while systems are in the development and system engineering phases of acquisition. The JTA identifies a common set of mandatory information technology standards and guidelines to be used for sending and receiving, understanding, and processing information. The Air Force's

The demand for military satellite communications (SATCOM) systems represents a good example of C2 system flexibility. The Gulf War used at least five different SATCOM systems to support operations with the military DSCS [Defense Satellite Communications System] and commercial INTELSAT [International Telecommunications Satellite Organization] systems being the most notable.

DSCS III Satellite

Alan D. Campen, ed.
The First Information War

detailed standards and guidelines are addressed in the JTA-Air Force document.

Flexibility, a feature of interoperability, allows the massing or combining of C2 systems needed to satisfy C2 requirements. *C2 systems should work in a complementary and synergistic fashion that avoids unnecessary duplication of functions.* C2 technological developments and capabilities are growing well beyond what is affordable by one Service or one organization. Numerous commercial and government efforts have produced unique and flexible C2 capabilities. Commanders, who want effective operations at minimum costs, should fully integrate these C2 capabilities.

A good example of a versatile C2 platform is the Joint Surveillance Target Attack Radar System (JSTARS) with its intelligence, surveillance, and reconnaissance capabilities. This airborne ground-looking radar system made history as a sensor-to-shooter platform in the Gulf War. Radar pictures of the highway exit routes from Kuwait gave commanders an operational picture that showed Iraq's retreat from battlefield positions. Other uses of the versatile JSTARS include tactical monitoring of peacekeeping operations and guiding rescue workers in humanitarian assistance operations.

Satellite communications (SATCOM) systems provide flexibility by allowing cross-Service and cross-functional communication among diverse joint force elements. The SATCOM "force mix" should be an interoperable blend of military and commercial systems that are based on deliberately planned requirements. Deliberate planning by the warfighter clarifies actual wartime network requirements, which in turn provides a sound basis for sizing needed bandwidth and throughput during a crisis.

Versatility, another feature of interoperable C2 systems, enables commanders to execute missions across the spectrum of engegement with existing resources. Scarce C2 weapons systems are labeled "low density, high demand" to reflect the low number of platforms and high operations requirements for these resources.

Sustainability

Aerospace power's expeditionary focus and rapid global mobility capability make unique demands on C2 system sustainability, maintainability, and redundancy. Leading edge C2 technology often has both military and commercial uses. The US Air Force supports using a cost-effective mix of military and commercial C2 systems to reduce expensive research and development costs when possible. However, sustainment of this mix poses long-term issues for commanders. Commanders should consider these issues and incorporate their decisions into C2 plans. These decisions are most critical for combined and joint force commanders as host-nations considerations greatly influence the mix and use of coalition C2 systems.

Radio frequency (RF) spectrum management is a key area in sustaining C2 systems. Global demand and advances in information technology make the RF spectrum a scarce commodity. As demand increases, management and coordination tasks become much more complex. Deliberate planning uses reasonable assumptions to anticipate RF spectrum requirements. RF spectrum management in a crisis situation demands rigorous procedures and rules. C2 systems that receive or transmit in the RF spectrum must be certified and licensed. Commanders should pay particular attention to this area.

The forward and home bases of expeditionary Air Force operations present a unique challenge to maintaining C2 systems. Maintainers are responsible for two C2 systems: one at the home base, the other deployed. "Temporary" fielded equipment, some remaining deployed for many years,

US Military Precision Lightweight GPS Receiver

Global positioning system (GPS) navigation technology enables precision command and control of maneuver forces and fires. This technology also enables a worldwide, multibillion-dollar, civilian navigation and positioning market. Sustainment decisions on military and commercial versions of C2 systems should be made ahead of time. For example, degrading an adversary's C2 system by lowering the precision of GPS signals may also affect friendly C2 systems.

Commercial GPS Receiver

eventually becomes obsolete. Maintainers should not be forced to repair old equipment while operations are in progress. Technology advances should be forecast and maintainability requirements should be consistent with the forecast. For example, yearly advances in computer technology may mean the adoption of a "disposable" computer maintenance concept in which computers are treated like a consumable item.

Survivability

Survivability of C2 systems is critical in war. C2 systems require special protection from overt and covert hostile action. Historically, C2 systems have been well-protected from attack by carefully locating, hardening, and securing the system. Host nations may restrict expeditionary Air Force C2 operations by determining the placement of C2 systems. Commanders should ensure that adequate hardening and security measures compensate for lesser degrees of force protection offered by distance or terrain. **Protection decisions should be based on cost, risk, and benefit factors that are continually reassessed as the threat environment changes.**

The US Air Force's use of global connectivity systems, such as the Internet, is increasing. Distributed operations rely on these systems, increasing the likelihood of information attacks. Commanders should only use secure and responsive C2 systems to transmit and receive essential war-fighting orders and information. Reliance on commingled military

and commercial systems during conflict may put the commander at additional risk. One possible solution is to segregate information needed for C2. Mission-critical information can be exchanged via secure military channels, while routine information via the first, free connectivity channel. Another possible solution is to integrate all information and use multiple high-capacity connectivity channels to ensure information flow. The choice will depend on security concerns and available C2 assets. This level of planning should be addressed as early as possible in deliberate or crisis action planning.

Redundant C2 systems provide the ability for alternative C2 systems to continue operations in the event of failure or damage to the primary system. *C2 system redundancy begins with planning.* Redundancy requirements should balance the goal of mission success against natural failures. High value C2 systems that are difficult to backup, such as the air operations center, are good candidates for redundancy planning. **A COMAFFOR should plan for redundancy by using distributed C2 operations.** For example, the commander could designate the alternate aerospace operations center (AOC) or another numbered air forces's (NAF) AOC as backup.

CHAPTER THREE
COMMAND AND CONTROL IN US AIR FORCE OPERATIONS

We must command aerospace power—not just administer the Air Tasking Order!

General John Jumper

The US Air Force follows the command relationships presented in JP 0-2, *Unified Action Armed Forces (UNAAF)* and provides OPCON, TACON, and support of forces according to the Joint Force Commander's (JFC) concept of operations. AFDD 2, *Organization and Employment of Aerospace Forces* provides the details on how the Commander, Air Force Forces (COMAFFOR) should exercise OPCON and TACON of US Air Force forces with the **preferred option of the COMAFFOR and the Joint Force Air Component Commander (JFACC) being the same individual.** *When this occurs, the JFACC may need to designate a Deputy COMAFFOR to oversee the combat support arrangements so the JFACC can concentrate on the battle rhythm.* Although the numbered air forces provide the core staff for the aerospace operation center and the AFFOR combat support staffing, manning levels do not match the robust support required. Augmentation, usually from the theater MAJCOM, is required to meet the mission requirements.

The JFC designates a JFACC based on several factors such as: *JFC's overall mission, concept of operations, the missions and tasks assigned to subordinate commanders, forces available, duration and nature of joint air operations desired, and the degree of unity of command and control of joint air operations required.* **The JFC will normally assign JFACC responsibilities to the component commander having the preponderance of air assets and the capability to plan, task, and control joint air operations.** *Because of these criteria, the JFACC will normally be a US Air Force officer. If the JFACC is not a US Air Force officer, the COMAFFOR must be designated to fulfill Service responsibilities.*

As the preparations for the Air War Over Serbia advanced, General Jumper began to consider the overwhelming command and leadership challenges Lieutenant General Short faced in his many U.S. and NATO roles, including that of Commander of Air Force Forces (COMAFFOR). He determined that without staff augmentation, General Short's 99-billet Sixteenth Air Force headquarters staff in Aviano, Italy, would be pressed to accomplish all assigned wartime AFFOR missions. Accordingly, General Jumper directed Major General Hobbins, USAF, USAFE Director of Operations, to lead designated elements of the USAFE staff as rear-echelon augmentation to the AFFOR Staff. General Hobbins would unofficially serve as the administrative commander in the "rear echelon" (AFFOR-rear).

Air War Over Serbia Report

Multinational operations are common and very likely the standard-bearer of future operations. When the aerospace force is multinational, a Combined Force Air Component Commander (CFACC) is designated. **Normally a US Air Force officer will be designated as the CFACC because the US Air Force will usually have the preponderance of air assets and the capability to plan, task, and control joint air operations, as discussed earlier.** In these circumstances, the US Air Force officer is designated CFACC, JFACC and COMAFFOR. When this occurs, augmentation is essential to ensure that multinational, functional and Service responsibilities are met.

To avoid unnecessary confusion, future references to the functional commander in this doctrine document will use the JFACC designation. When discussing purely Service command responsibilities, we will identify that commander as COMAFFOR.

In a joint operations area, the JFC establishes supported and supporting relationships. For example, **the JFACC should normally function as the supported commander for counterair operations; strategic attack operations; theater airborne intelligence, surveillance, and reconnaissance (ISR); space operations; and the overall air interdiction effort.** The JFACC may also be the supporting commander for close air support and the portion of air interdiction requested by the surface components within the land and maritime AOs. The supported commander should ensure the supporting commander understands the assistance required. In turn, the supporting commander will provide that assistance based on existing capabilities and other assigned tasks.

When the supporting commander is unable to provide the requested support, the designating authority (superior commander) will be notified for resolution.

COMAFFORs carry out additional US Air Force responsibilities through ADCON, a command authority, over US Air Force forces assigned or attached to unified or subunified commands or joint task forces (JTFs). A COMAFFOR can exist at each of these levels. Although the UNAAF allows the JFC and the Service component commander to be the same person, **AFDD 2,** *Organization and Employment of Aerospace Forces* **recommends that a US Air Force JFC should not also serve as the COMAFFOR or the JFACC.** This allows a JFC to focus on the appropriate level of warfighting, without distraction.

I sincerely believe that the inherent characteristics of airpower will make it the weapon of choice by the National Command Authorities, as we get deeper and deeper into the transition from the Cold War.

General Ronald R. Fogleman

EXPEDITIONARY AIR FORCE OPERATIONAL COMMAND AND CONTROL

Expeditionary C2 operations support both US Air Force commanders and JFCs. These operations will likely interface with host nations, allies, and nongovernmental organizations. The Service chain of command organizes, trains, equips, and sustains the Expeditionary Air Force. The US Air Force uses the Aerospace Expeditionary Force Center to coordinate, plan, and prepare AEF force packages. Activities should include conducting predeployment workshops, conferences, and other efforts to best integrate expeditionary aerospace forces into the theater CINC requirements. When expeditionary air forces are transitioned to the combatant commands, C2 becomes a theater responsibility.

Additionally, **C2 operations are required to support force mobilization, deployment, employment, sustainment, and redeployment activities.** Transition from day-to-day peacetime C2 to warfighting C2 is more straightforward when forces are deployed in the theater. The UNAAF provides a guide for establishing the command relationships and decision-making structure of the multinational or joint force in-theater. Theater CINCs undertake operations as authorized by the NCA and organize their forces as required to fulfill the mission. Establishment of a Joint Task Force (JTF) to handle a discreet mission is the norm, but this

does not preclude assigning operations to one of the Service or functional components. **Interoperable C2 systems are the critical enablers of command relationships and allow joint/combined forces greater flexibility and responsiveness.** The US Air Force is responsible for equipping its aerospace forces with the interoperable C2 needed to command and control aerospace forces. The parent MAJCOM and NAF, with the assistance of the Aerospace Command and Control and Intelligence, Surveillance and Reconnaissance Center (AC2ISRC), are the focal points for ensuring interoperable C2 systems.

The situation is more complex when forces, materiel, or services are projected from outside the theater of operations. To ensure unity of command, Air Force commanders and JFCs must coordinate the deployment and employment of forces. **The goal of coordination is the synergistic employment of forces to accomplish the JFC's objectives.** Time or space deconfliction of forces is not sufficient to achieve this goal. While the supported commander has the final say, supporting commanders still must make decisions regarding the coordinated employment of their forces. The functional combatant commands, such as United States Transportation Command (USTRANSCOM), have developed organic command and control operations to support decision-making and coordination of these decisions whether operating in a supported or supporting relationship.

THEATER OPERATIONAL COMMAND AND CONTROL

The focal point for the C2 of theater air operations is the JAOC. *Some operations establish a combined aerospace operations center to integrate multinational or allied forces.* **The JFC normally designates the component commander with the preponderance of aerospace forces and the ability to command and control these forces as the JFACC.** The JFACC exercises C2 of the JAOC. *When the COMAFFOR is the JFACC, the US Air Force component staff structure forms the nucleus for the JFACC staff and augmentation is usually required from the theater MAJCOM.* A notional theater C2 environment is depicted in figure 3.1. Details on the organization and processes of an AOC can be found in AFDD 2, *Organization and Employment of Aerospace Power*, and the AFDDs on *Air Warfare* and *Airspace Control in the Combat Zone.*

The COMAFFOR normally makes and executes command decisions through the AOC. When elements or functions of the AOC are placed in a geographically-separated location, the

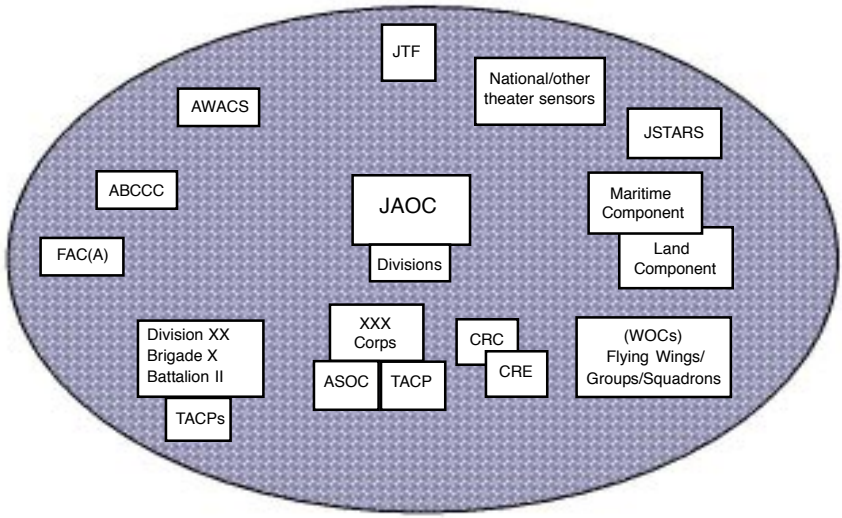

Figure 3.1. Notional Theater C2 Environment

COMAFFOR should have the same degree of control as if they were forward-deployed. Support/supporting relationships must be specific to ensure the COMAFFOR has the degree of control required. An AOC director runs the daily operations of the center. The notional AOC (figure 3.2) has four divisions: strategy, combat plans, combat operations, and air mobility. Specialty teams and support teams augment these divisions. The creation of an ISR division is an emerging concept being considered for use. The COMAFFOR

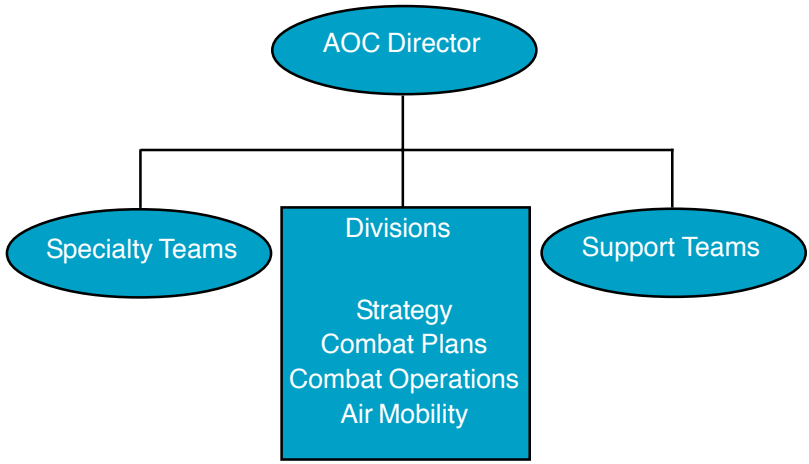

Figure 3.2. Notional Aerospace Operations Center Components

has the latitude to stand up new AOC divisions based on situational needs but should beware of creating additional "stovepipes" within the AOC.

NAFs are normally responsible for setting up AOCs and should tailor them to meet specific mission requirements of commanding aerospace power through execution. *The key C2 processes of an AOC are developing the air operations plan and master air attack plan; producing the ATO, special instructions, and the airspace control order; executing the ATO; and assessing and reporting the effects of aerospace operations in time for the next cycle of activities.*

The specialty teams are responsible for many operational aspects of the AOC as well as many of the technical and liaison activities with the supporting functional commands and other Services. Key C2 activities include air defense, information-in-warfare, information warfare, joint fires, combat search and rescue, legal, logistics, and weather. The primary function of AOC specialty teams is to support the planning and execution of an ATO. They are also responsible for areas such as administration, communications, information management, reporting, and supply.

The AFFOR headquarters should be comprised of normal staff directorates, A–1 through A–6, as well as a special staff. The A-staff structure is used instead of the "traditional" US Air Force staff designations (DO, LG, SC, etc.) to more readily identify the Air Force component staff equivalents of the corresponding J-staff functions. Figure 3.3 depicts the organization of a AFFOR headquarters. Senior component liaison elements may not be needed in all cases as required support can sometimes be obtained through reachback.

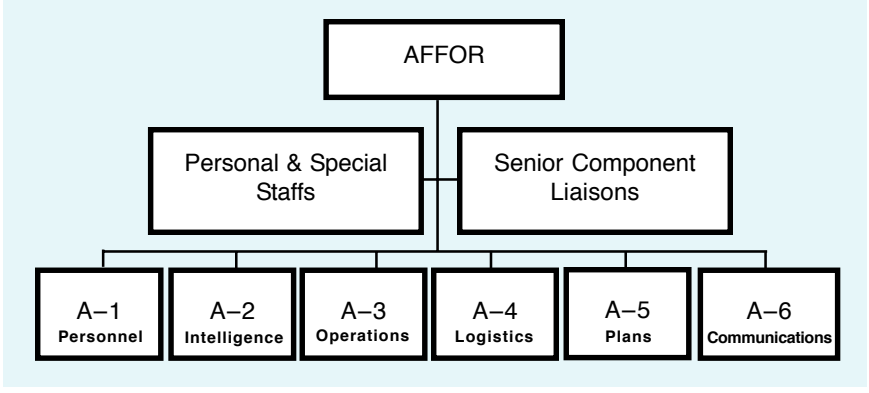

Figure 3.3. Notional Headquarters Organization (A–Staff)

Likewise, for very small or limited operations, a "full" A-staff may not be required.

The organization for a COMAFFOR who is dual-hatted as the JFACC is the largest, most robust capability required and will include a full A-staff, a JAOC, a JAOC director, and a Director of Mobility Forces (DIRMOBFOR). The COMAFFOR staff normally forms the core for the JFACC staff; however, the COMAFFOR staff still retains its function as the primary provider for the Air Force component. The principal Air Force component staff directorates (A–1 through A–6) normally assume parallel JFACC staff duties. Augmentation from relevant Service components ensures adequate joint representation.

COMMAND AND CONTROL OF REACHBACK AND DISTRIBUTED OPERATIONS

Reachback is a generic term for obtaining forces, materiel, or information support from Air Force organizations not forward-deployed. *Communications and information systems should provide a seamless information flow of prioritized data to and from forward and rear locations. Reachback C2 is normally provided from a supporting/supported relationship.* This relationship gives the forward-deployed COMAFFOR the support necessary to conduct operations while maintaining a smaller deployed footprint. *Effective reachback C2 enhances the operational capability and facilitates informed and timely decision making of the engaged COMAFFOR.*

Distributed operations occur when independent or interdependent nodes or locations participate in the operational planning and/or operational decision-making process to accomplish goals/missions for engaged commanders. For instance, space units located in CONUS may assist the theater AOC's operational planning by adjusting Global Positioning System (GPS) satellite upload times to increase weapon accuracy just prior to air strikes. While the relationships may vary according to the nature of the operation, the design of a distributed operation should enable a more survivable C2 network through distribution of tasks and information. In some instances, the commander may establish a formal supported/supporting relationship between distributed nodes. In other instances, distributed nodes may have a horizontal relationship. Military commanders have used distributed C2 for many years. The method and means for controlling forces have changed, but military leaders have always distributed

their operations between multiple echelons. What has changed in recent years is that technology enables more participants from greater distances to create and manage complex networks.

Split operations is a type of distributed operations. It is usually used to describe those distributed operations conducted by a single C2 entity physically split between two or more geographic locations. The commander (normally the forward-deployed COMAFFOR) should have the same degree of control over these operations as if they were forward-deployed. For example, sections of the ATO may be developed from a rear area or backup operation center to reduce the deployed AOC footprint. In this case the AOC, the single C2 entity, is geographically-separated and is a split operation.

Although distributed operations are similar to reachback, there is one major difference. Reachback provides ongoing combat support to the operation from the rear while **a distributed operation indicates actual involvement in operational planning and/or operational decision making.** Information technology advances may further enhance distributed operations. *It is critical to note that the goal of effective distributed operations is to support the operational commander in the field; it is not a method of command from the rear.*

Most Air Force units are assigned to MAJCOMs and are made available for taskings through their respective combatant commands where full authority resides to organize and employ forces as necessary to accomplish assigned missions. These organizations are assigned to combatant commanders that are normally tasked in the JCS warning order.

The US Air Force also has numerous other organizations capable of being tasked to support deliberate or crisis action planning. Because these organizations exist within the Service's authority to organize, train, and equip, they are not as visible for tasking and deployment through the existing joint channels. See the Appendix for examples of those Air Force organizations. These organizations may include civilians under contract with the Air Force.

Theater COMAFFORs may obtain support from such Air Force organizations by *requesting that personnel deploy forward or they may support in-place.* Organizations remaining in-place can provide reachback and/or distributed operations support to the COMAFFOR. The COMAFFOR is the supported commander in these relationships. *In cases*

of deployed support, the theater COMAFFOR makes the request through both the Service chain of command and combatant commander. The CSAF, through the Air Force Operations Center, tasks the support. This capability is then attached to the appropriate Air Force component within the supported joint force. The chain of command remains in Air Force channels. **This type of supported/supporting relationship over Service forces is known as "Air Force Support."** The establishment of Air Force support arrangements should be documented via memo or message to include nature of support, estimated duration, and funding guidance, as required.

In all cases when Air Force capabilities are needed, a formal support relationship should be established between the supported COMAFFOR and the supporting commander. This is true even when forces are not required to deploy forward. As with deploying forces, the supported commander should ensure that the supporting commander understands exactly the type of assistance required and estimated duration. The supporting commander will then provide the assistance as directed by the CSAF. Figure 3.4 illustrates the command relationships and the "Air Force Support" COMAFFORs should be granted for effective C2 operations.

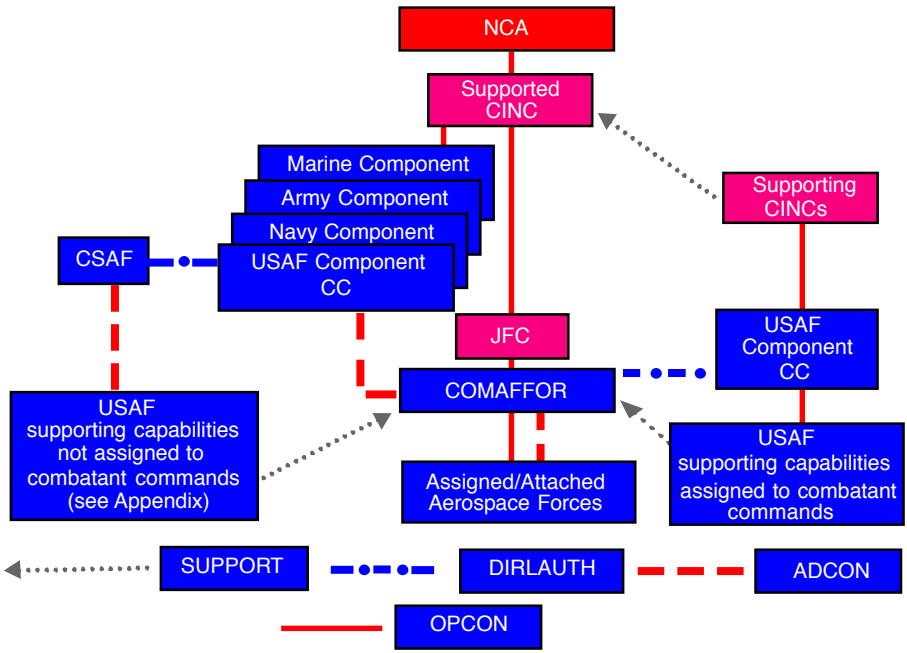

Figure 3.4. Command Relationships for Air Force Support

Because the NCA will normally approve "direct liaison authority for all concerned" (DIRLAUTH ALCON), the Air Force can facilitate the provision of anticipated Air Force support. The Air Force Operations Center will normally draft a message clarifying the specific supporting/supported relationship of the designated "Air Force Support". This message should be transmitted when the Secretary of Defense and Chairman of the Joint Chiefs of Staff send a warning order initiating a contingency operation. All Air Force units likely to be tasked should be identified so that they can determine their ability to contribute to the effort. It is essential that the Air Force Operations Center and the Aerospace Expeditionary Center be involved in the planning as soon as possible. The appendix lists, but does not limit, organizations that should be considered prior to sending the Air Force Support Planning message.

COMBAT SUPPORT COMMAND AND CONTROL

Combat support enables commanders to sustain and protect forces and capabilities needed to accomplish assigned missions. US Air Force commanders are responsible for combat support of US Air Force forces. In multinational operations, commanders should consider integrating host-nation resources or combining support efforts with allies. **Effective C2 of combat support forces allows operational commanders to maintain mission readiness, conduct efficient operations, sustain the force, and eliminate unnecessary duplication of effort among the Service components.** Support responsibilities for US Air Force forces, subordinate to the combatant commander, should normally follow US Air Force channels except when directed otherwise. Occasionally, Air Force commanders should be prepared to accept single-Service responsibility for common logistical items. For specific guidance, see AFDD 2-4, *Combat Support*.

JFCs and component commanders should ensure their plans fully integrate combat and combat support operations. Planning and prioritizing combat activities without considering combat support needs will likely result in inefficient operations. A goal of US Air Force combat support C2 is to maintain the balance between deployment planning, sustainment planning, and employment planning. This should reduce the commander's need to rely on emergency measures and improvisations to support combat operations.

NUCLEAR OPERATIONAL COMMAND AND CONTROL

As described in AFDD 2-1, *Nuclear Operations,* survivable C2 is vital to support US nuclear deterrence strategy. Without survivable C2, deterrence is not possible as the decision processes become dominated by dangerous use-or-lose considerations. **Nuclear C2 operations provide positive control of nuclear weapons and allow the National Command Authorities (NCA) to make authorization decisions during war.**

US Air Force forces assigned or attached to United States Strategic Command (USSTRATCOM) execute strategic military operations under direct control of the NCA. The functional nature of USSTRATCOM's organization allows joint task force commanders to exercise operational control of nuclear forces. The senior US Air Force officer (COMAFFOR) in the task force exercises ADCON of US Air Force members.

Nuclear C2 operations use rigorous processes and procedures to ensure total control of nuclear weapons. This rigor starts in the strategic level planning process that produces the Single Integrated Operation Plan. At the theater level, warfighting commands should integrate nuclear weapons planning if the selected course of action calls for it. If the employment of nuclear weapons is authorized, a series of emergency action procedures are executed to comply with the authorization. Weapon system safety rules ensure that detonation of a nuclear weapon is intentional and authorized.

Command and control systems, such as the Global Command and Control System (GCCS), are designed to communicate the authorization decision. C2 security plays a vital role in ensuring valid authorization orders are communicated to the nuclear forces. Encoding and decoding processes ensure nuclear authorization orders can be transmitted rapidly and securely through available channels. Routine communications use all available C2 systems, since exclusive use of secure channels significantly slows information flow. Redundancy of C2 systems is also another key aspect of nuclear C2 operations. Critical information can be sent via redundant communications systems such as landlines, available circuits on communications satellites, or low frequency radio equipment. Nuclear C2 operations are often the drivers for interoperable and survivable C2 systems.

SPACE OPERATIONAL COMMAND AND CONTROL

US Air Force space forces are organized for unity of command. Space commanders work through centralized control and decentralized execution. At the strategic warfighting command level, United States Space Command (USSPACECOM) is a functional unified command containing Army, Navy, and Air Force components and is responsible for space missions. **Fourteenth Air Force (14 AF), designated Air Force Space Forces (SPACEAF), serves as the Air Force component to USSPACECOM. All Air Force space assets assigned or attached to USSPACECOM should normally be under the Commander, Air Force Space Forces (COMSPACEAF). The Commander in Chief of USSPACECOM (USCINCSPACE) should normally delegate OPCON of Air Force forces to COMSPACEAF.**

Most US Air Force space assets have global responsibilities that will prevent them from being under OPCON of a theater JFC. The JFC, as the supported commander, should exercise general direction of available space assets. **Normally the JFC designates a subordinate commander, preferably the JFACC, as the single point of contact for space operations supporting the theater.** *The JFACC has expert space personnel in the JAOC to perform this function. Thus, general direction of space assets should normally reside with the JFACC who ensures that requests for space support are consolidated, prioritized, deconflicted, and forwarded through the established support relationship with COMSPACEAF or other supporting space agencies (i.e., DIR NRO, COMNAVSPACE, etc.).* **This single point of contact should have direct liaison authorized (DIRLAUTH) authority with COMSPACEAF.**

A working example of command relationships and command authorities is found with GPS accuracy. The accuracy may be modified for a given terrestrial region to produce a desired combat effect. Since GPS is simultaneously used by multiple CINCs, operational control cannot be given to any one CINC. Therefore, this combat effect should be requested by the supported commander, coordinated at the strategic and operational levels of war by USCINCSPACE or his designated commander, and executed by space operators.

As specified in JP 0-2, USCINCSPACE and the supported CINC must predetermine support relationships. To streamline the process, the US Air Force has created robust, capable, and frequently exercised command and control links between the aerospace operations centers in

the regional commands and SPACEAF's aerospace operations center. This allows supported commanders, such as the JFACC, to "own the effects" they need COMSPACEAF to produce, even if COMSPACEAF cannot transfer OPCON of his forces to the supported commanders.

Aerospace operations centers employ warfighters trained to specific standards. They use interoperable command and control processes and technology, including a common operating picture, and draw upon information from shared databases. This distributed operations capability allows for integrated aerospace operations and robust reachback capability. The US Air Force will continue its stewardship of space and will satisfy the space needs of both USCINCSPACE and other CINCs through the distributed command and control system.

AIR MOBILITY COMMAND AND CONTROL

Rapid global mobility is central to maintaining US presence and influence around the world. AFDD 2-6, *Air Mobility Operations*, covers the details of air mobility command and control. **The Commander in Chief, US Transportation Command (USCINCTRANS), normally retains OPCON of assigned forces necessary to accomplish global (intertheater) mobility missions and exercises OPCON of air mobility forces through the commander, tanker airlift control center (TACC).** *The TACC acts as the single point of contact for intertheater air mobility customers and providers.* A critical-enabling feature of the TACC is its robust global C2 system.

When forward-deployed in support of a regional operation, OPCON or TACON of air mobility forces may go forward to the supported CINC, who will normally exercise this controlling authority through the COMAFFOR/JFACC. *The COMAFFOR/JFACC should normally be given OPCON, rather than TACON, over intratheater assets to support joint force requirements.*

The COMAFFOR/JFACC exercises intratheater air mobility command and control through the Director, Air Mobility Forces (DIRMOBFOR) and Air Mobility Division (AMD) of the AOC. The size, composition, and layout of the AMD element will vary, but its core task of integrating air mobility operations into the overall aerospace function remains constant. To support the integration of inter- and intratheater air mobility operations, USTRANSCOM normally places an Air Mobility Element (AME) in or near the AMD, with the assigned mission of ensuring

that the Joint Force receives the maximum support possible from the intertheater forces and/or capabilities allocated by the NCA. Additionally, USTRANSCOM will normally place air mobility support units, such as Tanker-Airlift Control Elements (TALCEs) and Air Mobility Teams (AMTs) within the theater to support inter- and intratheater operations.

Depending on mission requirements, the TACC may position tanker aircraft and crews in preparation for deployment and may coordinate with the theater Air Mobility Operations Control Centers (AMOCC) for theater air refueling support. During a combat operation, the highest priority for intratheater air refueling forces is normally supporting combat and combat support aircraft executing the air campaign. Tankers allocated for theater support may also be called upon to provide air refueling for air bridge operations. *The DIRMOBFOR must judge the capabilities of and requirements for tankers assigned or attached to the theater to determine their ability to provide air bridge support.* When air bridge support operations will adversely impact theater support operations, the JFACC must consider the JFC's overall campaign objectives when deciding how to allocate tanker missions.

Since mobility forces often are the first to arrive in theater, these forces bring organic C2 systems with them. These C2 systems may be the only connectivity link during the initial stages of the operation. As such, the on-scene commander may require the use of these C2 assets for purposes beyond mobility operations. Crisis planning should account for such scenarios, as operations other than war become more common.

SPECIAL OPERATIONS COMMAND AND CONTROL

Assigned US Air Force special operations forces (AFSOF) in theater are under COCOM of the geographic combatant commander. Operational control of theater AFSOF is normally exercised through the theater special operations command (SOC). The SOC is a subunified command that functions as the special operations component for the theater. The theater SOC commander advises the theater CINC and other component commanders in all areas of special operations, providing them with the expertise to plan the employment of special operations forces (SOF). The theater SOC fully integrates special operations forces into theater and country peacetime plans, as well as the geographic CINCs' war plans.

The SOC also provides the nucleus for the establishment of a joint special operations task force (JSOTF). The JSOTF may fight alone; however, it is normally employed under a larger JTF. The theater SOC commander is responsible to the geographic CINC for planning and conducting joint special operations in the theater, ensuring that SOF capabilities are matched to mission requirements, exercising OPCON for joint special operations, and advising the CINC and component commanders in-theater on the employment of SOF.

When AFSOF deploys to conduct non-special operations missions, AFSOF should be attached to the JFACC via the Commander Air Force Forces (COMAFFOR). When conducting a purely special operations mission, AFSOF should be attached to the JSOTF. When both special operations and conventional missions are planned for AFSOF, the JFC, based on inputs from appropriate subordinate functional commanders, determines command relationships. When AFSOF are not conducting operations assigned by the JFACC, a Joint Special Operations Air Component Commander (JSOACC) subordinate to the JSOTF becomes the single airmen responsible for AFSOF mission execution. Additionally, the Special Operations Liaison Element (SOLE), provided by the JFSOTF, works in the Joint Air Operations Center (JAOC) to coordinate, deconflict, and integrate air and surface operations within the JFACC's battlespace. **Regardless of assigned missions and C2 arrangements, it is critical that AFSOF are integrated into the air tasking order (ATO) and properly adhere to the airspace control order (ACO) to ensure the JFACC's operations are unimpeded.** The COMAFFOR has ADCON of Air Force special operations component forces. Thus the COMAFFOR is responsible for supplying combat support.

Given the mission and capabilities of AFSOF, these forces use a variety of organic C2 systems. AFSOF should ensure organic C2 systems are compatible with supported commands. When civilian connectivity or security issues are paramount, custom sensors and special communications equipment are often needed to accomplish the mission. C2 operators need specialized training to effectively use the custom mix of C2 systems. During operations, commanders should make risk management decisions on interoperability, sustainability, and security issues incurred by these C2 systems.

INFORMATION OPERATIONS COMMAND AND CONTROL

Information superiority is the capability to collect, process, and disseminate an uninterrupted flow of information while exploiting or denying an adversary's ability to do the same. AFDD 2-5, *Information Operations,* further qualifies the definition as *"that degree of dominance in the information domain, which allows friendly forces the ability to collect, control, exploit, and defend information without effective opposition."*

Fundamental to the Air Force's success is its ability to focus on the effects necessary to achieve campaign objectives, whether at the strategic, operational or tactical levels. **Commanders should clearly articulate the objectives, or goals, of a given military operation. Effects should then flow from objectives as a product of the military operations designed to help achieve those objectives. Planners should design specific operations to achieve the desired strategic, operational, or tactical effects.**

The Air Force conducts information operations at the strategic, operational, and tactical levels. *Command and control of strategic information operations (IO) is done at the national level.* The NCA coordinates strategic IO with supporting US Air Force units. At the operational level, coordination of information operations among the components is normally accomplished at the JFC level. The COMAFFOR/JFACC proactively develops, coordinates and integrates information operation activities within the AOC/JAOC.

In an aerospace operations center, operational-level information operations should always include information-in-warfare (IIW) activities such as ISR. IIW activities feed the C2 processes necessary to plan and execute aerospace operations. IIW operations are the responsibilities of the various specialty teams such as the ISR team. Information warfare (IW) operations, such as defensive counterinformation and offensive counterinformation, are the responsibility of the IW specialty team. The COMAFFOR/JFACC must coordinate their actions with any established information operation efforts at the JFC-level and all participating support commanders.

IW planners in the AOC should recommend targets to support the theater campaign plan. *Targeting begins with the commander's intent, a strategy-to-task methodology, and includes legal and political*

guidelines. Following these instructions, the targeting process relies on clearly delineated national, theater, and command objectives and the effects required to achieve them to devise a maximum payoff for each course of action. JFCs establish broad planning objectives and guidance for attack of an adversary's strategic and operational centers of gravity and defense of friendly strategic and operational centers of gravity as an integral part of joint campaigns and major operations. *The IW planners evaluate information target systems, functional relationships, and friendly and adversary critical nodes and recommend appropriate offensive counterinformation and defensive counterinformation missions for inclusion in the ATO.* The COMAFFOR/JFACC should devise robust plans of attack using both kinetic and non-kinetic means to achieve the desired effects. In the weapon selection and force application stage, target vulnerabilities are matched with weapons characteristics to produce optimal target nominations.

The Combat Plans Division, integrates IW target nominations into attack plans and tasking orders. Using JFC guidance, apportionment, and the approved target list, the master air attack plan team provides details on the execution of this guidance using available resources. The ATO and ACO production team converts the master air attack plan into a tasking and associated special instructions (SPINS). At the tactical level, C2 of IW operations should be planned and executed in a similar manner to C2 of aerospace operations.

CHAPTER FOUR

EQUIPPING AND PREPARING COMMAND AND CONTROL OPERATORS

I will tell you that a commander without the proper C2 assets commands nothing except a desk. You must have the ability to communicate with the forces under your command. You must have the ability to exchange information with them freely, frequently, and on a global basis. It's one thing to have highly technical, sophisticated observation platforms, but if you can't use the information in a timely manner, it's wasted.

General Ronald R. Fogleman

Operators from across the US Air Force play a significant role in making decisions that determine the appropriate employment of aerospace power. To employ C2, operators require state-of-the-art equipment and focused C2 training. The US Air Force has been transforming for over a decade and relies on leveraging technology in a changing strategic environment. Recurring training with C2 technology allows airmen to develop unique C2 skills and experience. These personnel become an indispensable part of any aerospace team. Command and control operators plan, coordinate, direct, and control aerospace forces, and provide the commander with the information required for informed decision making.

C2 operators function in war within an environment that cannot be precisely duplicated in peacetime. Many C2 operators work continuously in C2 operations; others perform these duties only in times of crisis. Therefore, realistic training on actual C2 equipment is critical to developing personnel with the judgment, experience, and instincts necessary to effectively perform C2 tasks. People, technology elements, and processes make C2 a force multiplier. **Commanders must ensure their people are fully proficient at using designated C2 systems when performing wartime duties.**

EQUIPPING C2 OPERATORS

We are critically reliant on technology to overcome the C2 obstacles of distance and time; however, the commercial sector outspends

the US Government on C2 systems. The US Air Force should take full advantage of the commercial sector by implementing and improving partnering efforts. **Commanders should fully integrate commercial and government C2 capabilities when planning operations, but will still have to specify unique military interoperability, sustainability, and security requirements when needed by the warfighter.** Commanders should also consider the operational risks and benefits of commercial C2 technology as the adversary might be using the same systems.

An advantage enjoyed by the US Air Force is the close relationship between C2 acquisition and operations. The Air Force uses specialized centers to integrate C2 acquisition and operations with C2 training and experimentation. These centers ensure people, processes, and technology work together, thereby becoming an asset valued highly by joint force commanders.

TRAINING FOR C2 OPERATORS

To deliver peak performance, individuals must develop and maintain proficiency in the operation of C2 systems. Initial and proficiency training are tools for developing and maintaining operator proficiency. C2 training should continually prepare individuals for their specific roles and responsibilities as they progress within their functional areas. Operators should receive a common core of C2 training, covering US Air Force and joint doctrine, strategy, employment, and operational art topics. In addition to developing basic C2 skills and providing training for each person in the C2 hierarchy, a C2 training system must **encourage flexibility of thought** and creative problem-solving skills necessary when under stress and in unfamiliar environments. C2 training should include **realistic exercises.** Technology advances in visualization, communications, and simulation increase the realism of exercises. These allow participants to experience more realistic individual and team training.

Training qualified operators to augment C2 operations presents a significant challenge. The first step toward a solution is identifying and tracking C2-trained personnel throughout the total force. C2 augmentees can then be trained to the requirements of their assigned AEF. Ensuring standardized C2 training across the total force lays a sound

foundation and develops the skills necessary for the employment of C2 systems.

TRAINING RESPONSIBILITIES

C2 system application training should be an integral part of each new C2 system acquisition. When developing C2 systems, the US Air Force should consider training requirements co-equal with operability, sustainability, and reliability requirements in system design. Initial C2 system training may be provided by Air Education and Training Command (AETC) or by contractors as designated by AETC. Recurring training on new C2 systems will almost always be needed as the system matures. Thus, MAJCOMs receiving the new C2 system should coordinate with AETC; Air Force Materiel Command; and the Aerospace Command and Control, Intelligence, Surveillance, and Reconnaissance Center on recurring training plans and requirements.

C2 EXERCISE TRAINING

Frequent and varied exercises provide commanders with feedback to control training and readiness. **To provide a realistic assessment, it is crucial that C2 be exercised as an overall system rather than a series of individual components.** Exercises like Blue Flag, involving multiple units and various C2 systems, provide needed complexity to train operators. Both joint and coalition C2 elements should be incorporated whenever feasible. *Training across the spectrum of military operations may include actual operations in addition to simulations and exercises.* Participation in these operations enhances the readiness of the entire force.

Airmen require appropriate level training throughout their careers. Senior-level officers likely to be assigned to joint force staffs need training in assimilating and using the products generated by the various C2 systems. NAF commanders, as potential joint task force commanders and JFACCs, may require senior-level C2 training. Airmen likely to serve in AOCs or similar organizations should receive appropriate MAJCOM- or NAF-sponsored C2 training. Airmen and civilians required to maintain and administer C2 systems should receive the appropriate technical and vendor-level training. Generally, experience-appropriate C2 training should become an integral part of the normal career progression of all airmen.

CHAPTER FIVE

CONCLUSION

The commander must work in a medium which his eyes cannot see, which his best deductive powers cannot always fathom, and with which, because of constant changes, he can rarely become familiar.

Carl von Clausewitz
On War

The objective of aerospace C2 is to use available forces, at the right place and time, to optimize the attributes of global vigilance, reach, and power—thereby ensuring decision dominance over adversaries. The enabler of this objective is good horizontal and vertical information flow within aerospace operation centers. These information flows, and their timely fusion, enable optimum decision making. This allows the centralized control and decentralized execution so essential to effective aerospace command. By having a robust, redundant C2 system, we provide a commander the ability to command and control his forces despite the "fog and friction of war" while simultaneously minimizing the enemy's capability to interfere with the same.

Making timely and informed decisions is at the heart of C2. The information age, however, foreshadows new opportunities for informed decision making while it simultaneously threatens a commander with "information overload," challenging his ability to synthesize data and make timely decisions. *Therefore, the identification of mission essential information is paramount to successful information flow. Much of this information is provided in the commander's estimate of the situation, course of action selection, and detailed plans.* By analyzing these products, the commander can determine the information he needs to conduct operations and filter out the unnecessary.

Experimentation, innovation and training in command and control are essential to harness the revolution in military affairs. Rapidly advancing technology makes reachback and distributed C2 operations more possible and practical. How well a commander orchestrates all of these capabilities in aerospace expeditionary force operations may be the new measure of "the genius of the commander."

At the Very Heart of Warfare Lies Doctrine . . .

Suggested Reading

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Joint Publication (JP) 0-2, *Unified Action Armed Forces* (UNAAF).

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JP 5-0, *Doctrine for Planning Joint Operations.*

JP 6-0, *Doctrine for Command, Control, Communications, and Computer (C4) Systems Support to Joint Operations.*

APPENDIX

EXAMPLES OF AIR FORCE ORGANIZATIONS NOT ASSIGNED TO COMBATANT COMMANDS

ORGANIZATION	CAPABILITY
Air Force Agency for Modeling and Simulation	Conducts modeling and simulation programs and initiatives.
Aerospace Command and Control Intelligence Surveillance and Reconnaissance Center	Air Force-wide focal point for all command and control, intelligence, surveillance, and reconnaissance issues.
ANG Readiness Center	Provides information to forces providing contingency augmentation.
Any Air Staff DCS or Directorate or MAJCOM as required	Provides policy, guidance, and oversight for Air Force FOAs, DRUs, and functional area expertise of organic Air Force capabilities.
Air Force Audit Agency	Audits for efficiency and effectiveness.
Air Force Center for Quality and Management Innovation	Provides innovative, expert management capabilities to USAF organizations.
Checkmate (AF/XOOC)	Provides operational planning assistance to CSAF and Air Force Components worldwide.
Wargaming and Experimentation Division (AF/XOCW)	Provides policy, guidance, and oversight for key Air Force Exercises, Wargames, Battlelabs, and ACTDs.
Air Force Civil Engineering Support Agency	Provides the best tools, practices, and professional support for base-level and contingency operations.
Air Force Communications and Information Center	Provides communications and information expertise and services.
Air Force Doctrine Center	Focal point for aerospace doctrine and wingman support to warfighters.
Air Force Flight Standards Agency	Performs worldwide flight inspections of airfields and flight instrumentation/navigation systems.

ORGANIZATION	CAPABILITY
Air Force Information Warfare Center	Provides expertise for Infomation Operations.
Air Force Intelligence Agency	Provides intelligence expertise in the areas of C2 protection, security, aquisition, foreign weapons systems and technology, and treaty monitoring.
Air Force Legal Services Agency	Provides commanders with specialized legal services.
Air Force Logistics Management Agency	Develops, analyzes, tests, evaluates, and recommends new or improved logistical procedures.
Air Force Medical Operations Agency	Develops programs to improve aerospace medicine and preventive and clinical healthcare services.
Air Force Office of Special Investigations	Provides criminal investigative, counterintelligence information, and force protection services to commanders.
Air Force Operational Test and Evaluation Center	Provides OT&E expertise from concept to employment to meet warfighter mission needs.
Air Force Operations Group	Supports CSAF and DCS for Air and Space Operations with 24-hour watch on current operations and processing emergency messages.
Air Force Personnel Center	Provide personnel operations service.
Air Force Research Laboratory	Develops, integrates, and delivers affordable technologies for improved warfighting capabilities, by leading a partnership of government, industry, and academia.
Air Force Safety Center	Manages USAF mishap prevention programs and Nuclear Surety Programs.
Air Force Security Forces Center	Manages requirements for safeguarding and protecting personnel and resources.
Air Force Weather Agency	Enhances combat power by providing quality weather and space products.

Glossary

Abbreviations and Acronyms

AADC	area air defense commander
ACA	airspace control authority
ADCON	administrative control
AEF	Aerospace Expeditionary Force
AETC	Air Education and Training Command
AFRC	Air Force Reserve Command
AFDD	Air Force doctrine document
AFI	Air Force Instruction
AFPD	Air Force Policy Directive
AFSPC	Air Force Space Command
AFSOF	Air Force special operations forces
AMC	Air Mobility Command
AME	air mobility element
ANG	Air National Guard
AO	area of operations
AOC	aerospace operations center
ATO	air tasking order
AWACS	Airborne Warning and Control System
C2	command and control
CFACC	Combined Force Air Component Commander
CINC	commander in chief; commander of a combatant command
COA	course of action
COCOM	combatant command (command authority)
COMAFFOR	Commander, Air Force Forces
COMSPACEAF	Commander, Air Force Space Forces
CSAF	Chief of Staff, United States Air Force
DIRLAUTH	direct liaison authorized
DIRMOBFOR	Director of Mobility Forces
DSCS	Defense Satellite Communications System
GCCS	Global Command and Control System
GCI	ground-controlled intercept
GPS	global positioning system

IFF	identification friend or foe
IIW	information-in-warfare
INTELSAT	International Telecommunications Satellite Organization
IO	information operations
ISR	intelligence, surveillance, and reconnaissance
IW	information warfare
JAOC	joint air operations center
JAOP	joint air operations plan
JFACC	joint force air component commander
JFC	joint force commander
JOPES	Joint Operation Planning and Execution System
JSOTF	joint special operations task force
JSTARS	Joint Surveillance, Target Attack Radar System
JTA	Joint Technical Architecture
JTA-AF	Joint Technical Architecture - Air Force
JTF	joint task force
MAJCOM	major command
MAPE	monitor, assess, plan, and execute
MOOTW	military operations other than war
NAF	numbered air force
NCA	National Command Authorities
OPCON	operational control
ORM	operational risk management
RF	radio frequency
SATCOM	satellite communications
SIOP	Single Integrated Operation Plan
SOC	space operations center
SOF	special operations forces
TACC	tanker airlift control center
TACON	tactical control
TTP	tactics, techniques, and procedures

UNAAF	Unified Action Armed Forces
USAF	United States Air Force
USCINCSPACE	Commander in Chief, United States Space Command
USCINCTRANS	Commander in Chief, United States Transportation Command
USSOCOM	United States Special Operations Command
USSPACECOM	United States Space Command
USSTRATCOM	United States Strategic Command
USTRANSCOM	United States Transportation Command

Definitions

administrative control. Direction or exercise of authority over subordinate or other organizations in respect to administration and support, including organization of Service forces, control of resources and equipment, personnel management, unit logistics, individual and unit training, readiness, mobilization, demobilization, discipline, and other matters not included in the operational missions of the subordinate or other organizations. Also called **ADCON.** (JP 1-02)

aerospace power. The use of lethal and nonlethal means by aerospace forces to achieve strategic, operational, and tactical objectives. (AFDD 2)

airlift. Operations to transport and deliver forces and materiel through the air in support of strategic, operational, or tactical objectives. (AFDD 1)

apportionment. In the general sense, distribution for planning of limited resources among competing requirements. Specific apportionments (e.g., air sorties and forces for planning) are described as apportionment of air sorties and forces for planning, etc. (JP 1-02)

assign. 1. To place units or personnel in an organization where such placement is relatively permanent, and/or where such organization controls and administers the units or personnel for the primary function, or greater portion of the functions, of the unit or personnel. 2. To detail individuals to specific duties or functions where such duties or functions are primary and/or relatively permanent. See also **attach.** (JP 1-02)

attach. 1. The placement of units or personnel in an organization where such placement is relatively temporary. 2. The detailing of individuals to specific functions where such functions are secondary or relatively

temporary, e.g., attached for quarters and rations; attached for flying duty. See also **assign.** (JP 1-02)

battlespace. The commander's conceptual view of the area and factors that he must understand to successfully apply combat power, protect the force, and complete the mission. It encompasses all applicable aspects of air, sea, space, and land operations that the commander must consider in planning and executing military operations. The battlespace dimensions can change over time as the mission expands or contracts according to operational objectives and force composition. Battlespace provides the commander a mental forum for analyzing and selecting courses of action for employing military forces in relationship to time, tempo, and depth. (AFDD 1)

combatant command (command authority). Nontransferable command authority established by title 10, ("Armed Forces"), United States Code, section 164, exercised only by commanders of unified or specified combatant commands unless otherwise directed by the President or the Secretary of Defense. Combatant command (command authority) cannot be delegated and is the authority of a combatant commander to perform those functions of command over assigned forces involving organizing and employing commands and forces, assigning tasks, designating objectives, and giving authoritative direction over all aspects of military operations, joint training, and logistics necessary to accomplish the missions assigned to the command. Combatant command (command authority) should be exercised through the commanders of subordinate organizations. Normally, this authority is exercised through subordinate joint force commanders and Service and/or functional component commanders. Combatant command (command authority) provides full authority to organize and employ commands and forces as the combatant commander considers necessary to accomplish assigned missions. Operational control is inherent in combatant command (command authority). Also called **COCOM.** (JP 1-02)

command. The authority that a commander in the Armed Forces lawfully exercises over subordinates by virtue of rank or assignment. Command includes the authority and responsibility for effectively using available resources and for planning the employment of, organizing, directing, coordinating, and controlling military forces for the accomplishment of assigned missions. It also includes responsibility for health, welfare, morale, and discipline of assigned personnel. (JP 1-02) The Air Force also believes that force protection of personnel is the

responsibility of its commanders. Today's full spectrum employment of aerospace forces requires command responsibility to also include force protection. *[An order given by a commander; that is, the will of the commander expressed for the purpose of bringing about a particular action. A unit or units, an organization, or an area under the command of one individual.]* {Italicized definition in brackets applies only to the Air Force and is offered for clarity.} See also air command; area command; base command; combatant command; combatant command (command authority)

command and control. The exercise of authority and direction by a properly designated commander over assigned and attached forces in the accomplishment of the mission. Command and control functions are performed through an arrangement of personnel, equipment, communications, facilities, and procedures employed by a commander in planning, directing, coordinating, and controlling forces and operations in the accomplishment of the mission. Also called **C2.** (JP 1-02)

Defense Information Infrastructure. The shared or interconnected system of computers, communications, data applications, security, people, training, and other support structures serving DOD local, national, and worldwide information needs. The Defense Information Infrastructure connects DOD mission support, command and control, and intelligence computers through voice, telecommunications, imagery, video, and multimedia services. It provides information processing and services to subscribers over the Defense Information Systems Network and includes command and control, tactical, intelligence, and commercial communications systems used to transmit DOD information. Also called **DII.** (JP 1-02)

distributed operations. The process of conducting operations from independent or interdependent nodes in a teaming manner. Some operational planning or decision-making may occur from outside the joint area of operations. The goal of a distributed operation is to support the operational commander in the field; it is not a method of command from the rear.

doctrine. Fundamental principles by which the military forces or elements thereof guide their actions in support of national objectives. It is authoritative but requires judgment in application. (JP 1-02)

force protection. Security program designed to protect Service members, civilian employees, family members, facilities, and equipment,

in all locations and situations, accomplished through planned and integrated application of combating terrorism, physical security, operations security, personal protective services and supported by intelligence, counterintelligence, and other security programs. (JP 1-02) *[The prevention of successful hostile actions against friendly combat power while it is not directly engaged with the enemy. Force Protection measures may be defensive (passive and active) or offensive, and include the actions of every element of a combat force, encompassing the supporting community and individuals.]* {Italicized definition in brackets applies only to the Air Force and is offered for clarity.} (AFDD 2)

fusion. Process of combining/aggregating data to derive a more complete assessment of a specific capability, action, or situation.

information. 1. Facts, data, or instructions in any medium or form. 2. The meaning that a human assigns to data by means of the known conventions used in their representation. (JP 1-02)

information-in-warfare. Involves the Air Force's extensive capabilities to provide global awareness throughout the range of military operations based on integrated intelligence, surveillance and reconnaissance (ISR) assets; information collection/dissemination activities; and global navigation and positioning, weather, and communications capabilities. Also called **IIW.** (AFDD 2-5)

information operations. Actions taken to affect adversary information and information systems while defending one's own information and information systems. Also called **IO.** (JP 1-02). *Those actions taken to gain, exploit, defend or attack information and information systems. This includes both information-in-warfare (IIW) and information warfare (IW).* {Italicized definition in brackets applies only to the Air Force and is offered for clarity.} (AFDD 2)

information warfare. Actions taken to affect adversary information and information systems, while defending one's own information and information systems. (JP 1-02)

intelligence. 1. The product resulting from the collection, processing, integration, analysis, evaluation, and interpretation of available information concerning foreign countries or areas. 2. Information and knowledge about an adversary obtained through observation, investigation, analysis, or understanding. (JP 1-02)

joint doctrine. Fundamental principles that guide the employment of forces of two or more Services in coordinated action toward a common objective. It will be promulgated by the Chairman of the Joint Chiefs of Staff, in coordination with the combatant commands, Services, and Joint Staff. See also **doctrine.** (JP 1-02)

joint force. A general term applied to a force composed of significant elements, assigned or attached, of two or more Military Departments, operating under a single joint force commander. See also **joint force commander.** (JP 1-02)

joint force air component commander. The joint force air component commander derives authority from the joint force commander who has the authority to exercise operational control, assign missions, direct coordination among subordinate commanders, redirect and organize forces to ensure unity of effort in the accomplishment of the overall mission. The joint force commander will normally designate a joint force air component commander. The joint force air component commander's responsibilities will be assigned by the joint force commander (normally these would include, but not be limited to, planning, coordination, allocation, and tasking based on the joint force commander's apportionment decision). Using the joint force commander's guidance and authority, and in coordination with other Service component commanders and other assigned or supporting commanders, the joint force air component commander will recommend to the joint force commander apportionment of air sorties to various missions or geographic areas. Also called **JFACC.** See also **joint force commander.** (JP 1-02)

joint force commander. A general term applied to a combatant commander, subunified commander, or joint task force commander authorized to exercise combatant command (command authority) or operational control over a joint force. Also called **JFC.** See also **joint force.** (JP 1-02)

joint task force. A joint force that is constituted and so designated by the Secretary of Defense, a combatant commander, a subunified commander, or an existing joint task force commander. Also called **JTF.** (JP 1-02)

Joint Technical Architecture—Air Force (JTA-AF). The Joint Technical Architecture-Air Force (JTA-AF) forms the foundation for information transfer and processing within the Air Force and is essential to system

interoperability. It complements the Joint Technical Architecture (JTA) and provides the minimal set of rules governing the arrangement, interaction, and interdependence of Air Force system components. It provides the framework of engineering specifications, common building blocks, and product lines which guides system implementations. This technical architecture is based on operational architecture requirements and will constrain systems architecture development. (HQ USAF/SC)

logistics. The science of planning and carrying out the movement and maintenance of forces. In its most comprehensive sense, those aspects of military operations that deal with: a. design and development, acquisition, storage, movement, distribution, maintenance, evacuation, and disposition of materiel; b. movement, evacuation, and hospitalization of personnel; c. acquisition or construction, maintenance, operation, and disposition of facilities; and d. acquisition or furnishing of services. (JP 1-02)

military strategy. The art and science of employing the armed forces of a nation to secure the objectives of national policy by the application of force or the threat of force. (JP 1-02)

National Command Authorities. The President and the Secretary of Defense or their duly deputized alternates or successors. Also called **NCA.** (JP 1-02)

national strategy. The art and science of developing and using the political, economic, and psychological powers of a nation, together with its armed forces, during peace and war, to secure national objectives. (JP 1-02)

operational control. Transferable command authority that may be exercised by commanders at any echelon at or below the level of combatant command. Operational control is inherent in combatant command (command authority). Operational control may be delegated and is the authority to perform those functions of command over subordinate forces involving organizing and employing commands and forces, assigning tasks, designating objectives, and giving authoritative direction necessary to accomplish the mission. Operational control includes authoritative direction over all aspects of military operations and joint training necessary to accomplish missions assigned to the command. Operational control should be exercised through the commanders of subordinate organizations. Normally this authority is exercised through subordinate joint force commanders and Service and/or functional component commanders. Operational control normally provides full authority to organize commands and forces and to employ those forces as the commander in operational

control considers necessary to accomplish assigned missions. Operational control does not, in and of itself, include authoritative direction for logistics or matters of administration, discipline, internal organization, or unit training. Also called **OPCON.** (JP 1-02)

operational level of war. The level of war at which campaigns and major operations are planned, conducted, and sustained to accomplish strategic objectives within theaters or areas of operations. Activities at this level link tactics and strategy by establishing operational objectives needed to accomplish the strategic objectives, sequencing events to achieve the operational objectives, initiating actions, and applying resources to bring about and sustain these events. These activities imply a broader dimension of time or space than do tactics; they ensure the logistic and administrative support of tactical forces, and provide the means by which tactical successes are exploited to achieve strategic objectives. (JP 1-02)

operational risk management. The systematic process of identifying hazards, assessing risks, analyzing risk control measures, making control decisions, implementing risk controls, and supervising and reviewing the process. Commanders accept the residual risks. (AFI 91-213)

reachback. The process of obtaining forces, materiel or information support from Air Force organizations not forward-stationed or forward-deployed.

reconnaissance. A mission undertaken to obtain, by visual observation or other detection methods, information about the activities and resources of an enemy or potential enemy, or to secure data concerning the meteorological, hydrographic, or geographic characteristics of a particular area. (JP 1-02)

special operations. Operations conducted by specially organized, trained, and equipped military and paramilitary forces to achieve military, political, economic, or informational objectives by unconventional military means in hostile, denied, or politically sensitive areas. These operations are conducted across the full range of military operations, independently or in coordination with operations of conventional, non-special operations forces. Political-military considerations frequently shape special operations, requiring clandestine, covert, or low visibility techniques and oversight at the national level. Special operations differ from conventional operations in degree of physical and political risk, operational techniques, mode of employment, independence from friendly support,

and dependence on detailed operational intelligence and indigenous assets. Also called **SO.** (JP 1-02)

spectrum management. Planning, coordinating, and managing joint use of the electromagnetic spectrum through operational, engineering, and administrative procedures, with the objective of enabling electronics systems to perform their functions in the intended environment without causing or suffering unacceptable interference. (AFI 33-118)

split operations. One type of distributed operations. It describes those distributed operations conducted by a single C2 entity that is separated between two or more geographic locations. A single commander must have oversight of all aspects of a split C2 operation.

strategic level of war. The level of war at which a nation, often as a member of a group of nations, determines national or multinational (alliance or coalition) security objectives and guidance, and develops and uses national resources to accomplish those objectives. Activities at this level establish national and multinational military objectives; sequence initiatives; define limits and assess risks for the use of military and other instruments of national power; develop global plans or theater war plans to achieve these objectives; and provide military forces and other capabilities in accordance with strategic plans. (JP 1-02)

strategy. The art and science of developing and using political, economic, psychological, and military forces as necessary during peace and war, to afford the maximum support to policies, in order to increase the probabilities and favorable consequences of victory and to lessen the chances of defeat. (JP 1-02)

surveillance. The systematic observation of aerospace, surface or subsurface areas, places, persons, or things, by visual, aural, electronic, photographic, or other means. (JP 1-02)

sustainment. The Air Force's ability to maintain operations once forces engage. Sustainment involves the provision of personnel, logistics, and other support required to maintain and prolong operations or combat until successful accomplishment or revision of the mission or of the national objective. (AFDD 1-2).

tactical control. Command authority over assigned or attached forces or commands, or military capability or forces made available for tasking,

that is limited to the detailed and, usually, local direction and control of movements or maneuvers necessary to accomplish missions or tasks assigned. Tactical control is inherent in operational control. Tactical control may be delegated to, and exercised at any level at or below the level of combatant command. Also called **TACON.** (JP 1-02)

tactical level of war. The level of war at which battles and engagements are planned and executed to accomplish military objectives assigned to tactical units or task forces. Activities at this level focus on the ordered arrangement and maneuver of combat elements in relation to each other and to the enemy to achieve combat objectives. (JP 1-02)

tactics. 1. The employment of units in combat. 2. The ordered arrangement and maneuver of units in relation to each other and/or to the enemy in order to use their full potentialities. (JP 1-02)

theater. The geographical area outside the continental United States for which a commander of a combatant command has been assigned responsibility. (JP 1-02)

war. Open and often prolonged conflict between nations (or organized groups within nations) to achieve national objectives. (AFDD 1)