$C^{nth}I^{nth}xyz$, TACS, and Air Battle Management

The Search for Operational Doctrine

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"WHAT DO YOU DO?" That rather innocent question from a fellow student at Air War College was the genesis of this paper. Instead of a simple, direct answer like "I drive ships" or "I fly planes," my long, rambling response included "equipment" like radar, radios, computers, and scopes; "planes and places" including ABCCC (airborne command and control center), AWACS (airborne warning and control system), JSTARS (joint surveillance, target attack radar system), and CRC (control and reporting centers); and "tasks" such as weapons control, surveillance, identification, weapons assignment, and battle direction.[1] He responded, "Sounds like you're in C^2" (command and control).

My answers did sound a lot like "C^2"; yet the Air Force recently changed my "command and control operations" career field to "air battle management." The obvious answer to my classmate's question—"I manage the air battle"—simply raises more questions. What does it mean to "manage" an air battle?[2] Does air battle management describe a product, a process, an organizational structure, some combination of each, or something entirely different? I should have been able to answer these

questions with some precision, but I couldn't. As the prospective commander of the "schoolhouse" that trains air battle managers, I had the harrowing thought that some second lieutenant might, with all sincerity, ask me, "I still don't understand, sir. What do we do?"

At the tactical level, my answer was straightforward—largely junior officer tasks. However, most air battle managers support the joint force air component commander (JFACC) at the operational level of air warfare, where things can be much more murky. Air battle managers work at the interface of the tactical and operational levels of war where the JFACC's intent is translated through tactical action into results that achieve the joint force commander's (JFC) objectives. My search for a coherent answer begins with understanding what occurs inside the box in figure 1:

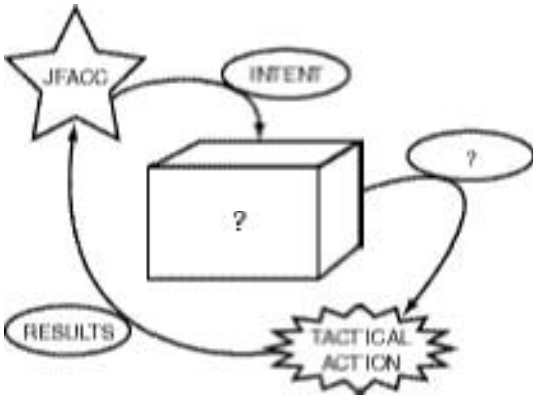


Figure 1. The Link between Intent and Results

Doctrine at the Operational Level of Air Warfare

Operational doctrine should, but does not, clarify what occurs in this box. The area between the JFACC's intent and tactical results is, unfortunately, confusing—even for supposed experts. Past doctrinal explanations began and ended with the traditional air "missions and roles."[3] The operational level of air warfare, however, includes more than the combat operations functions of counterair, interdiction, close air support, and strategic attack.[4]

These critical functions, executed at the tactical level, are actually operational-level "outputs" designed to achieve the "inputs" of the JFC's objectives and the JFACC's intent. Viewed as the enabling link between the intent input and the results output, the operational level of air warfare can best be understood as a system. Several "systems" vie to explain this translation of strategic objectives and operational intent into air warfare results. The principal candidates are C^2; theater battle management; the theater air control system (TACS); and command, control, communications, computers, intelligence, surveillance, and reconnaissance (C^4ISR).[5] Often used interchangeably, each has both overlapping and unique elements, yet each provides only a partial conceptual explanation.

Air Force operational doctrine should sort out this conceptual confusion and end the proliferation of new explanatory constructs, thereby fostering a shared understanding of the operational level of air warfare—both within the Air Force and in the joint community. That understanding will only come from a coherent framework for operational doctrine—a model for thinking about the box in figure 1.

Operational doctrine is the Air Force's intellectual entree to the joint force. Doctrine provides both the definitional context and operational framework within which future joint force commanders and their staffs will plan to employ the US Air Force in future theater contingencies. As Air Force manning shrinks, organizations disappear, operational requirements expand, and every airman and, nearly as important, the joint community must have a common comprehension of how we intend to operate, not only at the tactical level but also at the operational level of war.

Operational doctrine is the key to such understanding.

The JFACC's operational art is in translating the joint force commander's intent into tactical results that support the joint force's achievement of strategic and theater objectives. The JFACC achieves these results by orchestrating the "when, where, and for what purposes" he employs airpower.[6] The box in figure 1 is the arena in which the JFACC conducts this orchestration and comprises the bulk of the operational level. A clear understanding of what occurs inside that box is vital to our search for air operational doctrine.

With this fuller understanding of the core function of operational-level airpower doctrine, the output of our box would consist of tasking and controlling the air effort. This omits the critical commander's estimate of the situation process and its result, the joint air operations plan. Also missing is an explanation that goes beyond the "JFACC's responsibilities" and explains the who and how of "C^3I requirements," "tasking orders," and "control." This can and should be done in a comprehensive, understandable manner. However, it requires that operational doctrine go beyond the JFACC to the organizations and people who must accomplish these operational tasks and the systems in which and with which they work.

The conceptual confusion among the various system explanations of the box in figure 1 is the central challenge to the Air Force search for a coherent, unified, operational-level doctrine. We will focus on three candidate systems—C^2, the TACS, and C^4ISR. These three systems are the most commonly used and have the analytical advantage of having joint approval of definitions. To begin to sort out this confusion, we should be able to compare and contrast the joint-approved definitions in Joint Publication 1-02, *Department of Defense Dictionary of Military and Associated Terms,* of our candidate systems and determine what is unique to each and where the overlap exists.[7]

command and control system—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.

tactical air control system—The organization and equipment necessary to plan, direct, and control tactical air operations and to coordinate air operations with other Services. It is composed of control agencies and communications-electronics facilities which provide the means for centralized control and decentralized execution of missions. (The Air Force changed "tactical" to "theater" in 1992.)

command, control, communications, and computer systems—Integrated systems of doctrine, procedures, organizational structures, personnel, equipment, facilities, and communications designed to support a commander's exercise of command and control across the range of military operations.

Unfortunately, this approach does not solve our problem. All three definitions focus on the commander and include the same organizations, people, equipment, systems, and facilities. Both the TACS and C^2 have the purpose of planning, directing, and controlling operations. C^4 and C^2 include procedures—also implicit in the TACS definition.[8] Comparison of the three definitions indicates that they have very large areas of conceptual redundancy. Contrasting the three provides only the notions that the TACS is the Air Force's C^2 system (but with an emphasis on the "control" of operations) and that C^4 systems are definitionally unique only in the addition of the idea of integrated systems that support commanders.

While this analysis does not provide many answers, it does illustrate why the three systems are so difficult to differentiate and why official documents often use them interchangeably. One reason we have created new concepts such as C^4ISR and battle management

(BM)/C² is the unmet need for a unified system model of the operational level of war. We are left to approach our box from a non definitional perspective and attempt first to define a generic system that might fulfill our requirements for a coherent, unifying concept and then apply our existing C², TACS, and C⁴ISR explanations to this model.

A generic system[9] model would, at a minimum, include (1) a *product*, the rationale for the system which relates system inputs and outputs; (2) a *process*, the tasks which must be accomplished to achieve the desired product; (3) an *internal structure*, the organizational dynamic within which the system assigns responsibilities for the requisite process tasks; and (4) an *external support structure*, the architecture by which the system acquires necessary support from outside the system and connects and distributes these external capabilities within the system. Applying this generic system model to the operational level of air war may allow us to clarify the core rationale of our competing systems, discard the confusing areas of redundancy, and build a new model of the operational level (table 1).[10] Such a unified model of the operational level would require us to complete the following:

Table 1

A Unified Model of the Operational Level

GENERIC CATEGORY	CATEGORY DESCRIPTION	MODEL CATEGORY	MODEL SYSTEM
PRODUCT	The rationale for the system, its output which relates its *function* to system inputs.	Function	?
PROCESS	The *tasks* which must be accomplished to achieve desired product.	Tasks	?
INTERNAL STRUCTURE	The *organizational* dynamic by which the system assigns responsibilities for the requisite process tasks.	Organization	?
EXTERNAL SUPPORT STRUCTURE	The *architecture* by which the system acquires necessary support from outside the system and connects and distributes these external capabilities within the system.	System Architecture	?

The Product: Airpower Functions

Both US Air Force basic and operational doctrine will, when released, undoubtedly adequately cover the combat operations air functions. They are well understood both within the Air Force and in the joint community. We can begin to rebuild our conceptual model of the operational level with this description of the product of air functions:

> **air functions—**The operational level model products are the combat operations air functions of counterair, air interdiction, close air support, and strategic attack. These sytems output tactical results achieve the system inputs of JFACC intent and JFC strategic objectives.

Having defined both system inputs and outputs for our model, we will now turn to the process, internal structure, and external support structure requirements posited in our generic model. As we consider the three candidate systems—C^2, TACS, and C^4ISR—it may seem to the reader that all we have demonstrated is that we have three names for the same thing. However, the actual—versus definitionally derived—purposes underlying these concepts are as different as those of the counterair, interdiction, close air support, and strategic attack air tasks. These air tasks may seem the same at the tactical level. At that level, each task involves delivering ordnance from aircraft; but at the operational level, the distinctions are fundamental. Those distinctions are the differing contributions each makes to establishing the conditions necessary for meeting the JFC's objectives. Similarly, we must understand the distinctions among the C^2, TACS, and C^4ISR systems and clearly differentiate them in our operational doctrine.

It would take an article at least as long as this one simply to sort out the meanings of all the acronyms associated with these three systems—or what they seem to mean because they are freely interchanged (and proliferated) without precision, denying us the ability to speak clearly about the operational level of air warfare. We can, however, classify this system mélange into three distinct categories from our generic model—process "tasks," an internal structure of "organizations," and an external support structure provided through a "system architecture."

Due to their conceptual overlap and redundancy, neither C^2, TACS, nor C^4ISR systems individually provides a comprehensive basis for operational thinking about the entire system entity through which the JFACC employs airpower. Yet, the description of each of these three systems has a distinct (though incomplete) place in our conceptualization of the operational level of war. We will now examine each separately, determine each system's core conceptual value to our quest, then attempt to reformulate them as a coherent whole using our model's categories of product, process, internal structure, and external support structure. This "best fit" approach will allow us to deconflict and reformulate the operational level into a single system. First, we will look at C^2.

> **command and control system—**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.

The Process: Command and Control System

Joint Pub 3-0 outlines four basic questions that operational art should resolve:

1. What military conditions must be created in order to realize the strategic objective?
2. What sequence of events must occur in order to create the required conditions?

"Does air battle management describe a product, a process, an organizational structure, some combination of each, or something entirely different?"

3. How should forces and resources be used in order to make the sequence happen?
4. What degree of risk is acceptable at each stage of the enterprise?[11]

These questions describe the planning output we should expect from the "missing link" in figure 1. Operational planning guides[12] apply this process to air operations planning without reference to either C^2, the TACS, or C^4ISR. While the relationship may be implied, it is essential that operational doctrine explicitly make that linkage and explain the process by which these four questions are answered in terms that all airmen and the joint audience can understand. The concept of a C^2 system provides this commonly understood and accepted conceptual framework.

The emphasized words in the joint definition of a command and control system demonstrate a common functional thread running through the definitions of all three systems. This thread simply and comprehensively explains the process that occurs within our box and provides a straight forward link to the products that are necessary for success. However, to be complete our model of the operational-level process must include all three tasks: planning, directing, and controlling of air functions in the execution of combat operations. Following are some preliminary attempts at definitions:

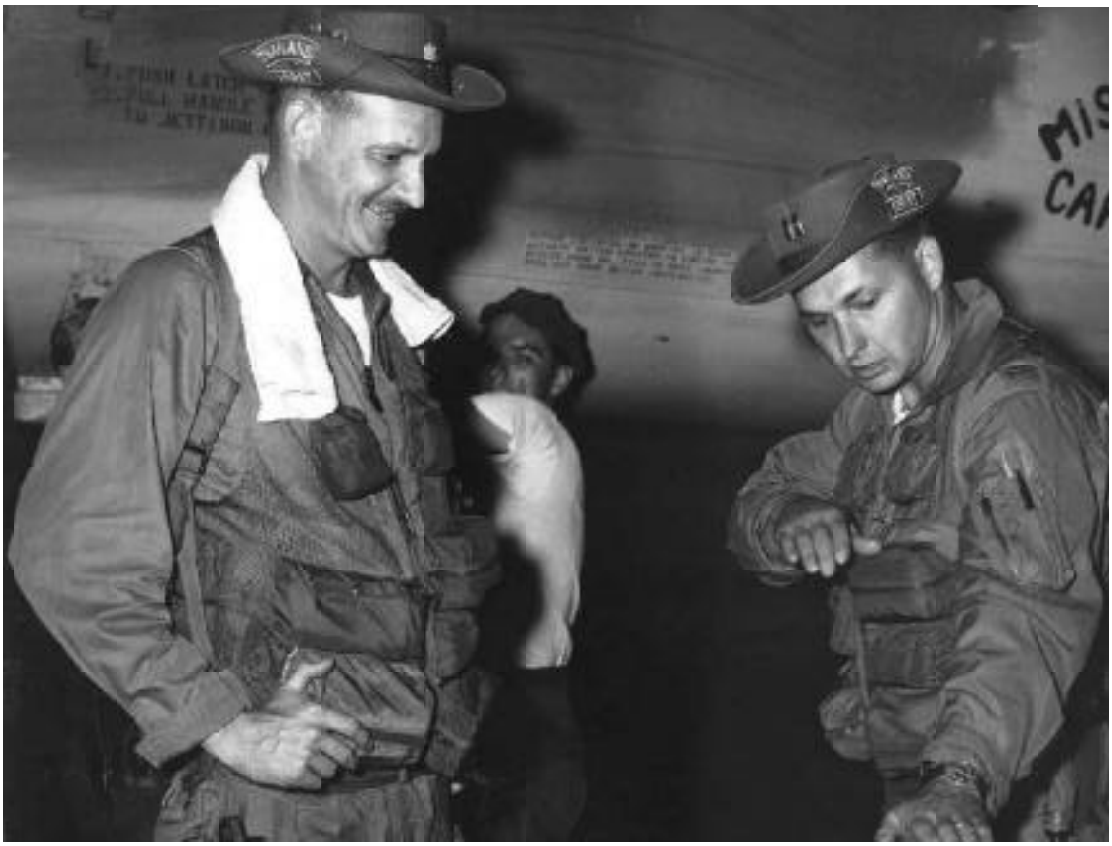
- **planning—**The planning task is executed through the Commander's Estimate of the Situation process and results in the development of the Joint Air Operations Plan.
- **directing—**The directing task is the translation of the JFACC's intent and concept of operations outlined in the Joint Air Operations Plan into an air tasking order (ATO). Directing is principally a sortie allocation, weaponeering, and targeting task, augmented by real-time changes made during the execution of the air function.
- **controlling—**The controlling task is the extension of the JFACC's authority over operations by monitoring, restraining, and adapting ATO execution of air functions. Its operational purpose is to support and maintain centralized control of execution of the JFACC's planned and directed operational concept through situation awareness (SA) and authoritative real-time execution adjustment.
- **operations—**The combat operations air functions are the operational-level products of the planning, directing, and controlling tasks. This system output achieves the JFACC's intent as outlined in the Joint Air Operation Plan's concept of operations and directed by the ATO to achieve tactical results that achieve the JFC's operational objectives.

Incorporating these four descriptions in our conceptual model, the second piece of the model involves results:

tasks—The operational-level model process consists of the command and control tasks of planning, directing, and controlling combat operations. These tasks establish the conditions necessary for air function tactical results that achieve JFC objectives.

The personnel who accomplish the planning, directing, and controlling of combat operations air functions of the C^2 system are members of the theater air control system. This second, competing systems concept has existed since the World War II birth of radar.

theater air control system—The organization and equipment necessary to plan, direct, and control tactical air operations and to coordinate air opera-



The lure of the cockpit. "Only the Air Force's tactical doctrine seems to excite interest. Officers care about what goes into this document because it has a direct impact on how we fly and fight. Unfortunately, no comparable vehicle or level of interest exists at the operational level."

> tions with other Services. It is composed of control agencies and communications-electronics facilities which provide the means for centralized control and decentralized execution of missions.

The Internal Structure: The Theater Air Control System

It has been nearly 55 years since a group of officers in the War Department, in response to the debacle of Kasserine and the perceived misuse of airpower, wrote Field Manual 100-20, *Command and Employment of Air Power*.[13] This manual provided the starting point for understanding the theater air control system:

> *First Priority.*—The primary aim of the tactical air force is to obtain and maintain air superiority in the theater. *The first prerequisite for the attainment of air supremacy is the establishment of a fighter defense and offense, including radio direction finding (RDF), GCI, and other types of radar equipment essential for the detection of enemy aircraft and control of our own.* (Emphasis added)[14]

FM 100-20 originated the idea that essential to achieving air superiority is the "establishment of a fighter defense and offense," which

depends on equipment capable of detection of the enemy and control of friendly aircraft. This description of equipment and personnel is the doctrinal birth of what we now call the theater air control system.

A great deal was written about the TACS during the 1970s and 1980s. However, the Air Force has produced very little doctrine since then to explain how the TACS employs air at the operational level. Official publications, primarily the 55-4X series of regulations issued by Tactical Air Command, described in great detail the manning, equipment, responsibilities, and relationships of the many TACS elements. Unfortunately, more recent publications such as the 1992 version of basic doctrine and the *JFACC Primer* barely mention the TACS.[15]

Nevertheless, we are today doctrinally clear—on both service and joint levels—on the idea that the theater air control system extends the JFACC's authority throughout the theater of operations. The TACS has expanded to include not just the FM 100-20 capabilities to detect and control but also all the organizations that plan, direct, and control air operations. The core role of the theater air control system, then, is its organizational nature, which provides our model's internal structure.[16]

The operational tasks accomplished by the people in the organizations of the theater air control system include each of the command and control functions—planning, directing, and controlling combat operations functions—not just control. We might, then, tentatively define the internal structure of our operational model as follows:

> **organization—**The operational-level model internal structure includes all units subordinate to the JFACC which extend his authority throughout the theater. The TACS, using capabilities provided by external support systems, performs the tasks of planning, directing, and controlling combat operations to achieve JFC objectives.

Multiple systems provide the capabilities in our organizational description. These systems, which exist independently of the TACS, nevertheless have the core purpose of providing the information support necessary to achieve the C^2 tasks. These systems must be conceptually and technically arranged in a "systems architecture."

The External Support Structure: $C^{nth}I^{nth}xyz$

> **command, control, communications, and computer systems—**Integrated systems of doctrine, procedures, organizational structures, personnel, equipment, facilities, and communications designed to support a commander's exercise of command and control across the range of military operations.

Originally, command, the function of authority and leadership on the battlefield, expanded to command and control to explain the process commanders used to exercise their authority and leadership throughout the expanding space of modern battlefields.[17] Driven in part by the size and complexity of cold war force structures and the technical aspects of the emergence of electronics as a contributing factor in warfare, another large body of work grew during the 1970s and 1980s which explained this change by extending the C^2 concept to command, control, and communications (C^3). This extension of C^2 to C^3 was originally a scientific-engineering conceptualization.[18]

C^3 attempted to explain how the burgeoning electronic systems support structure necessary to employ new technology would be integrated with current systems while achieving the necessary degree of interoperability and connectivity to allow the proliferating systems to share information. This gave rise to the concept of a systems architecture. The addition of "computers" (ergo C^4) was in keeping with this systems-architecture approach; then came intelligence, integration, and in-

teroperability. Depending on which source you consulted at the time, it appeared we should just call this "thing" $C^{nth}I^{nth}xyz$ (command, control, communications, computers, intelligence, surveillance, and reconnaissance).

C^3, C^4, C^4I, C^4ISR, and all the C^2 variants are fundamentally scientific representations of sets of electronic hardware and software interoperability and integration interactions—an architecture. This architecture allows the scientist and engineer to make generalizations about that which they otherwise cannot generalize and, therefore, cannot use to explain other phenomena. This process is legitimate for the furtherance of science; it is problematic for warriors trying to survive in the most chaotic of environments—combat. None of these acronyms represents actual objects. They exist as aids to understanding—heuristics—not actual systems. Thus, they are inappropriate as a stand-alone doctrinal base upon which to build a clear understanding of operational-level airpower employment.[19]

This expanding conceptualization of systems supporting the air commander has now stabilized at C^4ISR—command, control, communications, computers, intelligence, surveillance, and reconnaissance. There have been many efforts over the last decade to help US Air Force senior leaders "get their hands around" these conceptualizations. Strategy-to-task study groups, theater battle management general officer steering groups, the current C^2 task force, and the recent four-star C^2 summit, and its resultant Aerospace Command and Control Agency, are only a few of many such examples. This high-level emphasis indicates that Air Force leadership sees the potential benefit in these systems conceptualizations. It also indicates that they are unsure how to maximize that potential or fully integrate C^4ISR in airpower employment.

Intelligence, surveillance, reconnaissance, and communications systems are conceptually different from command, control, or computers. Intelligence, surveillance, reconnaissance, and communications are distinct systems. Computers, while essential to each of the other elements, do not exist as a separate system. Control is a task, while command is an authority; neither is an independent system. Additionally, if we establish the criteria for such systems as technology-based system capabilities that support the air operation, and we include intelligence, surveillance, and reconnaissance, then why wouldn't we also include, at a minimum, logistics.[20] As information warfare technology develops as an independent system, it too will be a candidate to extend the initials of our C^4ISR system. Perhaps the best solution is to discard the $C^{nth}I^{nth}xyz$ approach and adopt this final piece of our conceptual model:

> **systems architecture—**The operational-level model system architecture provides the connectivity, interoperability, and integration with the external support structure's technology-based capabilities required by the air functions, tasks and organizations.

What's the Solution? A New Model for Operational Doctrine

We began with a generic system model and developed its essential categories of product, process, internal structure, and external support structure. Applying these categories to the C^2, TACS, and C^4ISR systems, we found that each makes a core contribution to our operational-level model's output—the airpower product of the combat operations air functions.

The C^2 tasks of planning, directing, and controlling combat operations fulfill our process category. The planning task results in the Joint Air and Space Operations Plan (JASOP). The JASOP is then translated into an air tasking order as the central product of the directing task. The controlling task produces the situation awareness necessary for successful combat operations that provide the tactical results necessary to achieve the JFACC's intent.

All of these process tasks are accomplished through the personnel of the theater air control system, which provides the internal structure for our operational-level model. This organization includes the air operations center (AOC), ground elements, and airborne elements. The AOC is the JFACC's headquarters and the personnel assigned to it largely accomplish the planning and directing tasks. The ground elements of the TACS consist of the control and reporting centers and smaller control and reporting elements (CRE) along with tactical air control parties and air liaison officers, who provide the TACS linkage to US Army units through air support operations centers. Airborne elements of the TACS include AWACS, ABCCC, and JSTARS. Both ground and air elements execute the core controlling task, while supporting the planning and directing tasks.

The external support system capabilities necessary for these personnel to accomplish the operational-level tasks are provided by a systems architecture most commonly associated with the C^4ISR systems. These independent supporting systems provide the capabilities that the operational model's system architecture ties to the TACS organizations through interoperability, connectivity, and integration capabilities (table 2).

Table 2

Model of Air Operational Level of War
Theater Air Command and Control System

GENERIC CATEGORY	MODEL CATEGORY	MODEL SYSTEM	MODEL ELEMENTS
PRODUCT	Function	Combat Operations System	Counterair, Close Air Support, Air Interdiction, Strategic Attack
PROCESS	Task	Command and Control System (C^2)	Planning, Directing, and Controlling Combat Operations
INTERNAL STRUCTURE	Organization	Theater Air Control System (TACS)	AOC, AETACS, GTACS
EXTERNAL SUPPORT STRUCTURE	Architecture	Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C^4ISR) System	Supporting Systems: Control, Communications, Intelligence, Surveillance, Reconnaissance, [and Logistics]

We have redefined the requirements for achieving the JFACC's intent through a model of air functions (product), tasks (process), organization (internal structure), and systems architecture (external support structure). This model of the operational level of air warfare enables the combat operations necessary to achieve the joint force commander's strategic objectives using the capabilities of external support systems through a system architecture and command and control process accomplished by the units of the model's internal structure—the theater air control system. Clearly, in addition to the controlling task, the TACS organizations perform both planning and directing tasks of the command and control process. Thus, we should expand the TACS to the theater air command and control system theater air command and control system (TACCS) to properly convey the full organizational responsibility and its relationship to the operational-level tasks. We are now ready to look back at our box and see what this reformulated model looks like. Figure 2 depicts our new representation of the operational level:

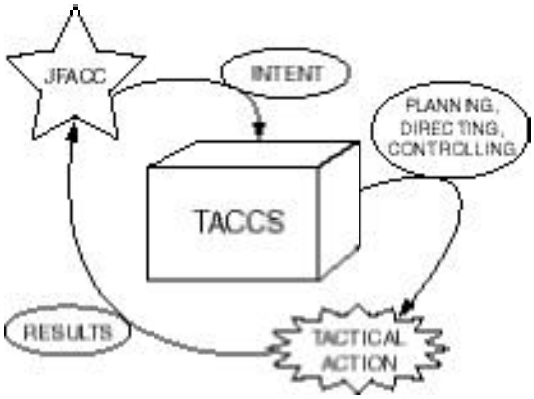


Figure 2. The Link between Intent and Results

Figure 2 shows the system input JFACC's intent to our operational model of the theater air command and control system, while the C^2 process of planning, directing, and controlling combat operations establishes the conditions that allow air functions to achieve the system output product of tactical action results. The consolidated model components provide its description:

air functions—The operational-level model products are the combat operations air functions of counterair, air interdiction, close air support, and strategic attack. These sytems output tactical results achieve the system inputs of JFACC intent and JFC strategic objectives.

tasks—The operational-level model process consists of the command and control tasks of planning, directing, and controlling combat operations. These tasks establish the conditions necessary for air function tactical results that achieve JFC objectives.

organization—The operational-level model internal structure includes all units subordinate to the JFACC which extend his authority throughout the theater. The TACS, using capabilities provided by external support systems, performs the tasks of planning, directing, and controlling combat operations to achieve JFC objectives.

systems architecture—The operational-level model system architecture provides the connectivity, interoperability, and integration with the external support structure's technology-based capabilities required by the air functions, tasks, and organizations.

Summary

Operational doctrine is critically important to the Air Force role as a member of the joint team. This new importance results from both the joint focus on doctrine and the need for the entire joint community to understand how the US Air Force operates at the operational level of war. The decreasing manning and increasing taskings of our operational forces reinforce the need to eliminate functional redundancy and ensure that all airmen understand their role in Air Force operations. The Air Force needs a comprehensive framework for operational doctrine that includes all components necessary for success at the operational level of air warfare.

Air Force operational doctrine should comprehensively explain the tasks of planning, directing, and controlling combat operations and the air functions that produce the tactical action results which achieve the joint force commander's operational objectives. These C^2 tasks are executed through the organizational dynamic of the theater air command and control system and supported by the technical system capabilities of communications, intelligence, reconnaissance, surveillance, and logistics systems, enabled by the connectivity, integration, and interoperability of the TACCS architecture. This conceptualization of operational air functions, tasks, organizations, and systems architecture provides all airmen and the joint community a common framework for understanding airpower employment at the operational level of air warfare. As the benchmark for developing new operational forms, the TACCS will allow us to break away from hierarchical preinformation-age constructs and approach a new model for accomplishing the timeless requirements to plan, direct, and control air operations.[21]

My Answer to the Lieutenant's "What Do We Do?"

The air battle manager serves at both the tactical and operational levels of war in all units of the theater air command and control system. The air battle manager (1) "plans" implementation of the JFACC's intent as a part of the commander's estimate of the situation planning process; (2) "directs" air tasking order execution and makes changes during the air battle through real-time decisions to adapt air function execution to the changing air battle situation; and (3) "controls" execution of combat operations as an operational-level extension of the joint force air component commander's authority to ensure the tactical action results achieve the joint force commander's theater objectives. The air battle manager accomplishes these operational tasks through the capabilities of intelligence, communications, surveillance, reconnaissance, and logistics systems, and "manages" those parts of the TACCS architecture assigned to his or her responsibility.

The air battle manager's role is as the symphony conductor of the air battle. Air battle managers start with the air tasking order "score" written by the planners in the joint air operations center and ordered by the joint forces air component commander. Just as the symphony conductor integrates the music of the orchestra's string, woodwind, brass, and percussion sections into a coherent whole, the air battle manager brings together the many missions of air power. These sections of the airpower orchestra range from the counterair, counterland, electronic and strategic attackers, to the critical air refuelers and search and rescue forces, and include the critical elements of information superiority and global awareness provided by the space and intelligence, surveillance, and reconnaissance forces. Each of these "players" provides an indispensable component of the air battle. The air battle manager brings them together to create the "music" of airpower.

Finally, all airmen, but especially the twenty-first century air battle manager, must begin to think today about this system, where

it is synchronized and where it is misaligned. When all parts of the TACCS are technologically, functionally, and organizationally aligned, we can begin to think about the possibilities for the future.

Notes

1. ABCCC, AWACS, and JSTARS, and the CRCs are all elements of the theater air control system. The best sources for explanations of these systems and the history of the TACS are Maj Kevin N. Dunleavy and Maj Lester C. Ferguson, "Command and Control and the Doctrinal Basis of the Theater Air Control System," in *Concepts in Airpower for the Campaign Planner* (Maxwell AFB, Ala.: Air Command and Staff College, 1993), 123–48; Lt Col Robert J. Blunden Jr., USAF, *Tailoring the Tactical Air Control System for Smaller-Scale Contingencies* (Maxwell AFB, Ala.: Air University Press, 1992), and *Tailoring the Tactical Air Control System for Contingencies* (Maxwell AFB, Ala.: Air University Press, 1992); Lt Col David Tillotson III, USAF, *Restructuring the Air Operations Center: A Defense of Orthodoxy* (Maxwell AFB, Ala.: Air University Press, 1993); Lt Col J. Taylor Sink, USAF, *Rethinking the Air Operations Center: Air Force Command and Control in Conventional War* (Maxwell AFB, Ala.: Air University Press, 1994); and Lt Col Richard T. Reynolds, USAF, *What Fighter Pilots' Mothers Never Told Them about Tactical Command and Control—and Certainly Should Have* (Cambridge, Mass.: Center for Information Policy Research, Harvard University, 1991).

2. Both "manage" and "battle" are problematic descriptors. This paper deals with "things" and "systems," as well as people. People must be led; things and systems can only be managed. Whether we control—my preference—or manage air battles, engagements, or operations—my preference—is an important distinction. For the purposes of this article, however, this comes too close to unnecessarily tilting at too many acronym "windmills." We must do enough of that in this article, so I'll leave this fight for another day.

3. Past doctrinal explanations began and ended with the traditional air missions and roles, now described as air and space functions.

4. To this list we could add a host of enabling air power functions such as airlift, space, and reconnaissance; however, the emphasis here is on the critical airpower functions that directly achieve tactical results against the enemy.

5. The principal candidate systems are TACS, the C^2 system and its seemingly never-ending progeny (C^3, C^4, C^4I, and the latest, C^4ISR). Battle management/C^2 (BM/C^2), another as-yet-undefined candidate, has now joined the fray and has resulted in the new Air Force specialty code—air battle manager. Making matters worse, the proliferation of vague, future-vision constructs leaves those of us who sense we may have to implement these visions with the uneasy feeling that perhaps we should figure out exactly where we are before we charge off into the twenty-first century. Progress towards the promises of the visions of the next century requires this first critical step: We must understand what happens inside this "box" now to enable the changes implicit in "battlespace dominance" based on "global battlespace awareness" and "information superiority."

6. Air Force Manual 1-1, *Basic Aerospace Doctrine of the United States Air Force*, states in section B, "Aerospace Operational Art," that

> the essence of aerospace operational art is the planning and employment of air and space assets to maximize their contribution to the combatant commander's intent. Aerospace power may be employed independently of or in conjunction with surface operations. The air component commander's exercise of operational art involves four tasks. The first is envisioning the theater and determining when and where to apply what force in concert with the combatant commander. The next is creating conditions that give units applying force the best chance of success. The third is directing adjustments to operations in accordance with mission results and the operational commander's revised intent. The final is exploiting the often fleeting opportunities that result from combat. In each task, the key to success lies in an air component commander's ability to achieve objectives by orchestrating aerospace roles and missions so they produce a mutually reinforcing effect.

AFM 1-1, *Basic Aerospace Doctrine of the United States Air Force*, March 1992 (Washington, D.C.: Government Printing Office, 1992), vol. 1, 10.

7. Joint Pub 1-02, *Department of Defense Dictionary of Military and Associated Terms* (Washington, D.C.: Government Printing Office, 1994).

8. C^4ISR has no joint-approved definition (or any other that the author could determine); however, C^4 is its precursor and is adequate for our purposes.

9. Our use of "system" is as "a group of interrelated, interacting, or interdependent constituents forming a complex whole." The operational level fulfills each of the three qualifiers. *Webster's New Riverside University Dictionary* (Boston, Mass.: Houghton Mifflin, 1984), 1175.

10. An indication of the lack of conceptual development and maturity of airoperational thinking is the difficulty in sorting out the words to describe these various concepts. *Function*, *role*, *mission*, *task*, *output*, *product*, *category*, *purpose*, and *element*—these words seem almost interchangeable across the spectrum of activities when one attempts to be specific in delineating differences. The reader will, no doubt, find the author's choices open to disagreement. Doctrine should settle these terminology questions and allow a new clarity for future discussion.

11. Joint Pub 3-0, *Doctrine for Joint Operations* (Washington, D.C.: Government Printing Office, 1995), II-3.

12. Joint Doctrine Air Campaign Course faculty, "Air Campaign Planning Handbook," Maxwell AFB, Ala.: Air University, 1995.

13. Maj David A. Dellavolpe, USAF, "Command and Control of Tactical Air Forces, North Africa: 1942–1943," in *Theater Warfare Studies*, vol. 9A (Maxwell AFB, Ala.: Air Command and Staff College, 1992), 173.

14. Field Manual (FM) 100-20, *Command and Employment of Air Power*, 1943, 16.

15. The *JFACC Primer*, the Air Force's explanation of "how to best organize, plan and execute joint air operations," provides the following description of the TACS: "The JFACC's primary means of executing assigned duties is the TACS." Other than describing the Air Operations Center as the "JFACC's command post" and warning about the reliability of the "composite recognizable air picture," this "primer" merely outlines the JFACC's "responsibility for putting together a rational command, control, and intelligence system that allows him to accomplish the Joint Force Commander's directives." Headquarters USAF, *JFACC Primer* (Washington, D.C.: DCS Plans and Operations, August 1992), 26.

16. Perhaps the best evidence available for determining the core role of the TACS as a concept for our reformulation effort is simply that people assigned to organizations involved in what might be called the C^2, C^3, or C^4ISR "business" are much more likely to say, "I'm as signed to the TACS" or "I'm in a TACS unit" rather than "I'm as signed to a C^2 (or C^4ISR) unit."

17. For history and development of command and control, see Thomas P. Coakley, *Command and Control for War and Peace* (Washington, D.C.: National Defense University Press, 1992); C. Kenneth Allard, *Command, Control, and the Common Defense* (New Haven, Conn.: Yale University Press, 1990); Roger A. Beaumont, *The Nerves of War: Emerging Issues in and References to Command and Control* (Washington, D.C.: AFCEA International Press, 1986); and Martin L. van Creveld, *Command in War* (Cambridge, Mass.: Harvard University Press, 1985).

18. The "birth" of C^3 was due to a combination of the civilianization of military thought, the resulting professional requirement for defense academics to publish (and therefore write papers in which connected ideas were continuously reexplained with new approaches), and the scientific-engineering community's need to develop new constructs to explain inadequate paradigms. Engineers and scientists from various fields applied concepts from their disparate, previously mastered disciplines (such as cybernetics, stochastic processes, and systems technology) to the emerging interdisciplinary field of military electronics. This process was, no doubt, quite useful to the scientific community, but it has made life difficult for warriors. For an overview of the conceptual development of C^3I, see George E. Orr, *Combat Operations C^3I: Fundamentals and Interactions* (Maxwell AFB, Ala.: Air University Press, 1983); and John Hwang, ed., *Selected Analytical Concepts in Command and Control* (New York: Gordon and Breach Science Publishers, 1982).

19. We are all familiar with apparently good ideas that didn't pan out and were either thrown in the acronym trash heap or reconceptualized (electronic combat [EC]; battlefield air interdiction [BAI]; command, control, and communications countermeasures [C^3CM]; electronic counter-countermeasures [ECCM]; and so on). $C^{nth}I^{nth}xyz$ is directly tied to technology and thus is able to continually regenerate itself every few years, with no diminution of its growth potential in sight. Instead of demanding that concepts with no (or only marginal) utility for fighting be discarded, the military has accepted $C^{nth}I^{nth}xyz$ as if it represented some sort of intellectual Holy Grail. There is no doubt that our technological environment is gaining daily in complexity, but this should actually drive us to simplify our conceptualization of the operational level of war, not make it increasingly more difficult to understand.

20. A modest proposal. We should add "logistics and offensive and defensive operations (LODO)" to the current C^4ISR. In this final conflation, we would completely obliterate whatever usefulness such epigrammatic approaches to understanding our operational art may have had. Our tireless penchant for finding shorthand paradigms for waging war would then be complete in our new "command, control, communications, computers, intelligence, surveillance, reconnaissance, logistics, and offensive and defensive operations." In this utterly useless affectation of understanding we will have to tally subsumed war, thereby creating an acronym demonstrating the futility of our search for operational doctrine through the repackaging of acronyms.

21. There is an example of where that future may take us. Col John R. Boyd provided all airmen a legacy of thought about airpower that is both rich in content and, at least for the present, badly flawed as a guide for our continuing search for air operational doctrine. His conceptual decision cycle of observe-orient-decide-act is a fighter pilot perspective of decision making as yet not adaptable to our nonflight command and control environment. For all the wondrous advances the microprocessor has wrought, C^2 remains a manpower-intensive, sequential, deliberative process—a process not yet conducive to the logic of "lead-turning" an opponent's thought processes. Yet, one only need spend a short time dwelling on Boyd's "A Discourse on Winning and Losing" to know that there really is something there. To discover what innovation possibilities might exist, we must first understand the actual system we operate and not allow future visions to delude us into thinking we're ready to leap ahead. An important part of the process of clearing the way for the true innovation that might result in adapting Boyd's ideas to the future of C^2 is getting our conceptual house in order. Until we are clear on where we are, we can't really begin to move out to either the twenty-first century or C^2's "fast transient" potential. The construct advanced herein will provide one step down this road. Building on this reformulated conceptualization, it should be possible to compare the four models and discern their relative states of technological and functional adaptability to change and how to improve the whole by bringing the four systems into closer technological alignment. John R. Boyd, "A Discourse on Winning and Losing," a collection of unpublished briefings and essays, August 1987, document no. M-U 43947, Air University Library, Maxwell AFB, Ala.

If you once forfeit the confidence of your fellow citizens, you can never regain their respect and esteem. You may fool all of the people some of the time; you can even fool some of the people all the time; but you can't fool all of the people all of the time.

—Abraham Lincoln