

NAVAL WAR COLLEGE
Newport, R.I.

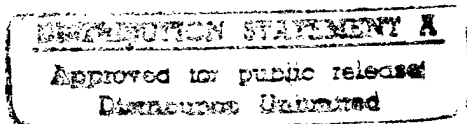
JOINT TARGETING
CONTROL, COMPROMISE, OR COORDINATION
BOARD

by

Randolph P. Miller
Major, U.S. Air Force

A paper submitted to the Faculty of the Naval War College in partial satisfaction of the requirements of the Department of Joint Military Operations.

The contents of this paper reflect my own personal views and are not necessarily endorsed by the Naval War College or the Department of the Navy.



Signature: *Randolph P. Miller*

~~13 June 1997~~

DTIC QUALITY INSPECTED 4

Paper directed by
Captain George W. Jackson, USN
Chairman, Joint Military Operations Department

David Della Volpe

Faculty Advisor

Lt Col David A. DellaVolpe, USAF

7 Feb 97

Date

19970520 194

REPORT DOCUMENTATION PAGE

1. Report Security Classification: UNCLASSIFIED			
2. Security Classification Authority:			
3. Declassification/Downgrading Schedule:			
4. Distribution/Availability of Report: DISTRIBUTION STATEMENT A: APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED.			
5. Name of Performing Organization: JOINT MILITARY OPERATIONS DEPARTMENT			
6. Office Symbol: C		7. Address: NAVAL WAR COLLEGE 686 CUSHING ROAD NEWPORT, RI 02841-1207	
8. Title (Include Security Classification): JOINT TARGETING CONTROL, COMPROMISE, OR COORDINATION BOARD (U)			
9. Personal Authors: Major Randolph Paul Miller, U.S. Air Force			
10. Type of Report: FINAL		11. Date of Report: 7 February 1997	
12. Page Count: 29			
13. Supplementary Notation: A paper submitted to the Faculty of the NWC in partial satisfaction of the requirements of the JMO Department. The contents of this paper reflect my own personal views and are not necessarily endorsed by the NWC or the Department of the Navy.			
14. Ten key words that relate to your paper: JOINT, TARGETING, COORDINATION, BOARD, SYNCHRONIZATION, STRATEGIES-TO-TASKS, SEQUENCING, DECIDE, DECENTRALIZATION, OPERATIONAL.			
15. ABSTRACT: Joint targeting is an extremely important and complex function which has understandably resulted in inter-service rivalry. This conflict has historically manifested itself the creation of joint targeting boards. These boards, including the Joint Targeting Coordination Board (JTCB) which emerged during OPERATION DESERT STORM, represent poor models for future Joint Force Commanders (JFCs) to use as a means of maximizing combat force capabilities. Cognizant of the diversity of combat environments, joint doctrine is deliberately vague on the formation, authority, methodology, and composition of the JTCB. Each of the services have developed their own perspective on the JTCB. These range from a vehicle to control joint air operations, to an ineffectual forum where senior leaders compromise on targets and the amount of planned close air support. The "Decide, Detect, Deliver, and Assess" approach used by many JTCBs forces the board to concentrate on individual targets and target sets. The result is a JTCB focus below the operational level of war, bordering on a violation of decentralized execution. Joint Force Commanders (JFCs) require an effective means to ensure coordination and synchronization of theater forces. By adopting a modified version of the Strategy-To-Task (STT) Framework, JTCBs would concentrate on achieving the JFC's objectives through an operational analysis of major operations' tasks and functional commanders' objectives. An objectives- oriented JTCB could provide the critically needed forum where senior commanders articulate the status of each component's operational scheme within the JFC's overall operational idea, and explore possibilities for synchronization. The modified STT approach would encourage future JTCBs to focus on the operational level of war and the synergistic application of theater forces.			
16. Distribution / Availability of Abstract:	Unclassified X	Same As Rpt	DTIC Users
17. Abstract Security Classification: UNCLASSIFIED			
18. Name of Responsible Individual: CHAIRMAN, JOINT MILITARY OPERATIONS DEPARTMENT			
19. Telephone: 841- 6461 6461		20. Office Symbol: C	

Abstract of
THE JOINT TARGETING
CONTROL, COMPROMISE, OR COORDINATION
BOARD

Joint targeting is an extremely important and complex function which has understandably resulted in inter-service rivalry. This conflict has historically manifested itself the creation of joint targeting boards. These boards, including the Joint Targeting Coordination Board (JTCB) which emerged during OPERATION DESERT STORM, represent poor models for future Joint Force Commanders (JFCs) to use as a means of maximizing combat force capabilities. Cognizant of the diversity of combat environments, joint doctrine is deliberately vague on the formation, authority, methodology, and composition of the JTCB. Each of the services have developed their own perspective on the JTCB. These range from a vehicle to *control* joint air operations, to an ineffectual forum where senior leaders *compromise* on targets and the amount of planned close air support. The "Decide, Detect, Deliver, and Assess" approach used by many JTCBs forces the board to concentrate on individual targets and target sets. The result is a JTCB focus below the operational level of war, bordering on a violation of decentralized execution. Joint Force Commanders (JFCs) require an effective means to ensure *coordination* and *synchronization* of theater forces. By adopting a modified version of the Strategy-To-Task (STT) Framework, JTCBs would concentrate on achieving the JFC's *objectives* through an operational analysis of major operations' tasks and functional commanders' objectives. An objectives-oriented JTCB could provide the critically needed forum where senior commanders articulate the status of each component's operational scheme within the JFC's overall operational idea, and explore possibilities for synchronization. The modified STT approach would encourage future JTCBs to focus on the operational level of war and the synergistic application of theater forces.

JOINT TARGETING
CONTROL, COMPROMISE, OR COORDINATION
BOARD

TABLE OF CONTENTS

ABSTRACT	ii
LIST OF ILLUSTRATIONS	iv
INTRODUCTION	1
The Importance of Targeting	1
The JTCB During Desert Storm	2
Current Joint Doctrine and the JTCB	3
Operational Concepts	4
THE SERVICES' AND JFC'S JTCB PERSPECTIVES	5
Air Force JTCB Perspective	6
Army JTCB Perspective	6
Naval JTCB Perspective	7
The JFC's Perspective	7
JTCB METHODOLOGY	9
The Decide, Detect, Deliver, and Assess Approach	9
An Alternative to D3A--Strategies-To-Tasks Framework	11
The JTCB-STT Methodology	12
CONCLUSIONS AND RECOMMENDATIONS	16
REFERENCE LIST	22

LIST OF ILLUSTRATIONS

Figure	Page
1. Modified Strategies-To-Tasks Model	12
2. JTCB Strategy-To-Task Framework	13
3. Generic Campaign Illustrated	15

INTRODUCTION

The complexities and uncertainties associated with large-scale joint military operations require Joint Force Commanders (JFCs) to efficiently coordinate, sequence, and synchronize joint forces during campaign execution. Targeting is a critical campaign function. Past joint targeting boards, including the Joint Targeting Coordination Board (JTCB) during Desert Storm, represent inadequate models to effectively facilitate future force coordination and synchronization. Cognizant of the diversity of combat environments, joint doctrine is deliberately vague on the authority, methodology, and composition of the JTCB. Competing service perspectives have produced a JTCB process poorly equipped to function efficiently. The "Decide, Detect, Deliver, and Assess" approach to target selection and force synchronization is inherently tactical. By adopting a modified strategies-to-tasks methodology, the JTCB would provide the JFC with a powerful tool for maximizing force capabilities and combat power.

The Importance of Targeting

Targeting is a vitally important and defining issue for the employment of U.S. military forces. The decision of what to strike goes to the very heart of the enduring questions of *how* and *who* will fight the next campaign. Targeting answers the how by defining the focus of attack. Will it be the enemy's military forces, the enemy's ability to sustain its military forces, the enemy's ability to command and control its military forces, or the ability and will of the enemy's entire nation to function and fight? Targeting also answers who will conduct the bulk of the fighting because a specific target's character, function, location, and defenses will specify the requirements of the striking force.

As a result of its overarching importance, targeting has been the subject of understandable inter-service contention. This friction has historically manifested itself in the creation of joint targeting boards. Past boards have included the Joint Board of the Army and Navy and Joint Target Group during W.W.II; the General Headquarters Target Group and Far East Command Target Selection

Committee during the Korean War; and the Rolling Thunder Target Team during the Vietnam War. Lack of targeting expertise, poor intelligence support, and disagreements over doctrine and target priorities limited their success.¹ An examination of the events and effectiveness of the JTCB during Desert Storm is important because it laid the foundation for subsequent developments.

The JTCB During Desert Storm

The Commander-in-Chief (CINC), U.S. Central Command, General Schwarzkopf assumed command of the campaign and centralized control of air assets using what was then a relatively new functional component command--the Joint Force Air Component Commander (JFACC).² General Horner, the U.S. Central Command Air Force (CENTAF) Commander, representing the service with the preponderance of air assets, became the JFACC. The JFACC was, in theory, a joint organization with many key functional areas staffed by joint officers. In reality, it was composed primarily of CENTAF officers, employing Air Force procedures and doctrine. At the time, no other comparable staff existed.³ The Navy resisted the concept of centralized control of air assets, and limited its involvement to about 40 relatively junior Navy and Marine officers on a JFACC staff which numbered almost 3,000.⁴ The lack of proper joint representation on the JFACC staff undoubtedly contributed to inter-service problems that surfaced during the course of Desert Storm.

As the ground offensive neared, the Army and Marine component commanders expressed dissatisfaction with the perceived lack of air effort assigned to battlefield preparation.⁵ Three factors contributed to this perception. First, many of the ground-nominated targets had already been hit.⁶ Second, General Schwarzkopf's primary concern was the Republican Guard. He often identified specific Republican Guard divisions for attack, even after air planning had been completed.⁷ Lastly, because General Schwarzkopf was also the Land Component Commander (LCC), corps commanders had no functional commander equivalent to the JFACC to adjudicate targeting disputes.

The furor over the lack of JFACC responsiveness by Marine and Army commanders prompted the CINC to appoint his deputy, General Waller, head of the JTCB (which already existed but *within* the JFACC).⁸ Waller's JTCB produced a target list which basically allocated air support *equally* between the two ground component commanders.⁹ While this ad hoc solution appeased the Army and Marines, it caused an *inappropriate* air effort because Iraqi units and targets were not spread equally between their respective areas.¹⁰ Neither did it prevent the CINC from issuing separate, often conflicting targeting guidance for air tasking order (ATO) input.¹¹

In the immediate aftermath of Desert Storm an opinion emerged amongst non-Air Force services that targeting was done according to the Air Force, for the Air Force. The Navy staff felt the JFACC enhanced Air Force prestige at the expense of the Navy.¹² Ultimately, the Marines simply refused to strike ATO-tasked targets unless they were in front of Marine ground positions.¹³ The Army had convinced the CINC to move the JTCB to a position superior to, and separated from, the JFACC. Each services' Desert Storm experience with the JFACC and JTCB has colored their perceptions.

Current Joint Doctrine and the JTCB

Cognizant of the diversity of potential combat environments, joint doctrine gives the JFC tremendous flexibility in forming a JTCB. Four current joint doctrine publications discuss the JTCB, and are intentionally non-directive regarding its formation, responsibilities, composition, and role in the campaign's planning and execution.¹⁴ Typically, a JTCB reviews targeting information and assists the JFC in developing or revising targeting guidance. The JTCB may even prepare and refine joint target lists, to include the list of restricted targets, and areas where special operations forces are operating. Because all components contribute to the targeting effort, a JTCB needs to be a joint activity.

According to joint doctrine, the JTCB's potential responsibilities include operating as an integrating center or a JFC-level review mechanism. If it serves as an integrating center, the JTCB would exist

inside the JFACC organization as an integral part of the air planning function. This approach has been adopted by U.S. European Command¹⁵ and the Combined Forces Command in Korea.¹⁶ If the JTCB is a review mechanism, it would reside outside the JFACC's staff and planning process. This presumably creates a less biased JTCB which addresses component interests equally. U.S. Pacific Command and U.S. Atlantic Command use this option.¹⁷

Although not strictly cited in Joint Publication 3-0, other joint publications specify the JTCB's oversight should be broad in nature. According to Joint Publication 3-04.1, the JTCB "...operates at the macro level and should not exceed its role..." and "...is not intended to operate at the micro level, encroaching on the authority of commanders to plan and perform assigned tasks."¹⁸ Joint publications include this guidance due to a tendency of JTCBs to concentrate below the operational level of war. To understand how involvement at the tactical level impedes JTCB effectiveness requires an examination of elements of operational design and functions.

Operational Concepts

Joint force commanders usually prepare campaign plans in support of the theater commander's overall strategy, which ensures unified effort throughout the theater.¹⁹ The unique contributions of land, sea, space, air, and special operations forces must be integrated and *synchronized* in order to effectively achieve campaign objectives. Through the synchronization of these forces, the JFC maximizes their relative combat power to achieve campaign objectives.²⁰

The essence of the JFC's campaign plan is the operational idea. Subordinate functional or component commanders develop their operational schemes or ideas from, and in support of, the JFC's operational idea.²¹ Achievement of an operational objective requires the proper ordering and prioritizing of major operations and operational tasks. Thus, the JFC's operational idea includes the *sequencing of major* events to achieve objectives with the least cost (both men and material), in the

shortest time. Operational sequencing includes the utilization of operational *functions* during combat force employment.²²

One operational function of critical importance to targeting is operational fires. Lethal operational fires are designed to "...delay, disrupt, destroy, or degrade enemy operational forces or critical functions and facilities."²³ Operational fires achieve operational objectives. Fires which have a *decisive impact* on the conduct of major operations or a campaign are operational. Isolating the area of operations, destroying the enemy's operational reserve, and preventing the enemy's operational maneuver are examples of operational fires. Tactical fires are intended to achieve tactical objectives.

The improved lethality and range of today's weapon systems has increased their operational impact. Many weapon systems are capable of operational fires including submarines, long-range surface-to-surface missiles, and special operations forces (SOF). As a result of their range, flexibility, and precision munitions, the overwhelming preponderance of operational fires in most modern theaters will be delivered by airplanes (both land and sea based).²⁴ While the Air Force definition of interdiction is *extremely* broad and does not use the term operational fires, its interdiction concept is clearly intended to encompass strategic, operational, and tactical fires.²⁵

THE SERVICES' AND JFC'S JTCB PERSPECTIVES

The choice of enemy targets is the most delicate operation of aerial warfare.

--Giulio Douhet, 1921

The overriding importance of targeting and targeting priorities will continue to create contention among services competing for resources and importance. Each service has its own capabilities, history, and philosophy toward the JTCB. The Air Force and Army perspectives represent two extremes. In many ways, the JTCB has become a vehicle to control joint air operations. While it is important to understand the differing *service* viewpoints, the people of the United States have a vested interest in ensuring the *JFC's* perspective prevails.

The Air Force JTCB Perspective

Colonel Phillip Meilinger encapsulated the lessons of the history of air power into 10 rules or propositions, the fourth of which is: "In essence, airpower is targeting; targeting is intelligence; and intelligence is analyzing the effects of air operations."²⁶ It is important to note targeting's central role in the employment of air power. To airmen, targeting is not a staff function--it is a *command* function. It is a command function partly because air operations expose aircrews to the perils of war. Additionally, striking and destroying targets is pivotal to the force's purpose to exist.

Air Force airmen believe they have the expertise to maximize the impact of attacks while minimizing risks posed by the enemy's integrated air defenses. The generally accepted view within the Air Force is: "Targeting boards that constrict the operations of any commander or duplicate the actions of any staff are a burden on the joint force."²⁷ If a JTCB is formed, it should be an integrating center inside the JFACC staff and planning process.

The Army JTCB Perspective

The Army's position is documented in FM 100-7, draft Joint Publication 3-09, and reflected in XVIII Airborne Corps Joint Task Force (JTF) Standing Operating Procedures (SOP). According to FM 100-7, a JFC may create a JTCB "...to direct the theater targeting process..." and the JTCB "...ensures the effective employment of all theater-level deep surveillance and attack resources, including SOF."²⁸ The Army also places the JTCB outside the JFACC, chaired by the Director of Operations (J3). The J3 has staff responsibility to integrate, synchronize, and deconflict joint fires.²⁹ To accomplish this awesome responsibility, the J3 either augments the staff, or consolidates fires planning in a new division headed by the Joint Force Fires Coordinator (JFFC).³⁰ The JFFC also serves as the executive agency supporting the JTCB with a large staff.

The concept is further refined and reflected in Atlantic Command's XVIII Airborne JTF SOP, which

identifies the JTCB as the targeting agency which coordinates and synchronizes joint fires in the JTF's deep operations and interdiction effort. "The JTCB must be run as a decision-making body."³¹ The SOP authorizes J3 to direct the attack of targets within the normal ATO planning cycle. The JFACC receives the approved list of JTF-level target nominations from the JFFC to be compiled with component nominations. All products produced by the JFACC during the targeting process will be forwarded to the JTCB for *approval*. The J3 publishes separate tasking for components to support execution of the joint target list, or if appropriate, *allows* the JFACC to task components through publication of the ATO. To *ensure compliance with JTCB direction* during the execution phase, the JFACC must receive concurrence from the JTF commander not to strike a target listed in the ATO.³²

The Naval JTCB Perspective

In many ways the Naval outlook represents the middle ground between the Army and Air Force points of view, and is currently documented in its revised NWP 3.56.1TP. There are many scenarios where the Navy will have the preponderance of air assets, operate as the JFACC, and direct various Air Force bomber, fighter, and support aircraft in pursuit of the JFC's objectives. While the Navy's publication is in agreement with current joint doctrine, it also offers additional guidance. The Navy views the JTCB as an *advisory* body only, whose purview includes all component operations--not just air targeting. The Naval JTCB is not a part of the JFACC organization, but superior to it, and normally chaired by the Deputy JFC. In essence, the Naval JTCB is a forum "...to ensure support and synchronization of JFC objectives."³³ The Navy also emphasizes the instrumental role component commanders play in assisting the JFC formulate targeting guidance.

The JFC's Perspective

The JFC focuses his campaign design on the effective employment of forces in pursuit of operational objectives. Each circumstance is unique. Some conflicts will be so small that neither a

JFACC or JTCB will be required. Others may involve air operations of 2,000 sorties per day. Large-scale operations, combined with the Clausewitzian notion of the "predominance of uncertainty"³⁴ in war, will continue to present the JFC with tremendous challenges.

The fog and friction of war in large-scale operations demand the JFC continue to provide for operational sequencing, coordination, and synchronization of joint fires, forces, and their effects, during the execution of the campaign plan. Operational *synchronization* is distinguished from sequencing in that synchronization involves the arrangement of *activities* (versus events) and *effects* to achieve operational *synergy*.³⁵ The JFC must provide for a coordinating body to ensure effective coordination among command elements, and be able to rely on the functional or component commanders to provide *effective* assistance in this critical area.³⁶ The coordination and synchronization of large scale joint operations, which encompass operational fire support, are monumentally complex undertakings. A JFC staff, primarily composed of augmentees with varying degrees of experience and expertise, is a poor substitute for component expertise and combat-proven liaison elements.

A JTCB-type coordinating body could provide the JFC the means necessary to achieve *operational* unity of effort and combat force synergies. Today's fiscal constraints make operational coordination and synchronization that much more important in attaining operational objectives. But, the JTCB, as currently institutionalized by service doctrine, SOPs, and reflected in joint exercises, is poorly equipped to function as the JFC's coordinating and synchronizing body. A JTCB with apportionment, target selection and prioritization tasking, like any board faced with tough decisions, will often reach a consensus through *compromise*. Just as in Desert Storm, compromise might not result in the maximization of combat potential. Moreover, if component commanders begin to focus on the *number* of their nominated targets selected for air strike, the JTCB may shift from a review mechanism to a focal point for component competition. Furthermore, once targeting and execution authority have been

divided, who can the JFC *hold accountable* if the major operation fails to achieve its objectives?

There are other important considerations in establishing a JTCB and defining its role. Just as in Desert Storm, the JFC must ensure the JFACC is responsive to the requirements of each of the components as well as the campaign's objectives. The JFC articulates commander's intent to two echelons below. Should another body of subordinate commanders interpret and issue targeting guidance or should the functional commanders simply implement the guidance issued by the JFC? How can JFCs ensure the JTCB stays focused at the macro level of war and avoid the piecemeal application of air power and weapon systems with operational impact? Each service has a stake in, and is part of, the joint targeting process. Certainly the JTCB provides part of the answer to these important issues, but it has not yet proved to be an ideal or complete solution.

JTCB METHODOLOGY

I built trust among my components because I trusted them...If you want true jointness, a CINC should not dabble in the details of component business.

General Norman Schwarzkopf

The Decide, Detect, Deliver, and Assess Approach

The methodology to be used by JTCBs is not specifically addressed in joint doctrine, command publications, service manuals, or regulations. Field Manual (FM) 6-20-10 highlights the complexity and coordination required by joint force targeting. While each service has their own tactics, techniques, and procedures for acquiring, selecting, and attacking targets, the FM 6-20-10 identifies four things they all have in common:

1. *Deciding in advance what is to be targeted*
2. *Locating the target*
3. *Attacking the target*
4. *Assessing the results of the attack*³⁷

These common steps mirror the "Decide, Detect, Deliver, and Assess" (D3A) model described in many

command publications, SOPs, and manuals.³⁸

Of the four functions, the decide function is the most critical. It requires the close coordination between the commanders and intelligence, plans, and operations staffs. The decide function drives intelligence collection and attack planning. The products of this phase include the high-payoff target list (HPTL), the intelligence collection plan, and the target guidance matrix (how to attack the target).³⁹

The detect phase is where intelligence staffs direct the collection effort and specify the who, what, when, and how for target acquisition of targets on the HPTL identified in the decide function.⁴⁰ The deliver function executes the attack of targets and must satisfy the attack guidance developed in the decide function. This requires tactical decisions including the time of attack, desired level of impact on the target (neutralize, destroy, suppress etc.) as well as the tactical system to be used. It also involves technical decisions regarding delivery means, type of munitions, unit, and response time. The assess function is composed of three elements: battle damage assessment, munitions effects assessment, and re-attack recommendation.

Many component commanders have used the D3A model throughout their careers, are comfortable with it, and believe in it. The D3A model is viewed as the accepted means of target identification and prioritization. TRADOC Pamphlet 525-200-5 states "To execute depth and simultaneous attack leaders must have a thorough understanding of the decide, detect, deliver targeting methodology. It has applicability as a warfighting methodology and should be ingrained in our thought process."⁴¹ But there is an inherent problem with the model when applied by the JTCB.⁴²

The D3A procedure, by its very nature, forces the JTCB to deal with, and to focus on, individual targets or target sets. Once the board focuses on an individual target, unless that target has a *decisive impact* on the campaign, the board is no longer oriented at the operational level of war. While almost every document describing the JTCB emphasizes that the board should maintain a macro or

operational level perspective, the D3A methodology makes doing so very difficult. A JTCB operating at the tactical level creates the potential for a violation of the tenet of decentralized execution.

The JFC defines the campaign objectives and expresses his intent. Every action taken by a subordinate commander must be in strict harmony with that intent. On the other hand, the JFC encourages innovation and initiative in realizing the campaign objectives. The JFC does not define every action necessary to achieve an objective, but relies on subordinate commanders to achieve them within the boundaries of his intent. This is known as decentralized execution. For example, the JFC relies on component expertise and initiative in achieving air superiority. By defining and *prioritizing* the list of targets, the JTCB risks dictating the planned actions in pursuit of that objective.

An Alternative to D3A--Strategies-To-Tasks Framework

The Strategies-To-Tasks (STT) concept is not new. The framework has been applied throughout the Department of Defense.⁴³ The STT concept is both simple and extremely powerful. An objective is a purpose or goal--an end to achieve. It is accomplished through execution of a strategy. A strategy is made up of a series of tasks. Within a command structure, objectives "cascade"⁴⁴ down the chain of command in the form of tasks. The strategy (or series of tasks) to achieve an objective becomes the objectives of the next lower echelon of command. Each tactical-level action can then be traced up the chain of command, ultimately to the National Command Authority's (NCA) objectives and to the goals of the United States (see Figure-1). Thus, a campaign's objectives are linked to supported theater strategic objectives and supporting operational tasks. The campaign plan or the JFC will determine the relative weight of effort to assign each of the campaign's objectives during each of its phases.

A top-down approach has several critical implications. The objectives and the supporting tasks are blind to the component force elements (although an objective or supporting task may ultimately involve one service or function more than another).⁴⁵ Most importantly for the JTCB, the framework as applied

in this proposal, focuses the board on *operational-level* objectives and tasks.

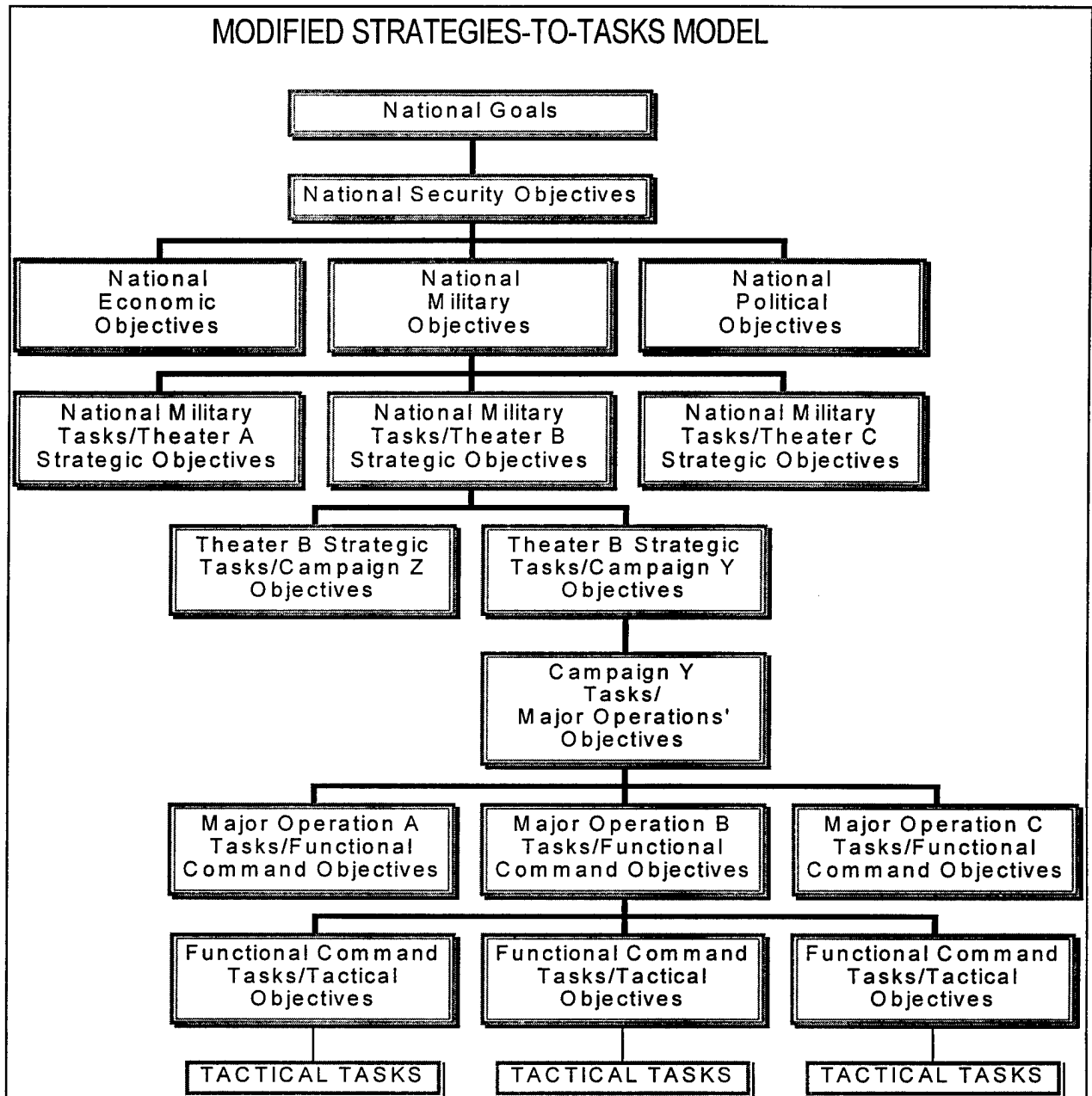


Figure 1 - Author's Modified Strategies-To-Tasks Model (Modified from RAND's Strategies-To-Tasks Framework)

The JTCB-STT Methodology

The STT approach proposed here for adoption by the JTCB utilizes the same objectives and tasks developed during the JFC's (and subordinate commanders') Commander's Estimate of the Situation (CES). The JTCB-STT process starts with the JFC's campaign objectives (see Figure 2). The campaign tasks are also the major operations' objectives. In the rare instance a major operation were

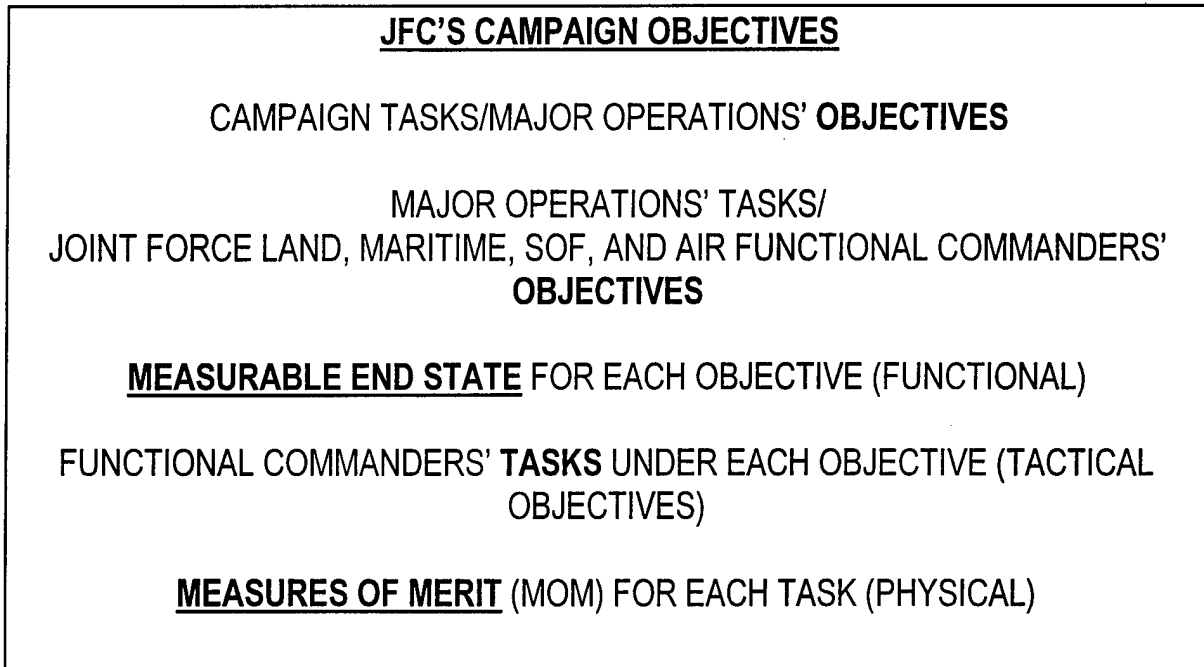


Figure 2 - JTCB STRATEGY-TO-TASK FRAMEWORK (Modified from 12 AF/JGAT Model)

to be conducted exclusively by a single functional commander, this level would be omitted. The tasks associated with each major operation become the functional commanders' objectives. Functional commanders develop a "measurable end state"⁴⁶ (MES) for each objective using *functional* criteria (e.g., has the enemy's command and control system ceased to control naval operations). They also identify the operational tasks which support the objective (from their CES). For each task, measures of merit (MOMs) are determined in quantifiable physical terms (e.g., percentage of aircraft destroyed).

To illustrate the model, consider the following generic example. The JFC's campaign objectives include: halt and destroy Attacker A's forces invading Country X. One of the campaign's tasks (major operation's objective) is to gain and maintain sea control. The maritime component commander's (MCC's) objectives (major operation's tasks) are to destroy enemy surface and subsurface vessels, neutralize enemy naval command and control (C2), and neutralize enemy land-based surface-ship missiles. The MES is to enjoy maritime freedom of action within the area of operations, and ensure freedom of navigation in the major straits and waterways throughout the JFC's area of interest—limiting enemy maritime action to minor hampering activities. The MCC's tasks include sinking or disabling

enemy surface and sub-service combatants in ports and at sea; sinking or disabling shipborne command posts; jamming, confusing, and disrupting communications; clearing the enemy's choke-point mining operations; jamming and attacking anti-ship missiles; and maintaining air superiority within carrier task force airspace. Each task would be assigned a MOM, which is defined in physical terms. Examples include sinking or disabling 60 percent of enemy combat surface vessels, or sinking or disabling 40 percent of enemy C2 vessels (see figure 3 for another generic example).

Rather than a JTCB which daily reviews *lists of individual targets* (Desert Storm's numbered over 1,200),⁴⁷ the functional commanders would brief the status of their operational objectives and tasks using *both* MES and MOM criteria. The JTCB-STT approach provides the functional or component commanders the vehicle to effectively describe their operational scheme of maneuver in both physical and functional terms. This will help eliminate inter-service distrust because functional commanders will have a better understanding of each other's role and progress in winning the campaign. In doing so, the participating commanders and the JFC will have a clear frame of reference to recognize deficiencies in coordination and additional opportunities for synchronization.

Not only does the STT methodology keep the JTCB's perspective at the operational level, it also promotes the effective analysis of tradeoffs between alternative means, apportionment of effort, and sequencing of events in achieving operational objectives, accomplishing operational tasks, and ultimately winning campaigns. A more appropriate name for the JTCB-STT forum of flag-level commanders would be the Coordination, Sequencing, and Synchronization Board.

Using the sea control objective as an example, the LCC and SOF Commanders could recognize and seize opportunities to strike maritime surface attack missile sites before naval vessels are within range. They could also destroy enemy port and repair facilities required by the enemy to repair vessels disabled by U.S. Navy attack. The JFACC could employ Harpoon-equipped bombers to

GENERIC CAMPAIGN ILLUSTRATED

GENERIC CAMPAIGN OBJECTIVES: to halt and destroy Attacker A's forces invading Country X.

MAJOR OPERATION OBJECTIVE	FUNCTIONAL COMMANDER'S OBJECTIVES	FUNCTIONAL COMMANDER'S TASKS
- Gain and maintain air superiority	- Destroy air vehicles and their support systems	- Destroy enemy aircraft in flight - Destroy runways and taxiways - Destroy planes on the ground - Destroy aircraft support facilities - Destroy C3 aircraft
		MOM: 60% aircraft/55% support facilities
	- Neutralize enemy air defense systems	- Neutralize/jam early warning and acquisition radars - Neutralize fixed surface-to-air (SAM) sites - Neutralize mobile SAMs and anti-air artillery (AAA) - Neutralize air command facilities - Neutralize enemy air defense support facilities
MES: Ability to conduct air operations without prohibitive interference		MOM: 40% EW/GCI, SAM, and AAA
- Establish defense and halt enemy	- Destroy 1st and 2nd echelon forward units	- Destroy armored combat vehicles ground forces and deny enemy's and provide fire support - Destroy artillery and rocket launchers - Destroy combat and support personnel - Destroy helicopters supporting forward units
		MOM: 60% armored, air, and artillery
	Deny critical routes of attack	- Mine natural choke points - Neutralize concentrations of forward supplies - Destroy bridges/Block tunnels
MES: Enemy halted and put on the defensive to protect gained territory		MOM: 100% major attack routes and 40% supplies

Figure 3 Author's Generic Tasks and Objectives with MES and MOM Criteria (Adopted from RAND's Strategies-To-Tasks)

assault enemy combat and C2 ships at sea in concert with U.S. submarine attacks. This would cause enemy ships to defend against torpedoes and air-launched missiles *simultaneously*. JFACC and MCC efforts to gain or maintain air superiority will naturally have a cumulative effect upon the enemy. The opportunities for coordination and synchronization abound. The JTCB-STT approach actually facilitates accomplishment of the JTCB's function--to coordinate, sequence, and synchronize forces

and their activities within the theater of operations.

Rather than being chaired by the J3 or Deputy CINC, these JTCB-STT operational command-level briefings are the purview of, and should be chaired by, the JFC (with Deputy CINC and J3 in attendance). A board chaired by the JFC will usually *reduce consensus building*, and avoid decision through compromise. There is no need for a large separate JTCB staff, as each functional commander uses his own staff's expertise and information in defining his operational scheme's progress during execution. The JFC's authority would also be required in considering certain individual high-payoff targets deemed critical or sensitive enough to merit special discussion by functional commanders. These would be very few in number, and might even require CINC or NCA input. Likewise, the JFC's authority is required to shift the relative weight of effort (with subordinate commander input) for each major operation, if modification is required during campaign execution.

CONCLUSIONS AND RECOMMENDATIONS

Our military forces are one team--in the game to win regardless of who carries the ball.

General Omar N. Bradley

Targeting's central importance, service history, and experiences during Desert Storm have led to very different and incompatible perspectives on the role and authority of the JTCB. One service views the JTCB as an integrating mechanism within the JFACC, another as an advisory board only, while another views it as a decision-making target prioritization board with authority to approve JFACC planning actions and recommend apportionment. Current joint doctrine affords the JFC tremendous flexibility in organizational design. All services have a stake in, and are part of, the campaign's operational fires. The JTCB, as currently institutionalized by proposed joint and service doctrine, represents an ineffective vehicle to maximize joint force capability and realize potential synergies through synchronization of activities and effects. The D3A methodology is inherently tactical in nature. As a result, the JTCB's use of the D3A model could easily lead to a violation of the decentralization of

execution tenet so crucial to past U.S. military success.

An objectives-based JTCB has many inherent benefits. The modified JTCB-STT methodology ensures unity of effort because every activity and every target is tied to a specific JFC objective. It facilitates the articulation and mutual understanding of functional commanders' operational objectives and tasks. It promotes effective determination of relative weights of effort for each campaign task, and provides for the robust analysis of alternate means and sequences in accomplishing the mission. The modified STT methodology focuses board members at the operational level of war. The board's agenda using this STT model encompasses the status of each commander's operational idea during campaign execution. A board whose agenda is of this magnitude should be chaired by the JFC.

In large-scale campaigns, JFC's should establish a JTCB-type organization using the modified STT approach to ensure proper sequencing and synchronization of forces during campaign execution. A STT oriented JTCB will lead to simplified coordination, proper sequencing, and greater synergistic application of force. An objectives-based JTCB, or Coordination, Sequencing, and Synchronization Board, provides the critical vehicle to assist the JFC in maximizing U.S. combat potential throughout the campaign. Adoption of JTCB-STT methodology also ensures functional commanders are responsive to JFC objectives and coordinates the efforts of all functional commanders. The U.S. military might not be able to rely on overwhelming superiority in future conflicts. The JTCB should not become a means to control joint air operations, nor an ineffectual forum for critical decisions based on compromise. It must become a powerful tool to maximize combat capabilities.

NOTES

¹ For a complete analysis see Michael R. Moeller, "The Sum of Their Fears: The Relationship between the Joint Targeting Coordination Board and the Joint Force Commander," Unpublished Research Paper, Maxwell Air Force Base, AL: Air University, 1995, 6-15.

² The concept of a single air commander is not new. It was used during the early battles for Guadalcanal (under the name of COMAIRCACTUS), during the Solomon, Philippines, and Okinawa campaigns, and even the Vietnam War. For a complete discussion see James A. Winnefeld and Dana J. Johnson, Joint Air Operations Pursuit of Unity in Command and Control, 1941-1991, (Annapolis, MD: Naval Institute Press, 1993).

³ James A. Winnefeld, and Dana J. Johnson, A League of Airman, F49620-91-C-0003, (Santa Monica, CA: RAND, 1994), 105.

⁴ Center for Naval Analyses, Naval Studies Group, The Navy and the JFACC: Making Them Work Together, CRC 202, (Alexandria, VA: 1993), 26.

⁵ James A. Winnefeld, and Dana J. Johnson, A League of Airman, F49620-91-C-0003, (Santa Monica, CA: RAND, 1994), 84.

⁶ Richard B. Lewis, "Desert Storm--JFACC Problems Associated with Battlefield Preparation," Unpublished Research Paper, Carlisle Barracks, PA: U.S. Army War College, 1993, 31.

⁷ Robert H. Scales, Jr., Certain Victory: United States Army in the Gulf War, (Washington: U.S. Govt. Print. Off., 1993), 180.

⁸ Ibid., 181.

⁹ Richard B. Lewis, "Desert Storm--JFACC Problems Associated with Battlefield Preparation," Unpublished Research Paper, Carlisle Barracks, PA: U.S. Army War College, 1993, 11.

¹⁰ Michael R. Moeller, "The Sum of Their Fears: The Relationship between the Joint Targeting Coordination Board and the Joint Force Commander," Unpublished Research Paper, Maxwell Air Force Base, AL: Air University, 1995, 15.

¹¹ Charles W. Johnson, "Joint Targeting and the Joint Target Coordination Board: Let's Fix the Current Doctrine!" Unpublished Research Paper, School of Advanced Military Studies, U.S. Army Command and General Staff College, Fort Leavenworth, KS: 1996, 31.

¹² Edward C. Mann, Thunder and Lightning: Desert Storm and the Air Power Debates, (Montgomery AL: Air University Press, 1995), 58.

¹³ Michael R. Gordon and Bernard E. Trainor, The General's War: The Inside Story of the Conflict in the Gulf, (Boston: Little, Brown, and Company, 1995), 503.

¹⁴ The four joint publications include the following documents. Joint Publication 1-02, DOD Dictionary of Military and Associated Terms, (Washington: U.S. Govt. Print. Off., 1994) . Joint Publication 3-0, Doctrine for Joint Operations, (Washington: U.S. Govt. Print. Off., 1995). Joint Publication 3-56.1, Command and Control for Joint Air Operations, (Washington: U.S. Govt. Print. Off., 1994). Joint Publication 3-01.4, Joint Suppression of Enemy Air Defense, (Washington: U.S. Govt. Print. Off., 1993).

¹⁵ Headquarters, U.S. European Command, Joint Force Air Component Commander Concept of Operations, (1993), 7.

¹⁶ Headquarters, R.O.K.-U.S. Combined Forces Command, Deep Operations Primer- Korea. (1995), 17.

¹⁷ Atlantic Command/Pacific Command, Joint Force Air Component Commander Concept of Operations, (1993), 4.

¹⁸ The Joint Chiefs of Staff, Joint Publication 3-04.1, JTTP for Joint Suppression of Enemy Air Defense, Washington: U.S. Govt. Print. Off., 1993, II-3.

¹⁹ U.S. Army Dept., Field Manual 100-7, The Army in Theater Operations, (Washington: US Govt. Print. Off., 1995), 4-5.

²⁰ Milan N. Vego, NWC 4106, Operational Synchronization, (Newport, RI: U.S. Naval War College, 1996), 12.

²¹ Milan N. Vego, NWC 4104, Fundamentals of Operational Design, (Newport, RI: U.S. Naval War College, 1996), 9.

²² Milan N. Vego, NWC 4105, Operational Sequencing, (Newport, RI: U.S. Naval War College, 1996), 2.

²³ Joint Military Operations Department, NWC 4103, Operational Functions, (Newport, RI: U.S. Naval War College, 1996) 25.

²⁴ John C. Burgess, Jr., "Operational Fires: Maximizing Effectiveness," Unpublished Research Paper, U.S. Naval War College, Newport, RI: 1996, 5.

²⁵ U.S. Air Force Dept. Air Force Manual 1-1, Volume 1, Basic Aerospace Doctrine of the United States Air Force, (Washington: U.S. Govt. Print. Off., 1992) 12.

²⁶ Phillip S. Meillinger, "Ten Propositions Regarding Airpower," Airpower Journal, Spring 1996, 58.

²⁷ Deputy Chief of Staff, Plans and Operations Directorate, JFACC Primer, 2nd ed., (Washington: US Govt. Print. Off., 1994) 32.

²⁸ U.S. Army Dept., Field Manual 100-7, The Army in Theater Operations, (Washington: US Govt. Print. Off., 1995), 7-9.

²⁹ The Joint Chiefs of Staff, Joint Publication 3-09, Doctrine for Joint Fire Support, final draft, (Washington: U.S. Govt. Print. Off., 1996) I-5.

³⁰ The Army and Air Force have agreed the name of the JFFC should be changed so it does not imply command authority. See: Headquarters, U.S. Army, DACS-ZA, Joint Agreements from Army-Air Force Warfighter Conference, Unpublished Message, 191947Z Dec 96.

³¹ Headquarters, Eighteenth Airborne Corps, Joint Task Force Standing Operating Procedures, (Fort Bragg, NC: 1996), 4-3-2.

³² Ibid., 4-2-7.

³³ U.S. Navy Dept., Naval Warfare Publication, Joint Force Air Component Commander Organization and Processes, revised test, (Washington: U.S. Govt. Print. Off., 1995), 2-8.

³⁴ Michael I. Handel, Masters of War: Sun Tzu, Clausewitz and Jomini, (London: Frank Cass & Co. Ltd., 1992) 124.

³⁵ Milan N. Vego, NWC 4106, Operational Synchronization, (Newport, RI: U.S. Naval War College, 1996), 1.

³⁶ Joint Military Operations Department, NWC 4103, Operational Functions, (Newport, RI: U.S. Naval War College, 1996) 9.

³⁷ Headquarters, Dept. of the U.S. Army, Field Manual 6-20-10, Targeting, (Washington: U.S. Govt. Print. Off., 1996), 1-7.

³⁸ The methodology is specifically described and adopted in both Headquarters, R.O.K.-U.S. Combined Forces Command, Deep Operations Primer- Korea, (1995), 5-8; and Headquarters, Eighteenth Airborne Corps, Joint Task Force Standing Operating Procedures, (Fort Bragg, NC: 1996), 4-1-5.

³⁹ Headquarters, R.O.K.-U.S. Combined Forces Command, Deep Operations Primer- Korea, (1995), 6.

⁴⁰ Headquarters, Dept. of the U.S. Army, Field Manual 6-20-10, Targeting, (Washington: U.S. Govt. Print. Off., 1996), 2-10.

⁴¹ Headquarters, U.S. Army, TRADOC Pamphlet 525-200-5, Depth and Simultaneous Attack Battle Dynamic Concept, (Fort Monroe, VA: 1994), 14.

⁴² Interview with Lt Col Dan Hickox, 8 AF/DOX (Exercise and Plans Branch), Barksdale AFB, LA: 19 December 1996, in which he revealed that in every one of many different joint exercises

involving 8 AF in the last two years, the JTCB had used some variation of the D3A methodology, and dealt with lists of individual targets identified by "BE" number. Col (sel) Larry Beaver (8 AF/DOX) represented the JFACC on the JTCB during UNIFIED ENDEAVOR 97-1, and described defending JFACC sorties "on a line-by-line basis."

⁴³ The concept has been used extensively in the weapon system acquisition process. Note that the STT framework described here has been modified extensively by the author and is not intended to represent the STT originally developed by RAND.

⁴⁴ David E. Thaler, Strategies to Tasks, A Framework for Linking Means and Ends, F49620-91-C-0003, (Santa Monica, CA: RAND, 1993), xi.

⁴⁵ "STT Definitions," <http://www.jast.mil/stt/stt_defs.html> (21 December 1996), 1.

⁴⁶ The proposed JTCB methodology has been developed by the author based upon the Joint Guidance, Apportionment, and Targeting Model documented in the Headquarters, Twelfth Air Force, 12 AF AFFOR AOC SOP, (Davis-Monthan Air Force Base, AZ: 1996) Appendix 3 to Annex B, 21.

⁴⁷ James A. Winnefeld, and Dana J. Johnson, A League of Airman, F49620-91-C-0003, (Santa Monica, CA: RAND, 1994), 157.

BIBLIOGRAPHY

Books

- Gordon, Michael R. and Bernard E. Trainor. The General's War: The Inside Story of the Conflict in the Gulf. Boston: Little, Brown and Company, 1995.
- Hallion, Richard P. Strike From the Sky. Washington: Smithsonian Institution Press, 1989.
- Handel, Michael I. Masters of War: Sun Tzu, Clausewitz and Jomini. London: Frank Cass & Co. Ltd., 1992.
- Mann, Edward C. Thunder and Lightning: Desert Storm and the Air Power Debates. Montgomery AL: Air University Press, 1995.
- Scales, Robert H., Jr. Certain Victory: United States Army in the Gulf War. Washington: U.S. Govt. Print. Off., 1993.
- Winnefeld, James A. and Dana J. Johnson. Joint Air Operations Pursuit of Unity in Command and Control, 1941-1991. Annapolis, MD: Naval Institute Press, 1993.

Manuals and Pamphlets

- Center for Naval Analyses. Naval Studies Group. The Navy and the JFACC: Making Them Work Together. CRC 202. Alexandria, VA: 1993.
- Headquarters, Eighteenth Airborne Corps. Joint Task Force Headquarters Standing Operating Procedures. Fort Bragg, NC: 1996.
- Headquarters, R.O.K. U.S. Combined Forces Command. Deep Operations Primer - Korea. 1995.
- Headquarters, Twelfth Air Force. 12 AF AFFOR AOC SOP. Davis-Monthan Air Force Base, AZ: 1996.
- Joint Military Operations Department. NWC 4103. Operational Functions. Newport, RI: U.S. Naval War College, 1996.
- Thaler, David E. Strategies-To-Tasks, A Framework for Linking Means to Ends. F49620-91-C-0003, Santa Monica, CA: RAND, 1993.
- The Joint Chiefs of Staff, Joint Publication 0-1, Joint Warfare of the Armed Forces of the United States. Washington: U.S. Govt. Print. Off., 1995.
- _____. Joint Publication 0-2, Unified Action Armed Forces. Washington: U.S. Govt. Print. Off., 1995.

- _____. Joint Publication 1-02, DOD Dictionary of Military and Associated Terms. Washington: U.S. Govt. Print. Off., 1994.
- _____. Joint Publication 2-01.1, Joint Tactics, Techniques, and Procedures for Intelligence Support to Targeting. 1st draft. Washington: U.S. Govt. Print. Off., 1995.
- _____. Joint Publication 3-0, Doctrine for Joint Operations. Washington: U.S. Govt. Print. Off., 1995.
- _____. Joint Publication 3-01.4, Joint Suppression of Enemy Air Defense. Washington: U.S. Govt. Print. Off., 1993.
- _____. Joint Publication 3-03, Doctrine for Joint Interdiction. 3rd draft. Washington: U.S. Govt. Print. Off., 1994.
- _____. Joint Publication 3-09, Doctrine for Joint Fire Support. final draft. Washington: U.S. Govt. Print. Off., 1996.
- _____. Joint Publication 3-56.1, Command and Control for Joint Air Operations. Washington: U.S. Govt. Print. Off., 1994.
- U.S. Air Force Dept. Air Force Manual 1-1, Volumes 1 and 2, Basic Aerospace Doctrine of the United States Air Force. Washington: U.S. Govt. Print. Off., 1992.
- _____. JFACC Primer. 2nd ed. Washington: US Govt. Print. Off., 1994.
- U.S. Army Dept. Field Manual 100-5, Operations. Washington: US Govt. Print. Off., 1993.
- _____. Field Manual 100-7, The Army in Theater Operations. Washington: US Govt. Print. Off., 1995.
- _____. TRADOC Pamphlet 525-200-5, Depth and Simultaneous Attack Battle Dynamic Concept. Fort Monroe, VA: 1994.
- U.S. Navy Dept. Naval Warfare Publication, Joint Force Air Component Commander Organization and Processes. test. Washington: U.S. Govt. Print. Off., 1995.
- Vego, Milan N. NWC 4104. Fundamentals of Operational Design. Newport, RI: U.S. Naval War College, 1996.
- _____. NWC 4105. Operational Sequencing. Newport, RI: U.S. Naval War College, 1996.
- _____. NWC 4106. Operational Synchronization. Newport, RI: U.S. Naval War College, 1996.
- Winnefeld, James A., Preston Niblack, and Dana J. Johnson. A League of Airman. F49620-91-C-0003. Santa Monica, CA: RAND, 1994.

Articles and Papers

- Burgess, John C. Jr. "Operational Fires: Maximizing Effectiveness." Unpublished Research Paper, U.S. Naval War College, Newport, RI: 1996.
- Carpenter, P. Mason. "Joint Operations in the Gulf War: An Allison Analysis." Unpublished Research Paper, Air University, Maxwell Air Force Base, AL: 1994.
- Collins, Patrick S. "Fires from the Sea: The Carrier Battle Group as a Source of Operational Fires." Unpublished Research Paper, U.S. Naval War College, Newport, RI: 1996.
- Corpac, Peter S. "Airland Battle Future--Fires How Do You Do It?" Unpublished Research Paper, U.S. Naval War College, Newport, RI: 1991.
- Eckert, Gregory M. "Joint Fire Support: How to Achieve Unity of Effort." Unpublished Research Paper, School of Advanced Military Studies, U.S. Army Command and General Staff College, Fort Leavenworth, KS: 1995.
- Hochevar, Robards, Schafer, and Zepka. "Deep Strike: The Evolving Face of War." JFQ, Autumn 1995, 80-85.
- Hood, Jay W. "Operational Fires and the Joint Force Commander." Unpublished Research Paper, U.S. Naval War College, Newport, RI: 1995.
- Hurley, Marcus. "JFACC Taking the Next Step." JFQ, Spring 1995, 60-65.
- Johnson, Charles W. "Joint Targeting and the Joint Target Coordination Board: Let's Fix the Current Doctrine!" Unpublished Research Paper, School of Advanced Military Studies, U.S. Army Command and General Staff College, Fort Leavenworth, KS: 1996.
- Kelly, Thomas R. "Operational Fires: Past, Present, and Future!" Unpublished Research Paper, U.S. Naval War College, Newport, RI: 1995.
- McCraken, Mathew T. "Understanding Operational Fires and Interdiction." Unpublished Research Paper, U.S. Naval War College, Newport, RI: 1993.
- McDaniel, Philip W. "Integration of Air Interdiction and Army Operational Fires." Unpublished Research Paper, School of Advanced Military Studies, U.S. Army Command and General Staff College, Fort Leavenworth, KS: 1993.
- Meilinger, Phillip S. "Ten Propositions Regarding Airpower." Airpower Journal, Spring 1996, 51-72.
- Moeller, Michael L. "The Sum of Their Fears: The Relationship between the Joint Targeting Coordination Board and the Joint Force Commander," Unpublished Research Paper, Maxwell Air Force Base, AL: Air University, 1995.

Nock, Richard E. "Intelligence Support in the BCE." Military Intelligence, October-December 1994, 40-41.

Probasco, Michael T. "Joint Force Air Component Commander or Coordinator?" Unpublished Research Paper, Air University, Maxwell Air Force Base, AL: 1994.

Reimer, Dennis J. and Ronald R. Fogleman. "Joint Warfare and the Army-Air Force Team." JFQ, Spring 1996, 9-15.

Seay, Stephen M. "Joint Fire Support Doctrine--Consensus Please!" Unpublished Research Paper, U.S. Army War College, Carlisle Barracks, PA: 1992.

Straight, Michael. "Commander's Intent: An Aerospace Tool for Command and Control?" Airpower Journal, Spring 1996, 36-48.

Veit, Rudy T. "Joint Targeting: Improving the Playbook, Communications, and Teamwork." Unpublished Research Paper, U.S. Army War College, Carlisle Barracks, PA: 1996.

Interviews and World Wide Web Site

Interview with Lt Col Kahoe, USAF, 12th AF/DOX, Davis-Monthan Air Force Base, AZ: 21 December 1996

Interview with Lt Col D. Hickox, USAF, 8th AF/DOX, Barksdale Air Force Base, LA: 3 January 1997

Interview with Col (Sel) L. Beaver, USAF, 8th AF/DOXS, Barksdale Air Force Base, LA: 3 January 1997

"STT Definitions." <http://www.jast.mil/stt/stt_defs.html> 21 December 1996.