DISTRIBUTION A:

Approved for public release;distribution is unlimited.

School of Advanced Airpower Studies
Maxwell AFB, Al 36112

Form SF298 Citation Data

Report Date *("DD MON YYYY")* 00061999	**Report Type** N/A	**Dates Covered (from... to)** *("DD MON YYYY")*

Title and Subtitle On the fields of friendly strifeThe Dichotomy of Air Force Doctrine and Training Involving Real-Time Targeting	**Contract or Grant Number**
	Program Element Number
Authors Deale, Thomas H.	**Project Number**
	Task Number
	Work Unit Number
Performing Organization Name(s) and Address(es) School of Advanced Airpower Studies Air University Maxwell AFB, AL 36112	**Performing Organization Number(s)**
Sponsoring/Monitoring Agency Name(s) and Address(es)	**Monitoring Agency Acronym**
	Monitoring Agency Report Number(s)
Distribution/Availability Statement Approved for public release, distribution unlimited	
Supplementary Notes	
Abstract	
Subject Terms	
Document Classification unclassified	**Classification of SF298** unclassified
Classification of Abstract unclassified	**Limitation of Abstract** unlimited
Number of Pages 94	

On the fields of friendly strife...

THE DICHOTOMY OF AIR FORCE DOCTRINE AND TRAINING INVOLVING REAL-TIME TARGETING

BY

THOMAS H. DEALE

A THESIS PRESENTED TO THE FACULTY OF
THE SCHOOL OF ADVANCED AIRPOWER STUDIES
FOR COMPLETION OF GRADUATION REQUIREMENTS

SCHOOL OF ADVANCED AIRPOWER STUDIES
AIR UNIVERSITY
MAXWELL AIR FORCE BASE, ALABAMA
JUNE 1999

DISCLAIMER

The conclusions and opinions expressed in this doctrine are those of the author. They do not reflect the official position of the US Government, Department of Defense, the United States Air Force, or Air University.

Contents

Page

Illustrations

Page

ABOUT THE AUTHOR

Major Thomas H. Deale received his commission through the United States Air Force Academy in 1987. Graduating from Undergraduate Pilot Training in 1988, he went on fly A/OA-10s and served as a Battalion Air Liaison Officer for US Army Mechanized, Light, and Cavalry Units that supported both CONUS and European joint exercises. Major Deale flew over 60 mission as an AFAC in the Gulf War, and he participated as an A/OA-10 pilot supporting Operations SOUTHERN WATCH, VIGILANT WARRIOR, and UPHOLD DEMOCRACY. As a Flight Commander for the 358th Fighter Squadron, he served as A/OA-10 Detachment Commander for the AIR WARRIOR augmentation to the US Army FORCE XXI, Joint Advanced Warfighting Experiment. Major Deale is a Senior Pilot with over 2300 hours flight time. He has a bachelor's degree in Astronautical Engineering from the Air Force Academy and a master's degree in Aeronautical Science from Embry-Riddle Aeronautical University. After graduating from SAAS, Major Deale will join the Air Force Doctrine Center at Maxwell Air Force Base.

ACKNOWLEDGMENTS

I would like to thank several people who provided valuable guidance and assistance throughout my research and writing. Officers of the ACC Training Division offered critical insights of today's training effectiveness. Lt Col (Ret) Price Bingham provided valuable information regarding JSTARS capabilities and operations. My thesis advisor and reader, Lt Col Roy Houchin and Lt Col Wray Johnson, proved most diligent in their efforts to translate my ideas and concepts relating doctrine and operations into a presentable literary piece. Finally, I would like to thank my wife, Annemarie, who endured the SAAS thesis process like a true champion.

ABSTRACT

The impact of advanced information systems on military strategy strains the relationship between doctrine, operations, and technology. If doctrine exceeds operational capability by looking too far into the future, the US military may face significant challenges by employing tactics and techniques not yet operational. While accounting for current capabilities, doctrine must also provide guidance for future systems and operations that fulfill each service's vision for the future. Indeed, the relationship between doctrine and technology is a delicate one. This study examines this relationship by comparing current doctrine and training involving interdiction with real-time information. Current doctrine relies on information superiority for advantages on the battlefield. Supporting this, doctrine describes "aerial" maneuver forces that execute interdiction missions with dynamic targeting. Current doctrine supports the technology of today, but current training does not support the concepts and capabilities called for by doctrine. Limited resources, scope, and assets compartmentalize current Air Force training. Furthermore, exercises do not effectively train at the operational-level since no exercise incorporates all the elements of the theater air control system. As strategy evolves towards supporting halt phase operations that permit minimum spin-up time, military forces must prepare for battle with the most realistic training available. Current training should support today's doctrine and include information integration, real-time targeting, and operational-level maneuver. One solution to this challenge is distributed

mission training that combines information systems, planning, control, and strike assets in a unified training exercise. Current US forces have the ability to fulfill the doctrinal assumptions regarding information superiority, but only through realistic training can military forces turn today's doctrine potential into tomorrow's operational capability.

Chapter 1

Introduction

On the fields of friendly strife are sewn the seeds that on other days and other fields will bear the fruits of victory.

- General Douglas MacArther

World War II highlights the critical linkage between doctrine, training, and employment. Prior to the Normandy Invasion, the Western Allies favored strategic airpower to directly attack Germany. After initial losses, Britain opted for nighttime operations against German population centers. But the United States Army Air Forces (USAAF) continued daylight precision bombing: a tactic derived from the Air Corps Tactics School's (ACTS) airpower theory and doctrine. The ACTS faculty based their concept on an industrial web theory, whereby targeting critical industries could bring strategic victory. However, the USAAF based the concept of high altitude daylight precision bombing on the unrealistic technologies and capabilities of 1930s era bombers.[1] As a result, WWII's strategic bombing campaign developed into a costly battle of aerial attrition, contributing to Allied air superiority for the Normandy invasion, but never producing the decisive effects predicted by the ACTS theory. Thus, while technology may modify doctrine and set the path towards future capabilities, advanced technology must not be the sole foundation for operational doctrine. Furthermore, realistic training

[1] Conrad C. Crane, *Bombs, Cities, and Civilians* (Lawrence: University Press of Kansas, 1993), 4-5.

must support the concepts advanced by operational doctrine. Unfortunately, today's airpower doctrine relies heavily on advanced technologies that efficiently gain and exploit information while current training fails to effectively integrate the real-time information that is doctrinally assumed.

Today, information technologies are driving dramatic changes in the theory and execution of war. Whether such advances represent a Revolution in Military Affairs (RMA) or a continued evolution in military affairs is beyond the scope of this study; however, what is important is the fact that today's information systems are bringing new and potentially decisive changes to campaign planning and operations. The modern battlefield is a fluid environment, and information technologies help commanders overcome many of the challenges to situational awareness. With a clear operational picture, commanders may employ forces in a fluid manner that optimizes their effectiveness, efficiency, which ultimately brings victory.

For air forces, information capabilities finally permit dynamic operational-level maneuvering that takes maximum advantage of airpower's characteristics of speed, range, and flexibility. Traditionally, interdiction operations have represented operational-level force employment, but without knowing precisely where the enemy was, interdiction missions focussed on cutting known lines of communication (roads, bridges, waterways, etc), industry, and storage areas. In the past, enemy forces were attacked if they could be located, but this often required either air or ground reconnaissance to first find the units. For air forces, armed reconnaissance missions were, and still are, a dangerous and inefficient use of limited assets. As described by Lt. Col. (Ret) Price T. Bingham, Grumman /JSTARS representative, ground maneuver units operated as if they

were fighting in the dark, feeling their way with one arm while keeping the other poised to attack. Today, information systems can find and identify units without relying on ground contact or armed reconnaissance, thus offering commanders armed with such awareness a decisive advantage.[2] Battle managers may direct air forces against enemy units in transit prior to ground contact, thereby optimizing airpower's effectiveness and efficiency. In the future, information technologies may dynamically change the nature of interdiction operations by providing air-battle managers a detailed view of the battlespace and the ability to rapidly orchestrate strike missions to maximize their effects. But to take advantage of these emerging capabilities, forces must define and refine their information processes and employment methods through realistic and in-depth training. Such methods will integrate real-time information, creating operational-level attack opportunities for air component commanders by diverting their strike fighters as they are enroute to a target.

Currently, the US is at a critical juncture: balancing its force modernization needs within a resource constrained environment. Following the Gulf War, military force reductions produced dramatic shifts in the nation's strategy. Consequently, present plans and doctrine rely on information superiority to act as a force multiplier, countering force reductions and providing US forces with the critical advantages they will need in future operations. But limited resources and a lack of proper training are hindering these integration efforts and organizational changes, thus denying military operations the benefits it could enjoy from information superiority.

This study investigates how the US Air Force has integrated real-time information technologies into its doctrine and training. It also describes how the service should revise

[2] Lt Col Price T. Bingham (Ret), personal interview with author, 1 March 1999.

its training to increase its capacity for short notice mission diverts while taking maximum advantage of the real-time target information now increasingly available. Although the implications of information operations cover a broad spectrum, this study focuses on current interdiction doctrine and the need to implement that doctrine through realistic training. Chapter 2 provides some overarching definitions and operational concepts unique to real-time information integration. Chapter 3 briefly highlights events from the Gulf War to illustrate the potential benefits and challenges the USAF might expect regarding the integration of real-time information. Chapter 4 presents the current Joint and Air Force doctrine on real-time information operations, systems, interdiction, training, and battlefield management. Subsequently, Chapter 5 focuses on current USAF interdiction training that ranges from local unit tactics to major exercises. Chapter 6 identifies the shortfalls between the capabilities assumed by doctrine and the service's existing training efforts. Chapter 7 describes several proposals for future interdiction operations from both the doctrinal visions and experimental points of view. Chapter 8 concludes with a discussion of the relationship between doctrine and these advanced concepts and technologies, as well as recommends an approach to operational-level training exercises, munitions, and joint training. These recommendations insure that real-time information will be integrated with future interdiction operations, fulfilling today's Air Force and joint doctrinal requirements.

Chapter 2

Definitions and Concepts

The beginning of wisdom is calling things by their right names.

Confucius

As a developing capability, the terminology and operational methods that address real-time information are in constant flux. This chapter provides some overarching definitions and concepts unique to integrating real-time information with interdiction operations. More detailed doctrinal definitions are provided throughout the analysis where they are appropriate. For the purposes of this study, real-time information refers to data gathered from various sensors that are used by battle managers or commanders to immediately adjust and optimize their force's employment. Real-time information may come from the E-8 Joint Surveillance Target Attack Radar System (JSTARS), RC-135 Rivet Joint (RJ), or E-3 Airborne Warning and Control System (AWACS) sensor aircraft. Space-based national reconnaissance systems and ground reconnaissance assets also provide real-time intelligence.

Real-time information incorporates data for both time sensitive targets (TST) and time critical targets (TCT). According to Joint Publication 1-02, *Dictionary of Military and Associated Terms*, TSTs are "those targets requiring immediate response because they pose (or will soon pose) a clear and present danger to friendly forces or are highly

lucrative, fleeting targets of opportunity."[3] Similarly, the Air-Land-Sea Application Center (ALSA) defines TCTs as a "lucrative, fleeting, air, land, or sea target of such high priority to friendly forces that the Joint Force Commander (JFC)/component commander designates it as requiring immediate response." Thus, TCTs pose or will pose an imminent threat to friendly forces or present an exceptional targeting opportunity. Other adjectives commonly used to describe a TCT are emerging, perishable, high payoff, short dwell, or time-sensitive.[4] Almost every military action or theater has some high value, prioritized targets which require timely reactions by military forces.

Air forces react to real-time information by tasking designated airborne alert aircraft, scrambling ground alert aircraft, or diverting aircraft away from previously assigned targets. Each method has both advantages and disadvantages. Airborne alert aircraft may offer the fastest response, but due to the unknown nature of the emerging targets these aircraft may go unused - a waste of valuable air resources. Ground alerts overcome the inefficiencies of airborne alerts, but increase the time required for aircraft to attack the fleeting targets. Diverting airborne missions offers a good compromise between time and effort, but the individual who holds the divert authority must be able to correctly orchestrate each "redirect" within the JFC's guidance and adjust for the ripple effects these changes create for other missions.

Real-time information integration is not new to the Air Force, both the close air support (CAS) and counterair (CA) missions rely on accurate, timely, and clear information for success. Pilots who fly CAS missions often take-off without the exact

---

[3] Joint Publication 1-02, *Dictionary of Military and Associated Terms*. Joint Staff, Joint Electronic Library [CD-ROM], May 1997. 543.
[4] The Joint Targeting Process and Procedures for Targeting Time-Critical Targets. *Air-Land-Sea Application Center, July 1997.* II-1.

knowledge of where and what targets they will attack, nor do they specifically know the threat, agency coordination, or tactics they will use. To facilitate the CAS mission, the Air Force delegates mission divert authority to forward command and control (C2) agencies. Likewise, the counterair mission requires a reactive network of systems to defeat possible enemy air attacks. CA assets usually do not know where or when they will be employed. As with CAS, the Air Force delegates divert authority and control of its counterair forces to lower level agencies. By controlling and executing CAS and CA missions at lower levels, the information, coordination, and response cycles are accurate and timely enough to achieve effective results.[5]

Information systems can now identify lucrative, high value, and critical targets for interdiction operations, but the process of integrating real-time information within the current C2 architecture often lacks the timeliness required to be effective. Concurrently, deciding who within the joint force should retain divert authority for interdiction operations remains an issue for debate, current Air Force options include Air Operations Centers (AOC), ground Control and Reporting Centers (CRC), or onboard sensor platforms like AWACS or JSTARS. Ultimately, Air Force doctrine assigns responsibility for the successful integration and execution of air interdiction to the Joint Force Air Component Commander (JFACC).[6]

Many current operational concepts and strategies revolve around executing some type of "halt" operation; integrating real-time information will be critical to the success

---

[5] Air Force Doctrine Document 1, *Air Force Basic Doctrine*. (Maxwell AFB: US Air Force, September 1997). 23.
Although a central tenant of airpower is centralized control, the flexibility required by both CAS and CA require decentralized control for effectiveness.

[6] Air Force Doctrine Document 2-1, *Air Warfare* (Draft). (Maxwell AFB: US Air Force, 12 March 1999). 26.

of these campaigns. AFDD 2-1 describes a halt phase as “the ultimate expression of [air warfare] doctrine … in which the enemy is both stopped short of reaching his objective, which may be to engage friendly ground forces and/or take territory, and destroyed or disrupted to such a degree that continued fighting is no longer possible.”[7] Thus, airpower provides a short-notice, global response to a time critical situation that favors direct counter-land operations over strategic attack operations that require more time to be effective.[8] Melding interdiction operations with timely information is critical to the successful execution of a halt phase of an aerial campaign.

The halt phase is ubiquitous in doctrine, combat plans, and budget authorizations. It also supports campaign design and force structure appropriations.[9] According to Maj. John Sims, HQ USAF/XOCI, halt phases comprise four key tasks: (1) exploiting information operations; (2) employing precise and decisive aerospace power; (3) mastering asymmetric strategies; and (4) the ability to find, fix, track, target, and engage anything significant in near-real time and assess the effects.[10] Information superiority and integrating real-time information are vital to such operations. So much so that the Quadrennial Defense Review (QDR) for 1997 stated that the capability to halt an enemy's advance short of his objectives in two near-simultaneous theaters is "absolutely critical.” It further states that a "failure to halt an enemy invasion rapidly can make the subsequent campaign to evict enemy forces from captured territory much more difficult, lengthy, and

[7] AFDD 2-1, 23.
[8] AFDD 2-1, 35.
[9] John T. Correll, "On Course for Global Engagement." *Air Force Magazine* Vol. 82, No. 1. January, 1999. 26.
[10] John N. Sims, HQ USAF/XOCI, Bullet Background Paper on the Halt Phase, September 1998.

costly."[11] Interestingly, the National Defense Panel (NDP) for 1997 differed from the QDR by omitting any reference to halt phase operations, largely due to the Army's efforts to de-emphasize airpower's prominent role during the halt phase.[12] Despite inter-service rivalries, halt phase strategies and capabilities will play a key role in future US combat plans, concepts of operations, and service budget considerations.[13]

[11] John A. Tirpak. "The Long Reach of On-Call Airpower." *Air Force Magazine* Vol 81, No. 12. December 1998. 22.
[12] Correll, 25.
[13] Tirpak, 22.

Chapter 3

Historical Evidence

You can't say that civilization don't advance . . . for in every war they kill you a new way.

-Will Rogers

The Gulf War represents the latest large-scale use of force by the United States and its allies. Since the Gulf War's physical and political environments were unique, specific lessons drawn from that experience must be balanced against contextual factors. With this in mind, two individual efforts during the Gulf War highlight both the successes and difficulties faced by the coalition while trying to integrate real-time information into their combat operations. The Iraqi defeat at the Battle of Khafji demonstrates the potential advantages of successfully integrating information and interdiction. However, the failure of the allied *Scud* hunting campaign revealed some critical inefficiencies of information and interdiction integration as allied forces attempted to attack these fleeting targets. Nevertheless, advanced information systems directly effected the Gulf War and, perhaps, no new system had a larger impact than the E-8 JSTARS. Originally cancelled by the Congress in 1990, two developmental aircraft (E-8As) arrived in theater on January 6,1991, the first day of the air campaign.[14]

---

[14] Eliot A. Cohen and Thomas A. Keaney, *Revolution in Warfare?* (Annapolis: Naval Institute Press, 1995), 210.
Air Force News Website, accessed 4 December 1998; available from

The Battle of Khafji

The Battle of Khafji was a critical event during the Gulf War, and exemplified the potential advantages of teaming information systems with interdiction assets. On January 29, 1991, two Iraqi heavy divisions began moving towards allied forces near Al Khafji. Once detected by the JSTARS' sensors and mission crew, coalition commanders quickly and decisively diverted airpower to counter the Iraqi offensive. In the three days and over 1,000 sorties that followed, the two Iraqi divisions were rendered ineffective. One Iraqi veteran described the coalition air attacks as causing more damage in 30 minutes than in eight years of the Iran-Iraq War.[15] Similarly, in a post-war study of the battle, Maj. Jeff Newell wrote, "No single aircraft contributed more to the Battle of Khafji than the prototype E-8A JSTARS."[16] Coupled with the capabilities of its mission crew, the technology on board JSTARS contributed in three critical ways. First, it located and tracked Iraqi armor columns, immediately passing this information to airborne strike aircraft. Second, it gave commanders at the Tactical Air Control Center (TACC) a significantly enhanced picture of the battlefield situation. Finally, it provided critical insights about the Iraqi's movements and intentions directly to Army and Marine ground commanders throughout the Khafji operation.[17]

Although critical to the coalition's success at Khafji, the Air Force's integration and reactions to this information were not optimal. Without any prior experience, the TACC

---

http:\\www.hiritage.org/library/catagories/natsec/bg808.html.

[15] Lt Col Price T. Bingham (Ret), "Revolutionizing Warfare through Interdiction." *Airpower Journal,* Spring 1996

[16] Maj John F. Newell, "Airpower and the Battle of Khafji: Setting the Record Straight," (Maxwell AFB, School of Advanced Airpower Studies, June 1998). 42.

[17] Newell, 42-43.

was initially slow to react to JSTARS real-time warnings, significantly impeding the coalition's decision-making process.[18]

Nevertheless, advanced information systems insured that the coalition forces at the Battle of Khafji maintained a heightened sense of awareness throughout the operation. Information technologies identified the enemy's intent, combat units, and scheme of maneuver, thus enabling coalition commanders to divert assets and decisively employ their airpower.[19]

Gulf War *Scud* Hunting

The Iraqi response to the coalition's air operations included launching *Scud* missiles against targets in both Saudi Arabia and Israel. Militarily, the missiles produced only minimal tactical and operational-level effects. However, the strategic and political implications of these launchers demanded a concerted effort, ultimately resulting in just under 2,500 sorties directed against *Scud* missile launchers.[20]

Although successfully integrated at Khafji, vital delays in linking real-time information with the proper command and control agency yielded only marginal success against fleeting *Scud* launchers. Thomas Keaney and Eliot Cohen, in their book *Revolution in Warfare? Air Power in the Persian Gulf*, describe the challenges faced by the coalition forces. Because Iraqi mobile *Scud*s take only minutes to set up, fire, and move, any delays in responding to an attack reduced the probability of their destruction. Coalition forces used JSTARS and space-based national intelligence assets to detect the *Scuds* and rapidly directed their aircraft against them. Such operations required timely

[18] Newell, 49-50.
[19] Newell, 20.

responses from the TACC to integrate, process, and disseminate the real-time targeting information. But TACC officials lacked both the experience and training to successfully integrate real-time information into their interdiction planning and execution. Coalition forces therefore lacked the ability to integrate JSTARS data and information from other systems. This failure created friction within the sensor-shooter link, and caused critical delays to forces attacking the fleeting *Scud* launchers.[21] Consequently, aircrews supporting the *Scud* campaign complained that if they couldn't see the missile launch themselves, they had little chance of finding the launcher vehicles.[22] As a result, *Scud* hunting during the Gulf War, although strategically and politically important for coalition unity, was mostly ineffective.[23]

The *Scud* campaign reveals the nature of the transitional problems that are common as forces attempt to integrate new information capabilities. Although the nation's advanced systems made real-time information readily available, during the Gulf War, the people who operated the C2 architecture, planned the campaign, and executed the plan lacked the experience, training, and skills to efficiently benefit from information. This reveals a critical flaw in US strategy: an over-reliance on capabilities that are not fully developed and integrated into the combat forces.

Although JSTARS and other information systems overcame these integration shortfalls and provided a critical advantage to coalition forces, two key aspects of the Gulf War greatly contributed to the coalition's information superiority. First, the allies achieved air superiority early in the campaign; this created a remarkably permissive

---

[20] Maj David E. Snodgrass, *Attacking the Theater Mobile Ballistic Missile Threat.* (Maxwell AFB: School of Advanced Airpower Studies, June 1993). 8.
[21] Cohen and Keaney, 107-108.
[22] Snodgrass, 6-7.

environment for coalition aircraft. Second, the desert environment simplified the aircrew's problems of target location, identification, and attack. These aspects simplified target search and identification for coalition pilots and directly contributed to the coalition's victory.

Desert Storm highlights the advantages to be gained, and the difficulty attendant when military organizations embrace the new capabilities brought by information systems. JSTARS and other information assets successfully supported the coalition at the Battle of Khafji, permitting their effective and efficient application of airpower. But the *Scud*s represented a unique challenge to allied commanders that created a requirement for more advances in C2, information processes, and battle management methods. Despite their inability to completely meet this demand, advanced, real-time information systems provided coalition forces with valuable insights about the enemy's locations and intent. Following the Gulf War, the US military's doctrine embraced these new advantages, ultimately setting the foundation for today's doctrinal assumption of information superiority.

[23] Cohen and Keaney, 78.

Chapter 4

Current Doctrine and Interdiction Operations

Doctrine undergrids everything we do, it is the logical beginning for our efforts to translate our vision of joint warfighting into reality.

—Gen Hugh Shelton, CJCS

Doctrine translates military theory into application. In that regard, both Joint and Air Force doctrine define current methods for interdiction operations that rely heavily on information superiority for success. Ultimately, Joint doctrine provides the overarching direction for all armed forces of the United States. The services tailor their doctrine according to their respective operations, capabilities, and beliefs. As described by the Air Force Chief of Staff, Gen. Michael Ryan, "Doctrine provides the Air Force with a common, integrated vision; it draws from agreed upon best practices supported by history, technology and our insights about the future. It guides commanders and offers all airmen a proven set of principles for how we in the Air Force organize, train for, and execute military operations. Air Force doctrine must be operationally relevant and must be tested, implemented, used and refined…. We rely on the principles and tenets of doctrine to capitalize on the unique capabilities of aerospace power when providing air and space superiority, global attack, precision engagement, rapid global mobility,

information superiority, and agile combat support."[24] The Air Force's senior leadership recognizes the critical role of operationally relevant doctrine.

This chapter the existing reviews current Joint and Air Force doctrine that addresses information operations, interdiction, training, and future operational concepts. Beginning with the topmost document, Joint doctrine lays the foundation for all other doctrine. Next, the Air Force's vision statement supports Joint doctrine and creates the focal point for all the USAF's doctrine. Air Force doctrine begins with AFDD-1 *Basic Doctrine*, which lays a foundation for all the service's operational-level documents. The specific doctrinal documents that deal with real-time information and interdiction are AFDD-2 *Organization and Employment*, AFDD 2-5 *Information Operations*, AFDD 2-1 *Air Warfare*, AFDD 2-1.3 *Counterland*, and AFDD 2-1.7 *Airspace Control*. This chapter also discusses the related Air Land Sea Application Center multi-service guidance. The doctrinal review reveals that an underlying theme of doctrine at all levels is the need for information dominance or superiority. Accordingly, strategy, methods, and the service's force structure should support the advantages offered by these advanced information systems. Throughout this chapter, exact reference to the doctrine allows the reader to understand the precise meaning and intent of current doctrinal concepts that assume the nation will have information superiority and will integrate real-time data into interdiction operations. Finally, this chapter sets the stage for an objective evaluation of the supporting training methods discussed in chapter 5.

[24] "Special Interest Notice to Airmen." Accessed 4 January 1999; available from http://www.hqafdc.maxwell.af.mil/.

Joint Doctrine

As a conceptual template for the future, Joint Vision 2010 (JV2010) provides a framework for future US military operations, technologies, and force structures. JV 2010 focuses on four operational concepts: dominant maneuver; precision engagement; full dimension protection; and focused logistics. All four operational concepts assume a foundation of information superiority.[25] Joint doctrine defines information superiority as the "degree of dominance in the information domain which permits the conduct of operations without effective opposition."[26] JV 2010 relies on an enhanced C2 and improved intelligence architecture to provide US forces with the efficiencies and advantages of these new technologies.[27]

For interdiction operations to succeed, joint forces must achieve dimensional superiority, sustain and concentrate pressure on the enemy, obtain accurate and timely intelligence, appropriate munitions, and synchronize their ground maneuvers with the campaign's interdiction operations.[28] Accurate intelligence allows commanders to tailor their objectives, operations, and reactions appropriately. Timely joint interdiction requires a command, control, communication, computer, and information (C4I) system that will permit the dynamic use of real or near-real time intelligence. Joint doctrine recognizes the need for such systems when dealing with targets which may have a near or immediate effect on friendly units or whose position is not accurately known.[29] Specifically, it credits JSTARS technology with the ability to "direct interdiction assets

---

[25] Joint Staff, *Joint Vision 2010*, Joint Electronic Library [CD-ROM], May 1997. 1, 16.
[26] JP 1-02, 263.
[27] JV 2010, 19.
[28] Joint Publication 3-03, *Doctrine for Joint Interdiction Operations*. Joint Staff, Joint Electronic Library [CD-ROM], May 1997. xi.
[29] JP 3-03, IV-2.

onto immediate, high-value, time-sensitive targets which might otherwise be undetectable."[30] Other developing technologies augment JSTARS information, enhancing the joint interdiction effort by finding, identifying, and targeting critical enemy targets.

In turn, well-developed concepts of joint interdiction operations integrate surface operations into the overall interdiction effort. Specifically, Joint Pub 3-03 states, "An important factor in successful interdiction operations is synchronizing interdiction and maneuver. Planning and conducting interdiction and surface operations within a coherent framework provides a synergistic effect."[31] Achieving such synergies requires effective C2, maneuver coordination, and responsive battle management. Moreover, such operations require extensive joint training to establish and refine such synchronized processes.

Thus, Joint Doctrine is built on a foundation of information superiority and depends on a seamless, efficient, and effective process to support interdiction efforts. As the pinnacle of US Doctrine, it represents the optimum method of joint operations.

The Air Force Vision Statement: Global Engagement

Global Engagement sets the Air Force's course for the next quarter century. Its concepts flow directly from the national security strategy and the chairman's vision as expressed in JV2010.[32] In Global Engagement, the Air Force identifies information superiority as a core competency, representing a "combination of professional knowledge, air and space power expertise and technological know-how that, when

[30] JP 3-03, III-4.
[31] JP 3-03, IV-4.
[32] *Global Engagement*, US Air Force. 3.

applied, produces superior military capabilities."[33] It relies on "interoperable, integrated and seamless information systems, which ensure information superiority, [and] will be key to successful future operations."[34]

To realize this and similar concepts in the Global Engagement vision statement, the Air Force is reorganizing itself and modifying its operations. According to MGen Donald Cook, AF/XOP, in order to better prepare the service for future operations and contingencies, the Air Force is organizing into 10 Air Expeditionary Forces (AEFs) to react to the needs of combatant Commanders-in-Chief (CINCs). Accordingly, the AEFs must be flexible and ready for short notice deployments and combat. This represents a shift in Air Force philosophy, away from forward presence and overseas basing towards an expeditionary model that presupposes that critical halt phase operations will be conducted at the beginning of the campaign.[35] Global Engagement Operations (GEO) will directly employ AEFs in support of Global Engagement. In *Air Force Magazine*, John Correll suggested that the Air Force's halt phase capabilities are well to justify the service's force structure requirements as it competes with its sister services in future QDRs and NDPs processes.[36]

Operational Air Force Doctrine

While Joint doctrine and service vision documents support future concepts and provide a path for future capabilities, operational level doctrine must bridge the gap between vision and capabilities. As described by Air Force Doctrine Document 1 (AFDD-1), operational doctrine establishes guidelines for the application of air and space

[33] *Global Engagement.* 8.
[34] *Global Engagement,* 11.

forces across the full range of military operations from global nuclear war or conventional warfare to military operations other than war.[37] Air Force basic operational doctrine identifies the halt phase as the decisive phase of future conflicts.[38] With airpower playing the critical role, US forces will quickly deploy to stop or deter aggression. Follow-on forces may then expel enemy forces as needed. With this concept in mind, current operational-level Air Force doctrine seeks to enhance halt phase operations and capabilities.[39]

Air Force Doctrine Document 2, Organization and Employment (AFDD 2)

AFDD 2 provides the initial framework for planning, coordinating, and executing air operations including interdiction. The Air Component Commander (ACC) develops the air operations plan that translates the overall campaign strategy into an executable Air Taking Order (ATO) which incorporates all available assets. The ACC may change the ATO's tasking in reaction to unforeseen events or actions. According to doctrine, this provides the ACC centralized control, yet allows the commander to retain airpower's inherent flexibility.[40]

Air Component Commanders execute their command and control through Air Operations Centers.[41] AOCs are usually separated into two divisions, combat plans and combat operations. The Combat Plans Division generates future ATOs that synthesizes

---

[35] MGen Donald G. Cook, personal interview with author, January 10, 1999.
[36] Correll, 25.
[37] AFDD 1, v.
[38] AFDD 1, 42.
[39] Gen. Charles Link, *Thoughts on the Future of War,* [CD-ROM] AF/XPXQ, 1998.
[40] Air Force Doctrine Document 2, *Organization and Employment of Aerospace Power.* (Maxwell AFB: US Air Force, September 1998). 4.
[41] AFDD 2, 34.

operational plans from component requests, JTF guidance, ACC strategy, and intelligence information. The Combat Operations Division executes the ATO. It also analyzes the battlespace environment and makes recommendations to the JFACC (or designated representative) to divert assets. By doctrinal definition, the Combat Operations Division normally integrates real-time information and redirects assets as necessary to attack TCTs.[42]

Air Force Doctrine Document 2-5, Information Operations (AFDD 2-5)

AFDD 2-5 addresses Air Force perspectives regarding information superiority and information warfare. It identifies information superiority as "an Air Force core competency upon which all the other core competencies rely." While information operations are not solely the Air Force's domain, the strategic perspective and global experience gained from operating in the aerospace continuum make airmen uniquely qualified to gain and use advantages yielded from information superiority.[43]

In turn, information superiority directly influences the use and effectiveness of real-time information. AFDD 2-5 notes:

> The Air Force believes that dominating the information spectrum is as critical to conflict now as controlling air and space or occupying land was in the past and is seen as an indispensable and synergistic component of aerospace power. The time between the collection of information and its availability to users at all levels has shrunk to heretofore unimaginably short spans. While possessing, exploiting, and manipulating information has always been an essential part of warfare, it may become central to the outcome of conflicts in the future. While traditional principles of warfare still apply, they are increasingly coupled with the realization that the possession and manipulation of information itself can be a key element of the war-winning equation. More than at any other time in history, information has evolved from being only an adjunct supporting primary

[42] AFDD 2, 71.
[43] Air Force Doctrine Document 2-5, *Information Operations*. (Maxwell AFB: US Air Force, 5 August 1998). 2.

> weapon systems to, in many cases, being itself a weapon or target. Since there are few distinct boundaries in the information environment, the military limitations of time, terrain, and distance, already reduced in this century by the advent of aerospace power, now are bounded in many cases only by the speed of light.[44]

Thus, AFDD 2-5 identifies the critical nature of information operations and the synergistic effects when forces combine real-time information with the ability to perform operational maneuvers.

Air Force Doctrine Document 2-1, Air Warfare (AFDD 2-1)

In the final stages of production, AFDD 2-1 establishes Air Force operational doctrine for air warfare. The doctrine discusses the nature of realistic operational training and the critical role it plays in future success. Addressing training for JFACC operational-level planning and control, AFDD 2-1 notes:

> Thorough training is vital for success in all aspects of aerospace operations. The ability to plan and execute a theater air campaign requires the same rigorous approach required to achieve tactical excellence. Training, therefore, involves mastering the necessary level of knowledge and then developing the judgment to use that knowledge in the fog of war. Training enables the timely and coordinated completion of many difficult and diverse tasks required by a JFACC and the JFACC's staff during the conduct of theater air warfare…. Individuals must learn and practice their wartime tasks prior to the outbreak of hostilities. The pace of modern warfare may not allow time to polish skills, develop new procedures and techniques, or create new organizational structures as the crisis develops or after hostilities begin. Hence, training for aircrews, battle staff, and support personnel must be as realistic as possible to reinforce the will as well as the skill of the airman.[45]

As a result, AFDD 2-1 identifies a crucial need for realistic, operational-level training for JFACCs and their staffs to insure that planning, control, and operations are integrated prior to hostilities.

---

[44] AFDD 2-5, 1-2.
[45] AFDD 2-1, 70-71.

Specifically addressing AOC operational-level training, AFDD 2-1 notes:

> At the heart of effective C2 of air forces is the battle management function. The goal for battle management training is to have component staffs train with the same realism and intensity that exercises such as Red Flag provide for aircrews. Just as aircrews face realistic threats in getting to the target, commanders and air component planners need to experience the stresses of selecting targets and devising concepts of operations in plausible and realistic scenarios. Campaign planning, combat staff expertise, and C2, are critical to warfighting--they make it possible to strike the right target with the most appropriate system. Training for this crucial aspect of warfare is conducted through specialized training programs and exercises. In addition to molding existing battle staffs into smooth operating teams, these programs ensure that personnel sent to augment battle staffs in theater commands have been trained to perform effectively immediately upon arrival. Proper training exposes planners to the environment they will be thrust into, should the situation arise, with very little warning.[46]

Realistic, operational-level training for AOC battle managers is equally important, but extremely difficult to achieve as the dynamics and enormity of the modern battlefield rarely permits replication.

Just as JFACC/AOC battle management training supports operational-level planning and control, tactical-level training ensures that the plan will be successfully executed and that the nation's aircrews will survive. Peacetime training must consequently hone these tactical skills to a razor sharp edge. AFDD 2-1 addresses these issues for tactical-level aircrew training, noting:

> Experience in war and peacetime tests shows effectiveness and aircrew survivability increase dramatically with combat experience. The peacetime training goal is to provide the equivalent of combat experience in the maximum quantity and quality that resources can support. Operational ranges are central to this effort. The primary objective of operational ranges is to provide realistic training and testing areas. The combat environment, in terms of weather and its effects, surface and airborne targets, enemy air defenses, and general fog and friction, should be as realistic as training constraints allow. Computer simulations are

[46] AFDD 2-1, 71.

> used to enhance realism since a realistic environment for training contributes directly to increased combat effectiveness.[47]

Creating realistic training remains a significant challenge because most local ranges cannot provide realistic threat environments. Current ranges also lack spectrally realistic (infrared) or mobile targets needed for aircrew training.

Aircrew training represents the tip of the spear; battle management provides the shaft and force, thus transforming an inanimate rod into a deadly weapon. For aircrew and battle management personnel, exercises furnish essential experience above and beyond the capabilities of local training areas and form the foundation for operational-level training.[48]

Air Force Doctrine Document 2-1.3, Counterland (AFDD 2-1.3)

In its final approval stage, AFDD 2-1.3 will provides the Air Force with operational guidance for the planning, execution, and training of air interdiction (AI) operations. Furthermore, counterland doctrine will define aerospace forces as being capable of performing maneuver operations: "If the ability to move and attack the enemy are indeed the key ingredients to maneuver warfare, then aerospace forces, with their inherent speed, range, and precision attack capabilities, cannot be defined as anything but maneuver forces."[49] Likewise, "as an aerial maneuver force, it is incorrect to think of counterland operations as 'flying artillery'." According to the doctrine, counterland assets have much greater range and targeting options, can adapt to changing situations while enroute to the target area, and can retarget based on on-board or off-board information updates, giving

[47] AFDD 2-1, 72.
[48] AFDD 2-1, 72-73.
[49] Air Force Doctrine Document 2-1.3, *Counterland* (Draft). (Maxwell AFB: US Air Force, 12 March 1999). 8.

air "maneuver" operations parity with ground "maneuver" operations.[50] This breaks the ground commander's "target list" paradigm for conducting interdiction missions by permitting independent air operations within the joint campaign plan. The concept of dynamic operational-level maneuver suggests that real-time information, responsive C2, and airpower's inherent speed, range, and flexibility can be combined into a synergistic force. If achieved through realistic training, the ability to perform dynamic operational-level maneuvers would validate the doctrinal definition of aerial "maneuver" forces.

Doctrinally, dynamic air interdiction is a key form of "aerial maneuver." Similarly, centralized control and decentralized execution, along with flexibility and versatility are four central tenants of airpower that are essential to AI operations. Because counterland missions effect the enemy across the entire theater, they must be centrally planned and consider the joint commander's priorities. The flexible nature of aerospace power allow commanders to concentrate it wherever it is needed in reaction to the air, ground, or overall campaign requirements. Decentralized execution is also essential, this gives air support operations centers (ASOCs) and airborne battlefield command and control centers (ABCCCs), as well as individual mission and flight leads, the flexibility they need to accomplish their tasks.[51] Indeed, flexibility is critical as aircrews integrate real-time information that has been gathered from the fluid battlefield. To successfully re-target AI missions, battle management operators must be able to rapidly assess these changing conditions. Maintaining flexible and versatile forces permit them to dynamically target their enemy across the entire spectrum of counterland operations.[52]

[50] AFDD 2-1.3, 9.
[51] AFDD 2-1.3, 21.
[52] AFDD 2-1.3, 22.

Equally important, the dynamic targeting process requires timely information and reactive C2. Finding and attacking critical AI targets is the key to breaking the "target list" paradigm of interdicting fixed lines of communication (LOCs) and static enemy targets. AFDD 2-1.3 suggests that, "Direct attack of enemy fielded forces has traditionally been more limited than the other effects, mainly due to the difficulty of finding and targeting individual guns or vehicles. Modern sensor and weapons technology is changing this picture, however, and [the] direct destruction of enemy forces is becoming a more viable option for air interdiction…. [The] direct destruction of enemy forces has an immediate impact on enemy combat power, which is an advantage over infrastructure attack that may produce delayed results."[53] Technology in both sensors and weapons are pushing the Air Force towards a more dynamic method of AI employment.

Dynamic targeting will allow pilots to react immediately to short-notice targets; AFDD 2-1.3 addresses these rapid, short-notice responses to TCTs by using alert forces or an area-targeting tactic. Armed reconnaissance missions search designated areas rather than attacking specific coordinates, these areas may be along LOCs, or within designated "killboxes." By augmenting armed reconnaissance type missions, airborne or ground alert aircraft may react to enemy targets that cannot be pre-located. Such alert operations require a reactive C2 architecture to designate targets, threats, and provide continuous support information.[54] The real-time information provided by a host of airborne and space-based assets offer an effective and efficient method to dynamically engage these enemy forces. This process integrates sensors and shooters with reactive C2

[53] AFDD 2-1.3, 26-27.
[54] AFDD 2-1.3, 29.

and will insure that AI operations are responsive against mobile, fleeting or time critical targets.[55]

To be effective this style of real-time targeting requires timely integration of information. Sensors must locate and identify enemy targets, then quickly disseminate this information to C2 agencies or directly to weapons systems.[56] Encapsulating this type of interdiction missions, counterland doctrine postulates a sensor-to-shooter concept of operations that integrates information sensors with strike aircraft, providing timely attacks against critical targets. As discussed in AFDD 2-1.3:

> An increasingly important part of AI connectivity is real-time sensor-to-shooter (STS) information flow. Whether the data comes via voice or data link, from an unmanned aerial vehicle (UAV), a recon team on the ground, or from the E-8 JSTARS, the ability to receive real-time targeting updates is a key element in effectively targeting mobile ground forces. Effective communications between sensors, shooters, and the battle managers is critical to the overall process. Decisions such as how much battle management authority to delegate to JSTARS must be a balance between communications connectivity, timeliness required to strike the target and achieve the desired effect, and access to the overall air and ground picture. As with all command and control, a clear line of which C2 elements have various levels of decision-making authority must be clearly stated by the commander to avoid confusion. Another key factor in proper STS execution is to provide the right kind of information to the shooter without overwhelming him with data or choking the data pipeline. Digitized radar and electro-optical (EO) images, while costly in terms of data volume, can be very helpful in some cases to assist the shooter in correctly recognizing and attacking the target. In other circumstances, however, such as when attacking rapidly moving targets, a picture that is even a few minutes old may be worthless and unnecessary.[57]

Indeed, the time critical nature of many targets on the modern battlefield will routinely demand a responsive targeting process that integrates real-time information.

---

[55] AFDD 2-1.3, 29-30.
[56] AFDD 2-1.3, 17.
[57] AFDD 2-1.3, 60-61.

Addressing the C2 architecture required to attack TCTs, counterland doctrine notes, "The key to providing proper control for air interdiction lies in assessing how much flexibility will be required, and which C2 assets will be in the best position to provide targeting updates in a timely fashion… There is no one best answer to [the] command and control of air interdiction, but a flexible approach that keeps counterland operations focused where needed has proven the most effective approach."[58] In short, doctrine does not define a specific C2 method that supports attacking TCTs, but it does call for a reactive system that integrates real-time target updates.

The doctrinal concepts of dynamic targeting and aerial "maneuver" forces take maximum advantage of the concept of information superiority, but the successful employment of these ideals requires the effective training of virtually every component of the operational Air Force. "Train like you fight" is the dominant training philosophy of the United States Air Force.[59] Focussing on realism, advanced information, C2 systems, integration, and computer simulations, AFDD 2-1.3 provides a valuable model for Air Force interdiction training. Drawing from successes during the Gulf War, the doctrine credits the coalition's effective interdiction operations on the service's realistic training and specifically compliments the Red Flag and Air Warrior exercises.[60]

Since advances in communication and information systems improve interdiction operations by making them more efficient and effective, the Air Force must incorporate these capabilities into its realistic AI training. The service's counterland doctrine calls for training programs and exercises to integrate advanced C2 and information. It provides operational refinements, improvements, and alternative methods for AI

[58] AFDD 2-1.3, 72
[59] AFDD 2-1.3, 92-93.

employment.[61] As with communication and information advancements, computer simulations provide another improvement by integrating all aspects of the Theater Air Control System (TACS) thus creating an accurate and fluid contingency scenario. These simulations can aid realistic training by including large forces and theater-size battlefields. They also offer units the opportunity to train effectively at the operational-level of war. However, today's simulation training is compartmentalized, which often reduces the effectiveness of joint training by limiting either the air force's role or over-scripting the ground force's actions.[62]

Usually, interdiction operations will be a joint effort and training should reflect inter-service dynamics and the systems that future conflicts will require. Since counterland operations often incorporate joint and combined forces, ground, naval, and multi-national forces should train together prior to combat.[63] Air Force doctrine notes the priceless advantage of integrated realistic training involving the forces that will fight together.

While interdiction operations, augmented with information capabilities, are evolving towards a flexible, dynamic employment concept, the Close Air Support (CAS) mission environment retains the dynamic, fluid nature of actual ground situations. Routinely operating across the theater, the TACS directs CAS forces to where they are needed, regardless of their pre-planned area of operations. CAS sorties flow to the point of greatest effect, as determined by the surface commander, often providing critical support to the ground forces. Since interdiction missions that are combined with real-time

---

[60] AFDD 2-1.3, 93-94.
[61] AFDD 2-1.3, 94.
[62] AFDD 2-1.3, 95.
[63] AFDD 2-1.3, 95.

information closely resemble the CAS environment, briefly reviewing the Air Force's CAS training doctrine is appropriate.

According to AFDD 2-1.3, insufficient CAS training and a lack of proficiency limits the missions effectiveness during the opening stages of a conflict. While aircrew and controller experience overcomes these deficiencies, it often does so at the cost of both ground and air losses. The only way to train for the dynamic CAS environment is through realistic integrated training during regularly held peacetime exercises. A flexible and responsive C2 architecture is critical for CAS operations. Usually supporting Corp level forces, ASOCs or airborne ABCCCs provide the centralized control of CAS missions, but this control is further decentralized to TACP elements or airborne FACs that provide target area guidance and control.[64] This system insures a dynamic C2 environment that is responsive to the needs of ground force commanders anywhere on the battlefield. With interdiction operations to be a dynamic "CAS" type operation, the decentralization of control would seem equally beneficial. In turn realistic training that incorporates real-time information would benefit from a decentralized control concept of operations.

Air Force Doctrine Document 2-1.7, Airspace Control (AFDD 2-1.7)

AFDD 2-1.7 establishes the Air Force's operational guidelines for airspace control by detailing the principles and characteristics of the theater air control system. This section briefly describes the doctrinal airspace control processes and the airborne C2 systems that integrate their real-time information with the interdiction mission. Supported by operational-level doctrine, two processes within the theater air control

system historically fuse their operations with real-time information: CAS and defensive counterair (DCA). On the other hand, integrating real-time information with interdiction missions continue to be a new challenge for the TACS.

AWACS

The AWACS is an airborne, early warning, command and control, and battle management aircraft. Normally one of the first air assets to deploy, AWACS can provide airspace control and battle management functions for the AOC. AWACs operations normally extend the TACS radar coverage, but are subordinate to a CRC.[65] Usually, airspace control operations assist in aircraft and missile identification, facilitate the engagement of enemy aircraft and missiles, and provide safe passage of friendly air vehicles.[66]

When responding to potential threats, air defense operations require highly flexible airspace control procedures. AOCs usually delegate this control to lower agencies (CRCs or AWACS). These agencies integrate air, land, and maritime air defense systems against the threat and mass these forces to meet the enemy. The time critical nature and responsiveness of the AWAC's system make air defense and air control operations a highly complex task.[67]

Current doctrine, operations, and training emphasize the linkage between airspace control and air defense, but a paradigm shift needs to occur if air is going to be added to ground operations. Once they are combined, they will create a synergistic combination

---

[64] AFDD 2-1.3, 47.
[65] Air Force Doctrine Document 2-1.7, *Airspace Control in the Combat Zone.* (Maxwell AFB: US Air Force, 4 June 1998) 37.
[66] AFDD 2-1.7, 17.
[67] AFDD 2-1.7, 19.

of battlespace awareness that will promote the most efficient use of real-time information.

ABCCC

While AWACS runs air defense and airspace control operations, ABCCC crews supervise air-ground efforts. This separates the two fights (air-air vs. air-ground) but adds to the lack of integration between assets and information.[68] The aircrew's primary role is to provide a C2 architecture for air assets that support the land component commander. On board controllers also coordinate with AOC officers to assign or divert sorties against more lucrative targets. AFDD 2-1.7 permits the operators on board ABCCC to act temporarily as an extension of the AOC cells for battle management and execution of the daily ATO, or to operate as a back-up ASOC by providing decentralized control and dynamic employment to counterland operations.[69]

Although combining two aspects of dynamic targeting, decentralized control and flexible execution, the ABCCC systems do not provide any sensor-type information. These systems support battle management and mission tracking with only a robust communications capability. This limitation degrades real-time targeting operations since the ABCCC would merely add a communication link within the sensor to shooter chain.

JSTARS

The JSTARS is an Air Force-Army command and control battle management system that is subordinate to the AOC. Its systems monitor the enemy ground situation and provide battle managers with ground surveillance, target detection, and target-tracking

[68] AFDD 2-1.7, 41.

capability. JSTARS information helps air battle managers identify opportunities for reactive interdiction operations.[70]

AFDD 2-1.7 omits any reference to JSTARS-based enroute control of interdiction assets. Doctrine does not give JSTARS operators a divert authority for AI missions. Divert authority usually remains with the ground elements, adding to the sensor-processor-shooter chain and delaying the fighter pilot's ability to respond to TCTs.

Airborne Forward Air Controller (AFAC)

The AFAC is an aerial extension of the Tactical Air Control Party (TACP) and has the authority to re-direct aircraft against a specific target. This provides AFAC pilots the additional flexibility they need to rapidly coordinate and execute their mission when the ground situation changes.[71] Tactical-level divert authority exists with AFACs for their assigned slice of the battlefield, but AFACs lack the operational-level view and real-time sensor information that is available to other control agencies (AWACs, JSTARS, and AOCs). In turn, they cannot effectively provide decentralized control. Instead, they add another layer of bureaucracy to the sensor-shooter chain because AFACs lack the theater-wide awareness generated by networked sensors and communications systems.

Air Land Sea Application Center (ALSA)

The ALSA develops multi-service tactics, techniques, and procedures (TTP) that guide joint force application. The center evaluates and recommends integration methods for joint activities including information and interdiction operations. Furthermore, the

---

[69] AFDD 2-1.7, 36.
[70] AFDD 2-1.7, 37-38.
[71] AFDD 2-1.7, 38.

ALSA identifies solutions to problematic information processes and challenge joint-interoperability systems.

ALSA officers specifically address the joint targeting process and procedures for time-critical targets in AFJPAM 10-225. *Scud* missiles represent potential TCTs. When reacting to TCTs, the joint force requires timely, integrated information. ALSA identifies friction to this process from current service "stovepiping" of information and communication systems. Today's, components cannot share common targeting information, thus degrading joint force reactions to TCTs.[72]

In addition to service "stovepiping" of information and communications, ALSA members also recognizes the lack of guidance regarding joint targeting selection and service assignment. Joint doctrine identifies the need for communication, deconfliction, and synchronization between components, but it does not explain "how" to rapidly conduct this coordination. Joint TTPs discuss basic concepts for joint targeting, but do not provide the specific instructions or guidance required for successful operations. This results in each combatant commander developing his own, theater-dependent, targeting processes.[73]

Regarding this deficiency, ALSA officers postulate that joint C2 of time-critical-targets requires a balance between flexibility and control. This "balance" must be maintained over theater-wide areas. Ideally, common "pictures" of the battlefield should be shared by all components. When they are shared, they focus the targeting effort, especially when real-time information is available. Current JTF C2 systems cannot coordinate real-time information with all forces. Likewise, national and in-theater

[72] ALSA, Time Critical Targets, vi.
[73] ALSA, Time Critical Targets, vi.

sensors do not necessarily provide all the combatant components with a "common picture" of the battlefield.[74]

In addition to systems integration, ALSA members evaluate inter-service processes and techniques that support interdiction operations. Considering the divert authority location for TCTs, ALSA officers believe that “the authority to engage should be delegated to the C2 node that has the best information or situational awareness to perform the mission and direct communications to weapons. Placing the appropriate level of battlespace awareness at subordinate C2 nodes can streamline the C2 cycle and allow timely engagement of these targets. The decentralized C2 nodes can exchange sensor, status, and target information with a fidelity that permits them to operate as a single, integrated C2 entity.”[75] Although other doctrines fail to specifically address decentralized control of interdiction operations, ALSA doctrine clearly supports the delegation of divert authority to lower C2 agencies who posses the necessary capabilities.

Current Interdiction Operations

Around the world, the US military is currently poised at several locations to strike any enemy on short notice. To accomplish this feat, it must combine strike, command and control, and information assets in localized theaters of operations. However, other than recurrent air defense operations in Iraq, the in-activity of these forces limits the actual employment opportunities that they have and reduces the dynamic use of the deployed TACS components. Furthermore, very few practice ranges can support these deployed locations and commanders restrict their aircrews from training with live

[74] ALSA, Time Critical Targets, II-3.
[75] ALSA, Time Critical Targets, II-33-34.

munitions because they do not want to deplete existing war stocks. Current contingency operations tend to dull, rather than sharpen the critical skills these aircrews need. In turn, many aircrews return from these deployments in dire need of extensive re-training just to meet yearly requirements.

During the initial phase of any deployment, USAF pilots often experience challenges involving coordination, command and control, planning, en route divert procedures, local orientation and target identification. This could degrade operations at the outset of a conflict. These challenges are normally overcome in time with experience as forces acclimate to the local C2 processes, theater characteristics, and operational dynamics including divert authority, rules of engagement, and attack clearance procedures.

Summary

This review of doctrine reveals several common assumptions and concepts involving real-time information operations. Both Joint doctrine and Air Force vision statements assume US forces will achieve information superiority over their adversary. Joint doctrine describes such superiority as the foundation for all other operations and the Air Force claims information superiority as a "core competency."

As founding doctrine assumes information superiority, operational-level doctrine further defines the concept with supporting organizational systems, processes, and methods. According to current doctrine, advance information systems have broken the target list paradigm for interdiction by permitting dynamic targeting: a flexible method that optimizes force application. Furthermore, such concepts support the doctrinal definition of "aerial maneuver forces." Although dynamic targeting is a current theme, doctrine does not provide specific guidance for its application. Air Force doctrine fails to

address service processes regarding real-time targeting including divert authority and target assignment.

In addition to dynamic interdiction operations, Air Force doctrine commits to halt phase operations. Assuming the dominant role in such operations, the Air Force is reorganizing to rapidly support short-notice contingencies. Halt phase operations demand immediate responses in order to stop an enemy's advance short of their objectives. Such timeliness rarely permits unit spin-up training. Today's expeditionary air forces cannot afford initial operational friction created by information integration, C2 processes, and battlespace awareness.

Realistic training must support information superiority operations. Air Force interdiction training should include real-time targeting, dynamic C2 processes, and halt phase scenarios. Doctrine describes such training as critical to future military operations.

Chapter 5

Current Interdiction Training

The Battle of Waterloo was won on the playing fields of Eton.

-Lord Wellington

Current interdiction training often emphasizes aircrew tactical skills but omits the advanced dynamic skills required by forces that integrate real-time target information into their missions. By investigating today's training methods of strike aircraft, battle management agencies, information systems, and major Air Force exercises, this section will reveal the training priorities of each system and its ability to integrate real-time information while rehearsing operational-level maneuvers. Although the Air Force Fighter Weapons School incorporates the concept of dynamic targeting into its mission employment phase of training, this section focuses on the Air Force training that is given to the majority of aircrews (from the local level to major exercises).[76] Air Combat Command's (ACC) training division and their operational aircrews have been consulted for each system's capability to perform real-time targeting and to verify their training priorities. ACC manages the training programs for all USAF strike aircraft and most of the information systems that are not assigned overseas; it also supervises the major stateside exercises included in this study. Each system or exercise centers focuses on

[76] David A. Flughum, "Intelligence Gathering Finds Niche in USAF Weapons School." *Aviation Week and Space Technology*, 24 June 1996. 62.

specific objectives. But present Air Force training efforts fail to integrate real-time methods into its training nor does the service sponsor an operational-level exercise.

Local Air Interdiction Training

USAF strike aircraft that support the interdiction mission include the A-10, F-16, F-15E fighters and B-1 and B-52 bombers. After providing a brief overview of each aircraft's primary role, capabilities, and their specific ability to support real-time integration in their training, this section discusses the potential for pilots to carry-over specific real-time targeting skills from other assigned missions. Finally, each aircraft's section reviews its local training options, overall training challenges, and some of the potential upgrades that might aid pilots in integrating real-time information into their mission.

According to ACC, aircrews now are trained under a Realistic Approached Training (RAP) methodology, rather than an event-based methodology. In the past, training programs required aircrews to accomplish specific events within a set training cycle. The RAP method tracks sortie type rather than individual events. Under RAP, local commanders may tailor their specific training requirements against contingency tasking needs or recognized weak areas.[77] The shift to RAP gives local commanders far greater flexibility as they attempt to meet real-world needs. Air Force doctrine calls for the integration of real-time information with operations, but current contingency operations do not emphasize, nor do local commanders designate RAP training priorities supporting real-time targeting.

[77] Maj Richard Humphrey. Telephone interview with author, 12 March 1999.

A-10 Thunderbolt II

Designed as an air-to-ground attack platform, pilot training for A-10 Thunderbolt II units emphasizes close air support and interdiction. The environment for CAS constantly changes with the ground situation, requiring enroute diverts, short-notice coordination, and various levels of C2. Since the CAS mission embraces the dynamic aspects of the fluid battlefield, A-10 pilots already posses many of the dynamic skills and tactics required by real-time information integration. Additionally, many A-10 pilots are also trained as airborne forward air controllers, representing the decentralized C2 demanded by the CAS, and some interdiction environments. According to Maj. Sean Kavanagh, ACC/DOTV-T (Realistic Training, A-10), A-10 pilots regularly train in a fluid environment that incorporates such advanced skills as enroute diverts and coordination, cockpit management, fluid mutual support tactics, target area search and identification, and dynamic attack options (albeit in a CAS role).[78] Such regular training carries over when these pilots begin to integrate real-time information and should contribute to the A-10 aircrew's ability to perform flexible, real-time interdiction missions.

Although CAS exercises common skills, A-10 interdiction training does not focus on real-time information and flexibility. ACC notes that A-10 pilots do not normally train locally with many of its information systems, and they have no RAP requirement to do so. Furthermore, most of the local live fire ranges A-10 units use for training does not offer realistic targets. A-10 crews practice live-fire interdiction missions on familiar and

[78] Maj Sean Kavanagh. Telephone interview with author, 15 March 1999.

immobile targets.[79] For local interdiction training, Thunderbolt pilots do not realistically integrate real-time information processes.

A-10 crews face many challenges with respect to realistic interdiction training, including asset availability, contingency deployments, and current systems limitations. ACC reports that their airborne and ground information systems usually fall into the low-density/high-demand (LD/HD) category, and real-world contingency taskings often preclude their availability for local training. Moreover, deployed contingency locations offer minimal training opportunities because the pilots are too busy performing actual contingency support and these locations lack training ranges and munitions. Finally, the A-10 aircraft lacks many of the advanced information and sensor technologies available in other interdiction assets (such as inter-linked situation displays and advanced weaponry pods). Without targeting aids, A-10 pilots rely on manipulating their current weapon's sensors (Maverick missile) to aid in standoff target search. The A-10's communications capabilities remain voice-based, making its pilots search the target area visually. Pilots could effectively react to real-time information, but the A-10's limitations hamper its ability to take full advantage of the efficient C2 architecture to acquire the targets.

F-16 Fighting Falcon

Similar to A-10 pilots, F-16 pilots train for both the CAS and interdiction missions; however, F-16 pilots perform many other duties and CAS training does not receive the same amount of emphasis that A-10 units give the mission. The opportunity to exercise the same dynamic tactical skills necessary for CAS missions exists, but other training

[79] Kavanagh interview.

requirements reduce the carry-over effect from CAS to real-time information interdiction operations. Some Falcon pilots do train as "Killer Scouts," a concept revived during the Gulf War that resembles the Vietnam War's "Fast-FACs." By directing interdiction efforts, "Killer Scout" training offers the potential for decentralized control and real-time targeting of interdiction missions. But according to ACC, F-16 pilot local interdiction and "Killer Scout" training integrates little to no advanced information systems.[80]

Although some carry-over skills from their CAS and "Killer Scout" training exist, F-16 pilot local interdiction training instructions do not specifically address real-time information integration. Maj. Douglas Young, ACC DOTV-T (F-16), has never witnessed combined JSTARS and F-16 training. This is due to the limited number of JSTARS aircraft that are available for training. Like A-10 pilot interdiction training, local AI training for F-16 units is limited to familiar ranges and immobile targets.[81] Local F-16 pilot interdiction training therefore does not emphasize dynamic halt phase scenarios.

F-16 aircrews face many of the same realistic training challenges as the A-10 pilots, including asset availability and contingency deployments. The availability of LD/HD assets is no different for F-16 units than with the A-10 units: similarly and deployed training availability and effectiveness are equally degraded. Still, many on-board systems aid F-16 pilots with real-time information integration. A targeting pod permits standoff target area search and precision guided weapons deliveries. Other on-board systems also link F-16 avionics with information networks, this facilitates the rapid transfer of information and is not limited to voice communications. Although anF-16

[80] Maj Douglas Young. Telephone interview with author, 9 March 1999.
[81] Young interview.

pilot's interdiction training does not emphasize real-time targeting, the aircraft is well equipped to maximize dynamic operational maneuvers involving real-time information.

F-15E Strike Eagle

The F-15E represents the USAF's most advanced interdiction fighter and includes many advanced technologies that favor real-time information integration. As the only fighter with a two-man crew, the F-15E's flexibility offers distinct advantages over single-seat aircraft. The challenges to short-notice enroute diverts (in-flight mission planning and extensive systems operations) are better handled by a two-place crew. According to Maj. Chris Dennena, 4th Fighter Wing DOW, F-15E aircrews are very comfortable with rapid re-targeting.[82] However, Strike Eagle pilot and weapons systems officer training centers on global and strategic attack missions, not CAS or rapid dynamic targeting exercises. Thus, the potential for the aircrews to retain carryover skills favoring real-time information operations is limited.[83]

Still, local F-15E aircrew interdiction training does integrate some information systems, but only on a limited basis as their current RAP does not require the integration of the TACS or information systems in their training. The 4th Fighter Wing includes both operational and basic training F-15E units. The wing reports some real-time target training occurs, but only on limited occasions. With their location in North Carolina, the 4th Wing is conveniently located near the JSTARS units of the 93rd Air Control Wing in Georgia; as a consequence, they conduct information coordination and interdiction missions when the systems are available for training. F-15Es from the 4th will join

[82] Maj Christopher Dennena. Telephone interview with author, 15 March 1999.
[83] Maj Doug Reynolds. Telephone interview with author, 16 March 1999.

JSTARS during the last 2 weeks of Green Flag 99, but the limitations of the systems will permit only voice communications, thus degrading the information integration training opportunities for the operators.[84] The F-15E training syllabus does not mandate rapid re-targeting exercises because they require advanced skills beyond basic systems employment. The F-15E Fighter Weapons Instructor Course does include some flexible targeting; but, only on a limited basis.[85]

As with other AI capable units, F-15E forces suffer from training limitations that degrade the integration of real-time information. Nevertheless, the on-board systems, additional crewmember, and the platform's advanced technologies make it ideal for combining real-time information and interdiction. However, according to ACC, the local ranges that support F-15E crew interdiction training still do not replicate real-world targets. The local targets and ranges do not offer unfamiliar locations or concealment factors that would require the areas to be searched, either visually or with on-board systems.[86]

The advanced systems of the F-15E enhance its capability to benefit from real-time information. Although designed for advanced weapons employment, the Strike Eagle's GOLDPAN pod provides a data link that allows it to transmit various data directly into the cockpit. This information can range from a complete visual mission brief to on-screen data or target area imagery. Aircrews can record data transmitted via GOLDPAN for playback as required. Although effectively employed during structured exercises such as Roving Sands, few of these systems are available for local crew training.[87] In

[84] Dennena interview.
[85] Reynolds interview.
[86] Maj Richard Basak. Telephone interview with author, 12 March 1999.
[87] Basak interview.

spite of these restrictions and the unrealistic nature of the range's targets, the Strike Eagle has the systems capability to integrate real-time information into a dynamic interdiction mission; but its aircrews lack the necessary aircrew training.

B-1 and B-52 Bombers

Heavy bombers support air interdiction with massive firepower. The weapons delivery system of these bombers simplifies the integration of real-time targeting; but they also limit their effectiveness against mobile targets. Although each bomber provides distinct capabilities, the B-1's and B-52's weapons (preplanned area targets for free-fall munitions or specific coordinates for cruise missiles) limit their flexibility to hit new targets. This limitation dictates how their aircrews train for interdiction missions. According to Maj. Richard Humphrey, Chief, ACC DOTV-T (Realistic Training), each system's training includes re-targeting events on a regular basis. For heavy bombers, re-targeting is weapon specific. For free-fall munitions, aircrews update on-board delivery systems to the new target location. Cruise missiles require aircrews to re-program coordinates and flight path changes. Accurate target coordinates are essential if re-targeting is to have the desired effect.[88]

Heavy bomber aircrews are limited by their weapon systems when reacting to real-time information. For accuracy with cruise missiles, a target's coordinates must be re-programmed well in advance. This prevents the heavy bomber aircrews from targeting smaller, moving formations with cruise missiles. Crews can update the on-board delivery systems for gravity bombs, but such methods are effective only against area targets because of the weapons lack of accuracy. This limits the B-1 and B-52 crew's

effectiveness against mobile target formations that are characteristic of halt phases. Integrating bombers into interdiction missions challenges the battle managers to correctly identify specific targets based on the bomber's weapons capabilities (area vs. pinpoint coordinates). Without accurate, timely information, bomber interdiction missions are limited to fixed, stationary, or area targets. This minimizes the impact of real-time information. However, advanced munitions that have self-contained, updateable would increase the bomber aircrew's effectiveness in halt type scenarios. Nevertheless, current heavy bomber training is limited by their system's limitations; subsequently the aircrews do not train for real-time targeting.

Information Systems and AOC Training

This section investigates the training and integration of two Air Force aircraft essential to the interdiction mission, RJ and JSTARS. Afterwards, this section will address local AOC training methods. As pointed out by BGen John Baker, Commander, Air Intelligence Agency (AIA), "Once we gain info, [the] challenge is to get it into the hands of somebody who can use it."[89] Local training of RJ and JSTARS crews rarely provides realistic sensor training or information synthesis with live agencies (strike aircraft or C2 systems).

RC-135 Rivet Joint (RJ)

The RJ system collects real-time electronic information in support of joint force requirements, but contingency taskings hinder its crew's realistic training. RJ systems

---

[88] Humphrey interview.
[89] BGen John R. Baker. AIA/CC, Presentation to 1999 Doctrine Symposium, 1 March 1999.

gather electronic intelligence (ELINT) and signals intelligence (SIGINT), and some variants of the aircraft also collect long range infrared and optical information.[90] Today's information requirements changed the RJ mission from just data collection to processing and analyzing the real-time information it gathers. This increased the RJ operators' workload by 70%.[91] Today, many in-theater C2 nodes and strike aircraft access RJ information in real-time via information networking.[92]

With a fleet of only 19 aircraft, RJ forces must continually deploy worldwide to support contingency operations. Such deployments minimize their training availability.[93] According to *Aviation Week and Space Technology*, Rivet Joint Airborne Intelligence Technicians (AIT) regularly deploy more than 200 days per year, creating a significant training backlog. Between 1995 and 1996, 79% of the RJ's missions were integrated combat operations that supported JTF operations in the Middle East and Bosnia. An additional 19% of RC-135 missions involved sensitive reconnaissance operations in the Caribbean, Mediterranean, and Pacific Rim. Only 2% of the flights supported crew training and deployed exercises.[94] When tasking exceeds force structure, assets are not available for operational training. Such LD/HD challenges define the nature of current efforts to train realistically. Without realistic training, air units cannot conduct the advanced capabilities, including dynamic targeting and operational-level maneuver, that doctrine assumes.

---

[90] Susan H. H. Young, "USAF Almanac," *Air Force Magazine*, May 1998, 144.
[91] David A. Flughum, "Large, Diverse Crews Make RC-135 a Heavy Hitter." *Aviation Week and Space Technology*, 24 June 1996. 62.
[92] David A. Flughum, "Rivet Joint Carves Out New Combat Roles." *Aviation Week and Space Technology*, 24 June 1996. 52.
[93] S. Young, 144.
[94] Flugham, RJ Crews, 63.

E-8 JSTARS

The information gathered by JSTARS breaks the fixed "target list" paradigm of traditional interdiction missions, and permits interdiction missions to evolve towards an operational-level maneuver and dynamic battle management methodology. But limited training opportunities, similar to RJ units, hamper the JSTARS efforts to integrate its data. Operational since December 1997, the 93rd ACW at Robbins AFB operates four aircraft.[95] The Air Force will add two more aircraft in 1999 and has funded a total of 14 by the year 2004. Still, a fleet of 14 aircraft can support 24-hour operations only in one major theater war; subsequently, planners estimate 19 aircraft will be needed to support two near-simultaneous conflicts.[96] Information provided by JSTARS technologies represent a quantum leap towards determining the enemy ground order of battle. By providing real-time intelligence to both air and ground commanders, E-8C information helps determine enemy actions, location, and intent.[97]

The few operational JSTARS aircraft that are available routinely deploy to support contingency operations worldwide, this critically limits local and exercise integration training. By constantly rotating among operations in the Persian Gulf, Bosnia, and Korea, little time is available for realistic JSTARS training.[98] According to Maj. Ron Wiegand, HQ ACC/DISA, JSTARS air battle managers will not meet their necessary requirements to work with other assets (F-15, F-16, B-1, B-52, etc.), as unit schedulers

---

[95] "JSTARS 101." Accessed 10 December 1998; available from http:\www.jstars.af.mil/info/jstars101/jstars101.htm..

[96] John A. Tirpak, "Projections from the QDR", *Air Force Magazine*, August 1997, 47. Bingham interview.

[97] Bingham interview.

[98] Maj Joseph Rossacci. Telephone interview with author, 9 March 1999.

cannot coordinate for supporting attack aircraft. Crews are deficient in several skills, including new targets, targets of opportunity, and near real-time targeting.[99]

With minimal local training, exercise support offers the best opportunity for training; unfortunately, current exercises do not realistically employ JSTARS systems, battle managers, or even integrate available real-time information. According to Price Bingham, Grumman JSTARS Division, the only effective exercise training for JSTARS crews occurs during its limited participation at Green Flag, when they target actual mobile missile launchers. The system performs very well during these exercises, but such TCT scenarios only scratch the surface of the JSTARS ability to integrate real-time information with interdiction missions. Currently, JSTARS airborne battle managers do not train enough to develop their skills effectively.[100] According to Maj. Joseph Rossacci, ACC/DO E-8 Functional Manager, the Airborne Control Element (ACE) on-board JSTARS currently trains to support mostly intelligence, surveillance, and reconnaissance air packages, but not interdiction mission. Lacking exposure to the operational Air Force, many exercise participants often experience initial challenges when trying to integrate JSTARS information due to their inexperience with the system's capabilities. Nevertheless, the growing JSTARS fleet will offer more training opportunities, thereby permitting operators to develop dynamic battlefield management capabilities and potentially assume a greater operational role.[101]

For training purposes, two ground simulators insure initial systems and continuation training for JSTARS operators, but current simulator training focuses on basic system

---

[99] Maj Ronald Wiegand. HQ ACC/DISA, Presentation*: E-4 NAOC/E-8 JSTARS Training Issues*. 28 January 1999.
[100] Bingham interview.
[101] Rossacci interview.

operations, not on dynamic C2 integration techniques with external units.[102] Without realistic training that routinely integrates JSTARS with strike assets, crews cannot develop, test, or exercise the necessary integration, coordination, planning, and execution skills in support of future Air Force operations. And without realistic exercises, the Air Force cannot test and evaluate improvements to the JSTARS systems and processes. With time, JSTARS crews can overcome most of these challenges, but future contingencies, especially halt phases, may not permit the required "spin-up" time for efficient battle management. As noted by ACC, current JSTARS training does not support the doctrinal concepts supporting real-time targeting or assumptions regarding information superiority.[103]

Air Operations Centers (AOC)

Numbered Air Forces (NAF) form the foundation for AOCs. Despite this fact, and their local training must be balanced against the NAF's normal duties as most operators perform staff functions in addition to their wartime roles. Aside from exercise and contingency participation, NAF staff officers accomplish AOC mission training on a quarterly basis, often compartmentalized by cell training (offensive, defensive etc.).[104] According to 12th Air Force sources, most local training assumes effective C2 of tactical assets by simulating external agencies and strike forces. This oversimplifies the combat environment while it reduces the need for local information integration and C2 training.[105] Therefore, local training for AOC operations focuses on compartmentalized internal processes that often omit external agency support and operational-level C2

[102] Bingham interview
[103] Rossacci interview.

challenges. Ineffective real-time information integration methods may appear successful when units train under such unrealistic environments. The Air Force cannot evaluate or improve new concepts including dynamic targeting and air maneuver forces when its center for operational-level planning does not train effectively.

Exercises

Exercises integrate Air Force and Joint systems into realistic operations and often provide training opportunities not possible at the local level. Flag exercises represent the Air Force's best interdiction and operational-level training environments. This section discusses Red, Green, and Blue Flag exercises, along with two other exercises, Air Warrior and Roving Sands. It provides an overview of each exercise's objectives and operations, training focus, and the specific activities that support the integration of real-time data. Although all the exercises discussed provide valuable training, none of these training environments integrates all the information systems that the nation employs in combat. Thus, they do not provide a true operational-level environment for realistic training.

Red Flag

Held at the Nellis Range Complex in Nevada, Red Flag is the Air Force's premier training exercise for air to ground operations. According to Mr. Gary Sambuchi, ACC/DOOE (Red Flag), the exercise provides Blue 4 pilots, often the least experienced wingman, experience in a realist combat environment. Red Flag is a tactical-level exercise and is not intended for operational-level training. According to ACC,

---

[104] Maj Gregg Andreachi. Telephone interview with author, 10 March 1999.

operational-level exercises should ideally be a joint-level program. Yet, Mr. Sambuchi suggests that current Air Force participation in joint exercises is extremely limited and poorly integrated.[106] Figure 1 graphically depicts Red Flag training.

Red Flag's tactical emphasis minimizes the "train like you fight" philosophy of Air Force doctrine: Red Flag scenarios simulate only a few of today's contingency operations because it incorporates a minimal amount of rapid re-targeting scenarios. The exercise does not provide the integrated realistic support that the nation's information systems are capable of yielding. According to ACC/DOOE, Red Flag objectives are not directed at Air Force doctrine's dynamic operational-level maneuver operations, and it has no AOC interaction (simulated or otherwise) because TACS training is beyond the scope of Red

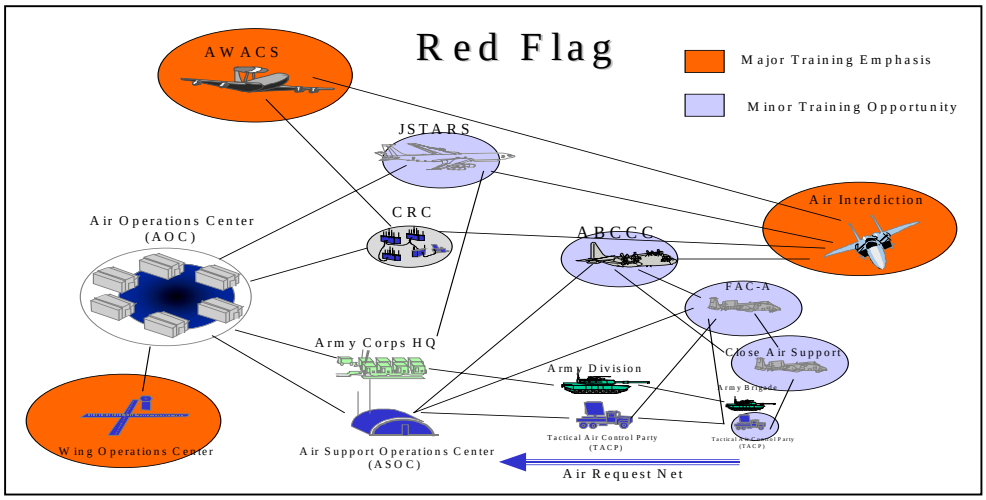

Figure 1. Red Flag Training

Flag's "tactical" orientation. Range and scenario limitations make information systems like JSTARS difficult to integrate. Furthermore, ACC is reluctant to make any changes because such higher-level agencies and capabilities would be transparent to Blue 4's

[105] Col John R. Sheekley. Telephone interview with author, 10 March 1999.

training. Against the recommendation of the Command and Control Training and Innovation Center (C2TIC), the Air Force agency responsible for advanced C2 integration, Red Flag has no plans to broaden its training. Expanding Red Flag's scope of training could encompass the required sensor-to-shooter processes required when air forces attack TCTs, such information integration appears beyond the scope of current Red Flag training.[107]

Some common lessons that units participating in Red Flag have learned highlight the exercise's limited ability to support real-time interdiction against surface TCTs. The 13 Air Support Operations Squadron noted that ground and air FACs at Red Flag do not even select their own targets in reaction to the scenario, rather they attack only pre-planned targets.[108] This restriction demonstrates the limited flexibility of Red Flag to realistically train TACS control agencies. The 414 CTS noted the lack of JSTARS information during their Red Flag exercise when over half their sorties were dedicated to interdiction operations. Any real-world situation requiring a 50% commitment to AI missions from air forces would demand JSTARS information support. Furthermore, the target arrays at the Nellis ranges were ill suited for realistic sensor and attack training because they lacked the appropriate infrared signatures and were immobile. [109] The Red Flag Range Users Group has discussed the possibility of developing mobile missile launchers for TCT training, but it notes that the required funding would depend on post-

---

[106] Gary Sambuchi. Telephone interview with author, 12 March 1999.
[107] Sambuchi interview.
[108] 13 ASOS. "Lessons Learned Red Flag 98-03." 8 September 1998. Accessed 16 March 1999; available from http://wwwmil.acc.af.amil/accll/accless/rf830002.htm.
[109] 414 CTS. "Lessons Learned, Red Flag 99-1." 30 October 1999. Accessed 16 March 1999; available from http://www.mil.acc.af.mil/accll/accless/rf910002.htm.

2000 budget considerations. Red Flag exercises cannot conduct realistic training without mobile targets that provide realistic visual and sensor cues.

Red Flag represents the best opportunity to integrate realistic AI training with real-time information. But both the limitations of the range and ACC's training emphasis

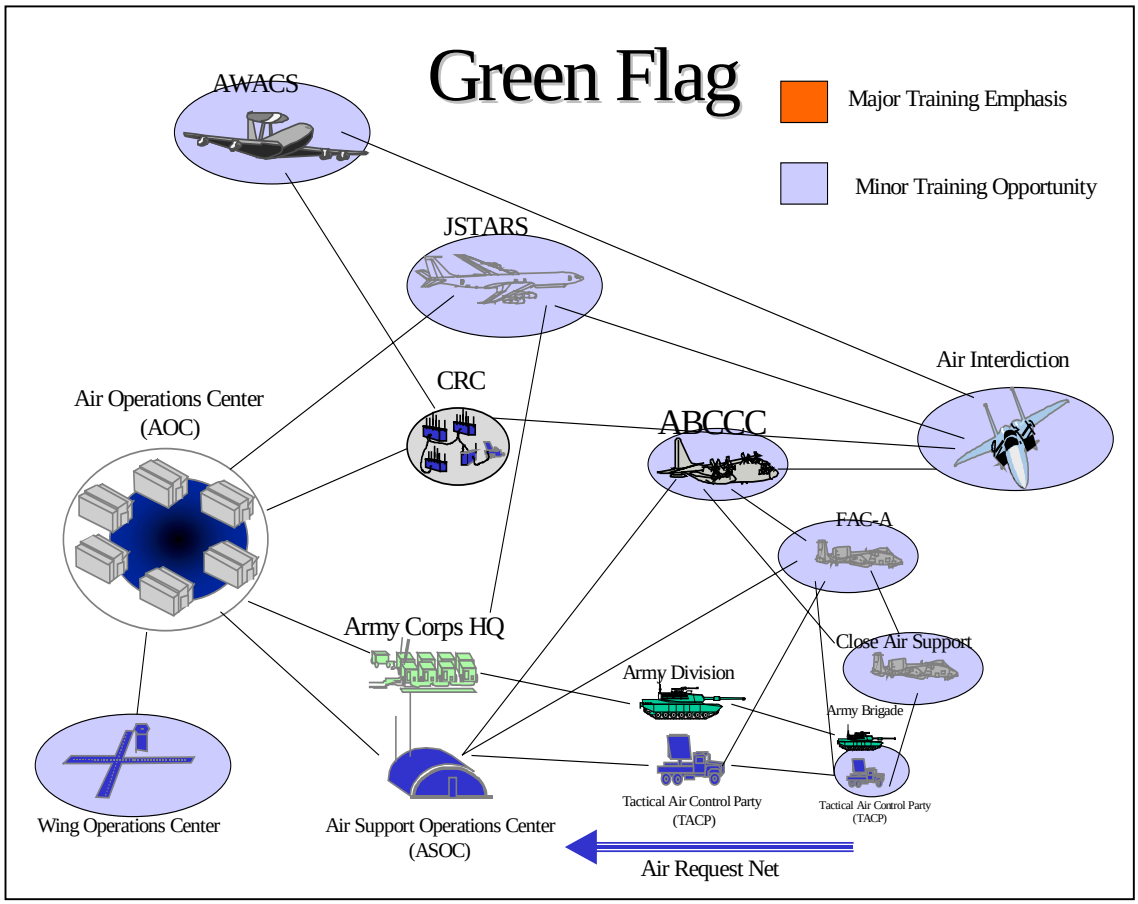

Figure 2. Green Flag Training

minimize the exercise's effectiveness to prepare air forces for contemporary operations. During today's period of contingency tasking and limited training opportunities, Red Flag can no longer center its focus on Blue 4. Red Flag must broaden its scope and include

operational-level training that includes advanced doctrinal concepts and expands its TACS agency participation.

Green Flag

Also based at Nellis AFB (and using the same facilities as Red Flag), Green Flag emphasizes information warfare. According to Mr. David Flughum, *Aviation Week and Space Technology*, Green Flag is the Air Force's premier electronic warfare exercise. Held once a year, it usually involves about 400 people. Throughout the exercise, Air Force operators gather, analyze, and distribute information from a variety of sensors and technologies.[110] Figure 2 graphically depicts Green Flag training. According to ACC, Green Flag 1999 will team F-15E Strike Eagle crews with JSTARS crews, but only for one third of the exercise's duration.[111] The Nellis range's lack of large mobile ground units or mobile TCTs will limit effectiveness of the training for the JSTARS sensors and crews as well as the fighter aircrew's ability to train with real-time information while being diverted to a new target.

Blue Flag

At Blue Flag exercises, JFACC and AOC planning, processes, and systems train against a simulated threat by employing simulated forces. Numbered Air Force units participate at Blue Flag, usually conducting the theater-level planning and C2. The exercise represents the Air Force's principal operational-level training. Figure 3

[110] David A. Flughum, "'Green Flag' Polishes Rapid Intelligence Use." *Aviation Week and Space Technology*, 24 June 1996. 55.
[111] Sambuchi interview.

graphically describes Blue Flag training. According to senior 12th Air Force officers, Blue Flag exercises offer the best training opportunity for planning staffs, although it includes little if any actual flying. The exercise simulates the employment of strike aircraft and attempts to integrate real-time information. This allows Blue Flag training to focus on the AOC's C2 methods in a simplified environment. The exercise includes about six real-time information events for integration per ATO cycle. Unfortunately, these events usually target TCTs and are not large-scale interdiction operations against large ground forces.[112]

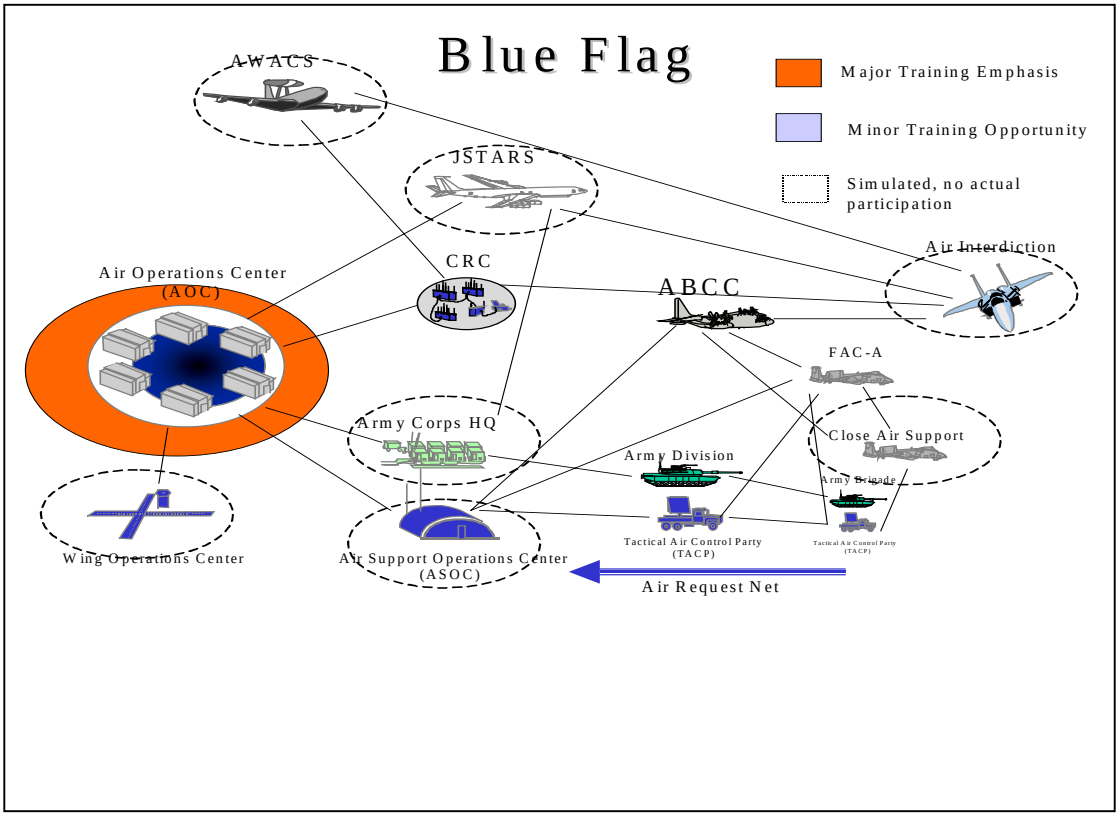

Figure 3. Blue Flag Training

During major exercises, AOCs need to be augmented to plan and operate cells.

These cells provide systems expertise and manpower for the operations. According to Maj. Gregg Andreachi, 12th Air Force AOC Chief of Combat Operations and Senior Offensive Duty Officer, such

> additional staffers are usually not familiar with the AOC's normal operations and processes. They often require training; subsequently, they hinder the initial phase of the exercise's operations.[113] For rapid halt type contingencies such spin-up training may not be possible and could create inefficiencies that could lead to devastating losses.

During Blue Flag exercises, NAFs define the AOC procedures that integrate real-time information on several factors including the operational factors of the AOC, scenario characteristics, and JFACC desires. Some AOCs integrate real-time information through dedicated strategy cells within the center's organizational structure. According to 12th Air Force's operational guidance, they maintain their divert authority for strike aircraft at the AOC because it is the hub of the JFACC's intentions, operational expertise, and operational-level battlefield awareness.[114] Because Blue Flag trains only AOC personnel and simulates the remaining TACS system, subordinate battle management assets cannot practice the kind of decentralized control that would reduce the sensor-to-shooter process of information flow. The lack of additional TACS elements at Blue Flag limits the realistic training opportunities that could integrate real-time information.

Air Warrior and Roving Sands

Although not directly focussed on the interdiction mission, Air Warrior and Roving Sands provide air forces with opportunities to integrate real-time information. Both exercises support joint operations. Air Warrior supports the Army's National Training

---

[112] Andreachi interview.
[113] Andreachi interview.
[114] Andreachi interview.

Center (NTC) at Ft. Irwin. Roving Sands supports the Army's ballistic missile defense at Ft. Bliss. Like Red Flag and Green Flag, both Air Warrior and Roving Sands focus on the tactical-level of training and simulate, or omit, operational-level agencies and inputs.

During Air Warrior, USAF assets provide support to the Army's NTC exercises by uniting CAS assets with tactical elements of the TACS. Figure 4 graphically depicts Air Warrior training. Mr. Bob Burke, ACC/DOOE (Air Warrior), notes that the NTC trains

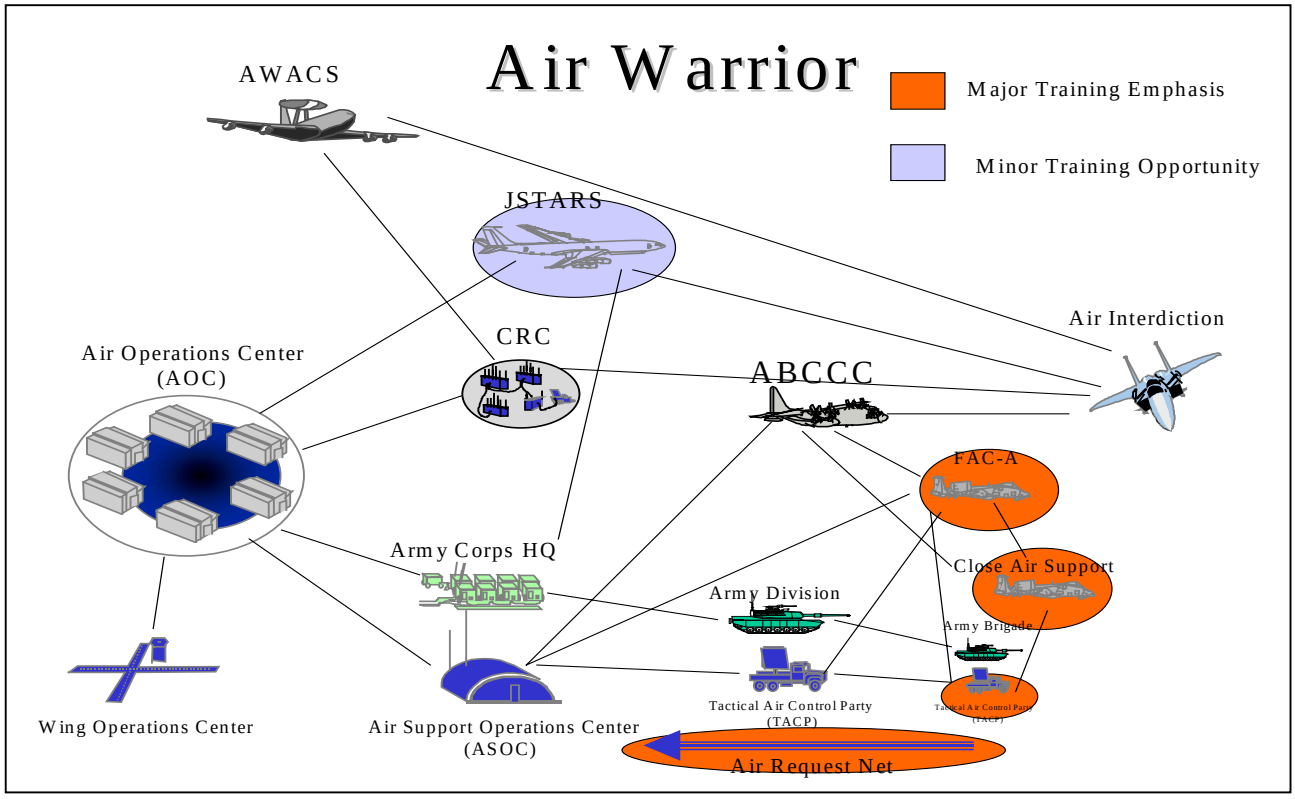

Figure 4. Air Warrior Training

army brigade maneuver units in a realistic combat environment. Because these forces operate fluidly on the battlefield, NTC may offer the most effective training environment for JSTARS operators. However, operational tempo, contingency tasking, asset

limitations, and fiscal resource constraints limit the JSTARS crews ability to participate at the NTC. Furthermore, higher-level assets or agencies do not support the

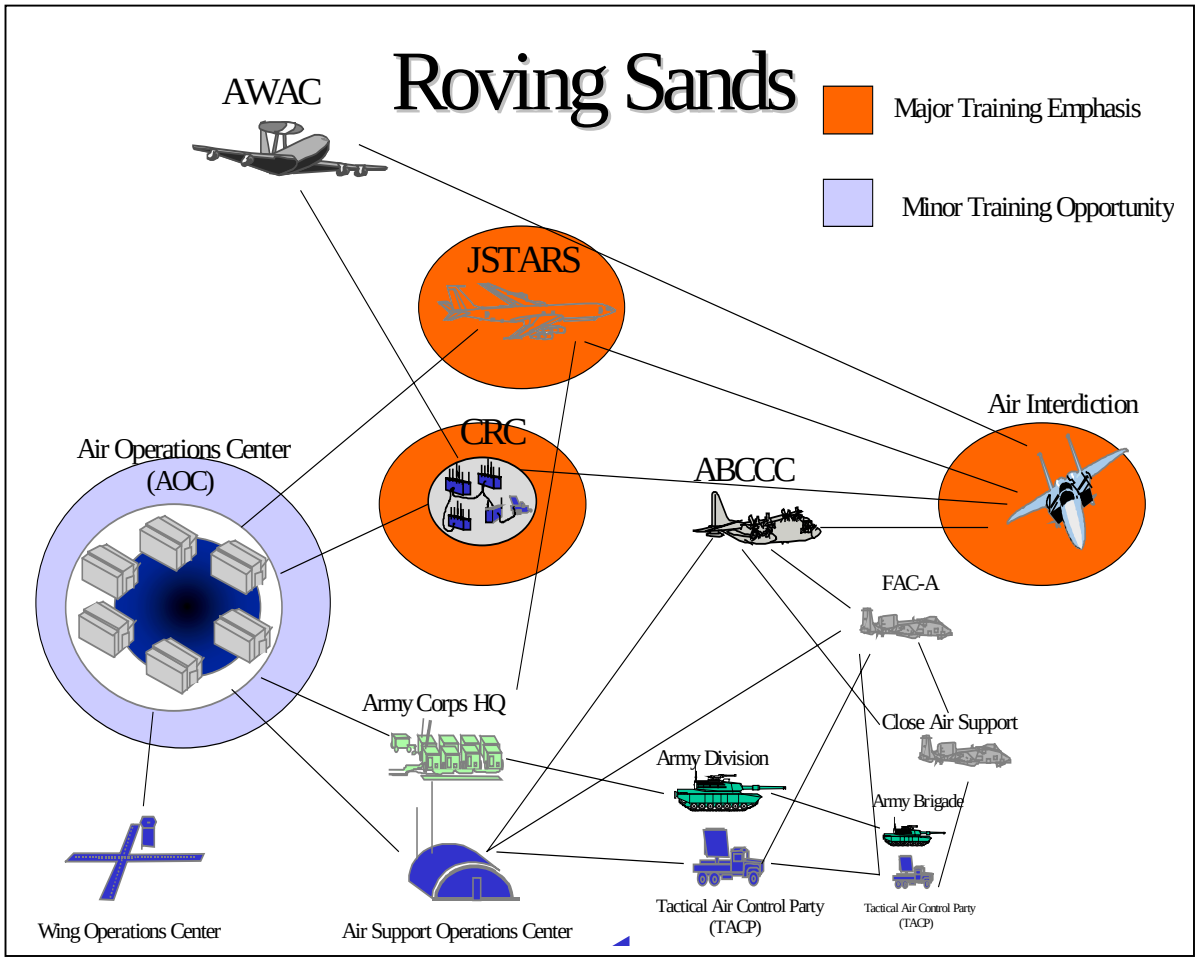

Figure 5. Sands Training Roving

lower-level TACS units and CAS missions during Air Warrior. NTC objectives and scenarios preclude almost all fixed wing interdiction missions and the air force's ability to maneuver at the operational-level. Thus, information systems supporting the NTC and Air Warrior present an unrealistic capability because brigade commanders task assets (JSTARS and others) that would normally be tasked by a higher-level, JTF control agency. This makes the information system's availability and responsiveness to the

needs of the ground commander unrealistic.[115] With the Air Force focussing on Air Expeditionary Force (AEF) operations, the Air Warrior offers a unique opportunity for joint training, but the NTC's focus on brigade-level close combat training minimizes the Air Force's operational-level training opportunity.

Like Air Warrior, Roving Sands provides an excellent opportunity to integrate real-time information into interdiction training with its emphasis on Theater Ballistic Missile (TBM) Defense. Although the scenario does not support larger halt-type interdiction operations, Roving Sands does exercise the real-time information process. Figure 5 graphically depicts Roving Sands training. According to Maj. Buddy Hauth, C2TIC/AFTED, Operational Concept Demonstrations (OCD) run concurrently with Roving Sands exercises and specifically address the integration of emerging technologies to attack mobile missile launchers. Teaming information systems, control agencies, and strike aircraft, OCDs exercise the sensor-divert authority-shooter process. OCD 97, within Roving Sands 97, improved the Air Force's divert response time from 30 minutes (in 1993's OCD) to just 4 minutes (evaluators measure response time from sensor notification to aircraft tasking and do not include the strike mission's travel, search, and attack time). According to Maj. Hauth, OCD 97 units assigned their mission divert authority to the forward CRC. This proved advantageous over AOC-controlled diverts which were often doubling the response times.[116]

Roving Sands 97's participants proved ineffective against a realistic TBM environment. As noted by Maj. Hauth, even a 4-minute response time proved inadequate because only one mobile launcher was destroyed throughout the exercise. Interestingly,

[115] Maj Robert Burke. Telephone interview with author, 12 March 1999.
[116] Burke interview.

it was due in part to an unrealistic opposing force tactic (parked along side a highway in easy view). Throughout the exercise, information sensors provided the general location of the targets, thereby forcing strike aircrews to visually search an expanded area while attempting to locate the mobile missile launchers.[117] As the 366 Fighter Squadron (F-15E) remarked about their Roving Sands 97 participation, the information coordination process lacked the essential data they needed for their targeting systems. This shortcoming degraded their ability to locate and attack the critical targets. Furthermore, the lack of sensor support and limited visibility of the area after dark rendered nighttime strike missions futile against mobile launchers. Additionally, the C2 structure of Roving Sands 97 could not interface with several battle management systems and failed to provide the common operating picture that was required for the mission to be a success.[118] In 1991, *Scud* hunting was relatively unproductive under wartime conditions, and TCT operations conducted during both day and night at Roving Sands 97 seem just as failing.

Overall

Large Air Force exercises afford aircrews the opportunity to "train like we fight," but no live exercise incorporates the TACS or its processes, much less the integration procedures that are required for real-time targeting that is necessary for dynamic interdiction operations. Red Flag gives "Blue 4" initial tactical combat experience, but offers only limited in-flight divert training. Green Flag emphasizes information and electronic warfare but only integrates its information systems with a limited number of

[117] Burke interview.
[118] 336 Fighter Squadron. "ACC Lessons Learned, Roving Sands 97." Accessed 11 March 1999; available from http://wwwmil.acc.af.mil/accless/rs9b0018.htm.

strike aircraft. Besides, these aircraft attack unrealistic live fire targets that are immobile and offer incorrect sensor signatures. Air Warrior provides the most realistic CAS training in the world, but limits the Air Force's participation by supporting only the tactical, close fight between army brigade maneuver units. Roving Sands provides an effective scenario that includes surface TCT strike missions, but by narrowing its operations to TBM threats, the exercise fails to test dynamic, operational-level C2 processes. Therefore, the Air Force lacks an operational-level exercise that integrates planning, battle management, information, and strike assets. Such an exercise could simulate today's real world contingencies and halt phase operations and include the doctrinal concepts of dynamic targeting and operational-level maneuver. If "train like we fight" is a founding philosophy for training, such exercises should be the capstone of Air Force training efforts.

Chapter 6

Current Interdiction Shortfalls

It is a disgrace that modern air forces are still shackled to a planning and execution cycle that lasts 3 days. We have hitched our jets to a hot air balloon. Even when this lackluster C2 system works properly, we are bound to forfeit much of the combat edge we know accrues to airpower because of its flexibility and speed of response.

-Gen. Merrill McPeak

There exists a distinct disconnect between today's training requirements and the skills aircrews require to integrate real-time target information on the modern battlefield. Crews often lack the advanced training they need to integrate real-time information with their platforms. Information systems, challenged with low-density/high-demand tasking problems, lack effective integration training, thus limiting the opportunities for potential improvements to interdiction operations. Operational C2 agencies limit much of their training to internal processes. Live exercises train parts of the TACS individually, but no training environment realistically supports operational-level training for the entire TACS process. Realistic training that integrates real-time information with dynamic interdiction methods and optimizes airpower's advantages of speed, range, and flexibility is not being conducted.

> Local training for interdiction does not capitalize on the real-time information that is available today. Some CAS mission training develops the carryover skills aircrews need for dynamic interdiction operations. Otherwise, integrated real-time information training at the local level is extremely limited. The lack of sufficient assets and the unrealistic surface attack targets degrade the aircrew's training for real-time operations.

> Without adequate resources to train or realistic targets to attack, the Air Force cannot exercise the interdiction C2 processes involving real-time information. Some aircraft systems offer integration operations and employment aids that may be beneficial to the real-time targeting, but their aircrews cannot practice such opportunities until they deploy to major exercises or contingencies. Aircrew training that incorporates real-time targeting data is minimal even at the contingency locations that unite information systems, C2, and shooter assets. When contingency operations stress the Air Force's available force structure, aircrew training suffers and the advanced operational methods described by Air Force doctrine cannot be effectively investigated, improved, or integrated into the service. Current doctrine assumes that information superiority will create decisive battlefield effects, but the services fail to train their forces to meet these doctrinal expectations. Today's advanced air forces take years to develop. Unless the nation commits itself to train the way it fights, airpower operations will suffer during times of crises.

Exercises combine various capabilities, systems, and threats, and provide a realistic combat environment. But the central focus of major exercises remains narrow and does not incorporate broad aspects of the TACS that would permit realistic operational-level training. The Air Force must exercise its operational-level processes to improve its aircrew's effectiveness, knowledge, and ability to uncover potential pitfalls. Compared to operational-level simulator-based training, units at live exercises routinely uncover procedural or electronic connectivity obstacles. Additionally, current exercises do not provide adequate evaluations or enough emphasis on the integration of real-time information into its interdiction operations.[119] By remaining at the tactical-level and providing participating units access to advanced JTF-level assets, some exercises actually present an unrealistic environment because tactical commanders become acclimated to receiving information they will probably not see in actual combat operations.

Information systems must integrate themselves more completely into interdiction operations if the true benefits of real-time targeting are to take effect. Specifically, BGen

[119] Maj Buddy Hauth. Telephone interview with author, 15 March 1999.

Baker, Commander of AIA, believes information operations must be fully integrated into each CINC's campaign plans and he is developing information forces that will augment the AOCs. If information systems are not fully integrated, information dominance will not work. Additionally, information processes must be part of normal AOC operations, not just augmented in times of need. Furthermore, embedding information systems into daily operations is important to the effective use of precision weapons because their employment requires precise and timely data. According to doctrine, EAFs must deploy in a timely manner; subsequently, information capabilities and advantages will be critical for the Air Force to make maximum use of its limited EAF assets.[120]

Unfortunately, today's Air Force emphasis on realistic training that integrates real-time information is minimal, but the situation is slowly improving. As more information systems (RJ and JSTARS) become available for training, integration efforts should improve. The Command and Control Training and Innovation Center in Florida concentrates on improving C2 processes and the integration of real-time data. Recently, the center has reported that their efforts are showing some improvements towards real-time integration, but the capability is still limited.[121] Current 12th Air Force AOC training is beginning to incorporate better real-time information processes, but current modeling and simulations cannot adequately duplicate a realistic real-time information environment nor does it provide feedback from "shooters" on their mission results. This limits the AOC's battle damage assessment and re-targeting training. Col. Sheekly, Chief of Combat Plans for 12th Air Force notes that the whole TACS environment should be modeled, not just AOC operations or small slices of system. However, before AOCs are

[120] Baker interview.
[121] Hauth interview.

deployed into actual flying exercises, their modeling and simulations must become more robust to exercise the entire TACS system and processes. Real-time integration processes exist, but real-time operations will not be successful without first preparing the force with adequate training

Chapter 7

Future Interdiction

Recent analyses of the potential offered by aerospace forces, coupled with innovations and advances in technology, point the way to a "new American way of war." This new operational way of war exploits the inherently offensive nature of the aerospace weapon to provide joint force commanders (JFCs) with additional options. It uses the rapid employment of sophisticated military capabilities to engage a broad array of targets simultaneously, strongly, and quickly, with discriminate application, to decisively shape the conflict and avoid the results of previous wars of attrition and annihilation.

- AFDD-2

Tomorrow's interdiction operations are defined by today's doctrine. Consequently, they will rely heavily on information superiority for success. Both Joint doctrine and the Air Force's vision statements highlight the military's reliance on advanced information systems. According to JV 2010, information superiority enables all other operational concepts. The Air Force's Global Engagement lays out the path for the service's future capabilities. And like JV 2010, it also commits itself to information superiority.

To fulfill today's doctrinal assumptions and prepare for future capabilities, the Air Force must overcome the challenges of providing real-time target information to airborne aircraft on short notice. According to the C2TIC, a standard for diverting aircraft by integrating real-time information into its systems does not exist. Creating a TCT reaction cell within the AOC, the proposed solution, is a workaround. Yet operational tests show

that such solutions are inefficient and often ineffective against critical, fleeting targets.[122] Flexibility is the key to airpower, but current training practices degrade airpower's flexibility and effectiveness by not taking advantage of the real-time target information that is readily available.

Future operational concepts and systems will enhance the integration of real-time targeting and permit air forces to truly employ as an operational-level maneuver force. The first step in achieving this concept is a Combat Integration Capability (CIC) that integrates real-time information with decision support tools, facilitating a rapid response to TCTs. Eventually, a CIC will evolve into a Dynamic Battlefield Management (DBM) process. ACC defines DBM as the ability to get the right information to the right C2 node and the right shooter in the right amount of time. Such a capability provides operational-level situation awareness across the theater and permits decentralized control. In turn, this expedites an air force's ability to respond to dynamic situations while fulfilling the JFACC's intent.[123] Price Bingham's concept for integrating real-time information also decentralizes control of operations. By placing an ACE element on-board JSTARS aircraft, sensor and decision-maker are fused. This fusion shortens the cycle time by directly linking the data and divert authority with the shooters.[124] Maj. Hauth of C2TIC believes joining advanced sensor capabilities within shooter platforms permits the ultimate dynamic employment. With mission type orders, such systems could react to TCTs and employ almost instantaneously and autonomously.[125]

---

[122] Hauth interview.
[123] Lt Col David Jones. ACC/DRAO Presentation: *CAF Concept of Operations: Command and Control against Time Critical Targeting,* 11 April 1997.
[124] Lt Col Price T. Bingham (Ret). *E-8C Theater War CONOPS for Halting an Invasion* (Draft). 15 January 1999.
[125] Hauth interview.

By supporting future concepts of operations, emerging systems will help develop dynamic maneuver air forces. One such system is the enhanced JSTARS simulators that offer a realistic virtual-combat environment for their aircrew's training. As ACC reports, a new simulation capability --termed "VSTARS"-- begins testing and integration in the summer of 1999.[126] Grumman developed VSTARS to provide realistic joint training. Once proven effective, Air Force training can incorporate the system's simulations by linking them to both ground devices and airborne JSTARS aircraft. VSTARS augments actual NTC battles (at the tactical brigade level) with virtual adjoining forces, thus providing a simulated combat theater representation with both virtual and live units embedded into the training.[127] VSTARS training augments offer the same opportunities for JSTARS operators and potential ACEs at the operational-level.

Most future concepts of operations begin to involve C2 structure and sensor operations, advanced munitions technologies may also increase the effects of real-time targeting and reduce the shooter's requirements to search the target area. According to Bingham, current Air Force munitions cannot engage moving targets from above 18,000 feet in all weather conditions. But forces armed with information provided by JSTARS can directly target such vehicles. Mobile *Scud* launchers represent a prime example of these types of targets. Future Air Force munitions projects will incorporate wind corrected dispensers with sensor fused weapons, these munitions accurately attack several vehicles dispersed over a wide target area. This offers a possible solution, but such munitions are not cost effective when attacking single vehicles (*Scud*s). Other future sub-munitions include target search, identification, and attack capabilities. The

[126] Rossacci interview.
[127] Bingham interview.

U.S. Army's Brilliant Anti-Armor Sub-munitions (BAT) recently passed live fire systems tests, and it could be fielded within 5 years. The Air Force needs to investigate and test how it will match munitions with information currently available. BAT-type munitions would be an ideal match for real-time targeting, solving the dilemma of target search/ID currently required by fighters whose crews must visually locate enemy targets for their weapons employment. Furthermore, by simplifying real-time information integration, sensor munitions reduce the necessary sensor-shooter coordination.[128] As noted in the visionary study *Beyond the Horizon*, the Air Force needs to develop munitions optimized for information gained with JSTARS which do not require pilot visual search that limits target engagements against mobile vehicles.[129]

[128] Bingham interview.
Northrop Grumman. BAT: Brilliant Anti-Armor Sub-munition Pamphlet, October 1998.
[129] USAF Aerospace Integration Task Force. *Beyond the Horizon Integrating Air and Space.* HQ USAF, (Draft) 4 December 1998, 2-13.

Chapter 7

Future Interdiction

Recent analyses of the potential offered by aerospace forces, coupled with innovations and advances in technology, point the way to a "new American way of war." This new operational way of war exploits the inherently offensive nature of the aerospace weapon to provide joint force commanders (JFCs) with additional options. It uses the rapid employment of sophisticated military capabilities to engage a broad array of targets simultaneously, strongly, and quickly, with discriminate application, to decisively shape the conflict and avoid the results of previous wars of attrition and annihilation.

- AFDD-2

Tomorrow's interdiction operations are defined by today's doctrine. Consequently, they will rely heavily on information superiority for success. Both Joint doctrine and the Air Force's vision statements highlight the military's reliance on advanced information systems. According to JV 2010, information superiority enables all other operational concepts. The Air Force's Global Engagement lays out the path for the service's future capabilities. And like JV 2010, it also commits itself to information superiority.

To fulfill today's doctrinal assumptions and prepare for future capabilities, the Air Force must overcome the challenges of providing real-time target information to airborne aircraft on short notice. According to the C2TIC, a standard for diverting aircraft by integrating real-time information into its systems does not exist. Creating a TCT reaction cell within the AOC, the proposed solution, is a workaround. Yet operational tests show

that such solutions are inefficient and often ineffective against critical, fleeting targets.[130] Flexibility is the key to airpower, but current training practices degrade airpower's flexibility and effectiveness by not taking advantage of the real-time target information that is readily available.

Future operational concepts and systems will enhance the integration of real-time targeting and permit air forces to truly employ as an operational-level maneuver force. The first step in achieving this concept is a Combat Integration Capability (CIC) that integrates real-time information with decision support tools, facilitating a rapid response to TCTs. Eventually, a CIC will evolve into a Dynamic Battlefield Management (DBM) process. ACC defines DBM as the ability to get the right information to the right C2 node and the right shooter in the right amount of time. Such a capability provides operational-level situation awareness across the theater and permits decentralized control. In turn, this expedites an air force's ability to respond to dynamic situations while fulfilling the JFACC's intent.[131] Price Bingham's concept for integrating real-time information also decentralizes control of operations. By placing an ACE element on-board JSTARS aircraft, sensor and decision-maker are fused. This fusion shortens the cycle time by directly linking the data and divert authority with the shooters.[132] Maj. Hauth of C2TIC believes joining advanced sensor capabilities within shooter platforms permits the ultimate dynamic employment. With mission type orders, such systems could react to TCTs and employ almost instantaneously and autonomously.[133]

---

[130] Hauth interview.
[131] Lt Col David Jones. ACC/DRAO Presentation: *CAF Concept of Operations: Command and Control against Time Critical Targeting,* 11 April 1997.
[132] Lt Col Price T. Bingham (Ret). *E-8C Theater War CONOPS for Halting an Invasion* (Draft). 15 January 1999.
[133] Hauth interview.

By supporting future concepts of operations, emerging systems will help develop dynamic maneuver air forces. One such system is the enhanced JSTARS simulators that offer a realistic virtual-combat environment for their aircrew's training. As ACC reports, a new simulation capability --termed "VSTARS"-- begins testing and integration in the summer of 1999.[134] Grumman developed VSTARS to provide realistic joint training. Once proven effective, Air Force training can incorporate the system's simulations by linking them to both ground devices and airborne JSTARS aircraft. VSTARS augments actual NTC battles (at the tactical brigade level) with virtual adjoining forces, thus providing a simulated combat theater representation with both virtual and live units embedded into the training.[135] VSTARS training augments offer the same opportunities for JSTARS operators and potential ACEs at the operational-level.

Most future concepts of operations begin to involve C2 structure and sensor operations, advanced munitions technologies may also increase the effects of real-time targeting and reduce the shooter's requirements to search the target area. According to Bingham, current Air Force munitions cannot engage moving targets from above 18,000 feet in all weather conditions. But forces armed with information provided by JSTARS can directly target such vehicles. Mobile *Scud* launchers represent a prime example of these types of targets. Future Air Force munitions projects will incorporate wind corrected dispensers with sensor fused weapons, these munitions accurately attack several vehicles dispersed over a wide target area. This offers a possible solution, but such munitions are not cost effective when attacking single vehicles (*Scud*s). Other future sub-munitions include target search, identification, and attack capabilities. The

[134] Rossacci interview.
[135] Bingham interview.

U.S. Army's Brilliant Anti-Armor Sub-munitions (BAT) recently passed live fire systems tests, and it could be fielded within 5 years. The Air Force needs to investigate and test how it will match munitions with information currently available. BAT-type munitions would be an ideal match for real-time targeting, solving the dilemma of target search/ID currently required by fighters whose crews must visually locate enemy targets for their weapons employment. Furthermore, by simplifying real-time information integration, sensor munitions reduce the necessary sensor-shooter coordination.[136] As noted in the visionary study *Beyond the Horizon*, the Air Force needs to develop munitions optimized for information gained with JSTARS which do not require pilot visual search that limits target engagements against mobile vehicles.[137]

[136] Bingham interview.
Northrop Grumman. BAT: Brilliant Anti-Armor Sub-munition Pamphlet, October 1998.
[137] USAF Aerospace Integration Task Force. *Beyond the Horizon Integrating Air and Space.* HQ USAF, (Draft) 4 December 1998, 2-13.

Chapter 8

Recommendations

Victory smiles upon those who anticipate the changes in the character of war, not upon those who wait to adapt themselves after the changes occur.

- Italian Air Marshal Giulio Douhet

Today a gap exists between current AI doctrine and training. The lack of realistic training with real-time information best illustrates this discontinuity. Doctrine should guide military operations and refine capabilities by incorporating emerging technologies and strategies. But as doctrine provides a pathway for the future, it must also account for the present. Dangers arise when doctrine becomes infatuated with future capabilities that are not yet operational. In WWII, AWPD-1 assumed daylight, precision bombing would be effective; combat proved that the doctrine was invalid. The strategic bombing campaign of WWII required a huge amount of effort and masses of aircraft to create the desired effects; ultimately, it resulted in a costly air war of attrition. The doctrine of daylight precision bombing was too far ahead of its 1930's technology. Current doctrine assumes that US forces will achieve information superiority, but the military has not integrated the operational capabilities it needs to achieve this objective. This may lead future US military campaigns down a dangerous path, potentially leading to catastrophic failures.

The Air Force must not use operational-level doctrine as justification for budgetary considerations or force structure acquisitions. Today's operational-level doctrine is for the warfighter, providing guidance on accepted norms for air strategy and combat. Air Force doctrine also sets the path towards future methods and capabilities. However, Air Force training must catch up to current doctrine. Operational forces must embrace and fully integrate real-time information systems and procedures. Future exercises must provide realistic training for the 21st century's reduced force structures. Such efforts should include ground simulations that provide real-time information inputs to all exercises. Furthermore, Air Force unit training requirements and syllabuses should reflect the mission essential skills aircrews require for short-notice diverts. As noted by MGen Kinnan, Commander of the Air Force Doctrine Center, only realistic training will expose aircrews to the challenges of integration operations. Once revealed, the Air Force can address and fix any shortfalls, resulting in the efficient and effective uses of force.[138]

The tactical effect of "bombs on target" often represents the culmination of the Air Force team effort; therefore, the integration of real-time information should start with tactical-level training. Air-to-ground qualified aircrews should have the basic skills required for attacking real-time TCTs. Such information integration skills could include divert control agency simulations, enroute target diverts, time critical diverts, target area search, target identification, mutual support, deconfliction tactics, and flexible weapons delivery options. Additionally, local-training ranges should include spectrally correct targets, multiple target arrays, and mobile targets that require crews to search a designated area. Mobile targets will break the habits many aircrews develop after

[138] MGen Timothy Kinnan. Speech to Aerospace Doctrine Symposium, 1 March 1999.

repeated attacks against the same target location. This will force the aircrews into formulating more realistic attack procedures.

Information systems often face LD/HD challenges, but the Air Force must overcome these challenges and integrate them into operational training to develop, exercise, and improve their coordination and C2 processes. For JSTARS crew training, VSTARS simulations may present an excellent training opportunity without requiring the operation of expensive or unavailable aircraft. Furthermore, with advanced communication networks today's strike units could integrate such simulations into their local training.

Once aircrews and battle managers address the essential tactical-levels requirements for the integration of real-time information, major exercises must continue the process by teaming C2, information, and strike forces against a realistic threat scenario. If the Air Force is to be an operational-level maneuver force, it should train at the operational-level by developing the required methods and systems that simulate current theater environments. Today's training capabilities only support sections of this fighting arena and either ignore or simulate the remaining parts. Effective operational-level training should integrate planning, information, C2, and strike systems all at once. When the Air Force goes to war, these systems combine into a combat team, but current training does not adequately provide such unity.

With advances in simulations and communications technologies, the Air Force can now connect the agencies of the TACS that support operational-level training. Such training would incorporate real-time targeting. Termed Distributed Mission Training (DMT), local training with information sensors (JSTARS or VSTARS) could unite with AOC's at Blue Flag, interdiction ranges and strike units at Red Flag, and CAS forces at

the NTC/Air Warrior exercises. DMT could also link local training with TACS agencies, providing effective operational-level training at home bases. Figure 6 depicts the potential effect of a DMT system. However, as noted by ACC, DMT offers a good capability, but it may reduce actual training due to budgetary constraints. When

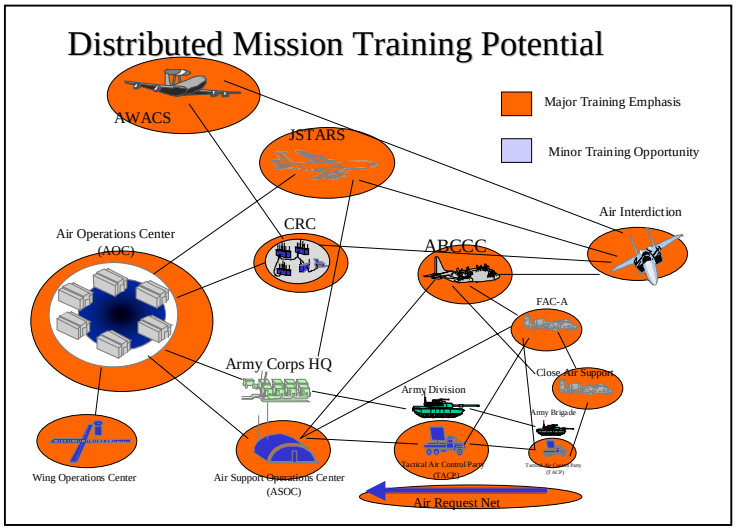

Figure 6. Distributed Mission Training Potential

complimentary simulator training is available, budget requirements often reduce live-flight training, resulting in a virtual competent Air Force that does not get the benefits of live-fire exercises. Widespread integration of DMT would probably cut into actual training resources.[139] To reduce the expense of this implementation and the risks to live training, DMT could apply only at major exercises, combining information systems with Red and Blue Flag exercises. Figure 7 depicts a united Red/Blue Flag exercise that includes VSTARS simulations. DMT could support realistic training at a reduced cost and lessen the operational tempo for personnel of low-density/high-demand systems. With DMT, JSTARS operators could develop operational-level situational awareness

skills that facilitate decentralized control and optimize interdiction operations with real-time targeting. To fulfill advanced doctrinal concepts like dynamic targeting and operational-level maneuver, the Air Force must train with information systems in a joint environment that exercises halt phase operations. By exercising dynamic battlefield

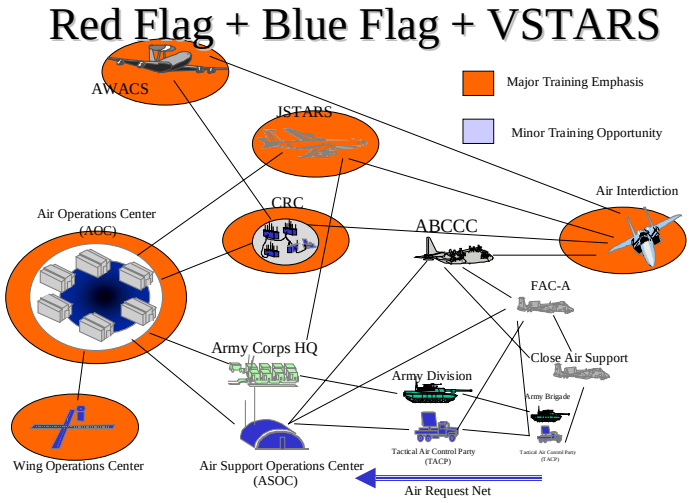

Figure 7. Combined Red/Blue Flag - VSTARS Figure Training

management, which includes diverts, re-tasking effects, and prioritization, air units can train for operational-level situational awareness. Today's vision statements and doctrine must be validated through experimental exercises with realistic scenarios. The Air Force must expand operational-level concepts (i.e. C2 for diverts from ACEs on JSTARS vs. cells within the AOC) beyond presentations and concept demonstrations. The service must integrate them into realistic training that executes current strategies. Such operations would validate the information assumptions made by current doctrine.[140]

---

[139] Kavanagh interview.
[140] Bingham interview.

Future conflicts will probably involve time critical, high value targets that force aircrews to integrate real-time information. Current training should address this requirement. If "train like you fight" is to remain the underlying philosophy of Air Force training, exercises and unit efforts must include those crew skill sets that they require to effectively engage targets with real-time information at both the operational and tactical levels. Future conflicts may not provide US forces the spin-up time for integration training, and a halt scenario, by definition, demands immediate effects to stop an advancing enemy. The Air Force must modify its training at the local and exercise level to support the integration of real-time targeting as defined by doctrine.

Bibliography

13 ASOS. "Lessons Learned Red Flag 98-03." 8 September 1998. Accessed 16 March 1999. Available from http://wwwmil.acc.af.amil/acccll/accless/rf830002.htm.

336 Fighter Squadron. "ACC Lessons Learned, Roving Sands 97." Accessed 11 March 1999. Available from http://wwwmil.acc.af.mil/accless/rs9b0018.htm.

414 CTS. "Lessons Learned Red Flag 99-2." 5 February 1999. Accessed 16 March 1999. Available from http://wwwwmil.acc.af.mil/accll/accless/rf920002.htm.

414 CTS. "Lessons Learned, Red Flag 99-1." 30 October 1999. Accessed 16 March 1999. Available from http://www.mil.acc.af.mil/accll/accless/rf910002.htm.

729 ACS. "Lesson Learned Roving Sands 97." Accessed 11 March 1999. Available from http://wwwmil.acc.af.mil/accll/accless/rs97000b.htm.

Air Force Doctrine Document 1, *Air Force Basic Doctrine.* Maxwell AFB: US Air Force, September 1997.

Air Force Doctrine Document 2, *Organization and Employment of Aerospace Power*. Maxwell AFB: US Air Force, September 1998.

Air Force Doctrine Document 2-1, *Air Warfare* (Draft). Maxwell AFB: US Air Force, 12 March 1999.

Air Force Doctrine Document 2-1.3, *Counterland* (Draft). Maxwell AFB: US Air Force, 12 March 1999.

Air Force Doctrine Document 2-1.7, *Airspace Control in the Combat Zone.* Maxwell AFB: US Air Force, 4 June 1998.

Air Force Doctrine Document 2-5, *Information Operations.* Maxwell AFB: US Air Force, 5 August 1998.

Air Force Doctrine Document 2-5.2, *Intelligence, Surveillance, and Reconnaissance Operations*. Maxwell AFB: US Air Force, December 1998.

Air Force News Website. Accessed 4 December 1998. Available from http:\www.hiritage.org/library/catagories/natsec/bg808.html.

Andreachi, Maj Gregg. Telephone interview, 10 March 1999.

Baker, BGen John R. AIA/CC, Presentation to 1999 Doctrine Symposium, 1 March 1999.

Basak, Maj Richard. Telephone interview, 12 March 1999.

Bingam, Lt Col Price T. and John Colligan *A look into the Future? JSTARS and EFX '98.* March 1999.

Bingam, Lt Col Price T. *Background Paper on Advanced MTI/SAR Systems*, 26 February 99.

Bingham, Lt Col Price T. "Revolutionizing Warfare through Interdiction." *Airpower Journal,* Spring 1996.

Bingham, Lt Col Price T. Personal interview, 1 March 1999.

Bingham, Lt Col Price T. *E-8C Theater War CONOPS for Halting an Invasion* (Draft). 15 January 1999.

Burke, Maj Robert. Telephone interview, 12 March 1999.

CENTAF. "ACC Lesson Learned: Roving Sands 97." 12-8-98. Accessed 12 March 1999. Available from http://wwwmil.acc.af.mil/accll/accless/rsa000f.htm.

Chairman of the Joint Chiefs of Staff. "Memorandum of Policy No. 30." *Command and Control Warfare*, 8 March 1993.

Chapman, William G. *Organizational Concepts for the Sensor-to-Shooter World.* Maxwell AFB: School of Advanced Airpower Studies, May 1997.

Clevenger, Maj Daniel R. *Effects of Air Interdiction Attacks on Advancing Arm & Mech.* Air Force Studies and Analysis Agency: Force application Division, March 1997.

Cohen, Eliot A., and Keaney, Thomas A. *Revolution in Warfare? Air Power in the Persian Gulf.* Annapolis: Naval Institute Press, 1995.

Cook, MGen Donald G. Personal interview, 10 January 1999.

1. January 1999. 22-27.

Covault, Craig. "Joint-STARS Patrols Bosnia." *Aviation Week and Space Technology*, 19 February 1996. 48-49.

Crane, Conrad C. *Bombs, Cities, and Civilians.* Lawrence: University Press of Kansas, 1993.

Dennena, Maj Christopher. Telephone interview, March 15, 1999.

Flughum, David A. "'Green Flag' Polishes Rapid Intelligence Use." *Aviation Week and Space Technology*, 24 June 1996. 55-59.

Flughum, David A. "Rivet Joint Carves Out New Combat Roles." *Aviation Week and Space Technology*, 24 June 1996. 52-53.

Flughum, David A. "Large, Diverse Crews Make RC-135 a Heavy Hitter." *Aviation Week and Space Technology*, 24 June 1996. 61-62.

Flughum, David A. "Electronic Recon Sparks Battlefield Dominance." *Aviation Week and Space Technology*, 24 June 1996. 53-54.

Flughum, David A. "Intelligence Gathering Finds Niche in USAF Weapons School." *Aviation Week and Space Technology*, 24 June 1996. 62-63.

Global Engagement, US Air Force.

Gudikunst, Capt Robert C. "EFX-98 Time Critical Targeting Division Lessons Learned." September 24, 1998. Accessed 13 March 1999. Available from http://wwwmil.acc.af.amil/accll/accless/efx_ll1.doc.

Hauth, Maj Buddy. Telephone interview, 15 March 1999.

Hauth, Maj Buddy, C2TIC/AFTED Presentation: *Sensor to Shooter*, 21 January 1999.

Hobbins, MGen William T. Presentation to 1999 Aerospace Doctrine Symposium, 1 March 1999.

Humphrey, Maj Richard. Telephone interview, 12 March 1999.

Joint Staff, *Joint Vision 2010*, Joint Electronic Library [CD-ROM], May 1997.

Joint Publication 1-02, *Dictionary of Military and Associated Terms.* Joint Staff, Joint Electronic Library [CD-ROM], May 1997.

Joint Publication 3-03, *Doctrine for Joint Interdiction Operations.* Joint Staff, Joint Electronic Library [CD-ROM], May 1997.

Joint Publication 3-52, *Joint Airspace Control in the Combat Zone.* Joint Staff, Joint Electronic Library [CD-ROM], May 1997.

Joint Publication 3-56.1, *Command and Control for Joint Air Operations.* Joint Staff, Joint Electronic Library [CD-ROM], May 1997.
Joint Targeting Process and Procedures for Targeting Time-Critical Targets. *Air-Land-Sea Application Center, July 1997.*
Jones, Lt Col David, ACC/DRAO Presentation: *CAF Concept of Operations: Command and Control against Time Critical Targeting*, 11 April 1997.
"JSTARS 101." Accessed 10 December 1998. Available from http:\www.jstars.af.mil/info/jstars101/jstars101.htm.
Kavanagh, Maj Sean. Telephone interview, 15 March 1999.
Kinnan, MGen Timothy, Speech to Aerospace Doctrine Symposium, 1 March 1999.
Larned, Lt Col John, HQ SWC/DOO, Presentation: *Flexible Targeting, Dominant Maneuver Operational Concept Implementation*, 28 January 1999.
Liddell Hart, B.H. *The Rommel Papers.* New York: Hardcourt, Brace and Company, 1953.
Link, Gen Charles. Personal interview, 3 December 1998.
Marshall, Maj James P. *Near-Real-Time Intelligence on the Tactical Battlefield.* Maxwell AFB: Air University Press, January 1994.
McPeak, Gen Merrill A., USAF. "For the Composite Wing." *Airpower Journal* no. 3. Fall 1990. 6-7.
Mills, Maj. Diane M. *Joint Command, Control and Comm under one Roof.* Maxwell AFB: Air Command and Staff Collage, March 1997.
Multi-service procedures for the Theater Air-Ground System. Air-Land-Sea Application Center, July 1998.
Newell, John F. *Airpower and the Battle of Kahfji: Setting the Record Straight.* Maxwell AFB: School of Advanced Airpower Studies, June 1998.
Northrop Grumman. BAT: Brilliant Anti-Armor Submunition Pamphlet, October 1998.
Reynolds, Maj Doug. Telepohone interview, 16 March 1999.
Rossacci, Maj Joseph. Telephone interview, 9 March 1999.
Sambuchi, Gary. Telephone interview, 12 March 1999.
Sheekley, Col John R. Telephone interview, 10 March 1999.
Sims, Maj John N.,HQ USAF/XOCI *Bullet Background Paper on The Halt Phase*, September 1998.
Snodgrass, Maj David E. *Attacking the Theater Mobile Ballistic Missile Threat.* Maxwell AFB: School of Advanced Airpower Studies, June 1993.
"Special Interest Notice to Airmen." Accessed 4 January 1999. Available from http://www.hqafdc.maxwell.af.mil/.
Tirpak, John A. "The Long Reach of On-Call Airpower." *Air Force Magazine* 81, No. 12. December 1998. 22.
USAF Aerospace Integration Task Force. *Beyond the Horizon Integrating Air and Space.* HQ USAF, (draft) 4 December 1998.
Valle, Dr Tony. Personal interview, 26 February 1999.
Wiegand, Maj Ronald, HQ ACC/DISA, Presentation*: E-4 NAOC/E-8 JSTARS Training Issues*. 28 January 1999.
Winnefeld, James A, and Johnson, Dana J. *Joint Air Operations.* Annapolis: Naval Institute Press, 1993.
Young, Maj Douglas. Telephone interview, 9 March 1999.

Young, Susan H. H. “USAF Almanac,” *Air Force Magazine*, May 1998, 139-162.