The Distributed Analysis and Control Element: An Attempt to Update the Threat Tactical Picture?

A Monograph
by

Major Bryan T. Peterson
Military Intelligence

School of Advanced Military Studies
United States Army Command and General Staff College
Fort Leavenworth, Kansas
AY 01-02

SCHOOL OF ADVANCED MILITARY STUDIES

MONOGRAPH APPROVAL

Major Bryan T. Peterson

Title of Monograph: The Distributed Analysis and Control Element: An Attempt to Update the Threat Tactical Picture?

Approved by:

____ Monograph Director
LTC(P) Alan M. Mosher

____ Professor and Director Academic Affairs, School of Advanced Military Studies
Robert H. Berlin, Ph.D.

____ Director, Graduate Degree Program
Philip J. Brookes, Ph.D.

Accepted this 14th Day of May 2002

Abstract

The Distributed Analysis and Control Element: An Attempt to Update the Threat Tactical Picture? by MAJ Bryan T. Peterson, USA, 62 pages.

This monograph discusses how the U.S. Army and Army tactical military intelligence branch could utilize a distributed analysis and control element (ACE) to support the commander's operational picture (COP) and situational understanding. Recent exercises to include the Experimental Force rotation at the National Training Center (EXFOR), the Division Advanced Warfighting Exercise (DAWE), and Division Capstone Exercises Phase I and II (DCX I and II) have incorporated portions of a distributed ACE. The distributed ACE could ultimately provide the tactical commander a threat picture that supports an integrated COP, and situational understanding. This would provide the commander an enhanced capability to make more timely and accurate decisions on the battlefield. The study focuses on three areas: (1) The advancing technology to support the creation of a distributive ACE, (2) The need to update military intelligence doctrine, (3) The training required to support a distributed ACE.

This monograph first examines the theoretical underpinnings behind the potential development of a distributed ACE. The theory chapter discusses the works of GEN (ret) Gordon R. Sullivan, the research group led by DR. David S. Alberts, and Michael O'Hanlon. Next, The study examines four recent digitized exercises at the Army tactical level. These exercises include the EXFOR rotation, DAWE, and DCX I and II. The study then analyzes the theory chapter and the exercise chapter in regards to the use of a distributed ACE.

This monograph reaches three conclusions. First, the technology required to support a functioning distributed ACE is still immature and requires further development. Numerous processors and sensors are not fully integrated technologically to satisfy the support to the COP. Second, the doctrine to support the distributed ACE is nonexistent, and recent exercises reveal weak tactics, techniques, and procedures on distributed intelligence operations at the tactical level. Lastly, the training on the technology must improve, and simultaneously the Army must continue to train all other required soldier and leader tasks to support warfighting.

TABLE OF CONTENTS

Chapter 1 – Introduction

> This new war is combat waged from the air and directed from the ground. It is not a war fought with battles, it does not have front lines, nor does it have marches or invasions. It is a war where men – or women – seated thousands of miles away can track the enemy's every move and then destroy them with a few strokes of a keyboard. It is a war where a whole country can be put under intense surveillance without being occupied, where no enemy is safe to set foot outdoors for fear of rocket-armed spies in the sky. It is twenty-first-century war, served up American-style.
>
> Paul Harris[1]

With the collapse of the Soviet Union and the subsequent coalition victory in the Persian Gulf, the United States has freed itself from contending with a large conventional threat. Without an equal for more than ten years, the United States stands as the lone superpower. In the early 1990s, the United States initiated its military drawdown to realize the anticipated peace dividend from the cold war due to the lack of a major adversary. "The United States Army cut over 600,000 people out of the force since 1989. That included the active component, the reserve component, and also some Department of the Army civilians."[2] This realignment of force structure left the active component of the U.S. Army with ten divisions, two cavalry regiments and five Special Forces groups.[3] Although, the U.S. Army is leaner today, however, most of the Army's worldwide requirements still demand attention. Because of this reduction in the Army's force structure, recent commercial success, technology and the application of distributed networks offer new ways to counter personnel cutbacks.

---

[1] Paul Harris et al., eds., "After the Taliban; Unfinished Business; It has been a War Fought like No Other – Hi-Tech, Brutally One-Sided, Breathtakingly Rapid. It Will Revolutionise the Way We Think about Conflict. But Where Will the US Take Its War on Terror next?" *Wall Street Journal*, 4 January 2002, 3.

[2] Tom Bearden, "Is the American Military Ready for Battle, or are its Resources Spread too Thin", (*Online NewsHour*, *Military Readiness*, 4 January, 1999), [Article on-line]; available from http://www.pbs.org/newshour/bb/military/jan-june99/military_1-4.html; Internet; accessed 5 March 2002, p. 2.

[3] GEN Eric K. Shinseki, "The Army Vision: A Status Report" *Army 2001-02 Green Book*, No. 10 (October 2001): 28.

As with most corporate entities in the business and commercial world, the U.S. Army is increasingly relying on the latest advanced technology to replace manpower, force structure, and firepower. With the draw down of the early 1990s, and changing threat environments, the U. S. Army is emerging as a capabilities based organization in lieu of a strategy based force.[4] In addition, Defense Secretary Donald H. Rumsfeld recently said, "The ability of military forces to communicate and operate seamlessly on the battlefield will be critical to the success of the United States Military."[5] He noted the success of U.S. Special Forces on the ground in Afghanistan was due to the communication of target information to the pilots of Navy, Air Force and Marine Corps Strike aircraft.[6] Since 1994, the tactical commander possesses unprecedented battlefield visualization with the development of advanced automation linked to new sensors. Battlefield digitization greatly enhanced the ability of tactical commanders to make accurate decisions as the first experiments with digitization commenced with U.S. Army tactical field exercises Desert Hammer, Warrior Focus, and Focused Dispatch.[7] The early experiments with digitization proved that the Army was fully capable of becoming a digitized force. In early 1997, the digitization of the battlefield began to take shape as the Army Force XXI initiative went from theory to execution.

On 16 March 1997, 1st Brigade, 4th Infantry Division deployed to the National Training Center (NTC) as the Experimental Force (EXFOR). The EXFOR was part of the overall Army's Force XXI program. [8] This was the first major effort by the Army in digitizing a tactical formation by outfitting an entire brigade combat team with the latest off-the-shelf technology to

---

[4] U.S. Department of Defense. *Quadrennial Defense Review Report 2001*, Washington, D.C.: Government Printing Office, 13.

[5] Robert Burns, "Rumsfeld: U.S. Must Prepare for More Attacks," *Associated Press*, New York, 31 January 2002; available from www.AOL.com/news, Internet; accessed 31 January 2002, 2.

[6] Ibid., 1.

[7] COL Thomas R. Goedkoop and CPT Barry E. Venable, "Task Force XXI: An Overview," *Military Review*, (March – April 1997): 71.

[8] Dennis Steele, "Countdown to the Next Century," *Army,* November 1996, 16.

enhance battle command. The digitization effort included the utilization of a full suite of Army Tactical Command and Control Systems (ATTCS) that supported each battlefield operating system (BOS) in the development of a new common operational picture (COP). The installation of a system called Applique' on nearly every platform within the brigade combat team provided the vehicles in the brigade with near real time friendly situational awareness. The Applique' also provided the capability to send digital messages, reports, and electronic mail between individual vehicles and different echelons of command. This meant that each vehicle commander could visually see his unit on a digital map display mounted inside his vehicle and communicate digitally with his tactical element. This allowed battalion and brigade level command posts to achieve nearly seventy five percent accuracy in friendly situational awareness when portrayed on a COP within a battalion or brigade tactical command post.[9] However, the threat digital picture would prove to be much more difficult to create in near real time for the creation of an accurate and timely COP.

Numerous tools and robust intelligence collectors like the Joint Surveillance and Target Acquisition Radar System (JSTARS), and Hunter unmanned aerial vehicles (UAV) played a crucial role in the building of the threat picture during the EXFOR NTC rotation. New organizations like the brigade reconnaissance troop and counterintelligence and interrogator teams within the analysis control team (ACT) brought an expanded human intelligence (HUMINT) capability to the brigade. These assets provided both the brigade and battalion S2 sections greater capabilities to locate and identify the NTC Opposing Force. These advanced sensors and reconnaissance assets provided near real time information on the threat disposition. Correlating this information into intelligence was the next step in building the threat picture for

[9] Task Force XXI Integrated Report, Training and Doctrine Analysis Center, Fort Leavenworth, KS, 19 March 1998, 21.

the COP.

One critical asset utilized at both the brigade and battalion level command posts to synthesize and correlate this information was the All Source Analysis System Remote Work Station (ASAS-RWS).[10] This is an automated system, which eventually correlates all enemy data to build a threat picture at each level of command from battalion to division level. The ASAS-RWS saves intelligence analysts time and effort in developing the threat situation by possessing a capability to store and process large volumes of threat information. The introduction of the ASAS-RWS to brigade and battalion level intelligence sections produced limited benefits during the EXFOR NTC rotation.

Even with maximum effort, however, the initial trials using the ASAS-RWS in the field during the EXFOR rotation at the NTC resulted in unsatisfactory results in depicting an accurate threat picture within a COP.[11] The process of building an accurate and timely threat picture for incorporation into the COP has been difficult. The time it takes to develop the threat picture was not as close the real time friendly picture that a friendly unit can achieve on the maneuver control system (MCS). The MCS receives current friendly situational updates from the vehicle based Future Battle Command Brigade and Below (FBCB2) automation system.[12] The ASAS-RWS is a customer to various sensor inputs throughout the tactical battlespace.

Unlike the automated FBCB2 system, the ASAS-RWS must receive data from a vast array of sensors and continuous analytical input by a human interface. In the attempt to correct the threat picture after the EXFOR rotation at the NTC, Brigadier General Daniel Zanini implemented a

[10] The ASAS-RWS as defined by the ACE Chief Handbook, 22 June 1999, is the Intelligence and Electronic Warfare (IEW) component of ABCS. It is mobile, tactically deployable, computer-assisted processing, analysis, reporting, and technical control system. It will eventually be capable of downloading moving target indicators from JSTARS, and UAV video, p. A-3-2.
[11] LTC Mark Hanna, "Task Force XXI: The Army's Digital Experiment," *National Defense University Strategic Forum*, No. 119 (July 1997), 3.
[12] The FBCB2 system replaced the Applique' after the EXFOR rotation at the NTC. The FBCB2 system was the platform system used during the Division Capstone Exercise Phase 1.

new concept for the Division's intelligence BOS which included a completely new construct in the development of a more current threat picture for updating the COP.[13] Prior to the Division Advanced Warfighting Experiment in the fall of 1997, this new intelligence architecture completely changed the way the intelligence BOS conducted operations within the division. The concept was called the virtual analysis and control element (ACE).[14] The virtual ACE would leverage all the command posts within the division to build the threat picture for the division commander.

The purpose of the virtual ACE was to distribute the intelligence analysis and requirements throughout the division's battlespace. This new structure would shift the synergy and correlation of threat combat information from within the division ACE to all the intelligence elements within the division. Renamed the distributed ACE in 1998, this new organization was a further attempt to decentralize intelligence analysis amongst all the division's command posts to build a much more accurate and timely threat picture for the division commander.[15] Each command post and intelligence element within the division was given an area of intelligence responsibility (AOIR) (See Appendix A).[16] For example, each brigade S2 and ACT would build the threat picture within their AOIR, then transmit that threat picture through the ASAS-RWS to the division tactical command post (DTAC). The intelligence support element (ISE) within the DTAC would then collect all the subordinate pictures and make a close battle threat picture (See

[13] LTC(P) William R. Tait, III Corps Chief of Exercises and former 4ID G2, interview by author, FT Hood, Texas., 19 February 2002.
[14] The ACE Chief Handbook, SH1 2G-F41, 22 June 1999. Defines the ACE as the intelligence organization responsible for producing the right intelligence at the right time based on the Intelligence and Electronic Synchronization Matrix, answering the commander's PIRs, and synchronizes the division collection effort. It is seen in some form from the Division level through to INSCOM, p. B-4.
[15] MAJ Brian DeOster, S3, 104th Military Intelligence battalion, interview by author, FT Hood, Texas, 19 February 2002. MAJ DeOster stated that LTC Quotoc, a former G2, renamed the virtual ACE as the distributed ACE in November 1998.
[16] Ibid., slide 8.

Appendix B).[17]

The threat picture built by the DTAC was then sent to the ACE at the division main command post (DMAIN). The ACE at the DMAIN had the ultimate responsibility of combining the DTAC close battle picture, the rear area threat picture, and the fusion of additional intelligence sensor input into the final complete threat picture for the division. The division's goal during the AWE was to distribute a complete threat picture every hour to update the division's COP with a near real time threat picture.[18] The goal was nearly achieved, but the Division's ACE still fell short on hourly updates due to the inability to integrate subordinate sensor input. The correlation of multi-echelon sensor input is a large component in building an accurate threat picture at the division level. Divisions facilitate this process by maintaining a large array of sensors that can support the development of intelligence within a distributed ACE.

When building a real time threat picture, the distributed ACE must also absorb multiple intelligence feeds from multiple assets throughout the division's battlespace. This battlespace not only includes organic division assets, but sensor input from corps and echelons above corps (See Appendix C).[19] These sensors provide a vast volume of information and intelligence that must enter a network that can rapidly correlate and synthesize data to produce a near real time intelligence picture. The shear volume of data from numerous intelligence disciplines within the division's AOR is massive. The days of producing intelligence from analog means would not support the commander in a digitized force. The synergy achieved in a correlated database may provide the necessary fusion to build a coherent and timely threat picture. The ultimate fusion of intelligence from both subordinate units and sensors will allow tactical commanders to make

---

[17] MAJ Scott B. Hill, Deputy G2, "DTAC Familiarization of Tactics, Techniques, and Procedures," 16 September 1997, briefing for the Commanding General, 4th Infantry Division, Fort Hood, Texas, slide 8.
[18] Ibid., slide 9.
[19] Division Advanced Warfighting Experiment Intelligence Architecture, October 1997, briefing for the Commanding General, 4th Infantry Division, Fort Hood, Texas, slide 4.

more timely and accurate decisions. This fusion of intelligence is the synergy within the distributed ACE.

The current fusion and formation of intelligence within a distributed ACE still has three major challenges. First, the training that intelligence analysts need to operate both the ASAS-RWS and the supporting network, challenges the implementation of the distributed ACE. The distributed ACE will require a highly trained set of intelligence analysts to execute distributed intelligence operations across all echelons. Second, the ASAS-RWS and supporting architecture requires a hardened and reliable system. Third, the doctrine must include references to the theories supporting the distributed ACE. These challenges will ultimately decide if the military intelligence BOS can create an organization that will support the tactical commander with an enhanced threat picture to support his COP.

This monograph examines the question: Can the creation of a distributed analysis and control element (ACE) effectively provide enemy situational understanding for tactical level commanders? This paper will reveal the emerging theoretical basis for the creation of a distributed ACE. This study also investigates four recent digital exercises to reveal the feasibility and potential application of networked based tactical intelligence systems. The areas examined are:

(1) Does the advancing technology support the creation of a distributive ACE?

(2) Is there a need to update military intelligence doctrine?

(3) Does the current training base support the distributed ACE?

This monograph consists of four major sections. Chapter two begins with a brief background on the theoretical origin of the digitization effort and the impact on military intelligence doctrine. The chapter then explores and presents the emerging theoretical views and utilization of commercial virtual network operations. This theory chapter focuses on theories from GEN(ret) Gordon R. Sullivan, David S. Alberts, John J. Garstka, and Frederick P. Stein from the book *Network Centric Warfare,* and Michael O' Hanlon, the author for *Technological Change and the Future of Warfare.* Chapter three examines four exercises in which distributive intelligence operations were a key component or training objective. These four exercises are the EXFOR rotation at the NTC, the DAWE, and both phase one and two of the Division Capstone Exercises. The four exercises highlight the technological, doctrinal, and training challenges of the distributive ACE. The fourth chapter is an analysis of the theory and exercise chapters in relation to the distributed ACE. The final chapter presents the conclusions and recommendations from the study.

It is necessary to define key terminology that is used throughout this monograph. *FM 3.0, Operations* defines the common operational picture as, "an operational picture tailored to the user's requirement, based on common data and information shared by more than one command. The COP is displayed at a scale and level of detail that meets the information needs of the command at a particular echelon."[20] In addition, FM 3.0 defines situational understanding, "as the product of applying analysis and judgement to the common operational picture to determine the relationships among the factors of mission, enemy, terrain and weather, troops and support available, time available, and civil considerations (METT-TC). The COP enhances Decision-making by identifying opportunities, threats to mission accomplishment, and information gaps."[21] These key definitions support the discussion of theoretical concepts in the next chapter. Several theorists emerged after the Gulf War who highlighted the need for the Army's harnessing of technology, the incorporation of new doctrine, and the adjustment of training requirements. All of these theories support the construction of a distributed ACE to improve the commander's ability to make decisions.

---

[20] *FM 3-0*, p. 11-14.
[21] Ibid., 15.

Chapter 2 – The Theory behind the Distributed ACE

> Information is the soul of morale in combat and the balancing force in successful tactics. Yet in an era of warfare which is on the whole extremely enlightened, when we are so concerned for the welfare of troops that we strain our supply lines so that fresh eggs and oranges may be served in the front line during the course of the most rapid advance by field armies in history (Germany, April-May, 1945), we have not found the means to assure an abundant flow of that most vital of all combat commodities-information.
>
> S.L.A. Marshall[22]

The Theoretical Origin of the Distributed ACE

The distributed ACE received its theoretical underpinnings after the conclusion of the Gulf War. Even with the stunning coalition victory, intelligence, though better than ever, was not reaching the tactical commander.[23] Along with other BOS weaknesses, General Gordon R. Sullivan, the Army Chief of Staff, and other key U.S. Army leaders in 1991 perceived a need to quickly crack the Cold War model of the Army.[24] This chapter discusses the theories of GEN(ret) Sullivan, DR. David S. Alberts, John J. Garstka, Frederick Stein the authors of *Network Centric Warfare*, and Michael O'Hanlon the author of *Technological Change and the Future of Warfare.* They all believe that technology and changes to doctrine and training can provide increased battlefield awareness and support commander decision making. Approximately eleven years ago, with spiraling technological advancements, GEN Sullivan instituted a change that would forever change the Army, and indirectly the intelligence community.

After Desert Storm, GEN Sullivan witnessed the successful application of network technology in the commercial world and saw the utility in applying its capability towards the U.S. Army. He also saw the need for the changing of the Army's doctrine, and the enhancement of

---

[22] S.L.A. Marshall, *Men Against Fire: The Problem of Battle Command in Future War,* (Gloucester, MA: Peter Smith, 1978), 92.
[23] Gordon R. Sullivan, and Michael V. Harper, *Hope is not a Method*, (New York, NY: Broadway Books, 1996), 7.

training. His ideas and theories concerning technology, doctrine, and training would continue with the Army's publishing of numerous works to include Training and Doctrine Command Pamphlet 525-5 and Army Vision 2010. GEN Sullivan's views on technology came at a time when Army units were still redeploying from the Persian Gulf, and sowed the seeds for the Army's transformation effort.

The growth of technology within the private sector during the 1980s and early 1990s ultimately influenced GEN Sullivan to lead a significant change for the U.S. Army and the intelligence community. He perceived the period after the Gulf War as a critical time for the U.S. Army and launched a new initiative to leverage technology for the U.S. Army. GEN Sullivan realized with the U.S. Army drawdown, he would have to leverage technology to maintain the combat power that the Army previously delivered in the Gulf War. GEN Sullivan states in a Army War College paper, "America's Army will be smaller but more capable, but only if it is equipped with modern technology, is well trained and led, and uses up to date doctrine."[25] He also believed in the potential synergy that could result in the collection and processing of information with advanced technology. GEN Sullivan's beliefs have vast implications for intelligence and enabling the future development of a distributed ACE. In the book *Hope is not a Method,* he delivers a profound visionary statement that builds an initial theoretical framework for the potential development of a distributed ACE.

> Organizing around information also enables operations to be *distributed*---that is, spread geographically but combined in effect. Everything does not have to be under one roof, either literally or figuratively, at any phase of an operation. The Industrial Age model led us to self-contained units. Information age units can also be virtual in nature, coming together with only what is needed where it is needed and when it is needed, thus creating both greater economy and greater flexibility. Information Age organizations are evolving around a number of important shared characteristics: They are organized around information, rather than around traditional functional areas. They are able to synthesize and focus knowledge

---

[24] Ibid., 11.
[25] General Gordon R. Sullivan and Colonel James M. Dubik, "War in the Information Age," Strategic Studies Institute, U.S. Army War College, Carlisle Barracks, PA, 6 June 1994, 17.

> rapidly, learning and adapting almost organically. They take risks and make mistakes, but they do not gamble and they can out run their mistakes. They are inherently more versatile at every level; connectivity is more important than boundaries. They recognize that many of their processes, even some critical ones extend beyond the traditional organizational boundaries. They are developing a capacity for simultaneity in thought and execution. They share an awareness of their global situation. Distributed operations, including many that are outsourced, is routine.[26]

GEN Sullivan's preceding theory concerning the distribution of operations and the organization of operations around information is applicable to the distributed ACE and the need to share information amongst all command posts within a tactical formation. The synergy that is created from the fusion of information that is rapidly disseminated will enable the commander in the future to make better decisions.

GEN Sullivan emphasizes throughout most of his writings that the commander's ability to make accurate and timely decisions should always be the main objective in the creation of future intelligence and command and control networks. In the future, as the objective force matures, distance within the battlespace will become less relevant. "Information, and the decisions that result, can travel almost instantaneously to the places where they are needed, making the location of those who gather, analyze, make decisions, and possibly those who act on those decisions, largely irrelevant."[27] Commercial enterprises, while not always a perfect model for the military, influenced GEN Sullivan and others in their use of distributive networks to share situational understanding. Numerous commercial entities like Wal-Mart have made great strides using distributive networks to build situational understanding. GEN Sullivan incorporated new instruments to rapidly exploit commercial technology that could support change for the Army.

GEN Sullivan formed the Louisiana Maneuvers Task Force, based on relevant commercial examples, he wanted to leverage the growing role of technology for the Army. Loosely based on

---

[26] Sullivan, *Hope is not a Method*, 163.
[27] Sullivan, *War in the Information Age*, 20-21.

a historical project initiated by GEN George C. Marshall during World War Two, GEN Sullivan wanted to escape the parochialisms, beaucracy, and politics of Washington D.C. to support the rapid change that he wanted to take place in the Army.[28] This working group facilitated technological breakthroughs such as the integration of virtual and constructive simulation, the creation of very-large simulations across all the battlefield operating systems, and the development of digital communications in the field.[29] Under GEN Sullivan's tenure, key Army leaders went out into industry to capture new technologies which could facilitate a transition to a more highly technologically advanced Army. "The Information Age has changed the relationship between the parts and the whole. The need to organize around information has created a different kind of synergy—one that we do not fully understand. We needed a discovery process that would give us a view of the organization as a whole—not just the "eaches."[30] GEN Sullivan also states in *Land Warfare in the 21st Century*, "extensive near real time communications among a number of intelligence gathering systems can provide the ground commander with a potentially revolutionary opportunity."[31] GEN Sullivan possessed a vision, but he knew there was more to the future Army than the leveraging the role of technology. He knew that the Army's doctrine had to change to maintain his leverage on technology.

In changing the Army's doctrine through GEN Sullivan's vision, GEN Frederick Franks, the U.S. Army Training and Doctrine Commander, briefed the new changes to U.S. Army doctrine to the members of the task force and GEN Sullivan.[32] In June 1993, the new FM 100-5 Operations was published along with a complete rewrite of most of the Army's "100 series manuals," from

[28] General (ret) Gordon R. Sullivan, interview by author, FT Leavenworth, KS, 10 April 2002
[29] Sullivan, *Hope is not a Method*, 12.
[30] Ibid., 15.
[31] GEN Gordon R. Sullivan and LTC James M. Dubik, *Land Warfare in the 21st Century*, U.S. Army War College study, 15.
[32] Sullivan, *War in the Information Age*, 11.

which all doctrine flows.[33] GEN Frederick Franks would take many of the "Louisiana Task Force" ideas and publish an updated document to *FM 100-5* in order to shape the Army's digital future. This new document would provide the intelligence BOS a relevant look into the future, since distributive intelligence doctrine did not even exist at this time.[34] Without the emergence of new intelligence doctrine as a stand-alone framework for intelligence personnel, new ideas in regards to threat, and distributive intelligence were siphoned from a new document.

On August 1, 1994, the U.S. Army published *Training and Doctrine Command* (TRADOC) *Pamphlet (PAM) 525-5* as a conceptual foundation for the development of Force XXI and it gave battle laboratories, doctrine writers, combat developers, and trainers a vision of future conflict for the further development of supporting concepts, programs, experiments and initiatives.[35] Although not doctrine, the purpose of *TRADOC Pam 525-5* was to bridge the gap between the recently published *FM 100-5 Operations* and the development of a new U.S. Army operations doctrinal manual sometime in the future. This document provided the intelligence BOS a new opposing force threat, and new techniques in executing intelligence operations. No doctrine from the military intelligence school existed at this time to facilitate the rapid development of the new technology. In the meantime, the advancement of information technology continued to advance both commercially and within the U.S. Army. To maintain the initiative, General Franks unleashed his new threat model and a new way to conduct warfare without additional doctrinal support from the military intelligence community.

The intelligence doctrine that could have emerged from the foundation of *TRADOC Pam 525-5* in regards to the future formation of a distributive ACE was obvious. "Networks of

[33] Sullivan, *Hope is not a Method*, 262.
[34] Mr. Steve Leeder, interview by author by telephone, 15 January 2000. Mr. Steve Leeder is currently the chief of doctrine at FT Huachuca AZ.
[35] *TRADOC PAM 525-5*, Department of the Army, Headquarters, United States Army Training and Doctrine Command. FT Monroe, Virginia 23651, 1 August 1994, p. iii.

distributed, multipurpose sensors will populate future battlefields. These sensors will locate, identify, and track enemy formations with a high degree of accuracy. These future reconnaissance and active and passive target-acquisition and surveillance systems will provide commanders continuous wide-area battlefield observation at greater ranges."[36] *TRADOC Pam 525-5* opened the door to experimentation, and the emerging validation of Army Battle Command Systems. In particular, *TRADOC Pam 525-5* was the baseline document for the EXFOR rotation at the NTC and future experiments involving digitization. "Better intelligence, shared among all the elements and moved or retrieved rapidly on demand, will allow commanders to control and vary offensive tempo based on superior knowledge of the friendly situation/location, enemy situation/location, and events shaping the overall battlespace."[37] Unfortunately, this is about as close as *TRADOC Pam 525-5* came in describing distributive intelligence operations.

Most of the effort in regards to intelligence within *TRADOC Pam 525-5* is sensor/platform based and focused on high technology systems that are relatively new to the tactical battlefield. *TRADOC Pam 525-5* occasionally makes vague remarks about networks, but usually as an after thought. The pamphlet introduced a new term in regards to the distribution of intelligence. Broadcast intelligence which is defined as, "the capability to rapidly "pull down" or broadcast accurate/real time intelligence (all levels, even national level) to the lowest possible tactical level, precluding the layered procedural intelligence flow of information."[38] This definition builds roots in the concept of distributed intelligence, but it is limited to a downward feed of intelligence from higher to lower command posts. The real power behind these new platforms like UAVs, JSTARS, and sensors above division level is the ability to capture their data, correlate it within a powerful database, and then disseminate it rapidly throughout a distributed network. The

[36] Ibid., p. 3-11.
[37] TRADOC PAM 525-5, p. 3-19.
[38] Ibid,. p. glossary – 1.

distributed ACE relies on the horizontal and vertical sharing and dissemination of correlated databases in order to develop a threat picture. This correlation fuses numerous intelligence disciplines along with this sensor input to build a COP. Once the COP is built, it is distributed throughout a tactical network to give the tactical commander his timely threat and friendly picture for his COP. The future requirements of the intelligence community's exploitation of information technology are well within *TRADOC Pam 525-5,* but it was only the beginning. The publishing of Army Vision 2010 would further advance the viability and feasibility of a distributed ACE across the tactical battlefield.

On November 13, 1996 prior to the EXFOR rotation at the NTC, the Chief of Staff of the Army, GEN Dennis Reimer, published Army Vision 2010. Army Vision 2010 identified operational imperatives and enabling technologies needed for the Army to fulfill its role in achieving full spectrum dominance.[39] In addition, the Army Vision 2010 moved the U.S. Army closer to the alignment with advanced network technology, and creating seamless and secure dynamic communications.[40] Some of these enabling technologies identified in Army Vision 2010 included continuous real time intelligence preparation of the battlefield, data compression, and robust correlated databases that can support sensor-shooter links at all tactical levels. None of these ideas were injected into the doctrine at Fort Huachuca, even after the completion of the EXFOR rotation at the NTC.[41] All of these technological capabilities exhibited by Army Vision 2010 require the power and synergy of a distributed ACE. "In the aggregate, information operations technologies will assist in understanding the battlespace. High speed processors will fuse information from multiple sources while rapid generation of high fidelity databases will

---

[39] General Dennis Reimer, *Army Vision 2010*, 13 November 1996, 17.
[40] The publication of Army 2010 occurred after the publication of Joint Vision 2010 by General John M. Shalikashvili. Former Chairman of the Joint Chiefs of Staff. "Joint Vision 2010 is the conceptual template for how America's Armed Forces will channel the vitality and innovation of our people and leverage technological opportunities to achieve new levels of effectiveness in joint warfighting,", p. 1.

enable the commander to visualize current and future operations."[42] With revised warfighting doctrine, eventually training must change to address the new doctrinal principles. GEN Sullivan believed in the need for challenging and relevant training to address the changes in technology and doctrine.

The future Army requires highly trained soldiers and leaders. GEN(ret) Gordon R. Sullivan recently declared that he did not want to be seen as only a "technology geek," and truly wanted to change the Army through changes to training and doctrine.[43] He suggests that only the highest quality soldiers, leaders, staffs, and organizations that understand the importance of speed and precision in information processing and applications will be able to succeed in the future environment.[44] This implied that the training had to change to meet this challenge. New training strategies would have to emerge. Hands-on, performance-oriented training would remain valid, useful, and essential. Simulations, often distributed, would form an essential part of the information age training strategy. All of the changes to training at the Army's major training bases would have to be necessitated by a change in the Army's doctrine, which should provide change to all the different BOS doctrines to include intelligence. GEN Sullivan ultimately believed that training was the key to maintaining the edge. Only during training are soldiers, their equipment, and doctrine welded together.[45] GEN Sullivan knew training was important to his overall effort to initiate change within the Army. To continue the changes commenced by GEN Sullivan, the Command and Control Research Program continued to further develop ideas involving distributive networks.

---

[41] Leeder, interview by author.
[42] *Army Vision*, 17.
[43] Sullivan, interviewed by the author.
[44] Ibid.
[45] GEN Gordon R. Sullivan, *The Collected Works*, 68.

Network Centric Warfare and its Potential Influence on a Distributed ACE

In 1995, the Deputy Assistant to the Secretary of Defense refocused the Command and Control Research Program (CCRP) to better serve the warfighter and entrusted Dr. David S. Alberts with the management of the entire DOD CCRP, making him the executive agent for the program.[46] Along with Mr. John J. Garstka and Mr. Frederick Stein, Dr. David S. Alberts would go on to launch a new theory of warfare pertaining to the growth of network technology, distributed operations, and challenges to doctrine and training. Although Dr. Alberts and his co-authors spent most of their work on technology and the supporting theory, they did comment on certain doctrinal and training aspects that must be accomplished to support Network Centric Warfare theory. The theory in embracing the technology in Network Centric Warfare offers a foundation for future doctrinal change.

Published in August 1999, *Network Centric Warfare* offers an after the fact theoretical basis for describing the utilization of technology and the imposition of network based systems within both commercial and military organizations. Network Centric Warfare is defined,

> "as an information superiority –enabled concept of operations that generates increased combat power by networking sensors, decision makers, and shooters to achieve shared awareness, increased speed of command, higher tempo of operations, greater lethality, increased survivability, and a degree of self-synchronization. In essence, Network Centric Warfare (NCW) translates information superiority into combat power by effectively linking knowledgeable entities in the battlespace."[47]

The ability of distributive intelligence networks to correlate incoming data and fuse a coherent and partially analyzed picture is the key to giving the tactical commander the threat information he needs to make a decision. "Collaborative tools enable intelligence analysts based worldwide to collaborate in the development of intelligence products. Sophisticated data mining and data

[46] The Command and Control Research Program. www.dodccrp.org. Accessed 10 April 2002.

warehousing applications provide intelligence analysts with significantly improved access to large volumes of source data for analysis and integration."[48] These capabilities to share information and to collaborate offer intelligence personnel the opportunity to synthesize information and create situational understanding. Among the numerous theories and ideas within NCW, there are key models which support a distributed ACE in theory.

Two models from NCW depict how theory can support the functioning of a distributed ACE. The first model is the Logical Model for NCW (See Appendix D).[49] This knowledge model depicts theoretically how a command and control cell would communicate with sensor and shooter nodes within layered information and shooter grids. The basic assumption within this model is the ability to transport and process information as rapidly as possible, with the achievement of maximum velocity.[50] The key to this model is a robust architecture of both computer hardware and software and communication systems that can receive, transmit, correlate and parse sensor inputs into a fusion cell to achieve threat situational awareness. Once situational awareness is achieved, then analysts can develop the situational understanding for the commander. In very simple terms, this model shows the basic construct of a portion of a distributed ACE at one command post. The sensor grid, which lies inside the information grid, is the key enabler for the entire model to function.

Within the Logical Model for NCW, the sensor grid provides the tactical force its awareness through the reception of the enemy entities, sounds, and perceptions of the battlespace. The systems that would support the sensor grid include brigade reconnaissance troops, task force

---

[47] David S. Alberts, John J. Garstka, and Frederick P. Stein, *Network Centric Warfare,* (Washington D.C.: CCRP), 2.
[48] Ibid., 114.
[49] LTC Charles Harvey and LTC Lance Schultz, "An Analysis of the Impact of Network-Centric Warfare on the Doctrine and Tactics, Techniques and Procedures of Intelligence at the Operational Level," Naval War College paper, 14.
[50] Woodward, 2.

scouts, UAVs, JSTARS, and other sensors throughout the battlespace. Their input of data as acquired is sent to the command and control cell for processing. Once correlated and processed, analysts can apply enemy intent graphics to help the commander achieve situational understanding. This dynamic process continues with return inputs back to the sensor grid in order to refine information, answer new requirements, or retask the sensor. The sensor grid then creates a need for some other element to correlate all the inputs within the command and control cell. This other element is known as the engagement grid.

The engagement grid is the software and hardware apparatus that assists the commander in making timely decisions necessary to facilitate mission success. If effectively tailored and employed, the engagement grid enables predictive planning and preemption; integrated force management; execution of time sensitive missions; increased ops tempo, massed effects, and maximized power; and eliminates enemy courses of action as a result.[51] The engagement grid at the command and control cell would demand an intelligence organization like a distributed ACE to answer the requirements of the engagement grid. The threat situation developed by a correlated database could give the commander the threat picture he needs within a COP to improve his ability to make decisions. The second model from NCW is titled The Military as a Network-Centric Enterprise.

The Military as a Network Centric Enterprise model is adaptable to any distributed organization. It provides the flow from the infostructure to a collection of sensor netting, data fusion, and information management systems, which correlates and processes information to increase shared battlespace awareness.[52] This theoretical process reveals the potential technological impact of the distributed ACE and the synergy that is created by sensor netting,

---

[51] Joint Chiefs of Staff, "Observations on the Emergence of Network-Centric Warfare," *J-6 Information Paper*, p. 6-7.
[52] *Network Centric Warfare*, 88.

data fusion, and focused information management. Through virtual collaboration and virtual organizations, the tempo of operations can be increased with lower risk, cost and increased battlefield effectiveness (See Appendix E).[53] The theories representing Network Centric Warfare are already on display within the commercial sector.

Distributed Network Technology in the Commercial Sector

In the late 1980s, the growth of technology in the commercial sector was already providing the theoretical foundation for the eventual creation of distributed operations. The technological capability in building a distributed ACE had a commercial foundation with the largest company in the world. The retail giant Wal-Mart is one company who has taken information technology and transformed it into a powerful competitive advantage it now enjoys over its competition. "The advantage it maintains is its ability to reduce distribution costs, which some have estimated to be less that three percent of sales, versus four and a half to five percent for the competition."[54] This revolutionary change enacted by Wal-Mart was the result of the installment of a distributed computer network throughout their organization.

In 1987, Wal-Mart installed a distributed network that links all it's stores, suppliers, and transportation hubs to the same common correlated database.[55] This robust distributed network is the largest private network in the world and second in size to that of the federal government.[56] Wal-Mart's network includes the tracking of every purchase at its cash registers within all its stores. Each sales transaction is recorded, and then transmitted to the mother database inside the network. The transmission is then correlated and sent to the supplier for reorder. Near real time sales figures are also available at each store, district and region. Wal-Mart management with

[53] Network Centric Warfare, 89.
[54] "The leaders in 1997 Sales and Profits," *Business Week,* (March 2, 1998), 110.
[55] Ibid.
[56] Wal-Mart Stores, www.walmartstores.com/wmstore/wmstores/homepage.jsp, accessed 10 April 2002, 2.

network access can view sales figures at different intervals of time in order to make better business decisions.[57] Wal-Mart possesses the capability to monitor their retail environment with a distributed network that shares understanding and responsibility throughout its company worldwide.

This distributed network technology allows each store manager, executive, and supplier to maintain situational understanding within the network. Each store or interested party can tap into the network and get information they need to make decisions. Suppliers can receive the numbers of items sold so that they can increase or decrease the numbers of goods shipped, thus saving money in inventory and shipping costs. This network distributes information, but also transfers responsibility throughout its stores. The Wal-Mart example shows the potential capability of the distributed ACE in increasing the quality, timeliness, and value of intelligence provided to the commander. If the distribution and synergy can occur throughout 1000 Wal-Mart stores worldwide, then the U.S. Army intelligence community could apply the same basic technology and theory to support distributive operations, a distributive ACE, and better decision making for the commander. The theories behind NCW are not only concerned with the advancement of technology, but they also include views concerning changes to doctrine.

The rapid advancement of technology is challenging the Army's ability to keep it's doctrine current. "Technology is now advancing at a rate which far outpaces our ability to fully leverage its potential, and it is not uncommon to have organizations operating with technology that is more than one generation removed from the cutting edge."[58] The theorists behind NCW theory argue that the technology development cycle is out of sync with military strategy and doctrine development.[59] Without updated doctrine, new operators to the system do not possess the

---

[57] Ibid.
[58] *Network Centric Warfare*, 200.
[59] Ibid., 201.

knowledge of previous processes and tactics, techniques, and procedures. Acquired information and learning is lost. The lack of doctrine to frame these technological advances, and to establish the development of NCW training at the Army's training institutions will impede the full use of NCW on the battlefield.

The NCW environment will need soldiers in the future who are properly educated and trained. The complete transformation of the individual mindset will have to adjust to incorporate these new theories. "The adoption of NCW will involve significant, if not fundamental changes in how the Army organizes duties and responsibilities of individuals. Soldiers will need to adopt new attitudes, accept more responsibility, learn new skills, master new approaches, and operate new systems---all in a faster paced environment."[60] NCW illustrated that a complete and comprehensive change must occur to existing educational systems to maximize distributed networking applications.[61] A comprehensive education and training process must evolve coincident with the NCW concept. As the U.S. Army continues to develop network processes, the consumer and producer of intelligence must know what to ask for in regards to data, information, and intelligence within a network environment, not based on a particular platform/sensor.[62] NCW requires an organization to change its training system to match a change in technology and emergence of network based systems. Counter to the growth and rapid assimilation of technology, another theorist articulates the ramifications and shortfalls of the continued technological advancement.

A Different Spin on Network Centric Warfare and the Distributed ACE

Mr. Michael O'Hanlon, who is a fellow at the Brookings Institute, shares a different Perspective when it comes to advancing technology. Mr. Michael O'Hanlon book,

---

[60] Ibid., 229.
[61] Ibid., 196.
[62] LTC Charles Harvey and LTC Lance Schultz, 58.

Technological Change and Future of Warfare, supports military technology initiatives, but also offers a view different from previously discussed theorists on technology, and training.[63] Mr. O'Hanlon's views do not address any doctrinal observations. This upcoming section covers his views on technology, and training. Michael O'Hanlon shares a more pessimistic view on the role of technology in supporting future military force development. His works focus heavily on technological observations, but he also offers some training issues to consider.

According to Mr. O'Hanlon, the ongoing and unchallenged technological advancement may have some limits in the future. Sensor input must be gathered, collected, processed, and disseminated to those in the field in a position to make good use of it. In early tests of the Army's tactical internet, command posts were not jammed or other wise challenged, future versions will have to be hardened, be made more redundant, and proved to be more reliable.[64] Even though the greatest gain in sensor development will be achieved in the future, the Army's tactical internet also involves several networks with limited interoperability between them at this point.[65] This is clearly seen with the development of the entire Army Battle Command System (ABCS) suite, different contractors, varying software programs, and different models of ASAS, which currently do not talk fluently with the other systems within ABCS.[66] Communication networks may also limit network operations in the future.

Basic and inherent limits on communications that would support a distributed ACE are limited bandwidth and effects from threat jamming. Bandwidth is critical in supporting digital

---

[63] Michael O'Hanlon specializes in U.S. defense strategy and the defense budget, military technology, Asian security issues, and military intervention. He is a senior fellow in Foreign Policy Studies at the Brookings Institution.

[64] Defense Science Board 1996 Summer Study Task Force, Tactics and Technology for 21st Century Superiority, Vol 1 (Department of defense, 1996), 5.

[65] Hanna, "Task Force XXI: The Army's Digital Experiment," pp.1-4; Scott R. Gourley, "U.S. Glimpses a "Digitized" Future," Janes International Defense Review, vol.30 (September 1997), 55.

[66] Ibid., 30.

operations. For example, a normal radio channel spanning six million-hertz can convey about twenty million bits per second, a data rate that allows one video image to be transmitted every tenth of a second. That is a rapid rate if one only needs to exchange data on the identities, positions, and speeds of threat forces; it is a slow rate, by contrast, if one needs to send raw imagery data obtained by numerous sensors from a network to a central base for processing.[67] Threat jamming can also impact systems, connectivity, global positioning systems, and satellite communications. "However, in NCW, the stakes are so high that this vulnerability should not be downplayed. If jamming succeeds, information networks collapse—at least locally."[68] Mitigation of U.S. Army network technology by threat forces will always be a part of the Army's environment. Safeguards and security measures must be robust and strong enough to deter threats from disrupting network capabilities, and communications. While Mr. O'Hanlon's views are mostly technologically based, he does offer limited opinions on the importance of training.

Mr. O'Hanlon believes that training must continue on all soldier skill sets. He cites that technology and training on technology will never fully support all conflicts and engagements. Technology advantages are limited in urban and mountainous terrain. JSTARS, UAVs, and signal collection capabilities for example cannot see or collect through buildings or complex terrain.[69] There is only so much today's sensors can see through and observe. U.S. Army forces still have to get close with the enemy in certain situations. Mr. O'Hanlon suggests that basic military skills must still be trained and technology training is only one element of soldiers training.[70] Mr. O'Hanlon's arguments concerning technology and training are relevant, and the Army leadership will have to address these issues in the future.

---

[67] Negroponte, Being Digital, p. 52; Coleman Bazelmon, Perry Beider, and David Moore, Where do We go from Here? The FCC Auctions and the future of Radio Spectrum Management (Congressional Budget Office,1997), p. 2.
[68] Ibid,. 58.
[69] *Technological Change and the Future of Warfare*, 48.
[70] Ibid., 197.

All of the theorists reviewed in this chapter believed in the military's need to harness technology and exploit its potential. Both GEN Sullivan and NCW maintained that doctrine must keep pace with advancements in technology to leverage the optimal utilization of fielded systems. The theorists also agreed training on technology was important, but the Army must train all skill sets to include combat fundamentals. The next chapter of the monograph will examine the recent exercises that featured digitized operations. The chapter will study each of four exercises with observations on technology, doctrine, and training.

Chapter 3 – The Application of Segments of the Distributed ACE

> Information technologies are among the most expensive in the military realm, because they exist only as a *system of systems*. Information dominance in future warfare is *not* built only upon the computer. It does not rely solely on communications. It is not based only on sensor technology. It is not merely a training innovation. It is *all* of these things---and much more---welded together by doctrine. In the short term knowledge is a pearl of great price.
>
> Robert R. Leonhard[71]

This chapter examines four exercises in which use of new off-the-shelf digital equipment were a common denominator. The four exercises reviewed are the EXFOR rotation at the NTC, the DAWE at Fort Hood, DCX I at the NTC, and DCX II at Fort Hood, Texas. Each of these exercises has relevant issues and observations within technology, doctrine, and training realms. The massive effort in fielding the EXFOR formation took place just over five years ago.

The EXFOR Rotation

At the NTC in March 1997, "digitizing and equipping the EXFOR for the Task Force XXI Advanced Warfighting Experiment was a monumental effort. The EXFOR received over 7,000 individual pieces of equipment with over 900 vehicles modified into over 180 different

[71] Robert R. Leonard, *The Principles of War for the Information Age*, (Novato, CA: Presidio Press, 2000), 253.

configurations."[72] The exercise featured 1st Brigade, 4th Infantry Division that consisted of one armor battalion, one mechanized infantry battalion, one light infantry battalion, and a wide array of artillery, army aviation, and support and intelligence assets. This exercise revealed issues concerning technology, doctrine, and training. The brigade used the newest off-the-shelf technology to execute the exercise.

During the first major Army effort towards digitalization, the use of ASAS-RWS as a major component of a digital intelligence network was in its infancy. Much of the developed software for the ASAS-RWS for this exercise was developed independent of the other ABCS systems and Applique'.[73] This resulted in a "stovepiped" system relatively unable to communicate digitally to the other systems of the ABCS family and to Applique'. The technology did not allow the ASAS-RWS to transmit enemy overlays to Applique' for situational understanding.

The almost nonexistent digital connectivity between ASAS-RWS and Applique' led to a poor and underdeveloped enemy situation. The threat picture rarely made it into the COP, or to individual Applique' systems at the vehicle platform level.[74] Tactical commanders relied on frequency modulation (FM) voice transmissions for most of the intelligence updates both at the brigade and battalion level. Connectivity between different ASAS-RWS systems amongst the different echelons was also difficult. Emerging bandwidth problems constricted message flow and digital communications. Digital enemy situational overlays could be sent from the battalion level to the brigade command post, but a transmitted overlay was not guaranteed. Digital message traffic also hampered FM voice communications by competing with Single Channel

---

[72] LTC Mark Hanna, "The Army's Digital Experiment," National Defense University Strategic Forum (July 1997), p. 2. This paper is the result of a trip to Fort Hood and the developing TF XXI by a National Defense University group including MG John S. Cowlings, Commandant of the Industrial College of the Armed Forces, and Dr. Hans Binnendijk, Director of the Institute of National Strategic Studies.
[73] Ibid., 3.

Ground Airborne Radio System (SINCGARS) and Enhanced Position Location Reporting System (EPLRS) radios transmissions within the tactical internet.[75] The digital connectivity between ASAS-RWS and Applique' had many challenges. The creation of the threat picture between ASAS-RWS and Applique' also had some difficulties.

The critical digital constriction occurred between the Applique' and the ASAS-RWS. The ASAS-RWS relied on digital enemy spot reports from the Applique' in order to build its threat database. Without this digital feed, the ASAS-RWS could not fully use its synergistic capability of correlating data to build a threat picture. Instead, battalion level intelligence (S2) sections had to both utilize digital and analog systems to build an enemy situation. The enemy situation picture was not always as accurate and timely as desired, indicating that improvements were needed in the fusion and dissemination of intelligence inputs from different sources.[76] Creating an accurate digital threat picture was difficult during the EXFOR rotation. Information overload was also typical in numerous tactical command posts.

At the NTC, units were able to gather near perfect intelligence on the enemy at times, but sometimes did not realize it because the information was buried amongst a mountain of non-essential data. The standard S2 section within a battalion in a light infantry company table of organization and equipment is five personnel.[77] "In the past, these soldiers monitored two radio nets for twenty four hour operations. Now the ATTCS systems to include Applique' and ASAS-RWS that have to be managed by the S2 are creating a manpower issue. More information

---

[74] Kent Johnson, Management Technology (MTISC) interviewed by author, 27 February 2002. Mr. Kent Johnson was the senior intelligence analyst for 1-5 Infantry during the EXFOR rotation. He now works for MANTECH as a senior analyst – trainer for the ASAS-RWS at FT Hood, TX.
[75] The Task Force XXI AWE Integrated Report, Training and Doctrine Command Analysis Center and OPTEC combined effort, slide 29.
[76] LTC James E. Harris, "To Fight Digitized or Analog", *Military Review*, (November –December 1999): 14. LTC James E. Harris commanded the 1-5 Infantry Battalion, 25ID during the EXFOR rotation at the NTC.
[77] Ibid., 15.

creates more processing time for the user. Lower the processing time, and the information will become more timely and relevant for the commander."[78] Filtering the threat information was impossible due to the lack of written tactics, techniques, and procedures (TTP), doctrine, and numerous hardware and software crashes. These challenges would remain until major improvements were made to the ASAS-RWS and supporting communications network.

Even with these apparent digitization challenges, numerous lessons emerged that would quickly advance the cause of digitization and the theory of a distributed ACE. The elimination of "stovepiped" systems and a more network focused strategy for capturing relevant intelligence. The information overload, systems integration, and network management would improve as the hardware, software, and operating procedures developed and matured. The issues regarding doctrine during the EXFOR rotation were also apparent.

The lack of a coherent set of TTPs also impacted the ability of the EXFOR to function as a digital force and support threat situational development. The TTPs in regards to ASAS-RWS alert messaging were deficient and did not allow the task force S2s to take action on critical threat spot reports.[79] The commander of one battalion stated, "The inability to clearly articulate requirements in terms of what we need to know, when we need the information, and means of delivery (ASAS, Applique', MCS, etc.) resulted in our inability to produce a refined threat picture."[80] The TTPs were too vague to be useful. After the last exercise in preparation for the EXFOR rotation, sixty-one percent of the EXFOR soldiers rated the quality of the TTPs as inadequate."[81] The TTPs developed for the EXFOR rotation in regards to digital operations were immature and did not support the force effectively. Several observations during the EXFOR

---

[78]Ibid.
[79] Task Force 3-66 Armor, After Action Review, Center for Army Lessons Learned, FT Leavenworth, KS, 2.
[80] Task Force 1-5 Infantry, Rotation 97-06 Executive Summary, March 1997, 4.
[81] Task Force XXI AWE Integrated Report, 15.

rotation pertaining to training were also noted.

The EXFOR rotation at the NTC highlighted several training observations that revealed weaknesses in digital skills. Three software upgrades on both ASAS-RWS and Applique' in a nine-month period did not allow soldiers and leaders to train on the digital tasks to standard.[82] It was extremely difficult to conduct operator and leader training when system capabilities and functions changed frequently. The extra time it took to train digital tasks borrowed valuable training time from other key training events. One battalion commander suggested that one of the courses of action for future experiments would be to train a unit to standard on both combat fundamentals and fully functioning digital equipment, and then train the unit on how to exploit the synthesis of the two.[83] There are numerous training challenges to digitizing a force to include stabilized system software, and coherent training plans. The challenging experience from the EXFOR rotation set the stage for the emergence of the distributed ACE. This new concept would emerge during the training and execution phases of the Division Advanced Warfighting Experiment (DAWE).

The Division Advanced Warfighting Experiment

During the DAWE, the 4th Infantry Division, as an unsupported early entry force, defeated four combined armies of the world class opposing force during a nine-day Battle Command Training Program Warfighting exercise.[84] The DAWE emitted several observations and issues in regards to technology, doctrine, and training. The advancement of technology was apparent during the conduct of the exercise.

---

[82] Ibid., 13.
[83] Ibid., 57.
[84] LTC Billy J. Jordan and LTC Mark J. Reardon, "Restructuring the Division: An Operational and Organizational Approach", *Military Review*, (May-June 1998): 19.

The division maintained unprecedented enemy situational awareness with the concept initially called a virtual ACE. With newly updated software, the ASAS-RWS version 4.3 allowed the actual near real time sharing of digital overlays with enemy intent graphics, enemy units from a correlated database within the ACE, and near real time sensor inputs of intelligence into the network.[85] Intelligence sections all throughout the division were able to send their respective databases to every ASAS in the division every twenty minutes.[86] This gave each intelligence section a full divisional picture of the enemy situation. Most of the subordinate threat pictures were set according to the level of detail required by each commander at their echelon. Tool pallets were developed on the ASAS so that icons and graphics could be made prior to the exercise. This capability allowed ASAS operators to place a preloaded set of graphics and threat unit symbols on a display with the ability to quickly retrieve them. This gave the operator increased capability to quickly build enemy overlays, which in turn allowed the rapid sharing of information. One of the key successes in integrating these new technological capabilities was the improvement of the ACT Enclave at the maneuver brigade. Introduction of the ACT Enclave for the brigade combat team installed a key component to the distributed ACE.

The ACT is a sub-component of the distributed ACE, which provides the division and other brigades, a threat picture from that brigades battlespace.[87] "The ACT Enclave provided the brigade with an unprecedented ability to see the battlefield and evaluate the effects of

---

[85] Johnson, interview.
[86] Division Advanced Warfighting Experiment After Action Review, HQS 4th Infantry Infantry Division, ATTN: G2 AAR, p. 2
[87] The Analysis Control Team is additional intelligence resource that is habitually assigned to a maneuver brigade within a division. The ACT is one of three that are assigned to the divisional military intelligence battalion. The ACT possesses two additional ASAS-RWSs for enemy situational development and targeting. In addition, the ACT provides key interfaces for JSTARS, UAV, HUMINT, and other sensors. The ACT should link digitally with both the brigade level S2 section and the division ACE.

engagements."[88] The ACT during the DAWE allowed the brigade to access information from other brigade ACTS for intelligence, and integrate, process and interpret real time sensor reporting via JSTARS and UAV.[89] These connectivity capabilities and the ability to conduct a much more thorough analysis enabled the ACT to support the threat picture of the COP at the brigade level and the division level. The only downside to the intelligence architecture with ACT enclaves was the lack of an ACT like organization at the aviation brigade and division artillery (DIVARTY) headquarters. The distributed ACE must have connectivity with all its major commands to build an accurate threat picture. The lack of an ACT at the two primary organizations that support the division's shaping operations was a mistake.

The lack of an ACT Enclave at both the aviation brigade and DIVARTY headquarters created numerous problems for these two organizations. By residing outside of the distributed ACE, their S2 sections could not receive the real time feed of the JSTARS, the UAV, and the ASAS-RWS threat picture that was available to all the other major command posts within the divisions battlespace. The division applied short-term fixes by either using FM or Mobile Subscriber Equipment (MSE) communications to transmit enemy target information or the division would move an uncommitted brigade ACT over to the aviation or DIVARTY headquarters as needed. The support of these two brigade level headquarters with this increased intelligence capability was necessary during any critical division shaping operations utilizing artillery and attack aviation. The organic aviation assets are highly mobile and lethal and must have the ability to quickly tap into the intelligence network created by the distributed ACE in order to conduct its mission.[90] Communications and network capability for all the command posts is vital in

---

[88] Training and Doctrine Command Analysis Center (TRAC) report on the Division Advanced Warfighting Experiment, FT Leavenworth, KS, 6.
[89] DAWE G2 AAR., 3.
[90] TRAC Report DAWE, 18.

supporting a distributed ACE. The sharing of near real time overlays provided an efficient technique in transmitting the threat picture within the division.

One huge shortfall from the DAWE was the inability of the brigades to fully utilize the dynamically distributed overlay (DDO) function, which was a key tool that enabled the information exchange in a distributed ACE. "During the DAWE, the DDO process for maintaining the enemy portion of the COP was effective between the DTAC and the DMAIN command posts. However, it was less effective between the brigades and the DTAC because the brigade S2s viewed updating their portions of the DDO as a low priority."[91] The brigade commanders had little confidence in other brigade S2s and revising the DDO and its accompanying database required highly trained and skilled ASAS-RWS operators. These problems were addressed at the mid-point of the exercise and the DDO process between the brigades and DTAC improved dramatically.[92] The DDO process became an integral part of the distributive ACE by sharing a near real time picture with all elements on the battlefield simultaneously. Real time data feeds are also an important part of the distributed ACE.

In denying or confirming enemy courses of action, the insertion of real time data feeds into the ASAS-RWS database did not occur at every echelon. Numerous UAV spot reports and JSTARS moving target indicator analysis reports never got inserted into the correlated database because the information occurred rapidly and the manual insertion process was too cumbersome. This near real time information stayed either on the video screen of the operator or in the head of the senior intelligence analyst and did not always get into the database for everyone to share. This technique worked at the individual command post that was receiving the data but it did nothing to support the rest of the network and other tactical command posts.[93] The use of a correlated

---

[91] TRAC DAWE Report, 22.
[92] Ibid.
[93] DAWE AAR from the 104th MI BN, 4th Infantry Division. 2.

database within the ACE was difficult and too immature to support development of a complete threat picture. There were some doctrinal observations during the DAWE that were also relevant.

During the DAWE several key doctrinal issues emerged. TTPs were found to be weak during the exercise and required better development for supporting a distributed ACE.[94] With no established doctrine for a distributed ACE, the creation of TTPs to allow the organization to function were critical. Organization functions also broke down in the use of sensors. There was a complete lack of integration of all the sensors within the division, and there was a focus on the use of JSTARS and UAVs as the primary sensors without the synergy of other intelligence disciplines.[95] With the lack of developed TTPs and the utilization of all available sensors within the division, the distributed ACE failed to receive all the required support it needed to function as an organization. Training observations also emerged from the exercise.

As part of the overall staff, the division ACE went through two warfighter preparation exercises, four division level staff exercises, and several other exercises involving just system connectivity. The investment by the division with this improved technology and training was heavy. The investment brought with it increased situational awareness, which was described as good, but not near perfect.[96] Many of the ACE leaders and analysts still required more training on the ASAS-RWS and the support intelligence architectures. This was a training issue that was attributed to continuous software updates, and the arrival of untrained analysts into the ACE prior to the exercise.[97] Besides systems and architecture training, the brigade command posts and ACTs had difficulty conducting training together in preparation for the exercise.[98] The ACT was

[94] BOS Intelligence Perceptions Division 1998, http://bctp.leavenworth.army.mil. Accessed 1 April 2002. Slide 6.
[95] Division Advanced Warfighting Experiment Insights, BCTP AAR, December 1997, slide 6.
[96] Division Advanced Warfighting Experiment After Action Review, provided by the 104th MI Battalion S3 on 19 February 2002, 1.
[97] Intelligence Perceptions, slide 6.
[98] DAWE Insights, 1.

an organization that belongs to the divisional military intelligence battalion and was normally in direct support to a habitual maneuver brigade during war and exercises. The training of soldiers in a divisional ACE on systems and architectures, and organizational intelligence training within the division was important in sustaining the capabilities of a distributed ACE. The execution of the Division Capstone Exercise Phase I (DCX I) would provide key observations from the areas of technology, doctrine, and training from a brigade formation.

The Division Capstone Exercise I (DCX I)

The Division Capstone Exercise Phase I (DCX I) conducted from 1-14 April 2001 at the NTC demonstrated some improvement over the EXFOR rotation from four years earlier.[99] The exercise was focused at the brigade level and incorporated the newly developed FBCB2 platform automation system. This system was a large improvement over the Applique' which was previously introduced during the EXFOR rotation. The study of this exercise will also focus on technology, doctrine, and training issues. Problems can often occur after the introduction of a new system. There were significant technical problems in DCX I with the link between FBCB2 and ASAS-RWS.

The largest issue concerning the use of the FBCB2 system was the inability of individual vehicles to send reliable digital spot reports back to the battalion command post so that they could enter the database of the ASAS-RWS and support the S2 section. The S2 section required these digital reports to build the threat database to share with the brigade. The distributed ACE required digital pieces of threat information to build the threat picture and maintain an accurate database to share throughout the divisional battlespace. Instead, the information was sent via FM voice to the battalion headquarters. The battalion commander would get this information, make

[99] Division Capstone Exercise 1, Initial Insights Memorandum, (Department of the Army, April 2001). 8.

decisions, but nothing was recorded in a format that could be sent to higher and adjacent units other than a voice transmission.[100] The synergy of using linked ASAS-RWS throughout the brigade and DTAC was lost due to the inability to build a threat picture for the COP. Without the threat picture being built at the battalion or brigade level, companies and platoons lost the ability to see the threat picture on their FBCB2.

With no return threat feed to the vehicle platform, commanders at both the battalion level and brigade ended up migrating back to the command post to see all the ATTCS systems and the generation of near real time sensor feeds. The commanders sometimes had better situational awareness back at the main CP than in their vehicle on the battlefield. The brigade reconnaissance troop was also unable to transmit effective spot reports via FBCB2 which exacerbated the problem of maintaining a enemy database for the brigade S2, and the ability to share the information with the battalion S2s.

> While the flow of threat situational awareness continued to improve, the threat thread architecture was inconsistently implemented. The complexity of the ASAS when integrated into the ABCS and FBCB2 system of systems was significant. It inhibited troubleshooting, challenged and frustrated the user, and precluded the efficient exchange of red situational awareness between battlefield functional areas and effective employment of the system.[101]

While the concept of the distributed ACE worked well at the main command posts, it had its challenges down to the platform level in incorporating the threat feed from combat and reconnaissance platforms on the battle field. Two key doctrinal issues resulted from the exercise. Despite the technical challenges, there were two key observations concerning TTP. There was a general lack of developed TTP leveraging the power of linking the COP to commanders and units, which would decrease the decision making time by optimizing information flow across

---

[100] Ibid.
[101] Ibid., p.16-3.

all the BOS elements to include intelligence.[102] The lack of a developed document to describe and direct the appropriate messaging, overlay construction, and architecture design impacted on the ability of the task force S2 to receive the information he needs to build a threat picture. The lack of integration of all the brigades' sensors within a correlated database also impacted on the ability of the S2 to adequately develop a picture during the exercise.[103] With the loss of synergy in developing a COP through a developed set of TTPs, or the full utilization of a unit's sensors, the building of the threat picture was difficult. Several training issues also emerged from the exercise.

Along with the doctrinal issues, there were some training issues. All the leaders in the formation needed battle focused training in an information dominant environment across the training institutions, at home station, and at the combat training centers.[104] This was the result of numerous leaders within the brigade not knowing the full capabilities of their systems and architectures during the exercise. More specifically, training was required with the man-machine interface at the platform level. The lack of training did not allow the sending of individual spot reports from the FBCB2 to the task force TOC for the building of the threat situation.[105] Leader and operator training must occur in a information dominate environment, and the interface between soldier and computer at the vehicle level was difficult due to lack of training. The last exercise was examined through technology, doctrine, and training issues that the BCTP observed.

The Division Capstone Exercise II (DCX II)

[102] Division Capstone Exercise I, Initial Insights Memorandum, (Department of the Army, October 2001), 11.
[103] Ibid., 11.
[104] Ibid., 8.
[105] Ibid., 13.

The Division Capstone Exercise Phase II (DCX II) was the Battle Command training program conducted at Fort Hood during 6-10 October 2001. Observations were made in technology, doctrine, and training during the course of the exercise. Technology is the area first examined.

One of the biggest technical observations was the lack of the integration of all of the division's sensors.[106] The UAVs and JSTARS were the preferred sources for real-time intelligence and targeting information even though UAV and JSTARS capabilities were weather and system dependent. Those systems may not always be available for intelligence collection. The other intelligence disciplines like signal intelligence, human intelligence, and electronic intelligence were not integrated into ASAS-RWS effectively.[107] This lack of sensor input from critical assets would denigrate the resolution of the threat situation.

The building of the threat situation for the division COP was also ineffective with regards to ASAS-RWS. The software for the ASAS-RWS was changed in the months preceding the exercise. Software version ASAS-RWS 6.2 in accordance with ABCS 6.2 was a software upgrade that went backward for the ASAS-RWS. The new software was unstable and was prone to crash much like the initial versions.[108] The creative tools like the tool pallet and other previous features were dropped in order to allow the ASAS-RWS to transmit enemy data into MCS via the Common Tactical Picture software.[109] Enemy intent graphics showing enemy courses of action and anything else besides an enemy unit icon would not transfer to the MCS. This digitization setback once again splits the COP between at least two machines, the MCS and the ASAS. Everyone had to get enemy situational understanding from the ASAS-RWS. During the exercise,

---

[106]Division Capstone Exercise II, Initial Insights Memorandum, (Department of the Army, October 2001), 7.
[107]Ibid., 25.
[108] Mr. Kirk Hamlet, interviewed by author, 14 February 2002. FT Leavenworth, KS. Mr. Hammlet is the ASAS-RWS analyst/trainer for Lockheed Martin.

experienced operators with the ASAS-RWS powerful database could build a great enemy threat picture. The complete threat picture would not transmit to other ATTCS machines.[110] Along with these major technical observations, there is one key doctrinal observation addressed.

There was one major observation during the conduct of DCX II that emerged in regards to the distributed ACE. There was a break down in the ABCS/ASAS-RWS link to the division's ISR architecture. The synergy of collecting all the data and information from every possible sensor in the division was not visible.[111] There was no standard set of procedures developed to take advantage of all the capabilities of the division's ISR and ABCS capability. However, the draft of *FM 34-10-5/ST, Digital Division Intelligence Operations* did incorporate some very minor aspects of a distributed ACE, but the FM lacked depth and detail to support brigade and divisional intelligence sections. The lack of developed TTP or doctrine allowed the ISR and ABCS capability to denigrate and not provide a clear focus. Several training observations from the exercise are reviewed next in the study.

ASAS-RWS operator training and other ATTCS systems training had shortfalls. During DCX II, "Many of the operators appeared adequately trained on basic functions of their system to support the planning, preparation, and execution phases of their unit's mission. However, many operators needed the ability to execute the more advanced functions to better support their unit's mission operations."[112] One of the key tasks that was observed during this exercise was the inability for ASAS-RWS operators to update, modify, delete, and manipulate databases.[113] Database management was a crucial task that conducted the accurate and timely fusion of intelligence disciplines, and allowed analysts to predict enemy intent. Without well-trained

---

[109] Ibid.
[110] DCX II Initial Insights Memorandum, 15.
[111] Ibid., 21.
[112] Ibid., 23.
[113] Ibid.

analysts and ASAS-RWS operators the distributed ACE will never reach its potential. These training shortfalls may reside back at the intelligence school for not originally training the network and advanced automation skills to intelligence soldiers.

Do to the lack of distributive ACE training at Fort Huachuca, unit level training conducted most of the initial and follow up training required to executing distributed ACE operations at the 4th Infantry Division. Most of the training that was required for new software updates, the training of soldiers outside of military occupational skill 96B10, and leader training occurs at the Central Training Support Facility (CTSF) at FT Hood.[114] This provided a baseline capability to keep a trained pool of ASAS-RWS operators and leaders up to date on ASAS-RWS. "With a fully trained ACE, the distributed ACE can be effective and assist the division in building the COP."[115] The conclusion of the four recent exercises revealed that the technology was still immature. More work must be done to update doctrine and TTPs, and training must improve not only on digital systems but also on combat fundamentals. The analysis chapter will analyze the theories and exercise results in the areas of technology, doctrine, and training.

Chapter 4 - The Analysis

> To satisfy its stringent requirements for intelligence, the division takes advantage of improvements in collection assets, digital communications and data processing to collect, analyze and disseminate enemy information with unprecedented speed and reliability. Integral to this effort will be the Army XXI Division's enhanced capability to access and incorporate information from all intelligence disciplines into a focused all-source product.
>
> COL John J. Twohig[116]

This chapter conducted an analysis of both the theory and exercise chapters. The chapter

[114] Johnson, interview by author.
[115] Ibid.
[116] COL John J. Twohig, et AL, "Structuring Division XXI", *Military Review*, (May – June 1998): 25.

reviewed ideas and concepts presented by the theorists, and the exercise results from the EXFOR rotation, the DAWE, DCX I and II. The analysis from this chapter supported the conclusions and recommendations in chapter five. The analysis focused on technology, doctrine, and training in regards to the distributed ACE. The analysis of the technology presented numerous ideas and issues pertaining to the future development of a distributed ACE.

Analysis of the Technology

The role of theory in defining and developing a distributed ACE was evident from Army leaders and theorists from the past decade. GEN Sullivan articulated the need to focus operations around information and produce a synergy that gave the commander the information he needed to make timely and accurate decisions. After GEN Sullivan witnessed the fast growth of network technology in the private sector. Along with the group of theorists behind the development of NCW, the idea of distributed operations emerged. NCW presented a simple model which described a theoretical construct for the distributed ACE.

To illustrate the theoretical building of a distributive ACE, one model adapted from Network Centric Warfare was tailored for representing the distributed ACE at both the present time and in the future. The Logical Model for Network Centric Warfare (Appendix E) shows the theoretical architecture to achieve the synergy of a network based intelligence system. This model illuminates an array of sensor grids, which could send electronic traffic through a preprocessor or directly into the ACE at the command and control cell based on system connectivity. The information is correlated at the all source database and distributed to the COP within the command and control cell. This model lays a theoretical foundation for the development of a distributed ACE and its purpose within the battlespace. Commercial aspects of distributed networks highlighted an example of functional distributed operations.

Much like the individual item purchased at the cash register in a Wal-Mart store, the distributed ACE with points of injection throughout the battlefield could also absorb incoming FBCB2, sensor, and analytical intelligence inputs. This inputted data would arrive at the ACE at the DMAIN command post where its correlated with intelligence from within the division battle space, and with higher echelon input. Then this data and picture could ultimately be sent out to all the command posts within the divisions battle space. This increases the accuracy of the threat picture, and the timeliness of getting it into the COP at each echelon. However, another theorist offered differing viewpoints concerning the growth of technology and the Army's reliance on it's potential.

The counter argument challenges the euphoria and excitement of the spiraling technological advancement in the military. Michael O'Hanlon in his book *Technological Change and the Future of Warfare* argues that there are limits to the capabilities of new technologies and theories that many leaders are ignoring or just not addressing. Threat forces could develop systems that jam signals within the Army's future distributed networks. The disruption of satellites and/or global positioning systems could wreak havoc on tactical digital architectures. Hackers and small hostile entities could attempt to disable correlated databases with viruses or inaccurate data.[117] With these many challenges, there are usually always technical or procedural answers to deal with new threats. However, the continued improvement of technology, and the ability to harden systems should mitigate most of the threats in the future.

With the advancement of information technology and recent theory developed by all the examined theorists, there was an unbridled energy that continued to push both the intelligence community and other BOSs into the creation of distributed networks. The continued advancement in the creation of a distributed intelligence network is the direction the intelligence

BOS is heading."[118] Chester Brown, the assistant TRADOC support manager for ASAS-RWS, said that NCW supported the future of ASAS-RWS, and the systems in the future (See Appendix F).[119] The ability to synthesize and analyze vast amounts of information will require even faster processors and networks in the future. This foundation of theory supports the distributed ACE, and the doctrine must reflect this network-based organization. The digital exercises, however, which were the practical application of some of this technology, have had mixed results since 1997.

With the conclusion of four major exercises during the past five years, the technology is still too immature to support the construct of a distributive ACE. The lack of a capability to send an enemy overlay with intent graphics to the MCS prevents the building of a single COP. Even with the recent edition of the Joint Correlated Database, the capability to send at least a simple threat situational understanding to all machines within a command post still does not exist as evident during DCX II. This technical shortfall still requires a commander to view more that one screen to visualize the battlefield and to force him to translate a separate friendly and blue picture. At the individual platform level there were also connectivity issues between the FBCB2 and ASAS-RWS.

The inability of the FBCB2 to populate the ASAS-RWS database left the threat picture outside of the tactical internet during DCX I. The synergy of merging various sensor inputs were lost, and this created the inability to build a threat database from numerous sources, and to share the picture with other command posts. This lack of a threat database also prevented the battalion and brigade headquarters from sharing the picture with its subordinate units. The threat picture

---

117 Michael O'Hanlon, *Technological Change and the Future of Warfare,* (Washington, D.C.: Brookings Institute), 62.
118 Chester Brown, phone interview conducted by author, March 25, 2002. Mr. Brown is the assistant Training and Doctrine Command support manager for ASAS-RWS, FT Huachuca, AZ.
119 Ibid.

never returned to the individual vehicle platform because of the lack of original sensor input. Other sensor inputs were also left outside the tactical internet.

The lack of UAV, JSTARS, and other intelligence discipline's ability to get inputted into the correlated database of the ACE also distorted the threat picture. Without the synergy of these dynamic sensors that produce near real time intelligence, the threat picture was neither complete nor accurate. The time it takes to manually input information into the database was too difficult. These sensor inputs should be seamless and automatically enter the correlated database as required.

Analysis of the Doctrine

All the previously mentioned theorists refer to the need to update or change doctrine as a requirement to change organizations, and appropriately leverage technology. NCW argues that the technology development cycle is out of sync with military strategy, concepts, and doctrine.[120] After reviewing all the military intelligence doctrinal manuals, the distributed ACE still exists as a concept. *Field Manual(FM) 34-10-5/Student Text* dated July 14, 2000 was in final draft. This manual was the closest reference discovered to discuss distributive intelligence operations at the tactical level. This manual at paragraph 3-10 specifies the ACE responsibilities were to record and evaluate relevant information on the threat and environment reported by the division reconnaissance and surveillance assets or other support organizations.[121] The manual also assigned general responsibilities that include, "the conducting of distributed intelligence production and dissemination through digital devices."[122] The military intelligence doctrine needed to be updated. The complete review of the rest of the military intelligence field manuals produced similar results.

[120] Network Centric Warfare, 201.

The intelligence doctrine to include FM 34-130, *Intelligence Preparation of the Battlefield*, FM 34-25-3 *The All-Source Analysis System and the Analysis Control Element*, and FM 34-8-2 *The Intelligence Officers Handbook* are basically void of any discussion of networked based technology, and the distributed ACE. There were no references for the key tasks involved at each echelon, the requirements from each of the intelligence elements, and the benefits in the synergy created in producing a valid threat picture for the COP and the tactical commander. Ideally most of the intelligence field manuals should address the varying nature of distributive intelligence so that it permeates throughout the branch and gives intelligence personnel guidance and support in making distributive ACE operations work in the future. If the military intelligence branch updates the doctrine, the impact would lead to the improvement of training.

Analysis of the Training

All the theorists highlighted the need for changes to training. NCW argued a complete alteration to individual mindsets in regards to training on the theories of NCW. Mr. Michael O'Hanlon and the examined exercises detailed the need to train on new technology, but other skill sets to include combat fundamentals were just as important. Updated software and hardware presented just prior to the execution of the major exercises also impacted on the training of operators and leaders within the ACE and other BOS elements. The level of training for intelligence analysts during the DAWE and DCX II never reached the depth required to execute more complex tasks to support intelligence operations. GEN Sullivan argued that training is the one component that brings together organization, doctrine, and soldiers to the same event.[123] Training on both digital tasks and other required Army skills was difficult during the four examined exercises. The final chapter presents the conclusions and recommendations of the

---

[121] *FM 34-10-5/ST (Final Draft)*, 49.
[122] Ibid.
[123] The Collected Works, 1991-1995, 76.

monograph.

Chapter 5 – Conclusions and Recommendations

> The fusion of technology and potent management skills that mobilize mass organizations makes military change inevitable. If anything, the technologies influencing civilian life in the next century may have even greater impact on military force than has been true in this century.
>
> Williamson Murray and Alan R. Millet[124]

The purpose of this study was to determine if the creation of a distributive analysis and control element (ACE) could effectively provide enemy situational understanding for tactical level commanders. This monograph examined the distributive ACE in terms of technology, both theory and practical application, doctrine, and the training. The analysis focused on the need for the technological maturity of systems, the requirement to update military intelligence doctrine, and the need to improve training on the distributive ACE and NCW. The analysis indicated three major conclusions based on the research that the distributed ACE could not effectively provide enemy situational understanding for the commander at this time. However, with the improvement of technology, training and doctrine, the distributed ACE will work as a new organization. The three conclusions of this study focus on technology, doctrine, and training.

Conclusions

First, the technology that was required to support a distributed ACE was not mature enough to build the COP. The inability to transmit enemy intent graphics to the MCS was a complete failure in supporting the commander with a COP that provides situational understanding. During

[124] Williamson Murray and Alan R. Millet, *Military Innovation in the Interwar Period*, Cambridge University Press, 1996, United Kingdom.

DCX II, the sole presentation of enemy unit icons alone only provided a basic situational awareness to the commander. For Example, the lack of enemy attack routes, kill zones, and time phase lines on the MCS will force the commander and staff to look at the ASAS-RWS display in order to get the threat situation, since it was not currently coupled with the friendly situation. During DCX II, the COP was not fully integrated to provide any commander situational understanding during DCX II. With no ASAS-RWS systems co-located with the FBCB2 in individual platforms, the threat picture was also missing at the lowest tactical levels.

With the connectivity between ASAS-RWS and FBCB2 just as immature as the core ABCS systems, the loss of the tactical sensor grid and inputs from the bottom of the network were also missing from the distributed ACE. The distributed ACE relied on the feed from FBCB2, and task force and brigade sensors to populate its correlated database. With no subordinate data, the synergy and fusion were lost. With no fusion, the threat picture was inaccurate and not returned to the original sensor as fused intelligence. The result was the tactical commander does not know what was ahead of him past the next terrain feature. Besides internal tactical sensors within a division that submit data higher, there were numerous other sensors that also failed to get into the network.

Both JSTARS and UAV required time consuming manual entries to get into the ASAS-RWS database. The information these sensors provide occurred at near real time. Without their incorporation into distributive ACE, the command posts without these downlinks will not get the detailed threat information required to support a COP. The master correlated database within the distributive ACE also lost the ability to correlate JSTARS/UAV data with other intelligence disciplines. One model from NCW presented a theoretical construct for the distributed ACE.

NCW provides one model (The Logical Model for Network Centric Warfare) in which current technology can be applied to form a distributive ACE. This model provided a basic outline in which to apply technology to include sensors, and fusion cells. The model as depicted in Appendix E could be expanded to fit any size organization. The model, however, provided only one framework in which military intelligence doctrine could absorb the theory and make it reality.

Second, the theories from GEN Sullivan, and NCW were missing from military intelligence doctrine. Without the doctrine, there was no framework to teach soldiers, noncommissioned officers, and officers operations concerning the distributive ACE. NCW was in the intelligence community. TSM-ASAS located at Fort Huachuca has full knowledge of NCW and believed in its future, but the theories have not crossed into doctrinal channels. The closest FM that the intelligence community possesses is FM 34-10-5/ST (Draft) and it was not approved doctrine. FM 34-15/ST (Draft) briefly remarked about distributed networks, and the sharing of information, but goes into no detail concerning the operation of a distributed ACE with involvement by the complete array of sensors and command posts within a division's battlespace.

Third, without approved doctrine or solid TTPs describing distributed ACE operations, the military intelligence school still has not adjusted to teaching distributive network operations, and tasks that would support the building and maintenance of a distributed ACE. Just over five years ago, the experiments began with the EXFOR rotation. In the near future, the 1st Cavalry Division becomes the second division to undergo digitization. There was still no doctrine to describe, and execute an organization like the distributed ACE to support the tactical intelligence community.

Recommendations

First, the ASAS-RWS and other ABCS systems to include FBCB2 must have a 100% interface to provide robust database sharing. The eventual correlated database for the distributed ACE could exist as a set of servers within a TOC or vehicle, but the data in the future cannot find breaks in the network, or interoperability problems with other systems. This means that the future ABCS system has to be a system that is built and installed by a single contractor, or hardware /software pairing of contractors that can get connectivity established between like systems. In addition, overlay functions between the ASAS-RWS and other ABCS systems must exist. These overlays provide situational understanding for the commander and should reflect all required graphical control measures for friendly and enemy units. These overlays should be able to enter the database and be retrieved when necessary with current information from the sensor grid.

Second, the military intelligence school should immediately send a doctrine writing team to Fort Hood to visit 4th Infantry Division and capture their TTPs and concepts on the distributed ACE. After capturing all the relevant information concerning the distributed ACE, the team needs to write a new draft manual implementing the distributed ACE as a tactical intelligence organization. This change to doctrine may also necessitate a change to all other applicable intelligence manuals that would be affected by the distributed ACE as an organization. For example, the doctrine writers would also have to address other intelligence manuals like FM 34-130 *Intelligence Preparation of the Battlefield*, and FM 34-2, *Collection Management and Synchronization*, to incorporate the distributed ACE. The functionality of this organization would impact on intelligence preparation of the battlefield, reconnaissance, collection, and other military intelligence doctrine.

Third, with approved doctrine, the training base needs to alter its curriculum to support computer network operations and the distributed ACE. Using the Master ASAS analyst course as a model, all intelligence personnel should receive training on computer network operations and concepts supporting the distributed ACE as they pass through the training regimen at the intelligence school. This not only supports future unit training, but it gives the necessary skills to intelligence personnel to actively support their commanders with better computer and networking skills to build intelligence.

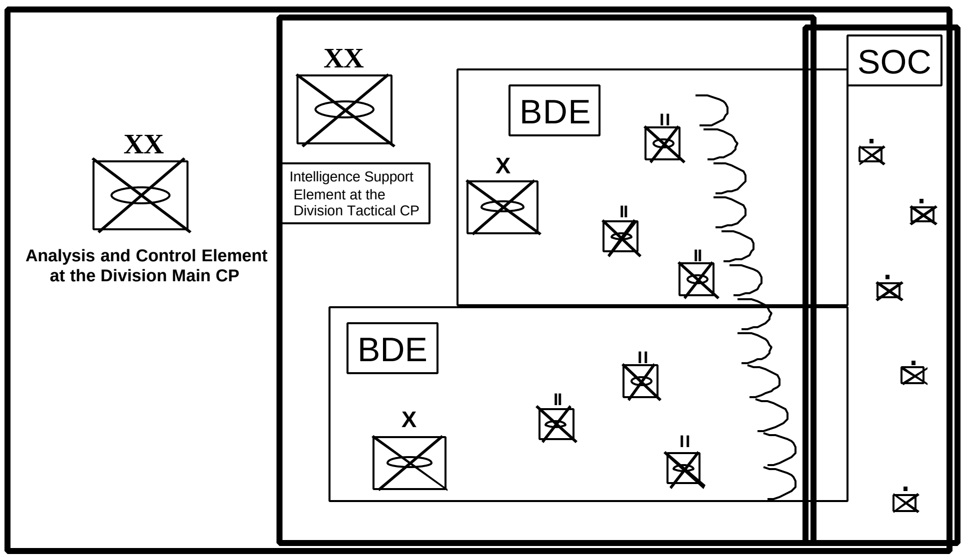
The major aim of the distributed ACE is to leverage network technology to increase the ability of the commander to make good decisions. " Much of the fog of war, or what is referred to today as a lack of battlespace awareness, has resulted in our inability to tap into our collective knowledge, or the ability to assemble existing information, reconcile differences, and construct a common picture. There needs to be equal emphasis placed upon developing a current awareness of both friendly and enemy dispositions and capabilities, and in many cases, there needs to be increased emphasis on neutrals."[125] The friendly picture will continue to get more accurate as FBCB2 improves. To replicate the ability of friendly platforms to update the MCS database at each echelon, the threat picture must be distributive, and require each tactical command post to report its threat picture for correlation at the division level.

Technology will continue to advance without regards to doctrine, and training. The U.S. Army must continue to adapt to all relevant forms of the latest off-the-shelf technology to maintain a competitive edge against all threats. The time is now for the military intelligence school to update its doctrine and adjust the training base to maximize the training on the latest network and digital technology. Intelligence soldiers are ready for the challenge!

[125] Ibid., 71.

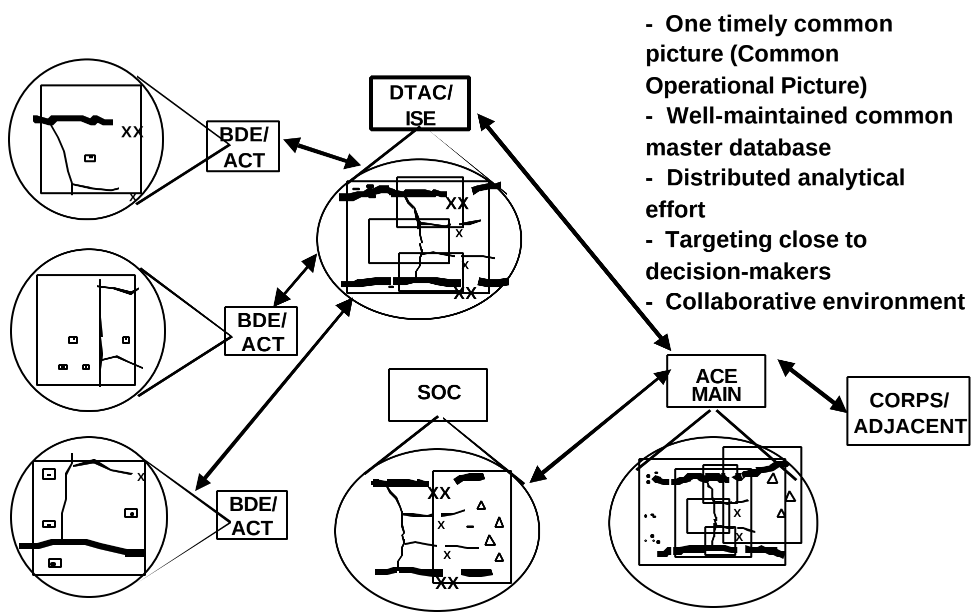
Appendix A

Assigned Area of Intelligence Requirement to Support the Distributed ACE

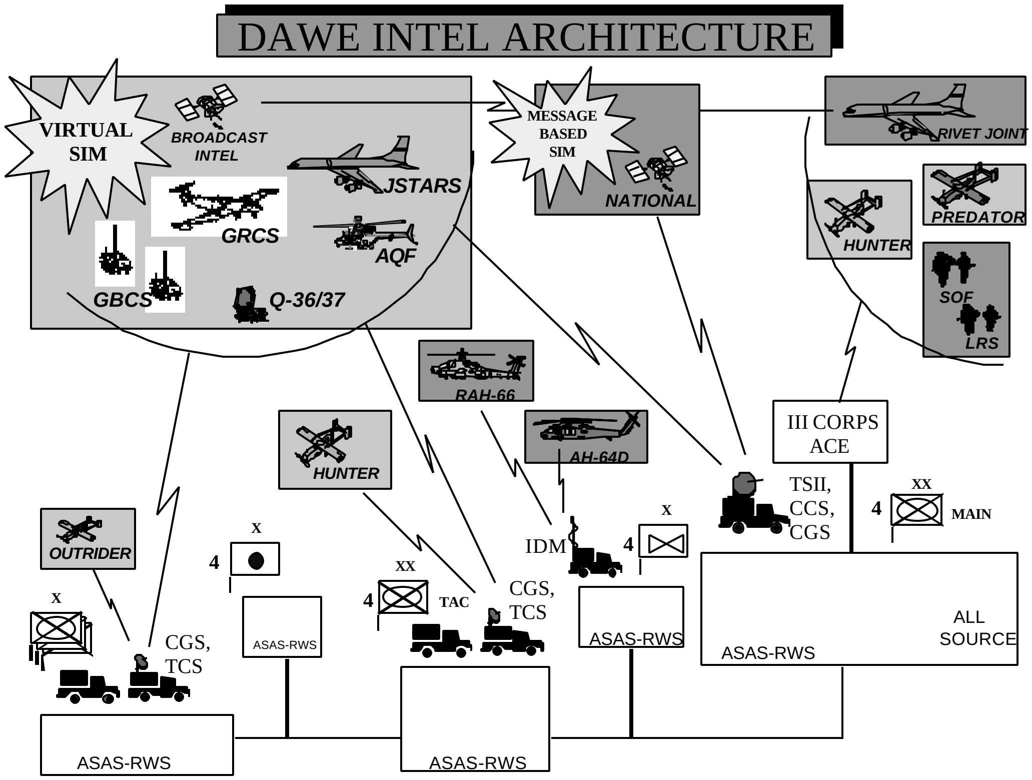


Appendix B

The Collaboration of the Threat Tactical Picture of The Distributed ACE

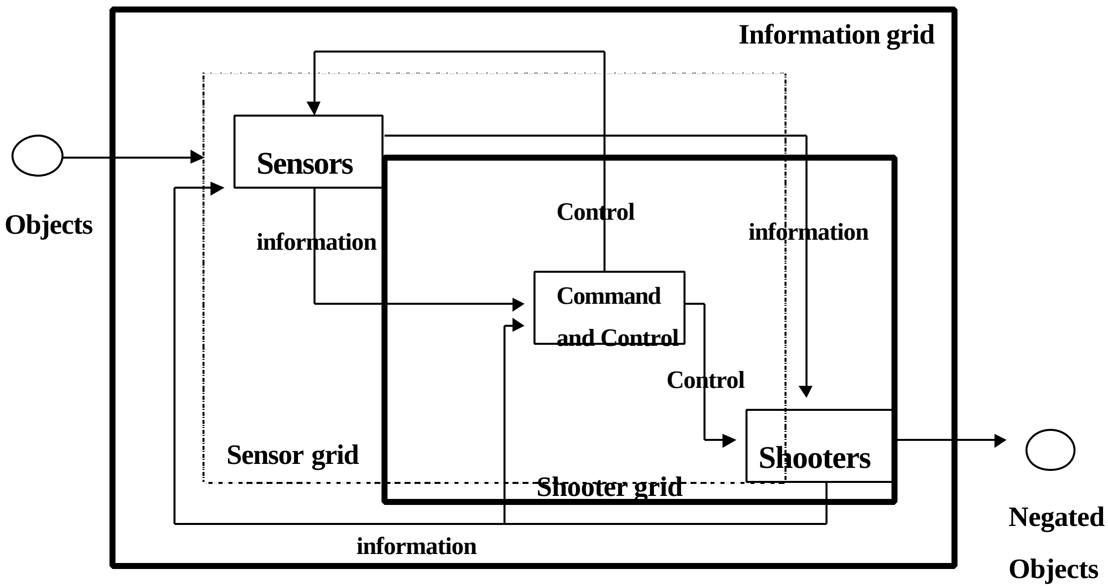


Appendix C

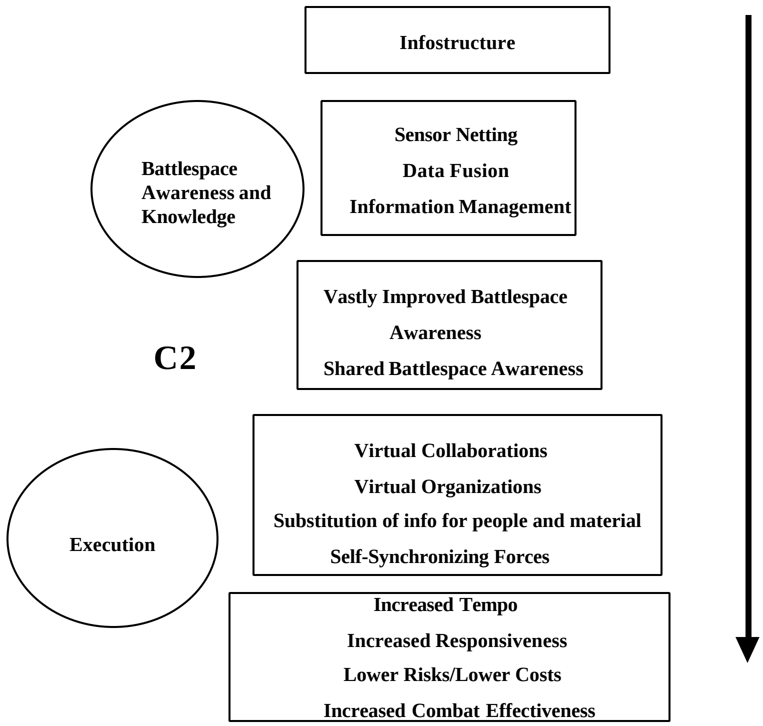

DAWE INTEL ARCHITECTURE
VIRTUAL SIM
BROADCAST INTEL
JSTARS
GRCS
AQF
GBCS
Q-36/37
MESSAGE BASED SIM
NATIONAL
RIVET JOINT
HUNTER
PREDATOR
SOF
LRS
RAH-66
AH-64D
HUNTER
III CORPS ACE
TSII, CCS, CGS
XX
4
MAIN
X
4
IDM
OUTRIDER
X
4
XX
4
TAC
CGS, TCS
X
CGS, TCS
ASAS-RWS
ASAS-RWS
ASAS-RWS
ALL SOURCE
ASAS-RWS
ASAS-RWS
ASAS-RWS

Appendix D

<u>The Logical Model for Network-Centric Warfare</u>

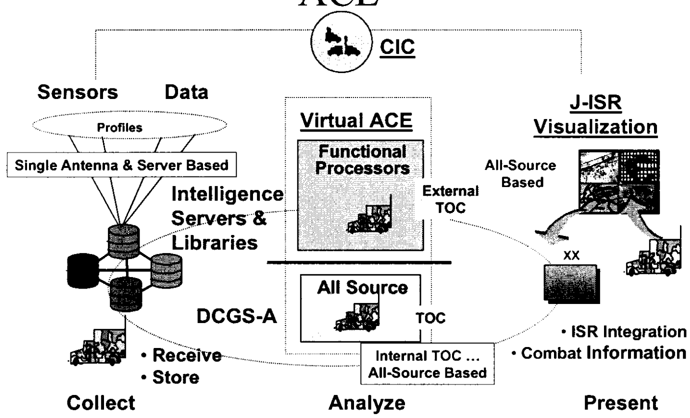


Appendix E


Infostructure
Battlespace Awareness and Knowledge
Sensor Netting
Data Fusion
Information Management
C2
Vastly Improved Battlespace Awareness
Shared Battlespace Awareness
Execution
Virtual Collaborations
Virtual Organizations
Substitution of info for people and material
Self-Synchronizing Forces
Increased Tempo
Increased Responsiveness
Lower Risks/Lower Costs
Increased Combat Effectiveness

Appendix F

Impending Network Centricity ACE



Bibliography

Alberts, David S., Garstka, John J., and Stein, Frederick P. *Network Centric Warfare: Developing and Leveraging Information Superiority*. CCRP Publication Series, Vienna, VA, August 1999.

Bateman, Captain Robert L. "Force XXI and the Death of Auftragstaktik," *Armor* 1, January-February 1996, 13-15.

Bellamy, Christopher. *The Future of Land Warfare.* St. Bellamy's Press, New York 1987.

_________. *The Evolution of Modern Land Warfare.* Routledge, London 1990.

Bornman, Louis G., Michael C. Ingram, and Peter J. Martin. "Information Technology in the Digitized Division." *Fiscal year 1995 Mobile Strike Force Battle Command Experiment.* Fort Leavenworth, KS: Training and Doctrine Command Analysis Center, November 1995.

Boyd, Morris J., and Michael Woodgerd. "Force XXI Operations." *Military Review* 74, no. 11 (November 1994): 17-30.

Calvo, Mark D. "Digitizing the Force XXI Battlefield" *Military Review* 76, no.3 (May-June 1996): 68-73.

Castillo, Raymond. LTC. "Integrating Digital Training as the Army Modernizes", Point Paper, 31 Jan 2000.

Center for Army Lessons Learned. *CTC, CMTC and JRTC Trends, Fiscal Years 1994-1996*. Fort Leavenworth, KS: U.S. Army Training and Doctrine Command.

Clapsaddle, Ben C. LTC. Commander of 3-66 Armor, 1st Brigade, 4th Infantry Division, Fort Hood, TX 76544, interview by Mr. Hill, 1998.

Clausewitz, Carl V. On War. "Translated by Michael Howard and Peter Paret" Princeton University Press, Guilford, Surrey 1984.

Colwell, LTC. 1st Brigade, 4th Infantry Division Executive Officer, Fort Hood, TX 76544, interview by Mr. Langoria, and Mr. Hill, 1998.

Cox, Robert D. "Information Pathology and the Army Tactical Command and Control System (ATCCS): Is ATCCS a Cure?" Fort Leavenworth, KS: School of Advanced Military Studies, First term 1990-1991.

Department of the Army Deputy Chief of Staff for Intelligence (DA DCSINT), *Army Intelligence Transformation Campaign Plan (AI-TCP),* August 2001.

EcKert, Colonel Gregory, and Major James Phillips. "Digital Training: The Way Ahead." Army, August 2000, 29-32.

Edwards, O.T., III "Digital Battlefield Training and Insights of a User," Armor 104, no. 3 (May-June 1995): 12-14.

Flowers, Jack D. "Digitization of the heavy Maneuver Brigade: Increased Situational Awareness and Decreased Decision Making." Monograph, SAMS, U.S. Army CGSC, First Term AY 97-98.

Franks, Frederick M. Jr. "Battle Command, A Commander's Perspective." *Military Review* 76, no.3 (May-June 1995).

Friedman, George and Meredith Friedman. *The Future of War: Power, Technology and American World Dominance in the Twenty-first Century*. New York: St. Martin's Griffin, 1996.

Goedkoop, Colonel Thomas R. and Captain Barry R. Venable, "Task Force XXI: An Overview," *Military Review* no.2, March-April 1997, 68-78.

Griffin, Major General Benjamin S., and Lieutenant Colonel Archie Davis. "Operation-Centric Warfare: Setting the Conditions for Success at Brigade and Battalion." *Army*, August 2000, 21-24.

Harvey, Charles H., LTC and Schultz, Lance LTC, "An Analysis of the impact of Network-Centric Warfare on the Doctrine and Tactics, Techniques, and Procedures of Intelligence at the Operational Level", Naval War College paper, 1 June 1999.

Hunt, James G., and John D. Blair, eds. *Leadership on the Future Battlefield*. Washington, D.C.: Pergamon Brassey's International Defense Publishers, 1985.

Ignatieff, Michael, *Virtual War: Kosovo and Beyond.* Henry Holt and Company, LLC, 2000.

Johnsen, William T., "Force Planning Considerations for Force XXI, Carlisle, PA, Strategic Studies Institute, 1998.

Koucheravy, Richard J. MAJ. "Whence the Soldier of the Future? Recruiting and Training for the Objective Force" School of Advanced Military Studies, United States Army Command and general Staff College, Fort Leavenworth, Kansas, First Term AY 00-01.

Leonhard, Robert R. *The Principles of War for the Information Age.* Presidio Press, Inc., Novato, CA 1998.

LaFace, Jeffrey L. MAJ. "Digitization and the Commander: Planning and Executing Military Operation," School of Advanced Military Studies, United states Army Command and General Staff College, Fort Leavenworth, KS First Term AY 00-01.

Laffey, Major, 4th Infantry Division Support Operations Officer, Fort Hood, TX, interview by Mr. Langoria, 1998

LaValley, Tyrone L. "24th Infantry Division Goes Digital in the Desert," *Army Communicator* 19, no. 2 (summer 1994): 39-41.

Leeder, Steve, Chief of Military Intelligence Doctrine, Fort Huachuca, AZ, phone interview by author, 15 January 2002.

Macgregor, Douglas A. "Setting the Terms for Future Battle for Force XII, 1995." *Association of the US Army, The Land Warfare Papers*, Arlington, VA.

Mariani, MAJ, Signal Officer from 1st Brigade, 4th Infantry Division, Fort Hood, TX, Interview by Mr. Langoria, 1998.

Marshall, S.L.A. *Men Against Fire*. Peter Smith, Gloucester, MA 1978.

Metz, Steven, "Armed Conflict in the 21st Century: The Information Revolution and Post-Modern Warfare," Strategic Studies Institute, 2000.

Mikula, Lieutenant Colonel John P. "The Challenges of Manning the Post-Cold War Army."" U.S. Army War College paper, 1999.

Miller, John E., and Kurt Reitinger. "Force XXI Battle Command." *Military Review* 76, no.3 (May-June 1996).

Mosher, Alan M. "Light Armor In Deep Operational Maneuver: The New Excalibur?" Monograph, SAMS, U.S. Army CGSC, Second Term AY 93-94.

National Training Center, G2 Section. *Advanced Warfighting Experiment/Force XXI Systems & Equipment Handbook.* NTC, Fort Irwin, CA, March 1997.

Newman, Richard J. "Dumbing Down the Military." *US News and World Report*, November 23, 1998, 22.

Nichiporuk, Brian and Carl H. Builder. "Information Technologies and the Future of Land Warfare," RAND, Santa Monica, CA 1995.

O'Hanlon, Michael O., *Technological Change and the Future of Warfare*, Washington DC: The Brookings Institution, 2000.

O' Hanlon, Michael O., *Defense Planning for the Late 1990s, Beyond the Desert Storm Framework*, Washington DC: The Brookings Institution, 1995.

Operation DESERT HAMMER VI – Analysis Cell, "The Digital Difference," *News from the Front.* Fort Leavenworth, KS: Center for Army Lessons learned, July 1994.

Parlier, Colonel Greg. Briefing: Manning the Army of the Future. U.S. Army Recruiting Command, Office of Program Analysis and Evaluation, 2000. Accessed October 6, 2000.

Peabody, John LTC. Commander of the 299th Engineer Battalion, 1st Brigade, 4th Infantry Division, Fort Hood, TX 76544. Interview by 1LT Kuhn, and Mr. Johnston, 1998.

Rosenberger, COL John D. "A Year in the EXFOR," *Army*, May 1995, 38-44.

Scales, Robert H. Jr. MG. *Future Warfare.* U.S. Army War College, Carlisle Barracks, *PA, May 1999.*

Sinclair, Karen L. "Information and the Future of Battle Command", Monograph, SAMS, U.S. Army CGSC, Second term AY 96-97.

Steel, Dennis. "DCX@NTC: Dust, Digits and Steel: Launching Warfare's Future," *Army*, Vol.51, No. 6, June 2001.

________. "Soldiering Outside the Box." *Army*, September 2000, 20-28.

________. "Forging Task Force XXI," *Army*, November 1996, 23-25.

Sullivan, Gordon R. and Michael V. Harper. *Hope is not a Method*. Broadway Books, New York 1996.

Sullivan, Gordon R. GEN(ret), President of the Association of the United States Army, Washington DC, interview by author, 10 April 2002.

Sullivan, Gordon R., *The Collected Works 1991-1995*, Department of the Army, Washington DC, 1995.

Sutton, William. Commander of G Troop, 10 Cavalry, 1st Brigade, 4th Infantry Division, Fort Hood, TX 76544, interview by Mr. Johnston, 1998.

Tate, William R. LTC(P). Chief of Exercises III(US) Corps, Fort Hood, TX 76544, interview by author, February 2002.

TRADOC Analysis Center, *Initial Insights Memorandum for the Division Capstone Exercise Phase I*, FT Leavenworth, KS. April 2001.

TRADOC Analysis Center, *Initial Insights Memorandum for the Division Capstone Exercise Phase II*, FT Leavenworth, KS. October 2001.

TRADOC News Service, "TRADOC Commander Reveals Some TF XXI AWE Results," *Military Intelligence*, July-September 1997, no. 7.

Training and Doctrine Command. *Training and Doctrine Command Pamphlet 525-5 Force XXI Operations*. Fort Monroe, VA: U.S. Department of the Army Government, 1 August 1994.

Van Creveld, Martin. *Command in War*. Cambridge: Harvard University Press, 1985.

U.S. Army Command and General Staff College. *FM 3-0 Operations*. U.S. Army Command and General Staff College, Leavenworth, KS. 2001.

U.S. Department of the Army FM 71-100-5 EXFOR Division Operations Tactics, Techniques, and Procedures, TRADOC, 1998.

U.S. Department of the Army. *Army Digitization Master Plan (ADMP)*. Washington D.C.: GPO, 2000. http://www.ado.army.mil/Br&doc/docs/ADMP.htm.

U.S. General Accounting Office "Battlefield Automation: Performance Uncertainties are Likely When Army Fields its First Digitized Division" United States General Accounting Office, Washington, D.C. 20548, 27 July 1999.

Wishart, LTG Leonard P. III, "Leader Development and Command and Control," *Military Review* no.1, January-February 1997, 62-65.

Wiskoff, Martin F., and Glenn F. Rampton, eds. *Military Personnel Measurement: Testing, Assignment, and Evaluation*. New York: Prager Publishing, 1989.

Yoder, Keith R., and Robert J. Rice. "21st Century Coup d'Oeil: Developing Commanders for Force XXI." *Field Artillery*, June 1995, 8-11.

Zook, Lola M. *Soldier Selection: Past, Present, and Future*. Alexandria, VA: United States Army Research Institute for the Behavioral and Social Sciences, 1996.