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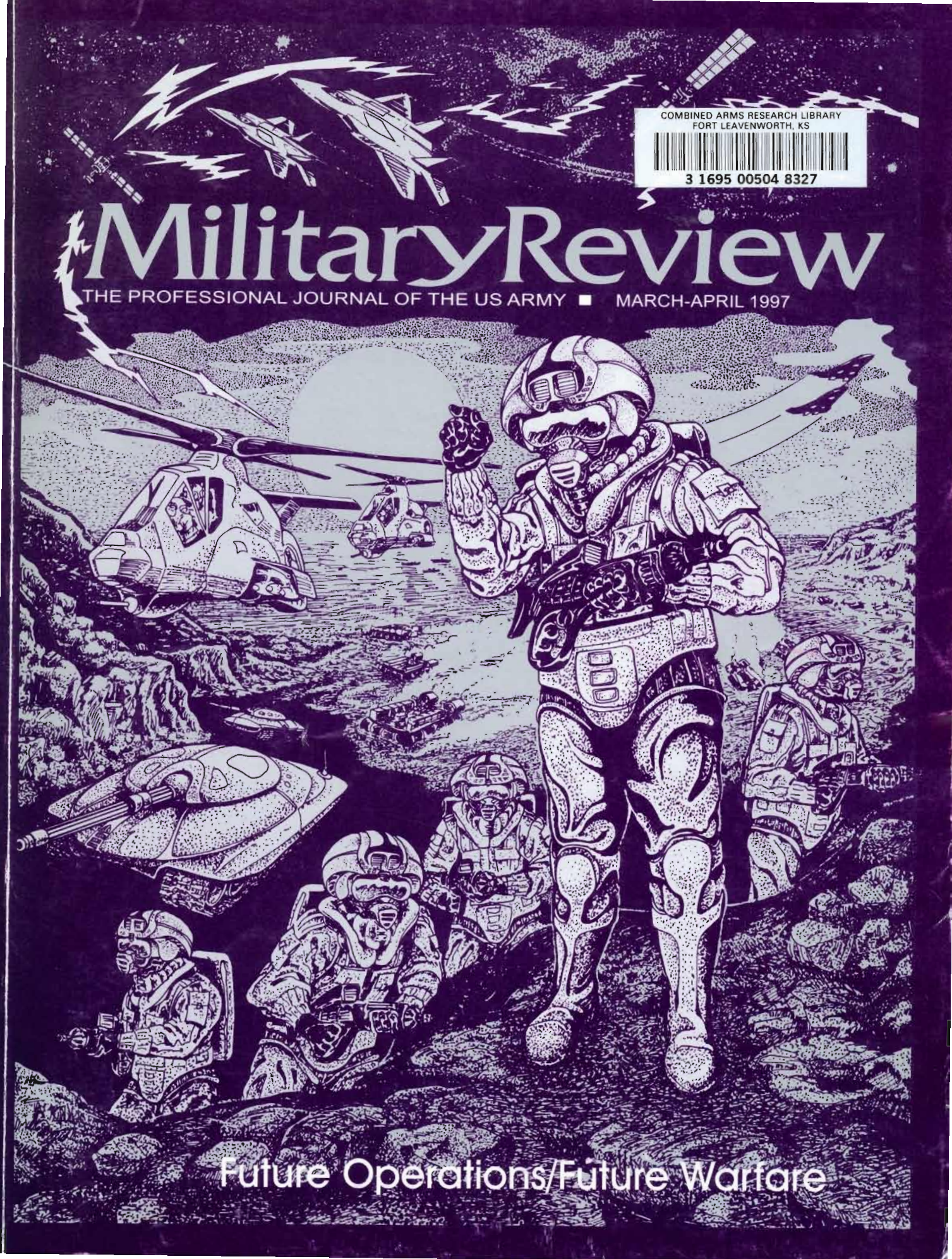

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Military Review's **Mission** is to provide a forum for the open exchange of ideas on military affairs; to focus on concepts, doctrine and warfighting at the tactical and operational levels of war; and to support the education, training, doctrine development and integration missions of the Combined Arms Center and Command and General Staff College.

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CONTENTS

Military Review, March-April 1997

From the Editor

Appearances are deceiving. While our Army continues to bear arms in Bosnia and elsewhere, keeping the peace through the physical presence of determined soldiers wearing camouflage, helmets and body armor, an "outline" of a new Army is emerging in offices, laboratories and training areas. The way the new force will be organized, trained, equipped and utilized will be as different from today's force as Patton's armored divisions were from Pershing's American Expeditionary Forces.

In this issue of Military Review, we continue our investigation into the military impact of "informatic" technology and the vast amounts of data that flow through it. Articles in our lead section, "Future Operations," explore the commander's integration of information operations into his tool kit of instruments of force and influence and examine the resulting risks and advantages.
In our "Future Warfare" section, authors provide diverse insights into using
more forward thinking to prepare for crises, develop new combat techniques and deploy hybrid systems and organizations.

We continue to receive numerous submissions to Military Review, and we thank you for your support. Due to resource challenges, we have been publishing bimonthly, rather than monthly, since January 1995. Because this means less space, we receive more good articles than we can print. Delays in publication of articles may occur as we design issues around specific themes. However, we plan to publish some articles directly on the Internet, in addition
to publishing the electronic version of the paper edition. Stay tuned to our web site at www-cgsc.army.mil for other innovations. We also are considering publishing articles sent to the English Military Review in our Spanish Hispano-American edition and our Portuguese Brazilian edition. We respectfully ask authors to limit articles to 2,500 to 3,000 words so we can include more ideas and discussion in each issue. Lengthy submissions will normally be returned to authors for revision.

One last note to prospective writers-we want to reduce flash-to-bang time. Because our authors are operators with writing only a secondary proclivity, we tend to publish provocative, interesting and professionally useful "I was there" manuscripts one to four years after the event. In other words, the Implemen- tation Force veterans now returning from Bosnia will be writing about their experiences from 1998 through 2002, perhaps as they rotate through the US Army Command and General Staff College and have the requirement and time to put fingers to computer keyboards. However, we and our readers are interested in these experiences right now. We have an immediate need to share the impressions of those who have been at the point of the spear and to assist our readers in learning the lessons of the "experienced." So, sound off!

GLH

Military Review, March-April 1997

Letters

One Generation Speaking to Another

I was thrilled to read that Military Review would celebrate its 75th Anniversary in February 1997. I remember the 50th Anniversary quite well, especially giving Colonel Forrest R. Blackburn a hand with his excellent historical article, which appeared in the February 1972 issue. One task I volunteered for was to write as many former editors in chief as I could locate for reminiscences which might be included in that edition.

The one I remember best is that from retired Major General Charles A. Willoughby, the first person to bear the title Military Review editor in chief (July 1932 to May 1934). If that file of responses is still in the Military Review archives, it might be interesting for the editorial staff to view again. Incidentally, we ran an obituary article about Willoughby on Cover 3 of the December 1972 issue. We were fortunate to get his recollections before he died.

I was an Army "brat" whose father was a student at the then Command and General Staff School during the 1939 to 1940 school year. I have fond memories of some of those mentioned in the article. Babs Benitez, Colonel Enrique M. Benitez' daughter, and I were seniors at Immaculata High School and rode together in several horseshows which were real social highlights in those days. Lieutenant Colonel Paul R. Davison, Military Review editor in chief from September 1937 to March 1939, was one of the most "gentlemanly" gentlemen I was ever privileged to know.

Additionally, Colonel Donald J. Delaney, Military Review editor in chief from October 1964 to February 1972, can surely regale you with many tales. So too, retired secretary Eleanor Tate is a wellspring of good stories if you can get her to talk. Needless to say, I am looking forward with great pleasure to seeing the 75th Anniversary edition.

Under today's utilitarian charter, is it possible to include in Military Review a bit more on the history and traditions of the US Army? At times we seem to have an Army without a soul-at least as it appears in its journals. It might also add interest and breadth to include a bit more on what the military forces of other nations are thinking and doing. Perhaps these are the observations of an outdated traditionalist, but I do believe that at least some of the "greats" would agree. Best wishes.

Colonel Orville Wells Martin Jr., USA, Retired, Military Review editor in chief, March 1972 to May 1974, Madison, Wisconsin

Editor's Note: Colonel Martin, thanks very much for your kind and thoughtful letter. When I found out that I would be the editor in chief for the 75th Anniversary issue, I felt it to be an exceptional honor. I have also worked rather hard over the past year to try and ensure a quality product, the same as I have described for you and other readers in my editorials. Although it is probably a little too late to take advantage of some of your useful suggestions and I am not sure we have all the archive material to which you refer, I would offer you the following. I had entertained the idea of inviting all former editorial staff members back for an open house timed to coincide with the 75th Anniversary. Alas, my departure in October 1996 for Washington, D.C., to serve as the Department of Defense (DOD) director for Defense Information, has precluded my issuing those invitations. My children also attend Immaculata High School, and your comments about the school and the atmosphere

for children growing up in Leavenworth still ring true.

Finally, your comment about history and traditions in the Army brings two things to mind. First, we published an article detailing Military Review's 75-year history in the November-December 1996 issue. Second, we published an article titled "Values and the American Soldier" by former Secretary of the Army John O. Marsh Jr. in the 75th edition. When I first read it as a young major, I did not have a clue as to what it was Marsh was driving at. As a colonel with some time in grade, I now have an appreciation for what he was after. I believe it and a number of similar articles will address your comments. Thank you again for your letter. I wish I had received more like yours during my tenure, but I guess when things go right no one is interested in registering concern.

Colonel Richard M. Bridges, USA, Military Review editor in chief, August 1995 to October 1996, DOD Defense Information, Washington, D.C.

The Forgotten Soldier Revisited

I recently established contact with Guy Sajer, the author of the well-known autobiography The Forgotten Soldier, a military literature classic that describes the author's experiences fighting for Germany against the Soviet Union during World War II. With regard to a previous letter to the editor by Lieutenant Colonel Edwin L. Kennedy, published in your March-April 1996 issue--"Military Professionals do not Use Fiction as Fact"--I would like to set the record straight.

After 18 months of research, I was able to locate Sajer. He lives in a rural village approximately 50 miles east of Paris under his nom de plume. Although not his real last name (Guy is his real first name), Sajer is his mother's maiden name. She was born in Gotha, Germany. He enlisted in the German Wehrmacht in 1942 under a German name to avoid the ridicule he would have received had he used his real French last name. To verify his book's authenticity, I asked Sajer a series of questions that had been raised by Kennedy in a Spring 1992 Army History article titled "The Forgotten Soldier: Fiction or Fact?"

Sajer quickly responded to my query. Although he admitted that minor details such as uniform insignia, weapons nomenclatures and other such things were not important to him, he stands by what he wrote 30 years ago. He insists that he did not set out to write the definitive history of World War II, only what he had personally experienced while fighting in the elite Grossdeutschland division on the Russian Front. He admitted that he could have erred in describing locations and chronology, but that he wrote things as he remembered them. In his letter to me, he stated that "In the darkness of a night in Russia, you could have told me that we were in China, and I would have believed you." Further details on Sajer's wartime and postwar experiences are described in an upcoming article I wrote for Army History, scheduled for publication in their Fall 1997 issue.

Kennedy's own key witness, former Grossdeutschland Division historian and reconnaissance squadron commander Major (Ret.) Helmuth Spaeter, who claimed that The Forgotten Soldier was fictional, has now changed his thinking. After reading several letters from Sajer, Spaeter admitted in a letter to me that he now believes that Sajer could have been a member of that famous division after all. Spaeter wrote about his new-found admiration for Guy Sajer and planned to reread his own German copy of the book, titled Denn diese Tage Quall war gross: Erinnerung eines vergessenen Soldaten (These Days Were Full of Great Suffering--Memories of a Forgotten Soldier, (Munich: Verlag Fritz Molden, 1969) in order to examine it from a more unbiased point of view.

Hopefully, Sajer's efforts to clear his name will reestablish the prominence his book has earned on many

a soldier's bookshelf. Readers can rest assured that when they pick up a copy of The Forgotten Soldier, they will be reading one of the best and most realistic books ever written from an infantryman's perspective, regardless of which side he fought for in World War II.

Lieutenant Colonel Douglas E. Nash, USA, US Special Operations Command, MacDill AFB, Florida

Making Room at the Table

Editor's Note: In response to our September-October 1996 "Stability and Support Operations" edition, Lieutenant Commander John C. Olsen builds on several important issues raised by Colonel Guy C. Swan III in his article "Bridging the Nongovernmental Organization-Military Gap."

Bangladesh, Somalia, Rwanda, Haiti, Bosnia and Zaire . . . each conjures up a memory of mass human suffering, incomprehensible political battles and worldwide pleas for humanitarian assistance (HA) and medical care. On the surface, each crisis, while taking enormous human tolls, eventually highlighted the willingness and ability of each relief organization-civilian and military-to cooperate and relieve human suffering. Sadly, willingness and cooperation are all that exist.

In the US Armed Forces Medical Corps, our lack of training, planning and rehearsed relations with worldwide relief organizations prevents a coordinated, swift and successful rescue operation in times of humanitarian crisis. To complicate matters, US military doctrine provides little guidance and ambivalent objectives for HA and disaster relief operations (DROs) and complex humanitarian emergencies (CHEs), allowing news coverage and public opinion to determine our level of commitment. Can we deny that it was the New York Times and other media chronicling the efforts by relief organizations which drew our eyes toward Somalia, and demanded our presence in Bosnia?

While the decision to enter or remain in-country will always be a political one, our strategies and the effectiveness of implementation are our own. But we need not reinvent this wheel each time. History clearly shows the value of coordinated military war planning, beginning with the Prussian general staff system in the mid 1800s. I submit that the experience of nongovernment organizations (NGOs) assigned to international war, famine and DROs in this decade provides us with ample guidance toward a coordinated effort.

The recent CHE in Zaire illustrates a recurring and uncomfortable dilemma for the US military. For the sixth time in as many years, our leadership found itself reinventing tenuous, ad hoc working relationships with charitable relief organizations, the UN and multinational peacekeeping (PK) forces. The forced and unrehearsed relationships created difficulties in coordinating the international relief efforts. Long a supreme fighting force, the US military is confounded by CHEs, which, sadly, are more common today than ever.

The first step is to invite civilian, UN and foreign PK leaders into the military decision-making and planning process that surrounds CHEs, HA and DROs. We must "make room at the table" for our experienced and knowledgeable civilian peers. They have walked this path before and can provide a unique perspective as we begin to define the military doctrine to guide a unified DOD approach. By developing an interagency humanitarian core group, we will begin to institutionalize a cohesive and efficient approach to relief planning.

The present political-military planning methods exclude the very organizations that can provide reliable

and important information about the geopolitical environment and the timing and logistic issues surrounding humanitarian relief. While military intelligence-gathering methods must remain secure, without sharing the data with NGOs and requesting their input, we fail to completely address the political, diplomatic, economic and humanitarian issues that can confound a long-term solution to military involvement in CHEs. Unless this is done, we will have nothing better than a confusing and uncoordinated set of crisis-driven policies that reflect only a few military leaders' ethical judgments.

It is understandable that military leaders are reluctant to become integrally involved with cash-starved relief organizations. The potential for abuse of the military's resources and its worldwide logistic reach is real. But where better to impress this point upon the NGOs than at the negotiating table?

The potential for great success is also real. The military will benefit from the sociological and geographical understanding that each NGO possesses about remote areas of the world and their peoples. And, once a cooperative and coordinated planning system is devised, we will forever avoid unnecessary duplication of service, supplies and personnel.

The Office of Foreign Disaster Assistance's concept of a "humanitarian adviser" and the development of international fellowships prioritizing military and civilian disaster training are both good ideas that may produce future leaders who are sensitive to these complex international relationships. Further development of information systems that establish voice and data standards compatible with the Global Command and Control System will be of great value to the US military and medical planners in future coordinated efforts with NGOs.

Finally, it is important to introduce the HA concept to students of military doctrine. In the earliest stages of our future leaders' education, they should be asked to address the ethical issues of PK missions. The site of a refugee camp is no place or time for a military officer to first confront a CHE ethical dilemma. The students at intermediate and top-level military schools must be able to conceptualize nontraditional answers to such scenarios, to vet their emotions, to effectively consider all available resources and to carry out a mission that perpetuates our nation's democratic ideals.

Changing ideologies and the ceaseless rattle of machinegun fire are only a few of the reasons for humanitarian relief operations. They will not go away. The issues we must face are difficult to understand-sometimes difficult to stomach. But who better to sit at the table than the most experienced, well-equipped and well-meaning civilian and military leaders of our time? A planned and proactive approach to HA, DROs and CHEs by this esteemed group would be visionary, and it would reaffirm this nation's commitment to the value of human life and the dignity of all human beings.

LCDR John C. Olsen, USN, Office of the Assistant Secretary of Defense forStrategy and Requirements, Office of Humanitarian Assistance, Washington, D.C.

Military Review, March-April 1997

Information Operations for the Ground Commander

by Major General David L. Grange, US Army, and Colonel James A. Kelley, US Army

"OPERATIONS in the 21st century will be heavily based on knowledge derived from relevant information and intelligence [RII] collected, processed, analyzed and disseminated over a complex global system of systems. This evolving military information environment [MIE] will fundamentally change the way we, the Army, conduct operations in peace and in conflict. . . . The Army will integrate information operations [IO] into every aspect of Army XXI."1 With this statement, Army Chief of Staff General Dennis J. Reimer charged commanders at all levels with being trained and ready to execute IO. IO is essential for the Army's wide range of ongoing missions, including support to the nation, peacetime engagement, conflict prevention and, certainly, defeating an adversary in combat.

While they should use the advantages IO gives them, commanders also should recognize that the Army's reliance on information technologies creates new vulnerabilities and asymmetrical courses of action advantageous to an adversary. The information superiority concept relies on information's availability. Thus, we must protect our information and information systems (INFOSYS). IO is evolving into a "total mind-set that adapts the means to achieve knowledge-based military [as well as diplomatic and economic] superiority over an adversary. . ."2 These IO concepts lead to new ways of thinking about warfare, new responsibilities and even new relationships for commanders to address. This article outlines IO's development in the Army and describes our new operating environment and how we are incorporating IO throughout the force. Some concepts for integrating IO into plans and contingencies are also offered.

Warfare's Changing Face

The challenges the Army faces are as dynamic as the world we live in. The rapid changes brought about by the computer chip and telecommunication advances have profoundly affected our environment. The world has become interconnected and interactive. The global information environment (GIE) evolves daily, as depicted in Figure 1. In conjunction with advances in science and computing power, the GIE brings tremendous benefits to humanity in fields such as medicine, education and manufacturing. This environment has great promise but also has new challenges, vulnerabilities and threats. There are no political or spatial boundaries, making what constitutes "acts of war" ambiguous.

Our nation's entire infrastructure-finance, energy, education, transportation, telecommunications, defense and most aspects of society-are linked together and interdependent. Even the Department of Defense relies on commercial telecommunication networks for more than 95 percent of its information traffic.3 These massive commercial networks are susceptible to attack and exploitation. This makes the United States, as the premier technologically dependent country in the world, more susceptible than anyone else to adversarial actions. Even for a poor adversary, IO offers a disproportionately high return for any investment.

Figure 1. Information Environments

Technological advances have not made for a safer, more secure world. The alarming increase in regional conflicts has heightened tensions and made the world more complex and unstable. Additionally, the fanaticism of some sects continues to cause worldwide destabilization. Terrorism is more sophisticated and could involve weapons of mass destruction and attacks on our computer networks and systems that control our power grids, air traffic and other critical infrastructures. The state-sponsored, transnational terrorist hacker is here and can hide in a mesh of interconnected systems. Even an unsophisticated opponent with very little money can obtain, or even hire, a wide range of capabilities from around the world. Technology such as the Global Positioning System (GPS), satellite surveillance, fiber-optic communications, direct broadcast systems, Internet access, cryptography, sensors and precision weapons are all commercially available.4 Adding to our security concerns is the GIE's open-source nature and our reliance on it. Potential foes may gain access to our sensitive data and use the GIE to attack us.

In this world of global communications, satellites, overhead imagery and CNN, individuals worldwide receive near-instantaneous information. This information and news coverage affect national and world opinion, shape the actions of our decision makers and have caused a merging of the tactical, operational and strategic levels of war. "Advances in technology, information age media reporting and the compression of time-space relationships contribute to the growing interrelationship between the levels of war. The levels of war help commanders visualize a logical flow of operations, allocate resources and assign tasks to the appropriate command. However, commanders at every level must be aware that in a world of immediate communications, any single event may cut across the three levels."5 Today's media coverage raises our sensitivity to both friendly and enemy casualties. The operation to capture Somali warlord Mohammed Farah Aideed on 3 October 1993 is a clear example of the merging of the three levels of warfare. The graphic television coverage of a US soldier's body being dragged through the streets of Mogadishu caused an almost immediate national policy shift. Here was an operational mission, conducted in a tactical framework, with strategic ramifications.

Technology and Information Dominance

Capitalizing on technological innovations, the Army is now an information-based fighting force. Information technologies can potentially give the commander a clear understanding of his current state in relation to an adversary and the environment. By deliberately and systematically processing large volumes of raw data, we obtain information that, when synthesized into a coherent whole, promotes understanding. This is the key to information dominance, a degree of information superiority allowing commanders to use INFOSYS and capabilities to achieve the operational advantage in combat or to control the situation in operations other than war (OOTW).6

IO's ultimate goal is to enable unit commanders to achieve information dominance while denying those same capabilities to an adversary. Commanders attain this dominance when their understanding of their

own situation, their environment and their potential adversary gives them a distinct advantage. Efforts to digitize the Army will support this process through enhanced situational awareness and battlefield visualization which will profoundly affect battle command and overall operations conduct.

We have taken advantage of INFOSYS advances to increase our command and control (C2) capabilities and weapons effectiveness. The technological advantage we enjoy has improved our ability to project the force and support it through split-based operations. Through concepts such as `just in time logistics`, `remoted collection` and `total asset visibility`, we will make the force more efficient and sustainable. All these efforts, exemplified by the Army's Force XXI initiative, rely heavily on our ability to capitalize on a host of new INFOSYS. However, Army systems are threatened by the same vulnerabilities civilian systems experience once an organization becomes totally dependent on technology. Army vulnerabilities are further exacerbated by our connectivity and reliance on the civilian infrastructure.

IO Doctrine

The new US Army Field Manual (FM) 100-6, `Information Operations`, outlines the fundamentals associated with the conduct of warfare and OOTW in the information age. IO consists of "continuous military operations within the MIE that enable, enhance and protect the friendly force's ability to collect, process and act on information to achieve an advantage across the full range of military operations; IO includes interacting with the GIE and exploiting or denying an adversary's information and decision capabilities."7

Army units conduct IO across the full range of military operations, from garrison activities, through deployment, to combat and redeployment. No unit is exempt, whether stationed in the Continental United States, forward-based or deployed to a contingency operation.

IO comprises three components-operations, INFOSYS, and RII-depicted in Figure 2.

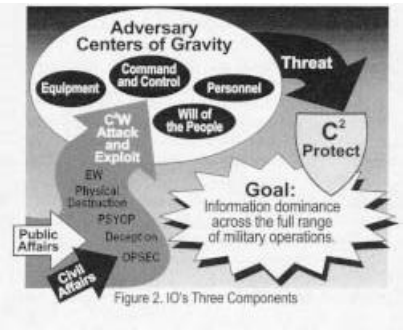

Figure 2. IO's Three Components

`Operations.` The `operations` dimension of IO is composed of all measures, both offensive (C2-attack) and defensive (C2-protect), used to achieve information dominance. On the battlefield, these actions are called command and control warfare (C2W). Commanders synchronize electronic warfare (EW) elements, battlefield deception, operations security (OPSEC), psychological operations (PSYOP) and, if necessary, physical destruction, and focus them against an adversary's C2 systems, personnel and equipment and the will and support of the adversarial populace. At the same time, commanders must protect their C2 systems from enemy attack or exploitation.

During operations conduct, public affairs (PA) and civil affairs (CA) have direct impact on IO. A coordinated IO plan that incorporates PA and CA is critical for building legitimacy for host nation, coalition, US and world support--especially in OOTW. PA must be integrated with IO to present accurate, balanced and credible information.8 CA activities are important because they interface with key organizations and individuals in the information environment.9 Finally, legal advisers analyze international and domestic law and help formulate appropriate IO rules of engagement (ROE) to guide operational conduct.

`INFOSYS.` In today's information environment, commanders require reliable and robust INFOSYS to

collect, process and disseminate enormous volumes of data in near real time throughout the globe. IO includes all INFOSYS that gather, produce, process and disseminate information. A dynamic INFOSYS structure is essential for commanders to gain situational awareness and battlefield visualization. These INFOSYS affect the way we conduct battle command. Our battlefield view is enhanced through digitization. Both friendly and adversary signatures can be located and displayed to commanders, giving them continuous updates on the current situation. We are developing sensor-to-shooter systems that use the infrared or millimeter wave portions of the electromagnetic spectrum to `see`, and `hear` with their acoustic sensors, `feel` seismic energy, `interpret` collected information, `decide` if they are sensing a target based on pre-established criteria and `engage` using high-speed miniature computers.10

We are developing battlefield situational awareness to an unprecedented degree. Through advanced INFOSYS and IO, commanders will be able to better manage the uncertainty of war. "In future joint land operations, force coherence and thus, application of combat power can be achieved through shared knowledge of battlefield conditions [instead of] traditional physical control means, such as graphic control measures or geographical demarcation of areas of operations."11 Future INFOSYS will have both classified stand-alone military and unclassified civilian components. The security of such systems is of paramount importance to successful IO. IO is predicated on the right person receiving the right information in the right place at the right time.

`RII.` Given advances in technology, however, it is easy to become awash in data. A critical IO aspect is obtaining RII that enables commanders to focus their efforts. This is key to attaining situational awareness. One Force XXI objective is to use shared information to achieve a common view of the battlefield at all levels and in real time. Obtaining this information is not solely an intelligence responsibility. To achieve this high level of fidelity, commanders must assist in these efforts by using all available assets and sources in developing RII.

The key to IO conduct is precise and timely intelligence preparation of the battlefield (IPB). Templating for IO must go far beyond the 3-D sphere of the battlefield and should include information on technology capabilities, availability and vulnerabilities. Additionally, in an interconnected world, we must consider the impact our actions may have on friendly and neutral systems. A commander's critical information requirements (CCIR) for IO, therefore, far exceed past requirements. CCIR will ask questions such as:

- How do an adversary's INFOSYS function, and what are their vulnerabilities?
- How does his decision cycle work?
- What are his critical nodes?
- What are his sources of authority and legitimacy?
- How does his society function?
- What are his capabilities to attack friendly systems?

As requirements change, so too must intelligence personnel. They must now process intelligence from nontraditional sources, such as the Internet and other GIE. Coordinating IO's three components will generate a fully integrated effort enabling us to achieve information dominance and operational advantage. These are integrated concepts and enhanced ways to approach conflict and warfighting in the information age.

IO Potential

IO is constantly conducted to deter aggression, reassure allies or compel an adversary-all in support of our nation's interests. If conducted early enough and successfully, IO could prevent conflicts, reduce

casualties or quickly stabilize conditions. For commanders, IO is a combat multiplier. Knowing where, when and how to strike a decisive blow against an adversary, while denying him that same capability, gives us a phenomenal advantage. Through IO, we can mass capabilities' effects quickly and efficiently.

In OOTW, we apply IO to control the situation. In Operation Joint Endeavor in Bosnia, IO was conducted 24 hours a day. Through IO, the Implementation Force (IFOR) always knew where the rival factions were and what they were doing. This enabled IFOR to control the situation on its own terms. Constant interaction with the media and the message of hope sent to the populace via PSYOP and CA were key ingredients for success in Bosnia. IFOR's IO efforts prevented conflict throughout the region.

IO targets also emphasize new ways of thinking about attacking and defending centers of gravity (COGs). An adversary's COG can be attacked using IO's nonlethal capabilities to undermine the adversary's legitimacy or actions. The end result could be either to prevent a conflict from escalating or to contribute to a decisive friendly victory.

As a nation's government, society and military become inextricably linked by their dependence on various information infrastructures, new vulnerabilities arise. IO's focus is on nodal analysis of friendly and adversary key vulnerabilities. IO can target things such as adversary leadership, decision making and C2 and gives us the potential to control the adversary's decision-process tempo and even cause it to collapse. The attack capabilities derived from IO and computer chip power provide engagement options beyond physical destruction by kinetic energy weapons. At the same time, IO's defensive aspects are equally critical for protecting our own vulnerabilities and COG.

C2W capabilities, such as PSYOP, EW, OPSEC, deception and physical destruction, are being technologically enhanced and will be key factors in executing an IO campaign. Their combined use, in conjunction with advanced intelligence, surveillance and reconnaissance capabilities, gives the commander tools for a genuine perception-management campaign so he can attempt to influence the adversary's emotions, motives and objective reasoning.12 If successful, this IO campaign could affect an adversary's leadership or population support so much as to forestall conflict and allow us to achieve our goals without placing US soldiers in danger.

However, should combat occur, successful IO will greatly reduce the casualty rate because we will have more information than the adversary and can control the conflict tempo. These factors increase IO's viability and importance in defending and furthering US interests around the globe.

Today, regional commanders in chief (CINCs) develop various flexible deterrent options (FDOs) to use to reduce tensions and deter aggression before hostilities break out. These methods include economic sanctions, blockades or a military show of force. With IO, CINCs can develop expanded FDOs beyond these more traditional methods. Given GIE proliferation, IO techniques could become the "FDOs of first choice" in a crisis. Exploiting adversary infrastructure vulnerabilities and affecting an adversary's decision-making process are among the possible FDOs that could help resolve a crisis before it becomes armed conflict. Such actions require close coordination and, most likely, interagency approval. In this way, IO will become an integral component of our power-projection capabilities.

Closely coordinated and synchronized PA activities have become vital in this environment. Accurate and timely PA-where commanders are viewed as doing everything in their power to present the truth-are critical to IO's conduct and will help deter aggression, reassure and support our allies and compel those who fight us to accede to our will.

Defining how we fight will depend, in part, on new ROE. ROE for IO are a significant challenge.

Through the connectivity of the GIE and shared use of information platforms, we must carefully analyze how we target an adversary's INFOSYS, because what we do might have an impact on neutral third parties. Another ROE predicament could occur if we decide to neutralize a power grid that controls the adversary's hospitals or air traffic control systems. The all-pervasive nature of INFOSYS will continue to drive the development, refinement and debate about IO ROE in both peace and war.

Organizing to Conduct Army IO

To focus the Army's efforts on this critical aspect of warfighting, Reimer stated in a September 1996 message that his intent is to institutionalize IO as vital to the way the Army conducts operations.13 To make this intent a reality, several organizations are responsible for integrating IO into the Army.

Headquarters Department of the Army (HQDA) IO triad. HQDA has established an IO triad consisting of the offices of the deputy chief of staff for operations and plans (DCSOPS), deputy chief of staff for intelligence (DCSINT) and director of Information Systems for Command, Control, Communications and Computers (DISC4). The triad receives direction from the secretary of the Army and Army chief of staff and ensures unity of effort among IO's three components. Within the triad, DCSOPS is the overall IO focal point.

US Army Training and Doctrine Command (TRADOC). The Combined Arms Center (CAC) commander at Fort Leavenworth, Kansas, is TRADOC's IO proponent. CAC is responsible for developing IO doctrine (FM 100-6), training, leader development, organizations, materiel and soldier-focused issues. Now that FM 100-6 has been published, CAC's next task is to develop IO tactics, techniques and procedures (TTPs). The forthcoming IO TTP manual will describe how to plan and execute IO at corps and division levels. CAC is also incorporating IO into various school curricula and exercises, including the Battle Command Training Program (BCTP) for divisions and corps and Exercise PRAIRIE WARRIOR for Command and General Staff College students.

Land Information Warfare Activity (LIWA). Located at Fort Belvoir, Virginia, LIWA is a critical organization for implementing IO in the Army. LIWA assigns field support teams (FSTs) to augment field commanders' staffs and provide IO technical expertise their staffs do not have. The teams coordinate, plan and synchronize the various IO elements to facilitate execution during military operations. The FSTs advise commanders on IO C2-attack and C2-protect. A team assisted US Army, Europe, in developing the C2-protect plan for Operation Joint Endeavor and continued to support the IFOR. LIWA FSTs also work with Army component headquarters during major exercises and real-world contingencies.

LIWA's newest mission is establishing the Army's Computer Emergency Response Team (ACERT). ACERT is developing the capability to respond to intrusions or attacks on either secure or nonsecure networks. Following such incidents, the team will identify the problem, establish control, repair system damage and coordinate for counterintelligence or law enforcement support.

IO Training Needs

Developing leaders and soldiers with the requisite skills to conduct future IO will take time and resources. The Army now has soldiers trained in various IO disciplines, including CA, PSYOP and EW, but few have any background or training in IO's broad concepts. Everyone can start to become proficient in several aspects of IO, such as C2-protect. System managers and users need immediate training in the basics of system and network security. The Army is developing the necessary courses. However, this

training can be leveraged right now from a variety of other sources. Even without formal training, individual computer users-every soldier in the Army's digitized force-can help win the information war. Simple things such as protecting passwords, using a virus check before downloading files and not leaving unattended computers turned on will dramatically increase security. IO should be integrated into exercises at the unit level and at our Combat Training Centers.

IO Command Responsibilities

Commanders can begin incorporating IO by requiring their staffs to become familiar with FM 100-6. Commanders should also ask two questions: Does a corps, division or task force (TF)-size unit need an ad hoc IO cell? How does the unit integrate IO into contingency plans and exercises?

IO cell. A proposed IO cell is depicted in Figure 3. One member is the IO/C2W officer. No such position or specialty exists today, but the requirement is there. This individual will need a basic understanding of all aspects of IO and C2W but, more important, should be able to synchronize IO to support the commander's overall plan and intent. Thought also should be given to requesting an FST from the LIWA to assist in IO planning and coordination.

IO contingencies. Because IO is applicable in both peace and war, the following examples show how commanders might integrate IO into contingency plans and operations. These examples are basic, but the challenge to commanders comes in the orchestration and synchronization of IO's myriad components.

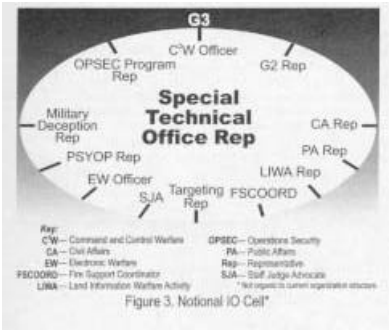

Figure 3. Notional IO Cell*

- Corps Deployment to Middle East: Compel Mission-In conjunction with other joint and coalition forces in the area, an in-depth C2W plan is developed to isolate and undermine adversary leadership. Capitalizing on national-level assets, interagency coordination is conducted to ensure an integrated plan. Nodal analysis of adversary infrastructures is completed along with profiles of adversary leadership personalities. A perception management campaign is waged to break down any coalitions the adversary might have with neighboring states. This campaign also targets population support for the adversary's government. At the same time, a strong PA operation is conducted to solidify domestic support behind our actions. Vulnerability assessments identify our own systems' shortcomings so we can protect our C2. There is a heightened awareness of security for the CONUS- and overseas-based infrastructure that supports our deployment. All actions are synchronized to allow for swift, unopposed entry to stabilize the area and reduce the risk to US soldiers.
- Division Deploys to Eastern Europe: Peace Enforcement (PE) Mission-As part of a NATO mission, a division-size unit establishes an IO cell under the division G3 (Operations). The IO cell focuses on ensuring IO support for the overall legitimacy of US involvement in the mission and for stability in the region. This cell receives input from a variety of elements, including special forces, counterintelligence (CI) and other intelligence assets in-country, then uses this information to coordinate all PA and CA efforts in the area of operations. Additionally, the cell staff ensures the PSYOP themes and "message" developed for the operation are integrated throughout its plans. The PSYOP message must be resilient to promote a more lasting peace and regional stabilization. The commander establishes CCIR that focus on the warring factions and friendly force protection. The IO cell develops a C2-protect plan based on a risk analysis of various systems and networks. To ensure PE mission success, the IO cell must constantly consider how to establish the legitimacy for US force involvement.

- Brigade TF Deploys to Africa: Humanitarian Assistance-A brigade TF, under UN charter, deploys to help conduct relief operations and protect lines of supply going to refugees. The IO objective is not only to assist in relief efforts but also to present the positive role US forces play in the operation. The TF commander requests an FST from the LIWA to help coordinate an overall IO plan. The FST works with the intelligence community to identify specifics about the local culture and people who will help develop a viable IO plan. Close coordination with nongovernment organizations, coalition partners and warring factions is essential to mission success. Planners must consider integrating these groups as a part of the IO cell. Determining how to best establish liaison with them in an area with little or no internal communications is critical. The commander analyzes the best way to get life-saving information to the refugees and ensures solid PA and CA operations take place.

These examples only scratch the surface in discussing IO. IO requires intense, detailed analysis, planning and coordination. However, the examples do point out some considerations commanders must weigh to optimize IO capabilities and missions.

Implications for IO

IO alone is not some type of "silver bullet" for winning future conflicts, but as Chairman of the Joint Chiefs of Staff General John Shalikashvili stated: "The explosive proliferation of information-based technology significantly impacts warfighting across all phases, the range of military operations, and all levels of war."14 Thus, IO's importance cannot be overstated. For commanders, IO provides an opportunity to possess a level of knowledge and understanding of battle command never before experienced.

In an interconnected world, based on and run by INFOSYS, the need to protect our infrastructure and citizens will be a formidable challenge. However, this is also a world we can exploit for our own interests. In these times, IO's successful conduct will be critical to victory for our Army and the future security and strength of our nation. ***MR***

NOTES

l. Chief of Staff Army message to the field, SUBJECT: "Information Operations (IO) Intent and Strategy-Reimer Sends" (Washington, DC: Headquarters, Department of the Army, 3 September 1996).

2. US Army Training and Doctrine Command (TRADOC) Pamphlet (Pam) `525-69`, `Concept for Information Operations` (Washington, DC: US Government Printing Office [GPO], August 1992), 8. This document describes the foundation for information operations today and in the future.

3. This is taken from an analysis done by the Defense Information Systems Agency, 1996.

4. Institute for National and Strategic Studies, "Information Technology and National Security, 2014: Technical Section," project for the Vice Chairman of the Joint Chiefs of Staff (Fort McNair, VA: National Defense University, 1994), 9.

5. David Jablonsky, "US Military Doctrine and the Revolution in Military Affairs," `Parameters` (Autumn 1994, abstract from Joint Pub 3-0, `Doctrine for Joint Operations` [Washington, DC: GPO, 1 February 1996], II-2), 24.

6. Ibid., 1-9.

7. US Army Field Manual (FM) 100-6, Information Operations (Washington, DC: GPO, 1996), 2-3.

8. Ibid, 3-13.

9. Ibid, 3-10.

10. "Information Technology and National Security 2014: Technical Section," 1.

11. TRADOC Pam 525-69, 9.

12. Joint Pub 1-02, Department of Defense Dictionary of Military and Associated Terms (Washington, DC: GPO, March 1994), 287.

13. CSA message.

14. The Joint Staff, Information Assurance Division (J6K) and Information Warfare-Special Technical Operations Division (J38) Pam, Information Warfare-A Strategy for Peace . . . The Decisive Edge in War (Washington, DC: GPO, 1996), foreword "From the Commander."

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Military Review, March-April 1997

Third US Army: Preparing for the Future

by Lieutenant General Steven L. Arnold, US Army

OPERATION *Desert Storm* came to a halt, everyone within LUCKY MAIN, the Third Army/US Army Forces Central Command (ARCENT) tactical operations center, felt a great sense of elation, relief and pride. Our victory was quick and casualties were light. As the Third Army operations officer, I was proud of everyone's contribution to the ground offensive's planning and synchronization. However, I was the first to recognize that thanks to their unparalleled professionalism, our divisions, corps and support troops would have made any plan a success. The Gulf War victory belonged to America's Armed Forces at all levels-soldier to general. Like other Army professionals, my thoughts turned inward after the war to ponder what happened and why and how we could make improvements. Many areas were identified for change-some that would be quick; others that would be complex, resource-intensive and long term. Among the long-term complex issues needing attention, the following were obvious:

- It took us too long to deploy our forces.
- More joint and combined command and control (C2) training was needed.
- Active Component (AC) and Reserve Component (RC) integration was too slow and must be improved.

After returning to Third Army three years later as its commander, I have been quite pleased to witness some of those key and essential long-term challenges finally coming to resolution. The Army's successful Pre-positioning (PREPO) program continues to mature and greatly facilitates our ability to respond quickly. However, we still need more improvement in quickening our sealift and airlift capabilities. A very robust joint and combined training program has contributed significantly to building an international coalition for the long term. This will minimize future team building when we cross the line of departure as in `Desert Storm`. Equally significant, we have built and improved the AC and RC personnel bridge within Third Army to ensure a smoother, faster transition to war. This article addresses each of these issues in more detail.

Army War Reserve Pre-Positioning Program

In the US Central Command (CENTCOM) area of responsibility (AOR), which includes 20 nations in Northeast Africa and Southwest Asia, the time and distance challenges and the diversities in language, religion, economic wealth and culture are significant. However, the Cold War's end and the Gulf War's results together produced watershed changes, challenges and opportunities. Tensions in the region have not diminished. Regional powers such as Iran and Iraq, who command their own resource bases and are no longer constrained by bipolar, superpower politics, are emerging. These two nations, and others, have shown a willingness to test their neighbors and the world community as they pursue their own interests, even at the expense of regional stability. Since `Desert Storm`, Third Army has responded five times to contingency requirements to deploy, command, control and support major Army forces to deter Iraqi adventurism. Each operation underscored the need for vigilance and quick response and reinforced the value of pre-positioned equipment and limited forward presence in offsetting the strategic time/distance challenges inherent in winning the "race for Kuwait."

The US Army currently has pre-positioned Army War Reserves Set 5 (AWR-5) at Camp Doha, Kuwait,

to meet this time/distance challenge. AWR-5 is a full, heavy brigade set of equipment that is ready to fight as fast as troops can be flown into theater. I have challenged Colonel Bob Smalser, commander, ARCENT-Kuwait, to issue at least a battalion set of that equipment every 24 hours. He has made that challenge a reality. We routinely exercise that equipment at least twice a year during the INTRINSIC ACTION exercise series with brigade command posts and battalion task forces (TFs) from the 1st Cavalry Division, Fort Hood, Texas, and 24th Infantry Division (ID) (Mechanized) [M], now redesignated the 3d ID(M), Fort Stewart, Georgia. In the recent past, the 4th ID(M), Fort Hood, and the 1st Armored Division, Bad Kreuznach, Germany, also participated. AWR-5 was a valuable deterrent during VIGILANT WARRIOR from October to December 1994 when the 24th ID(M) fell in on it and trained vigorously and visibly to demonstrate US presence and resolve to Iraq. From August to December 1995 during VIGILANT SENTINEL, the 1st Cavalry Division trained with the equipment, showing they are fully prepared to fight alongside our Kuwaiti allies. Well maintained, rapidly issued and versatile, AWR-5 puts a fighting force on the ground swiftly, at the "point of the spear."

In September 1995, Lieutenant Colonel Charlie Smithers was tasked to establish ARCENT-Qatar and receive a battalion set of equipment within four months. By January 1996, in Qatar, Third Army/ARCENT had pre-positioned the first increment of the next brigade set of equipment on the Arabian peninsula. A heavy battalion TF set of equipment is now in place and will eventually be expanded to a full division base set. A Third Army/ARCENT and Army Materiel Command partnership is developing the concepts to get this set of equipment rapidly into the fight.

AWR-3, PREPO Afloat, gives us a brigade of equipment for four maneuver battalions and a direct support artillery battalion, along with its requisite combat support (CS) and combat service support (CSS) and 30 days of sustainment supplies. During VIGILANT WARRIOR, the 24th ID(M) offloaded, reconfigured and fully exercised the set of equipment, which facilitates a powerful response in a flexible package that can be delivered to any port near any trouble spot within CENTCOM's AOR or to any deep water port in the world.

Pre-positioning is a great Army success story and certainly makes a big difference in response times. Response time was a problem during Desert Shield and Desert Storm. In the future, Saddam Hussein will not give us the luxury of a five-month force buildup. It will be a true "race for Kuwait." Although the Iraqis have a significant advantage in travel distance, the PREPO concept helps offset it. The CENTCOM commander in chief's (CINC's) goal is to pre-position a division of equipment on the Arabian peninsula. With Iraq and Iran still a threat to an area holding 65 to 70 percent of the world's oil reserves, a division of equipment is not too expensive. With AWR-5, AWR-3 and Qatar, we can muster eight maneuver battalions. We have come a long way since Desert Storm. With our PREPO presence, we can win the "race for Kuwait" on day one and prevent a second Desert Storm from ever taking place. However, failing deterrence, rest assured, we will be ready to fight and win!

Joint and Combined Training

Desert Storm brought together an Arab and Western coalition with equipment, training, doctrine and cultural differences of enormous magnitude. Prodigious efforts and energies were expended to make the coalition work. Frustration was the norm, because a shared vision and common understanding of tasks and missions were hard to come by. Even our own Air Force and Army found it difficult to fight a joint battle without serious disagreements and misunderstandings. Many problems could have been minimized had we trained together more often in a joint and combined environment before the operation.

C2 in combined operations is an inherent requirement for virtually all conceivable future Third Army operations. Because coalitions cannot be established effectively "on the fly" in a contingency, Third Army and CENTCOM are currently pursuing a robust exercise program and a number of other military-to-military contacts with AOR nations to address the C2 challenge.

Third Army plans, coordinates and supports 10 separate series of recurring, bilateral exercises with regional nations. These exercises range in size from company team to battalion TF; are executed by a combination of AC and RC units from US Army Forces Command and Europe and enhance US and host-nation training, interoperability and mutual understanding while building the trust and confidence so essential among coalition nations. In addition, Third Army directly engages in six recurring exercises that stress joint and combined operations and interoperability in major combat operations C2: BRIGHT STAR, ULTIMATE RESOLVE, INTERNAL LOOK, ROVING SANDS, IRON FALCON and BLUE FLAG. A thumb-nail sketch of these exercises follows.

- BRIGHT STAR (biennial). The oldest, largest and premier joint and combined CENTCOM exercise in the AOR, BRIGHT STAR 95 included nearly 60,000 AC and RC troops from the United States, Egypt, the United Arab Emirates, France and the United Kingdom, as well as observers from numerous Middle East and Western countries. Air, naval and land combined operations were highlighted by the first-ever coalition deep attack with Apache helicopters from the United States, United Arab Emirates and Egypt. BRIGHT STAR is invaluable as a large-unit deployment, sustainment, desert operation and redeployment training opportunity. It also allows Third Army to operate and train as a joint task force (JTF) headquarters and to conduct split-base operations.
- ULTIMATE RESOLVE (annual). A command post exercise (CPX) primarily aimed at building and strengthening the coalition, this year's exercise was hosted by Kuwait and included participants from Syria, Egypt, the United Kingdom, France, the United States, Saudi Arabia, Bahrain and the United Arab Emirates.
- INTERNAL LOOK (biennial). This is CENTCOM's major CPX and facilitates training the full battle staff for CENTCOM and its components. It also allows Third Army to exercise its deputy joint land forces command responsibilities.
- ROVING SANDS (biennial). The world's largest air and missile defense exercise, ROVING SANDS' emphasis is on the joint and combined interoperability of joint forces air component command (JFACC), joint missile defense command and air area defense command. ROVING SANDS 95 involved German and Dutch air defense units and provided invaluable interoperability training with the air defense forces of those two nations.
- BLUE FLAG (annual). This exercise allows Central Air Forces to practice JFACC processes and procedures. It also gives Third Army an excellent opportunity to exercise army land force deep operations, battlefield coordination element interface and integration with the Air Force.
- IRON FALCON (biennial). This exercise sponsors a mini-JTF that combines what were formerly three distinct single-service combined exercises into one joint and combined exercise in CENT-COM's AOR. This latest CENTCOM exercise addition represents progress in the maturation of CENTCOM's exercise program in its AOR.

Other coalition-building exercises were conducted with the United Arab Emirates, Oman, Kuwait, Pakistan, Kenya and Jordan. The exercises' underlying theme is that coalitions rely on trust and confidence, which can be gained only by building coalitions over the long term. In addition, the exercises build interoperability among coalition members involved in UN operations other than war and in warfighting missions. It is impractical to wait until a crisis to build a successful coalition. These exercises also are opportunities to practice mobilization and deployment of the AC/RC package each wartrace unit has developed. RC use is critical, not only in mobilizing manpower, but also in gaining

public support for US participation in a conflict.

The AC/RC Bridge

The United States will see a distinctive profile in conflict for the next quarter century. Conflicts will be fought in a joint, combined manner, led by US forces integrated from active, US Army Reserve (USAR) and National Guard components and deployed from power-projection platforms within the Continental United States (CONUS). There is no doubt of continued instability in the Gulf region, and it is one of two major, General Defense Plan areas of unquestionable international economic significance. The Cold War's end has not decreased tensions there. This, compounded with the military drawdown, has increased the need to maximize US AC and RC force capabilities and has created a new need for early-deploying cells, which can begin intratheater operations and planning while the remainder of RC units are mobilized under the Presidential Selected Reserve Call-Up (PSRC). Before `Desert Storm`, Third Army depended on RC capabilities, particularly CS and CSS but did not invest in maintaining RC readiness to deploy on short notice. The majority of support to RC units was given during Annual Training encampments. The lack of immediate AC support for the Theater Army/Service Component was inhibited by the time required to mobilize RC units. We needed more support to provide rapidly deployable cells.

As a result of wartrace mobilization problems, then Third Army Commander Lieutenant General John Yeosock worked with the US Army Reserve Command, Atlanta, Georgia, to assign 183 AC soldiers, mostly leaders and planners, to wartrace units. The program, `Bold Shift`, was an attempt to give the RC sustained, enhanced, go-to-war readiness and an early deployment capability before the PSRC. The program provided the cadre for planning, coordination and rapid deployment.

Major General Tommy W. Bonds, 335th Theater Signal Command commander, East Point, Georgia, believes the AC/RC initiative is cost effective and provides a huge dividend for both AC and RC units. About its efficiencies, he said, "I think the AC/RC integration gives us a chance in peacetime to work the relationships we will count heavily on when we transition to war. Therefore, you are up on the learning curve when you have elements of both components working together on a daily basis. They develop a valuable relationship and learn what the demands are for each component when the call comes. Also, by integrating AC into RC units and assigning operational missions, we receive the biggest bang for the defense dollar."

Because we know the formula for success, Third Army is pushing the envelope to the maximum extent possible to improve our ability to meet the demands in a joint/combined arena while deploying from a power-projection platform. Future conflicts will put greater emphasis on joint and combined operations. Third Army, the only deployable theater-level army, can serve as the C2 headquarters for a JTF. To this extent, Third Army's ongoing missions as "ARCENT" are critical in the Gulf region, which requires continued air defense support, contingency planning and pre-positioning of war reserves. Our go-to-war responsiveness is measured in terms of days, not weeks or months as before. Our wide range of requirements can only be met by well-rounded, fully integrated AC and RC units.

Recent Total Army Analysis and updated war plans place even more emphasis on the rapid deployment of Third Army/ARCENT. Third Army, as CENTCOM's Army Service Component Command (ASCC), has several key roles and responsibilities: fulfilling Title X responsibilities for CINCCENT; establishing required interfaces and connectivity for the Army in a theater of operations; and establishing theater infrastructure and support for Army and joint and combined forces in-theater, as required. Most important, Third Army also provides CINCCENT and the Army with a fully deployable warfighting C2

headquarters, capable of operating as a JTF, a joint force land component command or an Army forces (ARFOR) headquarters. As an ARFOR headquarters, Third Army/ARCENT is the only army-level headquarters in our force structure today with the actual mission to accomplish all ASCC doctrinal missions. To meet these mission requirements, Third Army relies heavily on the RC. Analysis indicates an additional personnel "plus-up" is needed within Third Army headquarters to meet its increasing demands.

Department of the Army headquarters has given Third Army 246 additional spaces to meet mission requirements. After careful analysis, I allocated 52 spaces to the RC and 194 to the headquarters. These positions meet operational-level requirements at headquarters and beef up the AC-RC bridge in daily operation support, training participation and providing key reception staging onward movement capabilities in building combat power in-theater.

AC/RC integration is a must for future conflicts. Although this program has had significant success, many challenges remain, including the timely call-up of the RC, RC readiness and early deployment support and RC mobilization and validation, just to name a few. The AC-RC bridge is a "value added," because it develops an integrated, functional AC/RC structure, capable of reacting to our force-projection Army's needs.

This AC-RC bridge allows AC soldiers assigned to RC units to deploy early so they can establish the RC unit's footprint long before the RC soldiers arrive. Major General Robert H.G. Waudby, 377th Theater Army Area Command commander, New Orleans, Louisiana, said, "The addition of the AC personnel to the headquarters has provided us with many unique opportunities and challenges. Our mobilization readiness has improved tremendously. We have been able to respond to Third US Army's requests for trained soldiers on 24-hour notice in hot spots in the AOR and have been able to send additional personnel to important exercises, such as ROVING SANDS, BRIGHT STAR and INTERNAL LOOK. I think it has been a real learning experience for the AC soldiers who have had an opportunity to see how difficult a job the RC soldiers have managing two careers- military and civilian."

This AC-RC bridge within Third Army's wartrace units helps form a quickly deployable, flexible and functional force capable of performing as part of an ASCC to support the CINC. Third Army's ability to identify and rely on AC soldiers to act on behalf of RC wartrace units during a contingency crisis is a tremendous benefit. The RC units reap great benefits by having AC soldiers available daily to perform duties, including interfacing with Third Army for planning, training and exercises.

This bridge also helps the Army attain our goal of a seamless transition from peacetime to wartime, particularly for RC units. The Total Force concept strengthens as AC and RC soldiers work together every day. The technical and planning capabilities of AC units are combined with the mobilization and manpower resources of RC units to support America's force-projection Army. Most important, the AC/RC initiative supports a bridge to the major subordinate commands that provide the nation with a C2 headquarters to fight a potential Desert Storm II or to deploy worldwide to fight a smaller, regional conflict as an ARFOR, a JFLCC or a JTF-now and into the 21st century.

Since Third Army's initial activation in November 1918, its soldiers have carved out a proud history and heritage, highlighted by bold, decisive, mobile, armored combat operations. It was "Patton's Own" that smashed across Europe to secure decisive victory during World War II and years later delivered the knock-out blow to Iraqi forces during Desert Storm's "100-hour ground war." With full and proud appreciation of the high-impact contributions of past Third Army soldiers and with total commitment toward meeting future challenges with similar success, today's Third Army stands prepared to face a

dynamic and distinctly different strategic and operational environment.

As stated, I am convinced the next 25 years will see a distinct profile in the way we deal with conflicts of any significant size. We will fight them in a joint and combined manner, led by US forces integrated from Active and Reserve components deployed from power-projection platforms within CONUS. Because I am convinced this is the formula for the future, I am also convinced we must follow our mantra-"train as we fight!" It then follows that we have learned our lessons well from the past, and we are heading in the right direction for the next quarter century.

My message is simple. Our azimuth is correct, stay the course and finish the PREPO. Train hard at joint and combined exercises to build the trust, confidence and coalitions for the long term and continue to refine our AC-RC bridge, not only in Third Army but throughout our great force. ***MR***

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Military Review, March-April 1997

Synchronizing Battlefield Logistics

by Colonel Stephen F. Garrett, US Army

IN THE INFORMATION AGE's ever-growing, automated environment, battlefield synchronization of what we know-situational awareness-and what we want to do-operational execution-is undeniably paramount today and in the future. We must control the information flow and use it efficiently and effectively-this may be the true definition of information age battlefield synchronization.

Emmett Paige Jr., assistant secretary of defense for Command, Control, Communications and Intelligence, foretold the changes in the basic ways we will conduct business when he spoke at the Armed Forces Communications and Electronics Association International Technet '96 Convention on 4 June 1996 in Washington, D.C.1 His central theme was that battlespace dominance depends on our ability to leverage the technologies that will give us precision forces and weapons and to enhance these with efficient and effective command and control. Information is important in our evolving concept of knowledge-based warfare-a concept dependent on synchronization. We must not only be able to access information but also share it through system interoperability and use it in coordinated battlefield operations.

Paige noted that commanders cannot possibly process all available information. What they need is the right information with the right amount of detail at the right time and place. He called this "decisionable information" that puts the commander inside the enemy's decision cycle. This is the essence of synchronizing battlefield operating systems (BOS) into singularly focused operational success.

Decisionable Information

Decisionable information may be as much process as product or technology. The Force XXI Army must drive technology to provide data collection; analysis, fusion and processing; and information dissemination systems. We absolutely need a common, shared battlespace picture to properly use precision forces and weapons in any situation. However, situation control is what brings success. Data bases, information and knowledge only define the situation.

Every process needs a purpose. Just as the five-paragraph field operations order (OPORD) clearly states the mission, synchronization needs a well-defined purpose. In fact, the synchronization process should remain an extension of the five-paragraph field OPORD. The common mission statement-and the synchronization process-provide a frame of reference for selecting useful, decisionable information from available data.

This process must be proactive, not reactive. Information is not centrally key to success-it is merely a decision-making tool. It represents what we know-situational awareness-not what we want to do-operational execution-or what we want to happen-mission. If we concentrate only on received information, no matter how timely it is, we can only react. Using information to determine how we want to shape the battlespace is the only way we can properly use the ever-growing automated information environment and be proactive.

This is particularly true for logistics. As German General Erwin Rommel once declared, "The battle is

won by the quartermaster before it ever starts." When it is time to act and accomplish the mission, combat service support (CSS) BOS actions must have already taken place and thoughts must turn immediately to logistic support for the next battle. Clearly and irrefutably, CSS actions precede battlefield success.

A recent Army Logistician article, "Beyond Synchronization," by US Marine Corps Captain Stephen E. Reynolds, a Combined Arms Logistics Officer Advanced Course graduate, criticized synchronization as an after-the-fact, reactive posture.2 I disagree-although it can be the case if the focus is on information and not on the mission. As Reynolds points out, focusing on recorded information could easily teach leaders and multifunctional logisticians to think in the past tense.

Reynolds uses this point to drive home the importance of logistics characteristics above synchronization. From my perspective, the logistics characteristics of anticipation, integration, responsiveness, continuity and improvisation promote synchronization. CSS is a precursor of success, not just its partner. By its nature, synchronization is coordination in time. The logistics characteristics are paramount to success, but only if we recognize the timing of logistics execution relative to other BOS elements and the mission. Logistics must come first, and we must use information to be proactive. Recent experience at the National Training Center (NTC), Fort Irwin, California, shows this does not always happen. The fourth quarter Fiscal Year 1994 Combat Training Center Trends for the Combat Service Support Battlefield Operating System from the NTC states, "Units are not synchronizing CSS planning with the OPLAN [operations plan]. Result: CSS staff officers are reacting, rather than acting to support requirements."3

Anticipating Battlefield Requirements

We tend to forget that CSS is a precursor to mission success. Reynolds correctly recognizes this in his discussion of anticipation-perhaps the most important logistics characteristic. He states, "Anticipation by the logistician requires that he be more aware of his commander's intent and plan than [anyone]."4 Nothing could be more important than understanding the mission and intent in order to synchronize CSS with other BOS elements to guarantee mission success.

The reason anticipation and true CSS synchronization are so important is demonstrated by who does the CSS close fight and what other battlefield logisticians do. The CSS current battle belongs to the specialist and below and occasionally may include a sergeant or staff sergeant or two. Regardless, the current CSS battle is truck-driver, ammunition-handler, mechanic and fuel-handler business. These soldiers do not need a lot of help doing their jobs. What they do need is our help anticipating the best time for them to do their work and synchronizing when they should do it. Additionally, we must ensure they have the resources to do their jobs.

We must do better supporting that close fight by looking ahead. Information will flow constantly in an automation-rich environment. The pace of events continues to increase, making it more difficult to discern the sequence of events as simultaneity sweeps through the battlespace. Even so, the mission, commander's intent and operational concept continue to be the road map to success and the frame of reference we use to filter the constant information flow to get the right information at the right time and place to achieve overwhelming information dominance and battlefield success.

The best thing we can do for CSS soldiers fighting the current battle is to use information to predict what they need to do "next," not to critique and change what they are doing now. This way, we remain proactive and can better synchronize CSS on the battlefield.

With so much information inundating decision makers today, it is hard to keep looking ahead. Reported facts pull at us to look back, and it is difficult not to react and want to change what is reported, especially if it is something different than what we want. Every commander wants full fuel tanks, enough ammunition and plenty of food for his troops. This is achieved when we know what is happening on the battlefield, what the mission states and where the mission and intent lead us in space and timing.

We must have focused, anticipatory logistics now and in the future. Precision in logistics cannot be ignored. The information age is giving us the tools we need to maintain that precision and to more accurately predict CSS synchronization in anticipation of battlefield success.

In the future, diagnostic and prognostic capabilities springing from today's technology will greatly enhance our ability to efficiently and effectively anticipate battlefield needs. Automobile dealers already offer onboard computers that display how many miles a car can travel before running out of fuel. Lincoln Continental and Cadillac advertise emergency satellite downlinks. Today, these are the "automatic transmissions" and "air conditioners" of the past. These options, and others like them, will become the future standard. Decisionable information will become routine and revolutionize the synchronization of military battlespace logistics. For now, we must rely on our own intelligence to process information and synchronize logistics information and actions with the other BOS elements. This proc-ess must be oriented on the mission and commander's intent and promote a proactive logistic effort that confidently leads to battlespace operational success.

Logistics Synchronization

We need a logistics synchronization process similar to the targeting board process used by the field artillery (FA) to synchronize fire support with the mission needs and commander's intent. A logistics synchronization board could promote anticipatory logistics by bringing decisionable information quickly into focus. The targeting board is designed to simply answer the who, what, when, where and why questions that put fire support on the battlefield at the proper time and place in relationship to mission and commander's intent. It is a formal, daily and continuous process that turns information into board decisions-decisions that synchronize fire support with other BOS elements. Who, what, when, where and why are important questions for logisticians too-questions that can ensure anticipatory, focused logistics are properly synchronized with other BOS elements.

FA targeting board composition provides a good template for determining who should be on the logistics synchronization board. The targeting board at division and corps levels includes the artillery commander, the supported division or corps G2 and G3 and the aviation commander (for deep operations). The chief of staff chairs the board at both levels. The proposed logistics board membership would include the division support command or corps support command commanders and the supported division or corps staff, such as the G4 and representatives from the G2 and G3 collocated in the division and corps rear command posts. The logistics synchronization board could be chaired at division level by the assistant division commander for support and at corps level by the deputy corps commander.

The targeting board matrix used to display decisionable information can be similarly adjusted to synchronize logistics, as shown in Figure 1. The matrix processes information to answer who, what, when, where and why. This matrix also relates logistics with operational needs over time. As such, it synchronizes logistics as a precursor to operational success and filters information into decisionable information on anticipatory, focused logistics.

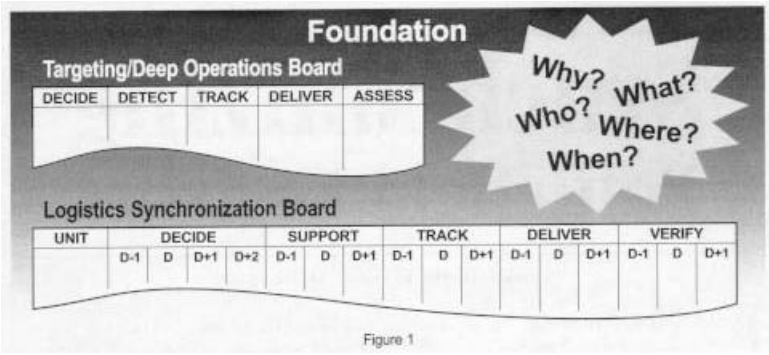

Figure 1

The key to this process is in the why question and in what we do about it. Why is answered by the mission, commander's intent and operational concept and can be defined through operational graphics, decision points and missions assigned to subordinate organizations within the supported command. It is the expected shape and definition of the battlefield in terms of objectives, avenues of attack, axes of advance, mission and commander's intent. What we do to make that battlefield unfold as logistically defined is just as important. As depicted in Figure 2, the what matrix question crosswalks the specified and implied logistics tasks needed to confidently ensure the successes necessary to shape the battlefield as the supported commander intends. Doctrinally, there is no such standard crosswalk of support tasks to mission tasks today.

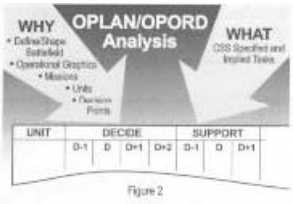

Figure 2

This crosswalk should consider two levels of visibility and unit detail. Corps synchronization boards should look for division and brigade missions and the appropriate specified and implied logistics tasks. Division boards and matrixes should consider brigade and battalion mission needs. An example is an extensive movement to an objective or contact. The specified or implied task would be a refuel-on-the-move support requirement. The who, where (resources come from) and when complete the synchronization matrix and process as illustrated in Figure 3.

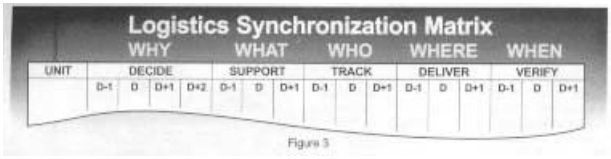

Figure 3

The completed matrix brings out logistics decisionable information relative to the battle by identifying the following:

- Who has the key specified and implied tasks-who/TRACK.
- Who provides the resources commanders will use-where (the resources come from)/DELIVER.
- Who determines the task's timeliness relative to the supported mission's needs-when/VERIFY.

A logistics synchronization matrix gives the board a tracking system to show that planned, specified and implied tasks are time-sensitive for anticipatory, focused logistics execution for battlefield success.

Tomorrow's Army will enjoy diagnostic and prognostic capabilities that will take advantage of existing technology and future automation. We have the opportunity now to promote anticipatory, focused logistics on the battlefield through formal board synchronization of decisionable information. We have the potential to revolutionize military logistics in the information age as we move rapidly toward Force XXI and the Army After Next. ***MR***

NOTES

1. Assistant Secretary of Defense for Command, Control, Communication and Intelligence Emmett Paige Jr., "Achieving the Integrated Systems Concept," keynote address to the Armed Forces Communications and Electronics Association International Technet 96 Convention (Washington, DC: 4 June 1996.

2. CPT Stephen E. Reynolds, "Beyond Synchronization," Army Logistician (May-June 1996).

3. Center for Army Lessons Learned, US Army Training and Doctrine Command, Combat Training Trends, National Training Center, 4th quarter, FY 94, Fort Leavenworth, KS.

4. Reynolds.

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Military Review, March-April 1997

Army Basic Research Strategy

by Thomas H. Killion

Our nation's defense advantage is grounded in the widest scope of scientific knowledge.
--Dr. Anita Jones, director, Defense Research and Engineering, Defense Science and Technology Strategy

AS THE NATION's full-spectrum land warfighting force, the US Army depends on technology to meet a multitude of mission requirements in today's geopolitical environment. To maintain its wide variety of overmatching capabilities, the Army must maintain its investment in the fundamental research that is the breeding ground for technological discoveries and innovations. Army Basic Research's role is to foster progress and innovations in niche areas or where the commercial incentive to invest is lacking due to limited markets-such as research in military medicine to develop vaccines for tropical diseases-while focusing research and innovations in other areas on issues related to Army applications and environments. The latter is critical because the fundamental issues that must be addressed can change. For example, the focus could be on electrochemistry to support battery power densities applicable to the soldier or on "smart" materials for real-time management of rotorblade structures and then quickly shift to something else.

The Army depends on technology as it evolves toward smaller, lighter, more lethal forces that must accomplish an ever-increasing variety of post-Cold War missions. Investments made in basic research today will help shape the future Army by providing the technological building blocks for addressing the imperatives emerging from the future warfighting concepts listed below:

Army Vision 2010

- Project the force
- Gain information dominance
- Protect the force
- Shape the battlespace
- Sustain the force

Army After Next

- Non-attrition warfare
- Force protection
- Strategic mobility
- Force sustainment

The Army must be able to deal with the increasingly capable threat posed by opponents who can take advantage of widely available and increasingly sophisticated commercial technologies. As stated in the National Security Science and Technology Strategy: "Technological superiority underpins our national military strategy, allowing us to field the most potent military forces by making best use of our

resources, both economic and human. It is essential for the United States to maintain superiority in those technologies of critical importance to our security. . . . Today's basic research lays the foundation for tomorrow's innovative development. To make possible the greatest range of options and avoid technological surprise, we must apply resources broadly at the basic research level and make further investment decisions as emerging technologies reveal the most promising payoff areas."1

Army Basic Research Strategy

The overarching basic strategy for meeting the Army's future needs is portrayed in Figure 1. Current Army modernization benefits from past investments in fundamental research. In the near- to mid-term, products are expected from programs, such as the Army Federated Laboratories, that will benefit Force XXI and Army Vision 2010. In the mid- to long-term, products of investments in key Strategic Research Objectives (SROs) and other basic research projects will influence the capabilities available to the Army After Next (AAN) and beyond. Underpinning all of these programs are investments in each of the basic research areas, as defined in the Department of Defense (DOD) Basic Research Plan.2

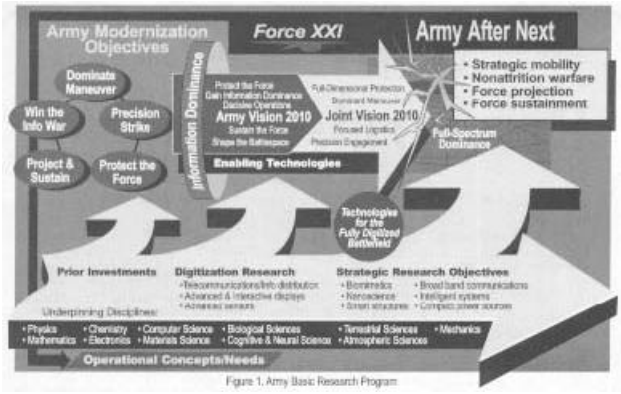

Figure 1. Army Basic Research Program

The fundamental approach is to conduct focused research to develop and tailor knowledge and technologies to address Army needs. This includes both evolutionary research that advances the state of the art and revolutionary concepts which provide the basis for breakthrough innovations and resulting capabilities. At the program's heart is a focus on conducting superior quality research across the spectrum of Army-relevant technical disciplines. This involves both in-house and extramural university or commercial research. Wherever possible, the Army must also leverage the investments of other services and agencies. This strategy is based on making investments in Army-focused research to continue the evolutionary progress in key technical areas-and on tailoring unexpected innovations to Army applications-to meet emerging threats and enhance future capabilities.

For example, consider future soldier system power requirements. As the electronics-based subsystem applications for the soldier have grown, the power demands have grown as well and will continue to grow. To meet these needs, the Army is investing in basic research addressing the fundamental technologies that support batteries, fuel cells and other compact-power sources. Past investments in electrochemistry for battery technology have led to significant advances in the energy density of primary and rechargeable batteries. This has significantly lowered the logistics burden for systems such as the Single Channel Ground and Airborne Radio System (SINCGARS). A single SINCGARS battery weighs about one kilogram. Based on current basic and applied research in battery chemistry, this trend is expected to continue. Additional research in fuel cells and microturbine technology offers the promise of alternative, compact, higher power-density electrical sources for the soldier and his support systems.

One must also recognize the unpredictable directions technology may take and the unforeseen benefits that can accrue. For example, when lasers, transistors and fiber optics were first developed, no one would have predicted their widespread applications.3 The Army must retain the flexibility to exploit technological opportunities as they appear, then foster their application to meet Army needs.

The time between discovery and application can vary widely. Within months of the discovery of X-rays

in 1895, multiple applications were developed.4 On the other hand, the transistor, invented in the late 1940s, did not see widespread application until the theory of semiconductors matured and integrated circuit design and fabrication techniques emerged in the 1960s.5 Superconductivity was discovered in 1911; however, its wide-scale application is still awaiting the development of superconducting materials that can operate at reasonable temperatures. The recent discovery of new forms of carbon, such as "Fullerene" and "Buckytubes," holds the potential for innovations in areas such as safer energetic materials and lightweight, extremely high-strength fiber, respectively.6 As history illustrates, productive application of such technologies depends on long-term, sustained investment.

The National Security Science and Technology Strategy states that: "Research sometimes pays immediate dividends, with a transition directly from laboratory bench to defense systems in the field. But most often, the full impact [of] research is not apparent until much later. It is only in hindsight that the patterns of research which spawned revolutionary military capabilities-radar, digital computers, semiconductor electronics, lasers, fiber optics and navigation systems capable of great accuracy-are discernible. Thus, in planning our research programs, we focus not only on immediate needs but also on opportunities that will sustain our technological edge far into the future."7

In planning the Army's basic research programs, US Army Training and Doctrine Command (TRADOC) AAN initiatives provide additional focus. AAN is an ambitious attempt to characterize the future Army and begin developing compatible doctrinal concepts for that Army. The definition of AAN concepts includes the types of technological capabilities that will underpin the Army's systems. Fostering the fundamental research that will enable these capabilities is a key role for the Army Basic Research Program. The AAN time frame is compatible with the program's long-term focus, and AAN concepts will provide a stable overall framework for investment and program direction to ensure the Army's projected needs are met by emerging technologies.

The bottom line is that basic research has paid off in the past and will be critical for the future Army-it provides the basis for the development of key AAN capabilities. In order to reap those benefits, the Army must maintain a productive basic research program, with flexibility in the investment portfolio to reap the benefits of unexpected discoveries and innovations.

Basic Research Focus

The Army's basic research investment is focused within the technical areas identified in the DOD Basic Research Plan: physics, chemistry, mathematics, mechanics, electronics, biological sciences, cognitive and neural science, computer science, materials science, terrestrial and ocean sciences and atmospheric and space sciences. Within these areas, the investment is focused on Army-related issues, such as rotorcraft aerodynamics in the area of mechanics and electrochemistry for compact, high electrical-power density sources in the chemistry arena. The investment varies significantly across the technical areas. This reflects a conscious management strategy that takes into account factors including:

- Future Army concepts.
- Emerging technical opportunities.
- Ability to leverage investments via application in a wide variety of systems.
- Investments that other services, defense agencies or industry are making.
- Maintain a capability in Army niche areas, such as armor design and penetration mechanics.
- Program continuity.

The Army's fundamental strategy is to invest in "Army-unique" basic research while leveraging the much

larger and broader investment made by other services, defense government agencies and the private sector. This constitutes more than a 100-to-1 leverage when one considers the overall investment made by the US government and private industry.8 The Army benefits from this much larger investment through the expertise, facilities and innovations it fosters and supports, and then bringing developed capabilities to bear on Army issues.

Under the DOD Basic Research Plan, the services have identified six SROs, which are high-profile, long-range scientific areas of strong military relevance and high-payoff potential. The current SRO list includes:

- Biomimetics: novel synthetic materials through exploitation of nature's design principles.
- Nanoscience: control of devices with tens of angstroms precision.
- Smart structures: dynamic control and response of complex systems.
- Broad band communications: flexible, high-volume multimedia communications.
- Intelligent systems: enable systems with ability to sense, analyze, learn, adapt and act.
- Compact power sources: up to 10 times improvement in portable batteries and fuel cells.

Although the relative investment in SROs is small, the benefits are expected to be substantial. Each area is of interest to the future Army, because it supports the development of critical technologies such as enhanced armors, high power-density portable power and high-bandwidth communications. In some instances, a single SRO may give rise to important new capabilities or systems. For example, applying biomimetics principles based on the nanostructure of sea shells and spider silk may result in ceramics of increased strength and toughness and in bioengineered fibers with phenomenal resilience, both of which may have armor applications. Additionally, synergy among multiple SROs will be productive. For example, at least four of the six current SROs would directly support the development of hummingbird-size unmanned aerial vehicles.

The bottom line is that the investment is focused on Army issues of critical importance. The program is managed and balanced to maximize return on investment by leveraging the much larger and broader investment in the US scientific base and focusing on high-payoff, militarily relevant issues.

How Is It Managed?

Army basic research is an integral part of DOD's overall basic research enterprise. Through the Defense Committee on Research and various scientific planning groups, Army research efforts are coordinated with other services and defense agencies. Within the Army, program direction is based on emerging Army needs-technology pull-and on technological opportunities-technology push. Internal program reviews and external peer reviews are conducted to ensure technical quality and relevance. The products of Army and other DOD investments are the innovations and knowledge that fuel technology development for the AAN.

The area of mechanics demonstrates the coordinated and complementary nature of the Army research program vis-à-vis the other services. Army-unique interest areas, such as penetration mechanics, as well as common interest areas in which the focus is on Army-specific subissues, are illustrated in Figure 2.

These investments fall within the overall Army Basic Research Strategy framework. As previously stated, in the near- to mid-term, the Army expects to reap significant benefits from the innovative Federated Laboratories program, which uses cooperative agreements with industry-led consortia, including university partners, and leverages their capabilities in areas where the commercial sector has the technical lead and investment incentive. The current programs are focused on telecommunications and information distribution; advanced and interactive displays; and advanced sensors. These research areas will foster technologies that significantly enhance battlespace situational awareness and benefit our command, control and communications processes, providing critical underpinnings for the information dominance foreseen in Army Vision 2010.

Figure 2. Common Areas of Interest in Mechanics

In the mid- and longer-term, the Army expects significant benefits in the AAN time frame from the SROs and other projects. Essentially, Army Basic Research provides the fundamental building blocks upon which innovative and higher-performance systems will rely. These technologies will be the products of investments in multiple disciplines, each of which is critical to the ultimate systems' capabilities. To develop systems with the key features we require for the AAN, we must invest today in a full spectrum of fundamental research areas. Figure 3 illustrates some key features desired for future Army systems, along with representative research issues that are vital to achieving the technological innovations which will support these features.

The program is executed through a balanced mixture of in-house and extramural research. The in-house research focuses on niche areas, supporting a critical mass of world-class researchers in areas essential to the Army. The extramural program leverages the power of academe and industry, focusing their capabilities on Army issues and interests.

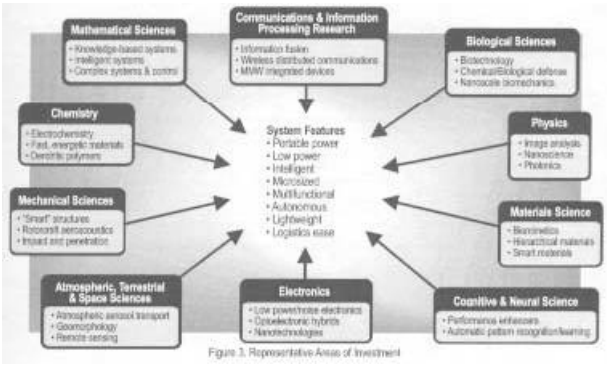

Figure 3. Representative Areas of Investment

The program is managed and conducted by a network of Army laboratories and centers. The Army Research Office (ARO) manages extramural programs through the University Single Investigator Program and selected Centers of Excellence. The Army Research Laboratory (ARL) conducts in-house research, manages the Federated Laboratories and supports several Centers of Excellence. The Medical Research and Materiel Command, Corps of Engineers and Army Research Institute (ARI) for the Behavioral and Social Sciences conduct a mixture of in-house and extramural research in their areas of interest. Finally, primarily through the In-house Laboratory Independent Research (ILIR) program, the Army Materiel Command Research, Development and Engineering Centers conduct a limited amount of basic research in relevant technical domains.

The bottom line is that the Army's basic research program is responsive to Army needs while being well integrated with other services and defense agencies. Current investments by the Army will make a significant difference in preparing for the challenges to be faced in the AAN time frame. The program involves a healthy balance of in-house and extramural research, allowing the Army to support an organic capability in niche areas while leveraging industry and academe where appropriate. Programs such as the

Federated Laboratories and the SROs are specifically designed to address high-payoff areas that will yield key technologies in both the mid- and long-term.

What Is The Payoff?

The Army's investment returns fall into two categories. `Direct` payoffs include the technologies and knowledge that support battlefield innovations, as well as the cadre of smart buyers supported by the in-house program. `Value-added` payoffs accrue from influencing the extramural research base to focus on Army needs and by supporting the training of future scientists and engineers via university research programs. The following paragraphs provide some examples of direct payoffs, but this value-added factor also has far-reaching implications for the Army and society as a whole.

The Army's research program has a track record of significant contributions. From the world's first electronic digital computer (ENIAC) to enhancements to the Patriot missile system and the continuing innovations of military medicine, the program has made a measurable difference in soldiers' lives. The extramural program has leveraged world-class researchers across the spectrum of technical areas, including Nobel Prize winners and innovators in areas such as lasers, superconductors, electronics and displays. A recent Nobel Prize for discovery of Fullerenes-a new form of carbon-was awarded to scientists whose research was supported by ARO. In-house programs have been just as productive, with a long history of innovations that have fueled the Army capabilities depicted in Figure 4.

Representative Products From Army Laboratories and Centers

1990s	• Scientific Visualization: enhancing interpretation of complex computational and experimental data—*Ballistic Research Lab* • New Transmission Concepts: yielding light, quiet, reliable transmissions—*Vehicle Propulsion Directorate, Aviation Systems Command*
1980s	• Dual-Mode Quartz Thermometric Sensing Device: broadening applications of crystal oscillators in communications, navigation and thermometry—*Electronics Technology & Devices Laboratory* • Rare Earth High-Power Permanent Magnet Structure: broadening applications of magnetic resonance imaging for medical diagnostics—*Electronics Technology & Devices Laboratory* • Thin-Film Electroluminescent Flat-Panel Displays—*Electronics Technology & Devices Laboratory* • Micro computer Compensated Crystal Oscillator: providing low power, high accuracy and a 100x improvement in performance of oscillators—*Electronics Technology & Devices Laboratory*
1970s	• Lithium Primary Batteries: fulfilling military needs for portable, high energy density power sources—*Electronics Technology & Devices Laboratory*
1960s	• Fiber Optic Inverter: enabling development of night vision goggles—*Night Vision Laboratory* • High Power Transmitter Tubes for Radar: enabling development of air defense and antitactical missile systems—*Electronic Components Laboratory* • Temperature-Compensated Quartz Crystal: allowing development of oscillators with frequency stability over a wide temperature range—*Electronic Components Laboratory*
1950s	• Photolithography: enabling miniaturization of electronic circuits—*Diamond Ordnance Fuze Laboratories* • Titanium Alloy Ti-6Al-4V: later to be a vital component of aircraft—*Watertown Arsenal Laboratories*
1940s	• First Auto-Assembly of Printed Circuits: a technique of fabricating miniaturized circuits, in worldwide use today—*Signal Corps Labs* • Synthetic Large Quartz Crystals Grown: enabling large-scale manufacture of electronic components—*Signal Corps Labs* • ENIAC: first digital computer—*Ballistic Research Laboratory, University of Pennsylvania* • Proximity Fuze: improving lethality of munitions—*Diamond Ordnance Fuze Laboratories* • "Zahl Tube:" allowing development of ultra high frequency (UHF) radar—*Signal Corps Laboratories*

Figure 4

Additionally, Army medical research has contributed much to soldier well-being as illustrated in Figure 5. Recently, the Medical Research and Materiel Command received Food and Drug Administration approval of a vaccine for Hepatitis A Virus and an effective treatment for malaria (mefloquine), both of which were directly tied to earlier basic research.

The US Army Corps of Engineers is demonstrating significant applications in a variety of areas that emerged from their basic research investments in relevant domains. Examples include:

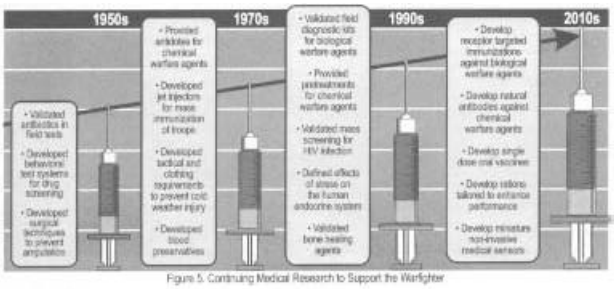

Figure 5. Continuing Medical Research to Support the Warfighter

- A site contamination characterization and analysis system based on Army basic research into sensing phenomena and predictive modeling of contaminant fate and transport.
- Rapid battlefield mapping systems for terrain visualization and analysis based on research in

spectral analysis and signatures, feature extraction and classification algorithms.
- Dynamic environment/terrain simulation techniques based on dynamic research properties of materials such as soil, vegetation and cultural features; dynamic energy properties; and temporal effects.
- A synthetic breakwater that will reduce wave action, facilitating the offloading of materiel for logistics-over-the-shore operations. This technology is based on basic research investments in the early 1980s that focused on wave theory, geomechanics and composite materials.

Products of basic research by the ARI on skill retention and acquisition were applied to Operation Joint Endeavor, providing a simple guide to help trainers schedule refresher training. Such research has also resulted in adjustments to Army policy on Selected Reserve Augmentee call-ups, allowing for immediate Reserve mobilization and rapid train-up.

Additionally, ARO and ARL make significant investments in materials science and mechanics. Figure 6 illustrates the research products expected from current programs as they relate to future armor systems based on smart, resilient structures. Finally, basic research in the early 1980s into energetic materials, penetration mechanics and composites mechanics led to M829A1 development for the M1A1 Abrams tank. Known as the "Silver Bullet," the M829A1's effectiveness was a factor in the overmatching capability displayed by the M1 during Operation Desert Storm. It is this overmatching technology that is the Basic Research Program's goal, ensuring Army technological dominance on future battlefields.

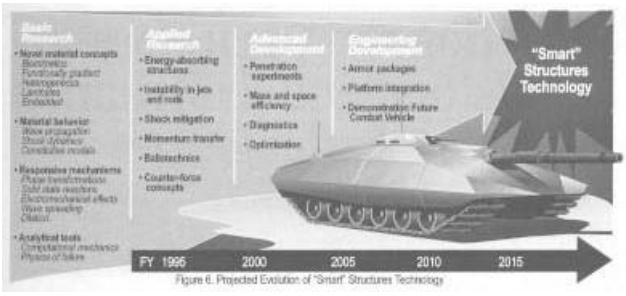

Figure 6. Projected Evolution of "Smart" Structures Technology

The Army Basic Research is a focused program, which addresses the future Army's needs by making smart and balanced investments today. The program is integrated with and leverages other services' and agencies' investments. The AAN provides a context for these investments, identifying the technological concepts on which America's Army will depend, thereby defining the enabling research that must be done today. Army basic research has demonstrated its value via past achievements and ensures the Army will reap the benefits of current investments on tomorrow's battlefields.

The United States depends on its technological innovations to maintain an overmatching defense capability and to remain competitive in the world of commerce. The Army's future soldiers will depend on the capabilities fostered by the investments made today in basic research. As stated by President Bill Clinton, "Investments in science and technology are critical to military preparedness, enabling us to stay at the cutting edge of new developments, so that our Armed Forces remain the best trained, best equipped and best prepared in the world."9 The Army owes no less to its soldiers. ***MR***

NOTES

1. National Science and Technology Council, National Security Science and Technology Strategy (Washington, DC: Office of Science and Technology Policy, 1995), 6.

2. Director, Defense Research and Engineering, Basic Research Plan (Washington, DC: Department of Defense, May 1996).

3. John Rennie, "The Uncertainties of Technological Innovation," Scientific American (September 1995), 57-58.

4. Graham Farmelo, "The Discovery of X-rays," Scientific American (November 1995), 86-91.

5. Robert Teitelman, Profits of Science: The American Marriage of Business and Technology (New York: Basic Books, 1994), 96-116.

6. Curt Suplee, "Infinitesimal Carbon Structures May Hold Gigantic Potential" Washington Post (2 December 1996), A3.

7. National Security Science and Technology Strategy, 16.

8. National Science Foundation, Federal Funds for Research and Development: Fiscal Years 1993, 1994 and 1995, NSF 95-334 (Arlington, VA: 1995).

9. President William J. Clinton, preface National Security Science and Technology Strategy.

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Meeting the Open-Source Acquisition and Exploitation Challenge

by Colonel Edward F. Dandar Jr., US Army Reserve, Retired

THE INTELLIGENCE COMMUNITY (IC) recently published an assessment of information technology and its impact on the intelligence process. This article summarizes the parts of the assessment that deal with the challenges and opportunities the IC faces due to dramatic increases in the availability and volume of open-source information. Expanding partnerships with industry and academia, effectively exploiting commercially developed information technology, re-engineering the IC organization and more outsourcing of selected IC open-source requirements are necessary for coping with the dynamic information environment.1

Changes in today's world affect how people access and use information. This information revolution goes beyond wide-scale personal computer use to encompass a growing use of wide-area, large- scale computer networks that provide the infrastructure for accessing and sharing information internationally. Although this global information infrastructure is in its infancy, it provides new frameworks and approaches for obtaining information. Corporations must use these new tools to compete effectively, and nations must use them to develop the information infrastructure needed to provide health care, education, economic viability and national security.

Although spreading unevenly throughout the world, this infrastructure enables domestic and cross-border information transmission in minutes. Information does not need a "visa" to enter or leave a state. The global information environment (GIE) is being used increasingly in diplomacy and as an educational tool for academia, governments and activists, as well as for groups whose goals and methods are unorthodox. GIE communication and information technologies can promote new forms of international grass roots cooperation and advocacy or increase social fragmentation within state borders or between countries.

Increased information source availability and accompanying technological developments-highlighted by the "Year of the Internet and Web" in 1995-provide the opportunity and challenge to rethink how information-processing tasks are performed. This rethinking requires `vision` and `decisive leadership` over the next few years. Our ability to exploit new information-access technologies and information stores is complicated by having to change how organizations and people do business. The associated re-engineering challenges are as significant within the IC as in society.

The IC must be able to exploit large amounts of disparate information. Analysts face greater work loads due to the increase in issues to address and information to manage-particularly from open sources-and due to resource constraints resulting from a reduced work force and competing tasks. The direct availability of essential information in original languages, replete with cultural and societal perspectives and biases, places even more emphasis on the specialized regional and language training analysts need to rapidly and effectively use information. In addition, they work within a fragmented systems environment with uneven connectivity to resources and widely varying practices, methods and tools for managing, accessing and exploiting information.

In this environment, analysts' requirements go beyond simple information access. They need an integrated information environment where they can seamlessly exploit information repositories, expert knowledge and necessary tools and services. This would facilitate collaboration across the IC, industry and academia and provide a basis for sharing information and disseminating it to consumers and decision makers.

Industry and academia can give IC analysts access to a wider range of open sources and experts, thus improving the information exploitation process. However, even the typical nongovernment information broker's open-source acquisition and exploitation business process, as depicted in Figure 1, must be re-engineered and automated to handle increasingly large volumes of disparate and globally distributed multimedia and multilingual open-source information (OSI).

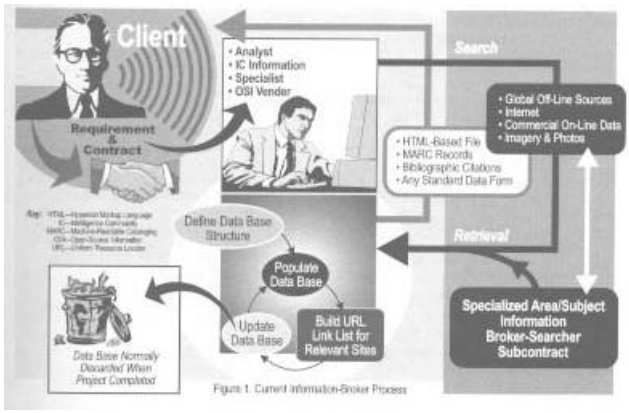

Figure 1. Current Information-Broker Process

The rapidly expanding GIE depicted in Figure 2 is challenging the government's information exploitation resources. IC analysts cannot be experts in all political, economic, technological, military operations other than war (OOTW) and major regional contingency (MRC) areas, nor can they master all the languages in which high-quality OSI is quickly accessible. They must get information from a wide variety of sources on a continuous basis to respond in a timely manner to decision makers' critical information needs. Given the preponderance of information sources, the IC analyst does not have the time, expertise or training to continuously and exhaustively collect information on multiple targets of interest.

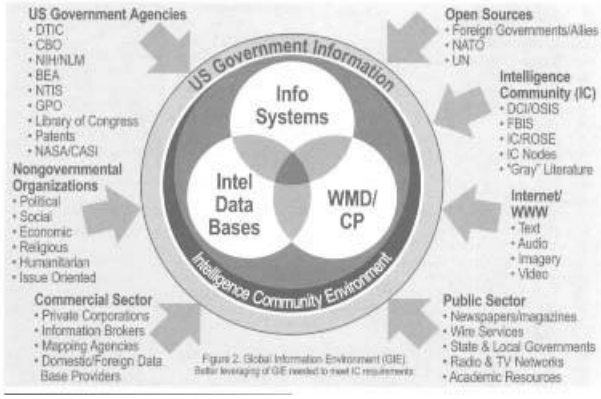

Figure 2. Global Information Environment (GIE)

A critical problem facing IC analysts in the GIE is access to OSI and tools to help them deal with large volumes of information. Today's OSI challenges and shortfalls are aptly described in the `Report of the Commission on the Roles and Capabilities of the United States Intelligence Community`. The report aptly describes analysts' needs and the status of the current OSI environment:

- "Analysts must have command of all relevant information about their subjects, not simply command of secret information.
- Ascertaining what relevant information may be on the public record has become more difficult.
- While the development of OSI data bases is growing, intelligence analysts have only limited access to them.
- Given the amount of open-source information that is readily available to the public over computer networks, the effort of the IC to structure and make available to analysts pertinent open-source data bases seems inexplicably slow.
- It is clear that open sources do provide a substantial share of the information used in intelligence analysis.
- With more information becoming available by electronic means, its use in intelligence analysis can only grow.
- An adequate computer infrastructure to tie intelligence analysts into OSI does not appear to exist. In the commission's view, the creation of such an infrastructure should be a top priority of the DCI

[Director of Central Intelligence] and a top priority for funding."2

OSI Acquisition/Exploitation Solutions

Addressing these OSI environment problems depends on effectively monitoring key information technology developments and inserting mature commercial software products into the OSI acquisition/exploitation process.

Government and nongovernment managers can work together to guide the use of the technology and information.3

Commercial software products can help automate current open-source business process functions, such as OSI search management, language translation, analysis and product generation. The exception is automated data base generation. A hybrid man-machine interface still is needed to generate even noncomplex data bases.

The IC is integrating maturing analytical software products from various organizations. `Project Pathfinder` and its tactical counterpart, `Sentinel`, are evolutionary, user-driven, Army-sponsored software research and development (R&D) projects pursuing the development of advanced tools for analysts. `Pathfinder,` a deployed system used by more than 30 IC organizations, enables analysts to translate their requirements into software tools right at their workstations, allowing them to interpret enormous amounts of electronic information. The IC TIPSTER program, an interagency effort begun in 1981, includes at least 15 projects with industry and academia aimed at improving text processing.4 As these R&D investments mature, they will become available in government and commercial off-the-shelf products. In addition, collaborative work and OSI sharing can be enhanced by establishing an IC-wide open-source directory service, which will require adopting IC-wide information access and sharing policies.

Existing commercial solutions offer significant enhancements to operational capabilities through incremental improvements and technology. Where those gains are possible, IC policies must not inhibit improved capabilities.

While the National Foreign Intelligence Program is addressing OSI shortfalls to varying degrees, more IC OSI budget reductions will curtail progress. The IC must continue exploring other OSI acquisition and exploitation alternatives, such as using commercial vendors, military Reservists and universities that can handle the information explosion and can support several IC and military core business areas, as shown in Figure 3.

Outsourcing as a partial solution. Commercial vendors, universities and military Reservists have the background and experience to continuously monitor and receive data to support IC transnational, OOTW and MRC issues. Industry and academic centers have information specialists with expertise on various world regions, cultures and related subjects. These nongovernment analysts can acquire and preprocess OSI to help satisfy many civil, political, law enforcement, economic and military community information requirements.5

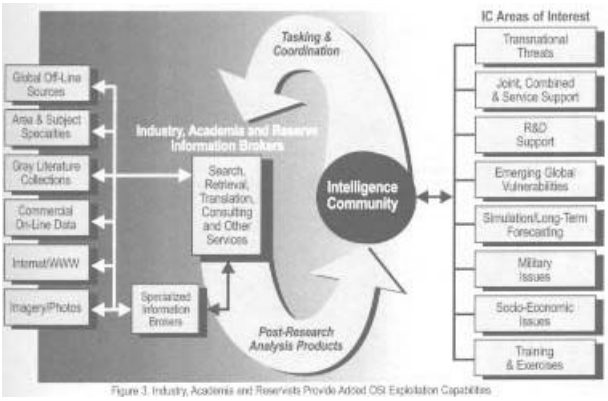

Figure 3. Industry, Academia and Reservists Provide Added OSI Exploitation Capabilities

US responsiveness to natural and manmade disasters relies heavily on a variety of open sources, especially information from humanitarian relief organizations. OSI from previous or existing IC external research contracts related to a country's or region's national religions, customs, personalities and basic infrastructures-such as food, water and health care availability; communications; transportation; power generation; and distribution systems-is invaluable in obtaining a realistic "picture" of the crisis to guide appropriate action.

Added OSI exploitation capabilities. Two objectives for meeting policy makers' and commanders' needs will be satisfied when incorporating OSI vendors into the intelligence flow:

- Short-suspense contingency requirements will be fulfilled through accessing, filtering and maintaining on-call source data.
- Strategic-level open-source research will be available to alert the IC about activities indicating abnormal or potentially alarming situations.

A thorough understanding of available and useful information sources is essential for meeting OSI research requirements. Many commercial vendors, academics and Reservists maintain their GIE knowledge through memberships in professional organizations dedicated to information research. They network and attend professional, international symposiums, conventions and trade shows to keep abreast of new OSI avenues and to pursue commercial business interests. In addition, these information specialists often build domestic and international networks that can leverage academic and professional contacts.

Industry and university centers maintain contemporary technical libraries with topical reference books, specialized publications and journals from around the world. They rigorously evaluate information sources to minimize bias and unsubstantiated claims that may have been reported or published. These OSI providers also acquire information not readily available through data services by soliciting "nonelectronic" information from sources such as embassies, trade missions and foreign libraries and organizations.

Because focused data acquisition is a fundamental part of their business, these OSI providers know how to acquire `gray literature`-publicly available information not distributed through normal publishing channels. Examples include academic writings, conference proceedings, trade show literature, video and still imagery reports, marketing research studies, international tender documents and industry-sponsored research. Knowing what information is available and how to obtain it requires a staff experienced in nontraditional research methods with broad commercial contacts.

Foreign Language Challenges

Foreign language open-source documents can be translated by available OSI exploitation vendor language support centers, usually staffed by translators familiar with a myriad of languages and dialects. Some vendor translators have security clearances from other government contracts. Contractors, academics and Reservists represent a large pool of subject-matter expertise and foreign-language capabilities that can be quickly tapped to meet current IC needs.

Processing text from multiple languages is of increasing importance to intelligence analysis. Historically, foreign-language processing required human translators and was limited to languages and domains with high mission priority. Increased access to foreign-language sources, especially on-line open literature, has created new requirements for a whole range of tools. The overall goal is to provide a multilingual text analysis capability for foreign-language information.

Analysts need tools to facilitate handling foreign-language text, especially when the analysts are not language experts. These tools may range from automatic language classification capabilities to identify the source material language, to tailorable information extraction and summarization tools for abstracting foreign-language documents, to presentation tools for handling specialized character sets. Machine translation (MT) capabilities are key to providing wide-ranging language skills and domain expertise to a broad user population.

A number of IC and Department of Defense (DOD) components are researching MT. DOD is doing most of the basic work, and some IC organizations are doing additional research. The IC's Open-Source Information System (OSIS), the Intelink-TS network and, soon, the Intelink-S network all host and maintain MT software that automatically translates text into language pairs, such as Chinese to English, for example. Other DOD agencies are working on developing machine translators for "low-density" languages.

The US Air Force National Air Intelligence Center (NAIC), Wright-Patterson Air Force Base, Ohio, has been using MT for more than 40 years, starting with the world-famous Systran Russian-to-English MT system developed during the Cold War. The system still supports the IC's translation needs. There are now 11 Systran MT systems in use throughout the IC and the US government. They include: Russian, French, German, Spanish, Italian, Portuguese, Japanese, Serbo-Croatian, Chinese and Korean to English and English to Korean. The last three systems are in very early development. In addition, Ukrainian and Cantonese systems will be developed this year, and operational prototypes will be available within two years.

The Systran MT systems no longer require mainframe computers, and the software is available for UNIX computers and computers using DOS/Windows. NAIC owns unlimited rights for free use by US government agencies. Government organizations with appropriate computer systems will soon be able to download certain Windows versions of Systran from the OSIS and Intelink networks. The languages that will be available include Russian, French, German, Spanish, Italian and Portuguese. Shrink-wrapped versions of Systran software are available from the NAIC.6

OSI Strategy

Four levels of effort are necessary to stay abreast of the exponential OSI growth:

- `Sustained` provides the basic information on a given region, target or area of concern.
- `Intensified` provides a focused effort that requires detailed, selected target examination and is based on potential "hotbeds" of activity.
- `Directed` provides a quick-reaction response requiring maximum effort against an imminent trouble spot.
- `Cued` focuses on unusual activities or events observed during the sustained level and indicates if a higher level of activity is required or if other IC sources should be tasked.

One way to implement this strategy while leveraging the strengths and availability of IC and non-IC resources is to divide the four levels between IC personnel and contractors. For example, contractors might provide continuous coverage of events in a particular region or topical area (`sustained`) and, on occasion, produce special-focus studies (`intensified`). If large, current data bases were built and maintained by this process, IC personnel could exploit these OSI repositories and other classified sources to respond to the ad hoc (`directed`) and indications and warning (`cued`) information requirements.

In acquiring more information above the sustaining level in this approach, customers must be aware of the limitations, especially the time allotted for ad hoc requirements and OSI availability. Availability will be partially based on the level of technology development and potential external information gateways in the country or area of interest. In cases where external access to the country is denied for publications, data bases and on-line vehicles, local access to libraries and other open sources must be used.

Greater access to open-source material puts a premium on critical evaluation and elevates the potential for deliberate and highly sophisticated deception. This problem rests more heavily with the analytical, rather than the hardware and software, OSI systems' components and processes. In addition, access to some open-source data bases may be fragile-quickly denied or lost due to conflict, natural disaster or, simply, system failure.

`OSI road maps.` OSI road maps identify potentially available information sources in a target country or mission area. The road maps are particularly pertinent to OSI acquisition through the Internet, where they identify relevant uniform resource locators (URLs) and details such as the general information content at each source, an assessment of its general accuracy level and the timeliness of data normally found at each site.

The need for OSI road maps is obvious in this information revolution era. The road map establishes directions for OSI acquisition processing and dissemination of evaluated information on specific IC topics of interest. Road maps become particularly important when planning ahead for international political or military crises, which do not always occur overnight and often are known days, weeks or even months in advance. Developing IC/industry/academic/private expert crisis teams well in advance enables us to better prepare for crises because all information sources and expertise are exploited.

The IC Open-Source Program Office began an initial commercial Internet reconnaissance in October 1995. The main purpose of the project, concluded in April 1996, was to investigate the Internet as a resource for OSI pertaining to Africa and Latin America and to research the availability of commercial data bases containing information on Latin America. The primary deliverables were a directory of bibliographic records of relevant sites and data bases and a report detailing the commercial vendor's research methodology and findings.

The study's importance is that it was one of the first known attempts to broadly explore the vast and inadequately charted Internet as a source of valuable intelligence information. Conducted just at the time the Internet was rapidly expanding its effects, especially in less-developed areas of the world, the study reached three conclusions:

- The Internet is an increasingly valuable source of information for the IC, both from content and process points of view.
- Without targeted and value-added directories, the Internet is unlikely to be a cost- or time-effective tool for most analysts, except those who become Internet specialists.
- The cost per unit for developing value-added directories should decrease as methodologies are further refined, making continued development increasingly more advantageous for coordinated IC support.

As the study states, "The `first` conclusion is based on the speed and extent of migration of publishing (especially gray literature) to electronic networked media. The `second` is based on the fact that [the] Internet is still very volatile in its nature and the search technology is not refined enough for the average user to use it in a cost-effective way. The `third` is based on the fact that a majority of the effort on this project was [on] developing methods and applying existing standards which would not have to be repeated for further directory development. With some additional application of automated tools to OSI processes, the cost per directory or OSI road map should decrease over the next five years."7

The need for more macro and domain-specific road maps should be pragmatically approached by building on lessons learned, methodology and recommendations.

`OSI pilot projects.` OSI pilots develop macro or micro information road maps; produce domain-specific products; establish directories of government, industry, academia and other private subject-matter experts; and contribute to re-engineering the OSI business process by automating as much of it as possible by inserting and integrating the best available software.

Figure 4 proposes a new and increasingly automated OSI business process that reuses and enhances information captured in various IC domain repositories through electronic profiling, normalizing, tagging and indexing. The IC information specialist's and/or vendor's role is to postprocess more acquired data by filtering it through available visualization and preanalysis tools. This new process provides the all-source analyst with a pertinent OSI working file. The IC end goal is the rapid access, processing and integration of OSI into timely, all-source products or validated open-source products for public or coalition force use.

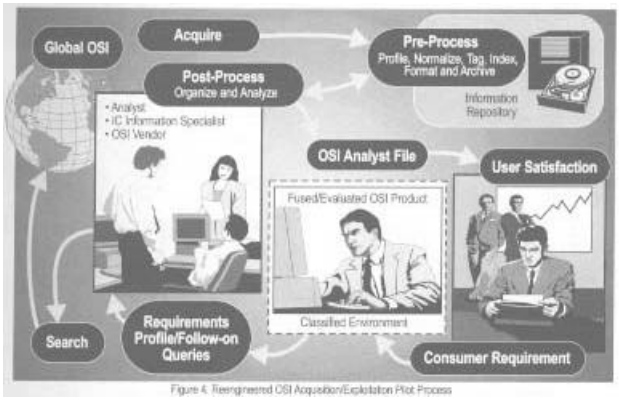

Figure 4. Reengineered OSI Acquisition/Exploitation Pilot Process

The primary intelligence operations within OSI pilots should focus on enhancing one or more of the following components: acquisition (road map strategies), data preprocessing, data manipulation, preanalysis processing, knowledge base development and transmission of results to the all-source analyst(s).8 Pilot projects also provide a controlled way of testing the use of non-IC resources to satisfy IC OSI requirements.

OSI Acquisition/Exploitation Pilot (OAEP) process criteria. Any OAEP can benefit from the lessons learned and criteria used in the Central Intelligence Agency's (CIA's) Project Overture.9 Applicable parameters follow:

- Be user-friendly, require minimal training and be as compatible as possible with other computer applications.
- Improve reading and research efficiency by enabling users to significantly increase document-processing speed, the amount of relevant information they can glean from documents or both.
- Instill a high confidence level in users so they will trust the results. Therefore, the OSI pilot must be perceived to be accurate and reliable and to produce clear, immediate and useful improvements in how users can process information.
- Be flexible and have enough options to permit users to tailor it to their work habits and preferences, especially concerning the degree of automation sought.
- Produce standardized results so everyone can understand the material identified or extracted and the results can be migrated to whatever level is useful-corporate, work group or personal-with no loss of meaning.
- Fit seamlessly with whatever search and retrieval tools are available and with a wide variety of analysis tools, such as chronology, linking or geographic, the analyst is using.
- Require minimum maintenance by users or system administrators, yet remain timely.

OSI vendor, academia and Reservist selection. A prospective OSI vendor or Reservist supporting the IC should have extensive experience with and understanding of the intelligence arena and various world regions, as well as specific topical expertise pertinent to customer needs. These organizations or individuals should have access to trained information specialists and/or intelligence analysts with a wide range of experience in applications software. Individuals must keep current with new developments in data base applications, information retrieval methods, fusion, information validation and collection. Small, high-quality consultant teams and larger vendors should be able to present a list of experts and specific skills available to fulfill tasks.

The following considerations should be addressed in developing a statement of work before employing a vendor to execute an OSI pilot project:

- Can other non-IC resources, such as DOD/government research and analysis organizations, corporate researchers and market analysts, academic researchers, nongovernment researchers, Reserve/ National Guard intelligence units and individual mobilization augmentees, potentially address this problem?
- How will information providers be selected? What are the selection evaluation criteria?
- How will information providers be tasked?
- How will information providers be compensated? By retainer? By the finished product or mission?
- How is the value versus cost of these products assessed?
- What are the deliverables, time frames and costs?
- How are finished products delivered-hard copy, hypertext markup language or multimedia-and disseminated to IC analysts?
- What measurement criteria and other evaluation mechanisms will be specified in advance?

While technology can offer some help to the IC facing a torrent of OSI, non-IC resources can provide essential support in dealing with the open-source acquisition and exploitation issue. The potentials and limitations of concurrently employing technology and OSI vendor solutions can best be determined by a

series of carefully designed, controlled, limited and assessed pilot projects.

In addition to implementing the available solutions cited, more focus is needed in guiding the re-engineering of IC analysis, collection and production processes for the 21st century and the retraining of the IC work force away from the lingering Cold War mold to enhanced exploitation of GIE resources. Many intelligence business skills and trainers needed to accomplish this 21st-century transformation are in the commercial and academic arenas. However, the current IC work force culture provides some serious challenges that must be met if we are to adequately meet our customers' information needs. Working closely with our business, academic and Reserve colleagues on OSI road maps and other projects should facilitate the IC work place transformation.

Forging improved government partnerships with industry and academia also should contribute to developing and identifying the "best of breeds" in emerging information technologies. Their timely insertion into IC OSI programs and subsequent evaluation should contribute to establishing broader-based IC OSI strategies and exploitation capabilities. Government, with business and academia, must seize this window of opportunity for leveraging the dynamic GIE into innovative, real-time knowledge bases to maintain its competitive edge in global economics, technology and information.10 ***MR***

NOTES

1. Joint Technical Office Working Group, Intelligence Systems Support Office, Deputy Assistant Secretary of Defense (DASD) for Intelligence and Security (I&S), "An Intelligence Community Information Technology Assessment: Recommendations for the Future" (McLean, VA: The MITRE Corporation, 31 July 1996).

2. Congressional Bipartisan Executive and Legislative Commission on the Roles and Capabilities of the United States Intelligence Community, Preparing for the 21st Century: An Appraisal of US Intelligence, Report of the Commission on the Roles and Capabilities of the United States Intelligence Community (Washington, DC: US Government Printing Office, 1 March 1996), 88-89.

3. An intelligence community (IC)-developed "Technology Navigator" for tracking "information technology areas of interest" is available in "alpha test" mode on the Internet at: http://www.mews.org/jto. Suggestions for improving this service are solicited.

4. Further application of Pathfinder, IC analysts' tool requirements and TIPSTER can be found within the Technology Navigator described in note 3.

5. PSC Inc., "The Paper-Use of Open-Source Vendors (Reston, VA: April 1996); International Trade and Technology Directorate, The MITRE Corporation, interviews by author, McLean, Virginia, 12 and 15 April 1996; and Alan D. Tompkins, Computer Consultants, Hinesburg, Vermont, numerous phone interviews by author, April 1996.

6. All the languages noted are available. IC analysts' exploitation of foreign electronic open sources in available languages can be facilitated by pasting an Internet hypertext markup language page into the OSIS MT system or other MT-equipped system. The entire web page will be returned, translated into English for quick content evaluation. The NAIC, the Federal Intelligent Document Understanding Laboratory and other IC elements are working together to develop optical character reader (OCR)

technology that can be integrated with Systran and other MT systems. A government-sponsored Easter Computers Inc. Chinese OCR package is integrated with Systran Chinese. The Cuneiform OCR package, which includes seven Germanic and Romance languages, Russian Cyrillic, Serbian Cyrillic and Croatian roman languages, also has been integrated with Systran, as has E-Typist, a commercial off-the-shelf Japanese OCR package. Another IC organization is developing Arabic and Farsi OCRs. These MT and OCR capabilities are major steps in dealing with the GIE that will become more regionally and linguistically focused.

7. Information International Associates Inc., "COSPO [IC Open-Source Program Office]Africa/Latin American Project: Electronic Sources" (Oak Ridge, TN: 22 April 1996).

8. Computer Sciences Corporation, "OSI Acquisition and Exploitation Pilot," White Paper (Falls Church, VA: 15 March 1996). I also used information from my discussions with several vendors.

9. Additional information on the CIA's Project Overture can be found within the Technology Navigator (see note 3).

10. The author acknowledges specific contributions and editing support from Richard Peze of DASD (I&S) Intelligence Systems Support Office, Alan D. Tompkins of Computer Consultants and Graham H. Turbiville Jr. of the US Army Foreign Military Studies Office. A special thanks to Robert D. Steele of Open-Source Solutions Inc. for his valuable contributions on open-source intelligence. Steele's national and international lectures, symposiums and papers continue to expand the knowledge base for open-source intelligence.

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Historical Perspectives on Future War

by Robert F. Baumann ©

THINKING DEEPLY about the future of war requires careful reflection on its past. A paradox? Certainly. B.H. Liddell Hart likened the opposing pull of science and history in forecasting the role of future armaments to a "tug of war."1 The march of science suggests the next war will employ many new means. In contrast, history suggests that by its very nature, war exhibits many continuities amid change. Broadly speaking, history gives a sense of the trajectory of war's evolution.

Using historical perspectives on the future, this article addresses several fundamental questions. First, how did past futurists frame their arguments in historical terms and what common approaches did they adopt? Second, how have past approaches to speculation on future war influenced the way we think today? And, third, how have historical perspectives entered into the current debate about shifting paradigms in strategy and the revolution in military affairs (RMA)?

Before addressing these questions, a brief review of a few prominent European intellectual trends during the century and a half before World War I reveals emerging assumptions about change and progress that are basic to any analysis of why war has assumed its variety of forms. The modern fascination with cutting-edge technologies and their undeniable impact on war often obscures our view of war's other dimensions. Historians have widely noted the social, political and economic factors in shaping the evolution of conflict. Cultural and intellectual changes have played a powerful role as well.

Past patterns of thinking about the future have influenced the way we speculate about war-so much that we often use them subconsciously. First and foremost examples are our notions of change and progress. As noted by scholar J.B. Bury in `The Idea of Progress`, until the Middle Ages, Western cultures generally adhered to a static view of history. The ancient Greek philosophers did not perceive progressive development as natural to humanity. While they did grasp the cyclical rise and decline of city-states and empires, they perceived no general direction, and certainly no conspicuous or inexorable improvement, in unfolding human history. Even at the dawning of the Renaissance, when the intellectual preconditions for its appearance were taking form, the idea of progress in earthly affairs was yet to be born.2

However, by the late 18th century, faith in progress was virtually a fixture in the outlook among all but the most pessimistic of Western thinkers. Period analysts founded this perception on an appreciation of comparatively recent but dramatic change brought about by scientific and technological advances. Progressive discovery in biology, botany, chemistry, physics and astronomy revealed dazzling patterns and regularities in the universe. Some inferred from the unlocking of nature's secrets that comparable tendencies might govern human affairs. A critical component of this revelation was the constancy of change and a fresh sense of the trajectory of historical development. Many looked boldly to a brighter future. For instance, Marquis de Condorcet wrote effusively in 1793 about the limitless perfectibility of humanity even as he was under death sentence and evading revolutionary authorities in France.3

Contemporary thought about warfare reflected the spirit of the time and place. In his `Essai general de tactique`, written in 1770, Frenchman Jacques Antoine Hippolyte Comte de Guibert purported to make a science of tactics. Based on a historical review of the art of war, he professed to have established a

series of enduring tactical principles that would transcend changes in weaponry. Along the way, he concluded that the states of the ancient world often exhibited a better grasp of the relationship between war and state institutions than kingdoms of contemporary Europe, although he held out hope for Frederick the Great's Prussia.4

By the early 19th century, European interpretations of the historical development of human knowledge, warfare and social organization tended to share one distinctive characteristic: They saw human progress unfolding not in a perfectly linear fashion but in distinct stages. Each stage represented a fundamental transformation that built on the foundation left by its predecessor.5 Even the French Revolution's excesses, the Napoleonic Wars' horrors and conservative reaction across Europe did not stifle the optimistic profusion of new writings anticipating a bold new age. War, many believed, was crossing a historic threshold as well.

To forecast the path the future would take, those analysts who most influenced 20th-century perspectives attempted to use scientific methodology. Setting the pace were the "positivists" and Auguste Comte. Comte set aside the questions of causality and meaning. Believing that contemporary German idealists and romantics were wasting time in their preoccupation with such problems, he focused his attention on what could be known. Thus, Comte sought to ascertain the laws governing human and social development through empirical observation-the cornerstone of positivist methodology. Comte described history as inexorably unfolding in three intellectual stages: theological, metaphysical and positivist. The latter did not build on its predecessors but, instead, replaced them by virtue of its superior insight. Comte dubbed the application of positive doctrine to human affairs "social physics," the spirit of which incidentally pervades modern social science theory and warfare modeling.6 Accordingly, positivists anticipated that knowledge of the laws by which societies functioned would make it possible in the future to engineer a perfect society and even put an end to war. Not only was the future predetermined, humanity itself could self-consciously bring it to reality.

Even John Stuart Mill, the English paragon of classical Western liberalism and champion of free speech and free will, could not entirely escape the idea that certain laws actually governed the flow of history. Mill separated history into so-called organic and critical periods. The former represented periods of stability and the latter, disruption and change. The search for truth was the moving force in history. Overall, he contended that historical laws direct human action, and "the influence exercised over each generation by the generations which preceded it, becomes more and more preponderant over all other influences."7 Shaping the same logic toward a different end, German historicists and early philosopher-nationalists, such as Johann Fichte, argued that the present and future were governed by the past.

Fichte saw the unfolding of history in the evolution of the modern nation, viewing the state as the vehicle by which politically self-conscious peoples would secure their destinies. Similarly, German philosopher Georg Wilhelm Friedrich Hegel saw historical progression as a dialectical process involving creative destruction in which each stage produced the forces that would undermine it and synthesize a new stage. In this context, Hegel wrote, "Freedom is nothing but the recognition and adoption of such universal substantial objects as Right and Law, and the production of a reality that is accordant with them-the state."8 This logical foundation served as the point of departure for much of Carl von Clausewitz's interest in the state and its defense.9

Against this common European cultural background, it is hardly surprising that popular philosophical concepts should have found their way into theoretical musings about warfare. Henri Jomini's works on warfare and his belief in the immutable principles that regulate it exhibit positivist influence. Although

he was also influenced by empirical scientific precepts, Clausewitz expresses German philosophical concerns with "how we know what we know," the force of human will and a host of other problems. Clausewitz adapted the Hegelian dialectical method to his consideration of war. He recognized implicitly that Napoleon's crushing defeat of the Prussian army in 1806 demolished the military synthesis of Frederickian absolutism.10 Though cognizant of change, Clausewitz did not foresee the perfecting of humanity or a prescription for perfect soldiering. His grasp of friction-sand in the gears of the perfect Enlightenment rationalist machine-doubtless made him skeptical of positivist influence on the study of war. Still, he did believe that soldiers could improve their minds through experience and the study of history and theory.

Another perspective that affected interpretations of change and warfare surfaced in 1859 with the publication of Charles Darwin's `Origin of Species`. All the theoretical parts of Darwin's synthesis were well established before he wrote his book. However, no one had woven them together as distinctively as he did. When fully assembled, Darwin's theory of evolution offered a new paradigm for thinking about the world. This paradigm depended on the assumptions that change was constant and normal, the earth was far older than previously supposed and the mechanism of biological evolution was natural selection. The most explosive implication was that humans were the product of evolution.11

Reactions to Darwin varied. To some, namely those who came to be called social Darwinists, "survival of the fittest" became the governing principle of peoples and states. This world view reflected a distinct notion of progress but certainly dispelled the optimism of preceding decades. The idea that struggle was integral to civilization's advance resonated widely and merged with another seminal 19th-century trend-nationalism.

A relatively recent phenomenon, `nationalism` was rooted in a late 18th-century cultural movement emphasizing the historical rise of distinct nations as expressed through ethnicity, language and heritage. Afforded political impetus by the Napoleonic Wars, nationalism became an incredibly potent social force in late 19th-century Europe, where the imagery of nations as living organisms fused with the concept of Darwinian struggle.12 A splendid example is `Russia and Europe`, published in 1869 by Russian Pan-Slavic theorist Nikolai Danilevski, which forecast a great war with Germany to decide whether Slavs or Germans would be masters of Central and Eastern Europe. With remarkable speed, the new nationalistic strain gained adherents among Europe's armies.

In the 1870s, Russian General Mikhail Skobelev remarked that only war, the highest manifestation of the life of the state, could stir a self-indulgent citizenry to the service of higher values.13 In 1911, in `Germany and the Next War`, retired German cavalry general and Pan-German publicist Friedrich von Bernhardi embraced the idea of struggle. War was not merely essential, it was the highest expression of civilization.

Not all, however, read Darwin the same way. To Herbert Spencer, evolutionary theory implied that human nature itself was subject to change and therefore offered a renewed hope for the perfection of humanity. Civilization's development through natural selection was itself natural. In contrast to the social Darwinists, Spencer suggested that societies would evolve away from armed struggle toward harmony and cooperation. An industrial age of peace would supplant the age of militant struggle.14

Marxism presented yet another competing interpretation. Though influenced by Comte and Hegel, Karl Marx predicated his views on materialist thought-all events and even intellectual processes have material or physical causes-and scientific social analysis. In 1848, Marx and Friedrich Engels wrote the `Communist Manifesto`, as well as several other works on the formation of social classes and proletarian

revolution. They organized the past and future into stages of development from slave societies, through feudalism and capitalism, to communism. Marx looked ahead to the annihilation of capitalism, the withering of the state and the creation of a classless society. The engine of history was class struggle and periodic revolution against the prevailing order of economic relations in society. A historical determinist, Marx saw humanity's path toward this end as preordained.

After Marx's death, Engels applied the Marxian dialectic to the discussion of war. In 1887, Engels described a cataclysmic future European war that would lay waste to bourgeois societies and create the necessary climate for revolution and working class triumph. Vladimir Lenin borrowed Engels' vision to create a new typology of war. Drawing from Clausewitz and Marx, Lenin penned "The Principles of Socialism and the War, 1914-1915," an essay in which he contended that bourgeois-national wars, which had predominated until 1871, subsequently gave way to imperialist war, a distinctive and inevitable feature of mature capitalism.15 In 1917, Lenin forecast in `War and Revolution` that World War I would devolve into international civil war and revolution.

By the eve of The Great War, many believed change and progress had joined with biological metaphor to define the relationship among European states. This outlook steeled the will of peoples across the Continent to raise gigantic armies and justified virtually any sacrifice in the name of the nation.

Speculation on War and Change

At the turn of the century, well before Lenin came to his revelation about war, Polish banker Jan S. Bloch published a radical non-Marxist critique of contemporary warfare. Employing only information that was available to professional soldiers of his day, Bloch contended that Europe's generals were wrong about what future war would hold. He wrote that ". . . war, instead of being a hand-to-hand contest in which the combatants measure their physical and moral superiority, will become a kind of stalemate, in which neither army being able to get at the other, both armies will be maintained in opposition to each other, threatening each other, but never being able to deliver a final and decisive attack. It will be simply the natural evolution of the armed peace, on an aggravated scale. . . . That is the future of war-not fighting, but famine, not the slaying of men, but the bankruptcy of nations and the breakup of the whole social organization."16

Bloch, failing to appreciate nationalism's power, was not entirely correct, although he did discern some of war's dimensions with remarkable clarity. In the end, there was a decision, but only at a stupendous and irrational cost that toppled empires and pulverized a generation.

The point is to note Bloch's revolutionary view of war. Bloch appreciated that the arms evolution had reached a new threshold which would fundamentally alter the conditions of the next great European war. Aside from his skills as an economic analyst and his mastery of professional military literature, Bloch brought a different perspective to his examination. His paradigm was partially a function of his pacifist outlook, but it was equally attributable to his perception that the old way of thinking about warfare could not accommodate new realities.

Many military thinkers on the eve of World War I also recognized the importance of recent changes, but most construed them differently. As early as 1893, Russian Captain E.I. Martynov wrote a study titled "Thoughts about the Technique of Future Wars," in which he attempted to describe how future strategy would guide theater-level war. Another forward-looking Russian was A.A. Neznamov, who served as an instructor at the Nicholas Academy of the General Staff from 1907 to 1912. Neznamov was among the leading proponents of unified military doctrine-a common approach to war for the Russian army.17

Based on his Russo-Japanese War analysis, Neznamov identified four essential features that would characterize the next war and which competent future commanders would have to reckon with:

- The predominant role of fire-more lethal, accurate and voluminous.
- The lower quality of conscript soldiers.
- Mass armies.
- The unprecedented complexity of command and control.18

Bloch shared most of Neznamov's projections. Both also pondered a question that had stirred great debate among generals and military theorists since the Franco-Prussian War: Was there a new relationship between technology and the human/moral factor in war? They both held to the radical view that "man was losing his grip on war." Future firepower would dominate combat and reduce soldiers to cogs in a vast, incomprehensible machine.19 Commanders would wrestle to control mass forces beyond the reach of communications.

Unlike many of his predecessors, Neznamov never referred to the power of genius in his writings. Whether or not he believed in genius, he did not expect to find it. What he sought were competent commanders-schooled leaders capable of properly executing any task in harmony with an overall battle scheme. Therefore, the Russian army's central problem was not a lack of genius but a parade-ground mind-set that stifled practical preparation and substituted templated courses of action for scientific analysis and artful judgment.20

According to Neznamov, the education of a proficient general had to be based on self-study. He cited Russian Field Marshal Aleksandr Suvorov's proposition that a good commander first mastered the regulations, then the principles of war and, finally, the history of recent and ancient wars. If the first two instilled a sense of what to do and why, the latter developed his critical faculties and an appreciation of the uniqueness of any situation. A commander had to create solutions, because every problem he would face in future war would necessarily be new, even if it was historically familiar in a general sense. In sum, Bloch rejected war because of its intrinsic futility, whereas Neznamov planned to prepare commanders to cope with future trials.21

The problem confronting Bloch and Neznamov was no different than the one leaders face today. The social and political changes that reshaped military organizations were combined with rapid, incremental technological advances and seemingly normal evolutionary design improvements in existing weapons to produce jarring, disorienting changes on the battlefield. In Marxian terms, quantity became quality.

Paradigm Shifts and RMA

Current literature on policy and international security hails a paradigm shift in US foreign policy and strategy.22 The basis for this shift is the Soviet Union's collapse, the disintegration of the Eastern bloc and the dissolution of Yugoslavia. Since 1991, the United States has adjusted to a world without its principal political, ideological and military adversary. The implications are large and numerous.

What exactly do we mean by a paradigm shift, and how do we recognize one? Physicist and historian Thomas Kuhn brought the expression "paradigm shift" into common usage in 1962 with `The Structure of Scientific Revolutions`. He attacked traditional interpretations of scientific development that depicted a steady building process where each breakthrough added to an established knowledge foundation. Kuhn's thesis maintained that science advances alternately between the

accumulation of discoveries within a given system of understanding and revolutionary changes which undermine the structure of existing knowledge and necessitate the building of a new conceptual framework. "Paradigms gain their status because they are more successful than their competitors in solving a few problems that the group of practitioners has come to recognize as acute."23

During periods of so-called normal science, new discoveries flow logically from, and in turn support, the prevailing paradigm. However, Kuhn explains that ". . . the successive transition from one paradigm to another via revolution is the usual developmental pattern of mature science."24 Scientific revolutions occur because an existing paradigm cannot accommodate new discoveries or theories. "Normal science . . . often suppresses fundamental novelties because they are necessarily subversive of its basic commitments."25 In other words, people are more receptive to new evidence that conforms to previously held views than evidence which contradicts them. Ultimately, normal science approaches a crisis when the results of research can no longer be adapted to fit the established pattern. Ultimately, each paradigm generates the very research that will eventually undermine it.

Therefore, a scientific revolution must drive the old paradigm from center stage to permit the advance of science. A revolution is not a mere reinterpretation of the existing paradigm. Rather, it leads to a fundamentally new comprehension of pre-existing knowledge. Thus, revelation and revolution demand a new paradigm.

Given the widespread adoption of Kuhn's terminology, it is appropriate to reconsider the extent of recent changes in the strategic environment in light of his definition. Has the American paradigm undergone a shift or merely a reinterpretation? The latter may be closer to the truth. Consider the continuities. NATO is still with us. The United States still seeks a world hospitable to free market economies and democracy, takes a proprietary interest in Western affairs and maintains highly capable military forces to protect its interests in the post-Cold War world. The lens of US-Soviet rivalry no longer distorts the American view of every regional conflict or Third World insurgency. Today, in terms of national security strategy, we are looking at the old post-World War II paradigm in an unfamiliar way.

The same is true of military strategy. Because US military forces can no longer focus on the former Soviet Union, a huge shift in emphasis is necessary. Still, the variety of missions proposed for US forces in the near term differs little from what we have done historically. US forces have engaged in low-intensity conflict and operations other than war since the founding of the republic and repeatedly in this century. Furthermore, if we look around the globe today, we see nothing unprecedented. Nationalist, religious and ethnic conflicts are hardly distinctive late 20th-century phenomena.

Yet, as the information age matures, some unfamiliar problems are likely to appear. For example, a determined adversary should be able to devise many insidious ways to sabotage, disrupt or contaminate the information highway upon which global and national commerce depend. Competition among multinational economic organizations could easily assume such a form. In addition, the advent of the alleged RMA will certainly influence how we practice war.

Historian Michael Howard recently posed a fundamental question: "Can technology change what has been, until now, the essence of warfare?"26 Many have attempted to answer this question. In the past several years, a host of books and articles have heralded the dawning of a new age in warfare. Characterized variously as the Third Wave, the Fourth Generation or simply the latest RMA, the new age in warfare has not escaped the notice of soldiers and scholars. The collective commentary has been impressive in its insight as well as its profusion. Perhaps no generation of military commentators has been so ready to embrace change and administer last rites to conventional wisdom about warfare.

One striking feature of the discussion is the periodization of history. Whereas most 19th-century observers periodized the past in terms of progressive stages of humanity's understanding of the world, social development or civilization, 20th-century writers typically focus on new technologies and the economic base that produces them. New technologies were central to the arguments of Liddell Hart and Julio Douhet. Even Soviet theorists, who relied on the Marxist description of historical stages, described the contemporary period-from World War II forward-predominantly in terms of technological change. Alvin and Heidi Toffler's War and Anti-War suggests that warfare is entering the Third Wave, in which power will be based on information technology. Eventually, they expect, technology and rationality will reduce the level of violence inherent in conflict to that of a hockey game.27 Could it be that the Tofflers and others are missing important continuities in the nature of war even as they offer provocative insights into the manner of its future conduct?

To be sure, the manner in which future war will be conducted is most relevant. In 1993, General Gordon R. Sullivan and Colonel James Dubik suggested five trends:

- Increased lethality and dispersion.
- Increased volume and precision of fires.
- Increased integration of technologies.
- Achievement of greater mass and effect.
- Refinements in invisibility and detectability.28
- Russian forecasters recently identified a similar set of distinguishing features for future nonlinear war:
- Absence of well-defined spatial limits.
- Combination of offensive and defensive operations.
- Increasing reliance on information systems for coordination.
- Conduct of mass strikes by radio-electronic high-precision, laser and superfrequency weapons, large helicopter groups and radio-electronic suppression.29

Upon close examination, each of these trends exhibits significant continuity with, or is rooted in, the evolution of warfare since the late 19th century. If we are in the midst of an RMA, historians can make a strong case that it has been unfolding for a long time. Viewing the same progression in another light, one could even argue that accelerating advance along the axes noted by Sullivan and Dubik constitutes one of the fundamental assumptions of the way we view warfare. Perhaps it is just part of our 20th-century paradigm and not a new revolution at all. Warfare has been in a state of rapid change for the past two centuries, and many modern phenomena were born in that progression. The recent trends identified by Sullivan and Dubik and their Russian counterparts differ from those noted by Bloch and Neznamov more in degree than in kind.

Problems inherent in linking futuristic technological change and doctrinal concepts are much the same today as they were a century ago. Consider the US Army's 1950s' response to the nuclear age. Having retained a conventional focus after World War II, the Army suddenly revealed the Pentomic Division in 1956. Consisting of five battle groups, the new division stressed air mobility and dispersion to function better in a nuclear environment. The bold experiment failed because "the technology lagged behind the doctrine, and the strategic concepts raced ahead of tactical realities."30

This time, the Army is valiantly attempting to prepare for change ahead of time. The future holds many eye-opening innovations, especially in technology. Recent dialogue has described future electronic combat as achieving spectrum supremacy which "will prove as critical as conventional battlefield

preparation and air supremacy operations of past wars."31 The near term also holds the prospects of cyberwar, robotic war and even neocortical warfare.32 Again, the underlying concepts are not altogether new. Most are consonant with J.F.C. Fuller's 1919 prescription for attacking the nervous system of the enemy.33 The imperative to gain spectrum supremacy might lead to escalatory scenarios reminiscent of the 1914 mobilization theory or Cold War nuclear logic.

Visions of new capabilities offer a glimpse of the future but leave even more unknown. In the Fall 1994 issue of Parameters, David Jablonsky asserted that the quantum leap in technology may actually increase the "fog of war," given compressed decision cycles and the increasing integration of the levels of war.34 Will we have more information than we can absorb? Will enemies find new ways to deceive us?

Because we cannot perfectly model future human behavior and interaction, past wisdom may be more helpful than critics suspect.35 Recent attacks on Clausewitz stress his neglect of insurgencies and ethnic strife within his state-oriented, trinitarian framework; his inability to anticipate the flood of future technologies; and his failure to consider the role of culture in determining modes of conflict.36 Although these criticisms have some merit, they are based on a misconception of the Clausewitzian trinity, the constituent parts of which are violence, chance and reason.37 The army, the government and the people are merely the rough real-world correlates of the trinity. The actual trinity is not bound to any particular historical context. It is as relevant to Operations Uphold Democracy and Desert Storm as to Prussia. Perhaps the trinity is a nonlinear concept.38

Were Clausewitz alive to comment, he might note that the idea of the state as Fichte knew it probably applies as well to the Palestinian Liberation Organization or Chechnya (which aspired to statehood) as to the United States. Furthermore, the passions and rationales that move states to roll the dice of war differ little from those which arouse tribes or insurgents. Finally, would a man who likened war to commerce really be unappreciative of the spectrum of conflict? Whatever features conflict assumes-urban operations, conventional air strikes, guerrilla fighting, psychological operations, random terror and even peacekeeping-all are discussable in Clausewitzian terms.

Like Sun Tzu, Clausewitz intuitively understood that the history of conflict revealed a dynamic tension among competing forces. Clausewitz, whose On War frequently bewilders American readers, drew heavily upon Hegelian dialectical reasoning, which sought synthetic truths through the resolution of opposing ideas or forces. It is this state of mutual opposition, regarded as perfectly natural by German philosophers, that characterizes the three parts of the trinity. Rather than ambiguity, Clausewitz saw in it flexibility and applicability to a many-sided reality.

Clausewitz did not describe in detail how future wars would be fought, but he was a futurist in his own right. In constructing a theory for thinking about war, he assumed that war's essential trinity would remain constant far beyond his lifetime.

As observed recently by Lieutenant Colonel Poncho Diaz-Pons, a historian formerly with the US Army Command and General Staff College, Fort Leavenworth, Kansas, "If you want to think outside the box, you want to know how the box was made." His point-and the point of this article-is that the writings of past thinkers have left us a legacy of intellectual constructs which we regularly apply to the study of change and future war. Thus, to paraphrase Liddell Hart, the "tug of war" between science and history remains a dynamic element in contemporary thinking on future war. The concepts of paradigm and revolution, rooted in past conceptualizations of history and progress, reflect this tension. ***MR***

NOTES

1. B.H. Liddell Hart, "Armaments and Their Future Use," The Yale Review (1930), 649.

2. J.B. Bury, The Idea of Progress (New York: Dover Publications, 1960), 7 and 36.

3. Franklin Le Van Baumer, Main Currents of Western Thought (New Haven, CT: Yale University Press, 1978), 454.

4. Azar Gat, The Origins of Military Thought from the Enlightenment to Clausewitz (Oxford: Clarendon Press, 1989), 44-49.

5. Frank Baumer, Modern European Thought (New York: MacMillan Publishing Co. Inc., 1977), 248-49.

6. Auguste Comte, Introduction to Positive Philosophy, translated by Frederick Ferre (New York: The Bobbs-Merrill Co. Inc., 1970), 8, 13 and 28.

7. J.S. Mill, System of Logic (New York: Harper & Brothers, 1884), 631-32.

8. Georg Wilhelm Friedrich Hegel, The Philosophy of History, translated by J. Sibree (New York: Dover Publications, 1956), 59.

9. Peter Paret, Clausewitz and the State: The Man, His Theories and His Times (Princeton, NJ: Princeton University Press, 1985), 177-80. Paret observes that Clausewitz was less sanguine than Hegel about the state.

10. Carl von Clausewitz, "Nachrichten uberPreussen in seiner grossen Katastrophe," chap. in Carl von Clausewitz, Politische Schriften und Briefe, edited by H. Rothfels (Munich: 1922), 202-17, as cited in Gat, The Origins of Military Thought, 216.

11. For exhaustive discussion, see Loren Eisley, Darwin's Century: Evolution and the Men Who Discovered It (Garden City, NY: Anchor Books, 1958); and Gertrude Himmelfarb, Darwin and the Darwinian Revolution (New York: Dover Publications, 1962).

12. Baumer, 290-91.

13. F. Geifel'der, "Vospominaniia vracha o M.D. Skobeleve," Russkaia starina, 55 (1887), 223.

14. Bury, 334-39; and Baumer, 364.

15. Jacob Kipp, "Lenin and Clausewitz: The Militarization of Marxism, 1914-1921," essay (Fort Leavenworth, KS: Soviet Arms Studies Office, 1985), 2-5. On Engels, see W.O. Henderson, The Life of Friedrich Engels (London: 1976), vol. II, 416-46.

16. Jean de Bloch, The Future of War, translated by R.C. Long (Boston: World Peace Foundation, 1914; reprint, Fort Leavenworth, KS: US Army Combat Studies Institute), xvi-xvii. For a good background piece on Block, see Jacob W. Kipp, "Soldiers and Civilians Confronting Future War," in Tooling for War: Military Transformation in the Industrial Age, edited by Stephen

Chiabotti (Chicago: Imprint Publications, 1996), 189-230.

17. E.I. Martynov, "Mysli o tekhnike budushchogo," Voennyi sbornik, No. 5 (1893), 38-39; and Bruce Menning, Bayonets Before Bullets: The Imperial Russian Army, 1861-1914 (Bloomington, IN: Indiana University Press, 1992), 128-29 and 176-77.

18. A.A. Neznamov, Trebovaniia kotorye pred'iavliaet soyremennyi boi k podgotovke (obucheniiu) nachal'nikov i mass (St. Petersburg: 1909), 3.

19. For more discussion, see Michael Howard, "Men Against Fire: The Doctrine of the Offensive in 1914," in Makers of Modern Strategy, edited by Peter Paret (Princeton, NJ: Princeton University Press, 1986), 510-26; and Robert Baumann, "Technology versus the Moral Element: Emerging Views in the Russian Officer Corps, 1870-1904," in New Perspectives in Modern Russian History, edited by Robert McKean (New York: MacMillan Publishing Co. Inc., 1992), 43-64.

20. Neznamov, 3.

21. Ibid., 21 and 26-27.

22. GEN Gordon R. Sullivan and COL James Dubik, "Land Warfare in the 21st Century," Military Review (September 1993), 13-32; Headquarters, Department of the Army (HQDA), Army Focus: Force XXI (Washington, DC: US Government Printing Office [GPO], September 1994); HQDA, Decisive Victory: America's Power-Projection Army, White Paper (Washington, DC: GPO, October 1994). See also MAJ Norman Davis, "An Information-Based Revolution in Military Affairs," Strategic Review (Winter 1996), 43-53.

23. Thomas Kuhn, The Structure of Scientific Revolutions, 2d ed. (Chicago: University of Chicago Press, 1970), 23. For alternative ways of thinking about foreign policy paradigms, see David Jablonsky, Paradigm Lost? Transitions and the Search for a New World Order (Carlisle Barracks, PA: US Army War College Strategic Studies Institute, 1993), 3-6.

24. Ibid., 12.

25. Ibid., 5.

26. Michael Howard, "How Much Can Technology Change Warfare," in Two Historians in Technology and War (Carlisle Barracks, PA: US Army War College Strategic Studies Institute, 1994), 9. For an insightful discussion of the military revolution concept, see Geoffrey Parker, "In Defense of the Military Revolution," in The Military Revolution Debate: Readings on the Military Transformation of Early Modern Europe, edited by Clifford Rogers (Boulder, CO: Westview Press, 1995), 337-65. See also Jeffrey Cooper, Another View of the Revolution in Military Affairs (Carlisle Barracks, PA: US Army War College Strategic Studies Institute, 1994).

27. Alvin and Heidi Toffler, War and Anti-War: Survival at the Dawn of the 21st Century (Boston: Little, Brown & Co., 1993), 223-40.

28. Sullivan and Dubik, 22-30. The authors are careful to note continuities in the evolution of war as well as impending changes.

29. US Army Foreign Military Studies Office (FMSO), The Nonlinear Nature of Future War: A Soviet Commonwealth View, Issue Paper No. 5 (Fort Leavenworth, KS: FMSO, 1992), 8-9.

30. Robert Doughty, The Evolution of US Army Tactical Doctrine, 1946-76, Leavenworth Paper No. 1 (Fort Leavenworth, KS: Combat Studies Institute, 1979), 19.

31. Gary Griffin, "Future Foes, Future Fights," Military Review (November 1994), 57.

32. Richard Szafranski, "Neocortical Warfare? The Acme of Skill," Military Review (November 1994), 41-55.

33. Christopher Bellamy, The Evolution of Modern Land Warfare (New York: Routledge, 1990), 242-43.

34. David Jablonsky, "US Military Doctrine and the Revolution in Military Affairs," Parameters (Autumn 1994), 24-26. See also Barry D. Watts, Clausewitzian Friction and Future War, McNair Paper No. 52 (Washington, DC: National Defense University, 1996).

35. For a splendid critique of foreign affairs modelling, see John Gaddis, "International Relations Theory and the End of the Cold War," International Security (Winter 1992-1993), 27-31; and Michael Mazarr, The Revolution in Military Affairs: A Framework for Defense Planning (Carlisle Barracks, PA: US Army Strategic Studies Institute, 1994), 7.

36. Steven Metz, "A Wake for Clausewitz: Toward a Philosophy of 21st-Century Warfare," Parameters (Winter 1994-95), 127-32; Kenneth McKenzie Jr., "Elegant Irrelevance: Fourth Generation Warfare," Parameters (Autumn 1993), 51-60; John Keegan, A History of Warfare (New York: Alfred A. Knopf, 1993), 3-12; Martin Van Creveld, The Transformation of War (New York: Free Press, 1991); and William Lind et al., "The Changing Face of War: Into the Fourth Generation," Military Review (October 1989), 2-11. For a good discussion of Clausewitz that tends to clear up some misperceptions, see Christopher Bassford, Clausewitz in English: The Reception of Clausewitz in Britain and America, 1815-1945 (Oxford: Oxford University Press, 1994), 24-30.

37. Credit belongs to Dr. Richard Swain, US Army School of Advanced Military Studies, Fort Leavenworth, Kansas, for impressing upon me how widespread this misperception is. For replies to attacks on the trinity, see Edward Villacres and Christopher Bassford, "Reclaiming the Clausewitzian Trinity," Parameters (Autumn 1995), 9-19; and Antulio Echevarria II, "A Wake for Clausewitz? Not Yet!," Special Warfare (August 1996), 30-35.

38. Alan Beyerchin, "Clausewitz, Nonlinearity and the Unpredictability of War," International Security (Winter 1992-93), 68-70.

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Knowledge-Based Warfare Implications

by Major Steven J. Eden, US Army

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HIGH-INTENSITY LAND COMBAT is evolving into a form conveniently labeled knowledge-based warfare, which is defined as warfare in which combat power is best concentrated through information transmission. We must make the distinction between evolution and revolution to illuminate what should be intuitively obvious: Many of the tactics, techniques and procedures (TTPs) developed over the last six decades retain their utility, but we have reached a technological watershed from which new forms of war will flow. Determining which features of traditional warfare will hamstring and which will facilitate the execution of knowledge-based operations is the key to future battlefield victories.

Future wars fought by what the US Army Training and Doctrine Command Pamphlet 525-5, Force XXI Operations, calls "complex, adaptive armies" will involve weapons of significantly increased range and lethality, expanding the battlespace where land forces fight.1 Survival in the presence of such weapons, particularly the new generations of artillery-deliverable munitions, demands troop dispersal. This emptying of the battlefield will require an array of multispectral sensors, often operating over great distances, to detect targets. Data collected by these sensors will then have to be transformed into usable intelligence or targeting information and then passed to firing units that often cannot directly "see" their targets. Linkage between units, between commanders and subordinates and between sensors and shooters will rarely be established through physical contact. The spatial separation of detector, analyst and firer, even at the lowest tactical levels, means that concentrating combat power at a specific point in time and space will involve electromagnetic spectrum reliance to a greater degree than ever before.

Concurrently, armies on the "future conventional battlefield" will possess robust formation technologies fully capable of exploiting that spectrum.2 Collection, analysis and dissemination of data on friend and foe will improve dramatically, due to communication system advances and computers' integrative powers.

Knowledge-based warfare's essence at operational levels and below is the synthesis of improved weaponry with the data transmission mechanisms necessary to properly employ them. That synthesis requires a re-examination of basic premises about tactics and battlefield functions.

Future tactics will be dominated by a single fundamental principle. "Whether they are in armoured vehicles, on their feet or dug in, troops deployed at high density will certainly be pulverized into incapacity . . ." if they are exposed to the enemy's firepower.3 Nevertheless, weapon systems still must be massed to win the close battle. The solution to this tactical conundrum is to mass maneuver elements at a point-either in time or space-where the enemy cannot effectively concentrate his fires against them. Traditionally, several techniques could be used to avoid the enemy's fire: destroying or suppressing his weapon systems, evading his systems by exploiting terrain or reduced visibility and maneuvering around his systems. In general, these techniques remain valid today and for the immediate future. However, knowledge-based warfare will render our current understanding of these techniques obsolete.

A good example of how our traditional thinking is undermined is our understanding of reduced

visibility. Thermal sights and second-generation forward-looking infrared radars, combined with position and navigation systems, have literally turned night into day. Today's average gunner actually prefers night engagements, because targets stand out much better when the background is largely stripped of daytime clutter. A light morning fog wreaks far more havoc with observation than the blackest night. Fog dampens heat emissions, interferes with communications and dissipates range-finding or designating lasers. While this particular lesson is easily grasped, not all changes will be so obvious.

Consider, for example, how our concept of terrain's tactical value must change. Battlespace expansion reduces the importance of any particular accident of geography but magnifies the influence of overall trafficability and the terrain's effect on communications.

Real-time intelligence from aerial reconnaissance using thermal, infrared and radar sensors degrades terrain's use in masking activity. Consequently, terrain's utility in protecting the force from detection or attack is reduced, especially when the force faces attack helicopters, which can use the ground tactically without depending on it for mobility-a quality which stands the traditional relationship between terrain trafficability and defensive strength on its head.

If you cannot hide from the enemy, your best bet is to keep moving. Despite real-time intelligence, hitting a moving target, whether an individual vehicle or an armored column, will still be difficult. On a battlefield dominated by missiles and artillery-delivered munitions, the ideal terrain would be highly trafficable but dotted with minor bits of cover, such as hedges, isolated stands of trees, small buildings and telephone wires. On the knowledge-based battlefield, the high-speed avenue of approach will be suburbia.

Another aspect of terrain that must be given more emphasis in the future is its effect on communications. To be effective, ground maneuver elements must be linked digitally to sensors, supporting artillery, air defenders, air attack assets, electronic warfare systems and neighboring units. Today, communications breakdowns are a severe handicap. On the future battlefield, where nonlinear systems will make up the majority of a force's killing power, such breakdowns will often be a death sentence. A competent commander must be able to examine a patch of ground and determine how to either overcome or exploit the obstacles it presents to effective communications.

As knowledge-based warfare evolves, commanders must apply different mind-sets when evaluating terrain. Typically, today's tactician first picks out the defensible terrain and then determines avenues to or around it. In all likelihood, he probably gives short shrift to any consideration of its influence on the electromagnetic spectrum. Those priorities may have to change when survival depends on movement, and combat power is massed via a digital net.

Knowledge-based warfare will also force a reconceptualization of current branch divisions and roles. This will result from the growing interconnectivity and specialization of the combined arms and will reflect technologically driven shifts in battlefield responsibilities.

At the turn of the century, an infantryman faced two enemies: artillery and other infantrymen. He might also occasionally have to overcome an engineer's handiwork, while he relied on the quartermaster for sustenance. By World War II's end, the battlefield mix included armor and airplanes, which necessitated the development of antitank and air defense artillery. Engineer work had become an integral part of attack and defense, and warfare's mechanization brought the ordnance officer from the arsenal to the front line. As the century winds down, the cavalry arm has reappeared as a heavily armed helicopter,

military intelligence has assumed a tactical role and the signal corps is once again a decisive combat multiplier.

The multiplication of weapon types has forced branches to integrate at lower command levels. Today it is rare to see a battalion operate without engineer, air defense, artillery, intelligence and electronic warfare support. In the future's extended battlespace, lower unit densities and smaller maneuver elements may drive the integration of all arms down to the company level. Reinforcing this devolution is the specialization paradox: As platforms grow more efficient at defeating a certain species of threat, they become vulnerable to a wider range of countermeasures.

Another factor blurring traditional branch distinctions is technological developments. The Bradley Fighting Vehicle, for example, is sharpening the differences between light and mechanized infantry. The "heavy" infantry officer has more in common with the tanker, in terms of maintenance, gunnery and tactical skills, than with his "light" brethren. Moreover, armor task organization with mechanized infantry units has become so habitual that it is almost reflexive, making the continued segregation of the two in garrison a questionable practice.

Field artillery is also headed for a major role change. As new munitions and fire control systems enter the inventory, artillery draws closer to the elusive ideal of "zero CEP [circular error probability]."4 On the knowledge-based battlefield, most artillery fire will be directly linked to some sort of laser-designator, unmanned aerial vehicle or microwave-radar sensor, which will allow shooters to "see" the target. They will also have a variety of rounds to use against different target types. These twin capabilities define artillery pieces as direct-fire weapons, regardless of the intervening terrain, and frees them from their reliance on infantry or armor observers. In effect, field artillery is returning to its former role as a maneuver arm.

This is all predicated on two assumptions, however. The first is that long-range firers will be able to focus their sensors on the appropriate portion of the expanded battlespace; the second is that the digital nets which give a knowledge-based force its cohesiveness can be maintained during conflict.

The former assumption implies that military intelligence efforts will have to be more closely synchronized with the tactical commander's plans and more responsive to changing requirements. As always, the best tactical information will originate with the forces in contact. However, the meaning of "contact" will expand with the battlespace. Maneuver elements must have in "in-house" means of transforming information into usable intelligence that is tailored to their immediate needs. Again, the trend will be to decentralize collection and analysis and integrate assets at ever-lower command levels.

Maintaining the digital nets supporting knowledge-based warfare will demand an increased tactical role for the signals officer. Digital nets must be protected physically and systemically. Conversely, the enemy's net must be either destroyed or disrupted. This involves a wide array of considerations. Some of these, such as terrain's effects, have already been discussed. Others include apportioning the electromagnetic spectrum among users, tailoring spectrum use according to the threat and conducting electromagnetic warfare.

The proliferation of chattering black boxes on the knowledge-based battlefield will rapidly saturate the electromagnetic spectrum. If we add to this the competition from the enemy's digital traffic and his jamming efforts, the transmission of vital tactical information could be crowded off the air or lost in the clutter. Spectrum use must be disciplined, just as road network use is regulated by movement control plans. Information must be prioritized by type, and those priorities must be reviewed and shifted as an

operation progresses and in a manner analogous to supply prioritization by class.

The threat's nature will also influence spectrum exploitation. Facing an enemy capable of delivering homing and antiradiation munitions, for example, will necessitate carefully controlled employment of active emitters. Additionally, an opposing force equipped with microwave-radar "spoofers" may impair the effectiveness of certain artillery fuzes. Thus, an understanding of the enemy's collection, direction-finding and jamming assets and doctrine will be vital for designing a robust communications net for a particular operation.

Obviously, sustaining the ability to concentrate combat power will require more than an information staff officer. Future commanders will have to shape the electronic battlefield the same way they attempt to shape the physical one today. In fact, dominating the electromagnetic spectrum may become a prerequisite for dominating terrain. This will involve developing sophisticated TTPs for electromagnetic warfare, akin to those already displayed during Operation Desert Storm's air campaign. In other words, we must learn to integrate fire and maneuver with electromagnetic warfare, not just have it serve as an adjunct to them. Doing so will inevitably lead to the melding of responsibilities currently divided among the military intelligence, signal corps and combat arms communities.

This necessarily subjective article has pointed out some revolutionary and evolutionary changes that may be in store for the Army as we approach knowledge-based warfare between forces of roughly equal capabilities. At the tactical level, these will include new ways of evaluating terrain, visibility and the battlespace's nature. Organizationally, we must rethink the roles and relationships of the various traditional arms. Some of these developments are already part of our doctrine; others are being discussed in our battle labs or tested during Advanced Warfighting Experiments. Still others are only dimly emerging from professional literature and dialogue. The challenge is not in identifying future trends but in visualizing how they will interact. Constructing a force that weaves those trends together will require us to think in new ways and to identify which lessons we must unlearn. ***MR***

NOTES

1. US Training and Doctrine Command Pamphlet 525-5, Force XXI Operations (Washington, DC: US Government Printing Office [GPO], 1 August 1994), 2-5.

2. Ibid., 2-7.

3. Richard E. Simpkin, Race to the Swift: Thoughts on Twenty-First Century Warfare (London: Brasseys Inc., 1985), 50.

4. National Research Council, STAR 21: Strategic Technologies for the Army of the Twenty-First Century (Washington, DC: GPO, 1992), 84.

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Battle Command: Vision for Success

by Lieutenant Colonel Jeffrey W.S. Leser, US Army

THE INFORMATION REVOLUTION in Military Affairs (RMA) promises much, but will it deliver? The author observes that information technology and precision weaponry will not necessarily guarantee success on future battlefields. He contends that leaders wielding a firm understanding of battle command principles-leaders with the ability to see and understand battlefield events before they happen-will be the key to future success. He cautions that overreliance on the decision, rather than the vision that guides the decision, can lead to failure. His proposed definitions make essential distinctions between command and battle command, offering logical methods for commanders to employ in the battle command process to take full advantage of the technology the information RMA has to offer.

Believers in the information revolution in Military Affairs (RMA) are promising much to the US Army: success in war with outnumbered forces, low casualties and a lower defense budget. But the information RMA will be unable to deliver on these promises. While information technology will allow the rapid movement and better management of data on and off the battlefield, it ignores how information will be used. That issue is at the heart of winning wars. The assumption implied in the RMA promises is that given "quality" data, individuals will make correct decisions. Yet, history provides numerous examples of commanders making poor decisions or refusing to change poor decisions in light of "quality" data. I believe our Army is focused on the decision itself rather than on the vision that gives the decision value. Further, this focus is embedded in our battle command definition. But is this definition correct, and is our current understanding of battle command creating chaos in our Army?

Challenging Current Concepts

The 1993 version of US Army Field Manual (FM) 100-5, Operations, formally introduced the idea of battle command.1 Battle command is defined as "the art of battle decision making, leading and motivating soldiers and their organizations into action to accomplish missions. [It] includes visualizing current state and future state, then formulating concepts of operations to get from one to the other at least cost." Battle command also includes "assigning missions; prioritizing and allocating resources; selecting the critical time and place to act; and knowing how and when to make adjustments during the fight."2 Does this definition provide insight to battle command or confuse the practitioner? In my opinion, this definition has several flaws. The most critical is its absence of vision. To decide, one must be able to see and understand battlefield events before they happen. The need to see is the critical task. Once everything on the battlefield is understood, decisions are easy. The FM definition, however, highlights the decision's importance, not the vision that creates the need for it.

The problem with this definition is that it is identical to the definition of command-"Command is the art of battle decision making, leading and motivating soldiers and their organizations into action to accomplish missions at least cost to soldiers."3 Why are there two terms to describe the same concept or collection of skills? This alone can cause confusion to anyone trying to apply the terms. Additionally, what is meant by "battle decision making?" Does this imply that battle command is practiced only on the battlefield during the execution of the plan and ignored at other times? If battle command includes vision, how can it be limited to the time of actual contact? What are the other types of decisions? Finally, what is leadership's role in battle command? Must a commander be charismatic to be a

successful battle commander? Is motivation a subset of leadership? These issues indicate that there is a definite problem with our understanding, definition and application of battle command.

The effect of these problems is obvious when one tries to integrate battle command with the other combat functions. FM 100-5 gives battle command equal weight with the combat functions of intelligence, maneuver, fires support, air defense, mobility and survivability and logistics.4 Yet, how can a concept that encompasses vision, that critical component which drives all that happens on the battlefield, be merely equal to these functions? Doesn't vision give these functions form and purpose? Doesn't "decision" determine what each of these other functions will do on the battlefield? Without decision and the vision that gives it substance, one cannot determine what to do with these combat functions. Should battle command be placed on a level above these concepts? All this is clear evidence that our Army does not understand the nature of the doctrinal concept we created.

After examining these issues, the first question that must be answered is, "Is there a need for the term battle command?" I believe there is. General Frederick M. Franks Jr. states in his Military Review article "Battle Command: A Commander's Perspective," "We saw that leaders must master a set of battle command principles. . . . thus, battle command demands more art than science."5 Franks points out that there are skills leaders must master. Carl von Clausewitz also addresses this in On War by discussing leaders' talents, abilities and characteristics.6 Initial draft FM 22-102, Command, states that "A successful commander will, of necessity, demonstrate the characteristics of a good leader."7 This statement points to a difference between the position of command and the qualities of the commander. All these sources indicate an individual's makeup has a direct bearing on combat success. Because the seeds of success reside principally in the individual, individual qualities cannot be defined by command. Command is merely a position to be filled by individuals with specific qualities. Thus, the term battle command is needed to describe the individual who possesses the qualities we desire in a commander.

A New Definition

Battle command should be defined as "the ability to create a vision for success and see it applied on the battlefield." This entails visualizing the current and future battlefield and enemy and friendly forces with all possible interactions and results. It requires the individual to identify an end state so the operation has purpose. Identifying an end state means the individual can visualize the conditions necessary for success and can select the correct mechanism for victory. If a commander can see all this on a battlefield yet to be filled with friendly and enemy forces, then he understands the art of war. When he actually makes his vision happen, he has mastered the ability to apply the art of war on the battlefield-he has mastered battle command.

As a concept, battle command demands a broad scope. The application of battle command is the ability to know and do, as shown in Figure 1. This is not a new understanding of what soldiers must master to become successful leaders. Clausewitz discusses these concepts and their relationships in On War.8 As an army, we are attempting to rediscover what is already known but perhaps not widely taught or broadly understood.

To Know. The ability to know is the ability to visualize. A commander must be able to build a mental battlefield view and be able to see the friendly and enemy forces in time and space, as well as the results of their contacts. He must perceive when and where the enemy's weaknesses reside, or better yet, determine how to create and exploit these weaknesses, and he must know what those weakness look like on the battlefield.

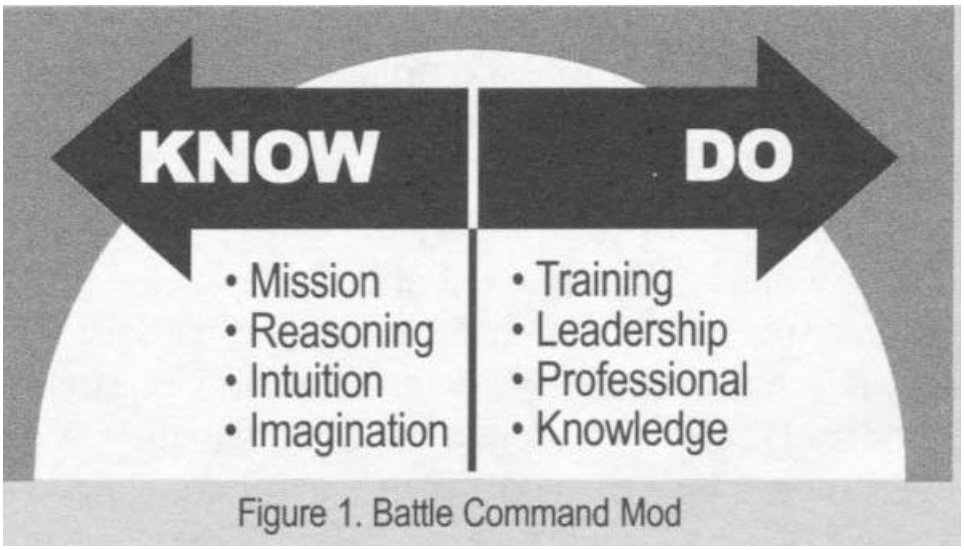

Figure 1. Battle Command Mod

The ability to know requires integrating intuition and imagination with the mission and reality, as depicted in Figure 2. *Intuition* allows the leader to see the battlefield without knowing all there is to know. Clausewitz states that uncertainty in war can never be completely eliminated, and this will always be true.9 For the foreseeable future, the information RMA will probably remove some uncertainties but will likely create new ones. Leaders must continue to rely on intuition for a complete understanding of battlefield events. The battle commander interprets what he knows by using intuition to complete his understanding of the battlefield. This creates certainty, which will only exist at the time of the decision. After the decision is made, the battle commander must accept that his intuition could be wrong. He must challenge his understanding with every new piece of data. If the new data supports his understanding, he has made correct assumptions. If the data conflicts with his understanding, he must resolve the conflict. Once established, his understanding is not sacred but is subject to change based on reality or operational necessity.

Figure 2. Battle Command Model Integration

The other battle command quality, `imagination`, is the ability to consider possibilities that intuition does not see. It allows boldness and enterprise in war. Both imagination and intuition must operate within the bounds set by the mission and reality. Mission sets the parameters that the end state must achieve, while reality is the limit of "doability" understood from mastering our craft. Reality must be challenged by imagination, for what is possible resides in the leader's mind.

`To Do.` The ability to `do` means taking our understanding of success-vision-and making it happen on the battlefield. The commander must be able to impart his vision to subordinates; construct a plan that seamlessly puts all the parts together to achieve success; train his forces to execute to standard; and then provide the leadership necessary to carry the operation to its end state.

Consider a symphony. The composer hears the music in his head-his vision-but he must set the notes down on paper so the musicians can play. The musicians must master their instruments, because one wrong note can destroy the harmony of the whole. The score is the plan. The composer must pass his vision to the conductor for interpretation of the plan. When everything is done correctly-the score, the interpretation, the musicians playing the right notes at the right time and place-something is created that only the composer initially heard.

The ability "to do" has several components: leadership, training and professional knowledge, as shown in Figure 2. `Leadership` is the ability to motivate soldiers and organizations to do what needs to be done. Good leaders have the moral courage to do what is right in the face of adversity and the physical courage to inspire-leadership by example. `Training` allows soldiers to master basic skills as well as their equipment. Obtaining `professional knowledge` means learning the myriad of details necessary to make decisions and understanding soldier and unit standards and capabilities.

Drive is a factor of knowing and doing. While a talented individual can be successful, only one who has drive will be great. Drive pushes an individual to accomplishment or personal improvement, thus expanding professional knowledge and experience.

The model just described is a generalized picture of battle command. While it separates intuition and imagination into neat areas, the reality is more complex. Doing requires the ability to know, because a subordinate must decide how to implement an envisioned action. Knowing requires the ability to do, because one must be able to separate the realistic from the unrealistic within the vision. What this means is that each command level requires some degree of both battle command components. However, the ratio between the two varies based on the command level, which is tempered by the battlefield situation.

Leaders at battalion level and below must focus on the doing part of battle command. If our soldiers cannot kill the enemy at 200 meters with M16 rifles, not even a General George S. Patton Jr. or a General Field Marshal Erwin Rommel can win the battle. Units must be able to execute to standard. Battalions are typically told what to do and when to do it and are usually given some guidance on how to do it. Their focus is on the single battle facing them, not the next battle. This is a difference between the operational and tactical levels of war and separates knowing and doing. In executing its part of the plan, a battalion will commit all its forces to win the current battle. Failure to execute becomes failure for all. At the tactical level, battle command is the ability to do-to make the commander's vision happen.

After the German counterattack at Kasserine Pass, Supreme Commander General Dwight D. Eisenhower relieved II Corps Commander Major General Lloyd R. Fredendall (front) because his division commanders and Allied Headquarters had lost confidence in his abilities. Left to right: Brigadier Generals Lunsford E. Oliver and Lowell Rooks, Northwest Africa, December 1942.

105 Army

Command is the legal basis that allows a commander to control specified resources ... and to make decisions involving those resources. Formally, command has no other definition or components. Command places an individual in a position to lead but does not bestow leadership qualities or mastery of the art of war. These are traits an individual develops and earns. The position of command only temporarily gives the illusion of these traits until the individual proves through performance that he truly has earned them.

The rules, however, change at brigade level. Brigades must know and do. A brigade commander must not only plan the current fight, he must also anticipate and win the next. Because he faces a minimum of two battles, he cannot expend all his resources in the first. He must make operational-level decisions on how much he must commit to win the first, while maintaining enough combat power to win the second. For example, examine the role of battalion and brigade reserves. Battalions can commit reserves to the current battle and be successful. Brigades that commit reserves to the current battle normally fail. Because a brigade also must do, its collection of battalions must be trained to work as a team.

Division and above battle commanders are heavily involved in knowing. They must anticipate future situations and conditions and make resource decisions based on where, when and how future fights will be won. Commanders at division level and above have little impact on the current fight beyond providing additional resources, unless they opt to become personally involved. The ability to do at this level relates to professional knowledge and setting standards for subordinate training. These standards become the planning factors or assumptions that are part of knowing.

Understanding this simple definition and its components-to know and to do-allows us to examine the human dimension in the art of war. It allows students to explore the relationships among various battle command components. How do we reconcile the definitions of command and battle command?

Battle Command, Command and Control

If battle command is to be redefined, then what exactly is command? Command is the legal basis that allows a commander to control specified resources-normally personnel and equipment-and to make decisions involving those resources. Formally, command has no other definition or components. Command places an individual in a position to lead but does not bestow leadership qualities or mastery of the art of war. These are traits an individual develops and earns. The position of command only temporarily gives the illusion of these traits until the individual proves through performance that he truly has earned them. History is full of individuals who commanded but were failures as battle commanders and leaders.

Major General George McClellan was clearly in command of the Army of the Potomac. Although he created an excellent, well-trained and well-equipped army, it failed in combat during the Peninsular Campaign. This was not a command or a control failure, because his forces executed everything he told them to do. McClellan had charisma, and his soldiers loved and admired him. His plan was excellent. However, he lacked the ability to do-to put his vision into operation. He failed at battle command, not at command itself. Napoleon understood this relationship clearly when he observed Bavarian General Karl Philipp Wrede's position at Hanau. "Poor Wrede, I made him a count, but I could never make him a general."10

Control should be defined as "using command authority to organize, train and establish procedures and standards to create and execute plans that will allow the organization to do what the commander wants it to do." This is very similar to the current definition in FM 22-102.11 While FM 22-102 states that the commander is assisted by the staff, I believe the staff is part of control. The bottom line is that control is simply an enabler or inhibitor of action. With these new "working" definitions, the relationship among battle command, command and control becomes clear-battle command tells command what to do with control.

From my perspective, this highlights an important point in understanding battle command. While only one individual can be the commander, anyone within the organization can be a battle commander if he has the ability. Many commanders in history were masters of battle command, but they are outnumbered by commanders who only possessed some battle command ability. Some of these leaders were successful; others were not. Why?

The successful ones understood that if they could not master battle command, they must have an individual nearby who could and whom they would willingly listen to. Field Marshal Gebhard Leberecht von Blücher and Field Marshal August Niethardt von Gniesnau, Marshal Michel Ney and his aide-de-camp Henri Jomini and President Franklin D. Roosevelt and General George C. Marshall are only a few examples. You need only look at the debate surrounding the relationships among General Robert E. Lee, Major General Thomas "Stonewall" Jackson and Lieutenant General James Longstreet to appreciate this issue. There is no discussion about who commanded the Army of Northern Virginia. The discussion revolves around who was the army's battle commander. Who won at Chancellorsville? Who lost Gettysburg? Who created the guiding vision?

Vision

Accepting and understanding this battle command definition is critical for our Army, because it stipulates what the commander and his staff must do to succeed in war. A vision that is understood by all

is essential, because the vision becomes the plan. Vision allows everyone to make decisions, because it provides the structure within which decisions can be made.

Relevant Common Picture (RCP). Examine the RCP principle. To most, RCP is a shared common map, updated periodically, that allows subordinates to "see into the mind of the commander." This is a promise made by the RMA. But if two individuals examine the same map at the same time, they are likely to develop two different understandings of the situation. Thus, there is more to RCP than a common map.

To attain RCP is to achieve a common understanding of the current situation, the actions necessary to effect the situation and the results of those actions on the end state. RCP is a concept, not a thing, that allows subordinates to make decisions. It is the centerpiece that enables command by influence.12 While the common map presents the same data to everyone, that data must be interpreted the same way or chaos will result.

RCP consists of three components: the common map; a common background and understanding of theory, doctrine, tactics, training, equipment and soldiers; and the ability to communicate within vision's framework, as shown in Figure 3. The vision tells how success can be achieved. The map provides the common data set everyone will use to examine the situation. This common background and understanding provide the ability for participants to similarly analyze the situation, assess options and reach similar conclusions, which are tempered only by imagination. Communications permit adjustment required by friction. Communication allows a commander and subordinate to verify data and vision and quickly "harmonize" to reach a high level of certainty.13

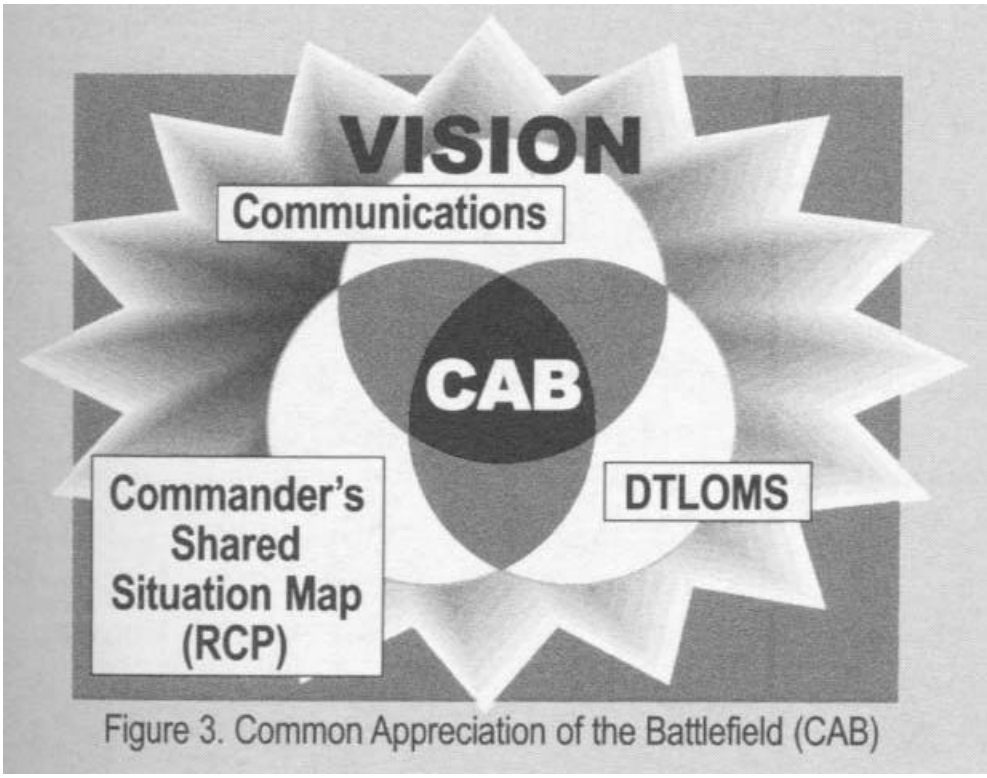

Figure 3. Common Appreciation of the Battlefield (CAB)

Vision is the critical part of RCP, because it gives meaning to the picture. The best example is British Admiral Horatio Nelson and his "band of brothers." Every captain in Nelson's fleet knew what to do as soon as they saw the Franco-Spanish Fleet (the common map), because Nelson had schooled them in how he planned to fight (common training and doctrine) based on his vision. His training was so successful that he only made two signals during the entire battle, the first being purely inspirational. That is RCP. Yet, our doctrine never addresses RCP in light of the vision. Without this understanding of vision's role, RCP is only another method that could lead us to defeat. What was Major General Lloyd R. Fredenall's vision for the fight at Kasserine? Did his units understand it and follow it? Did Major General Charles Lee understand General George Washington's vision for the Battle of Monmouth, or when he retreated instead of attacked, was he imposing his own vision, changing his understanding of the RCP?

`Critical information requirements.` Our understanding and use of the commander's critical information requirements (CCIR) is key. CCIR is currently defined as "unknown but needed information of such critical importance to a commander's decision-making process that they directly affect the successful execution of operations."14 The reasoning behind CCIR is that an army has finite resources and all information is not equal. Seeking all information is desirable but could result in passing on irrelevant information to the commander. How does one determine what information is critical? The CCIR definition lacks a concept to make it a useful tool for the commander and his staff. Examine some CCIR examples in our manuals. "What is the enemy doing? What are friendly forces doing? What are the enemy's problems?"15 What is the value of such questions, and how can they be answered? Our definition of CCIR lacks connection to vision.

Consider the following model: Our plan can defeat all the enemy's courses of action; the enemy acts as we predict; and our forces execute our plan to standard. If these three assumptions are true, the last decision the commander makes is approving the plan, because once he does this, all decisions have been made and discussion is over. This is the ideal situation all armies strive to achieve-applying vision to the

battlefield.

Because war is not a science, commanders never know with certainty if they have "read" the battlefield correctly.16 Given this, what does the commander need to know before and during the battle? He needs to know if any of his assumptions are false. Through his vision, he can identify events that indicate the unfolding battle is not matching his vision and assess whether these events will cause failure. Thus, he identifies what these failure-producing events will look like on the battlefield. These events then become his CCIR.

For example, the commander is attacking a defending enemy. Given that he has identified the correct decisive point and method for victory, does he need to know the enemy is counterattacking somewhere other than at the decisive point? No. He would like to know this, but it is not critical because it will not cause him to lose the battle. He must know if the enemy is counterattacking in a certain direction with a certain size force if his vision identified that potential action as a cause of defeat.

Look at the symphony analogy again. Is it critical for the conductor to know if one of the 15 flute players is having problems with a note? Although he would like to know, it is unnecessary, because the sound of one flute is covered by the other 14, and it is unlikely the audience will hear the error. However, does he need to know if the flute soloist is having problems with a note? Yes, because that soloist can destroy the wonderful mood the music has created for the audience. Vision allows a commander to see what constitutes failure and thus, establish his critical information needs accordingly.

Intent

`Intent` is defined as "a concise statement of what the force must do to succeed with respect to the enemy and the terrain and the desired end state."17 But how does intent achieve this? The mission statement normally contains the operation's purpose and end state. In this case, the concept provides the method.18 In practice, the intent statement merely echoes the concept of operations or offers doctrine. So what does intent add to understanding? Again, the definition lacks a connection to vision.

The commander must convey his understanding of the battlefield to his staff and subordinates. While he wants subordinates to use initiative when necessary, he also must ensure that when it is used, it supports his vision. Too often, subordinates see the battlefield through their own eyes and not the commander's and make decisions based on their own unit's needs rather than the needs of the higher element. When a second vision is injected into the battle, unity of command is destroyed and the operation is out of sync or "deharmonized." Thus, intent must be addressed in terms of the vision and must provide what is not given in other parts of the order.

Intent can be considered to be one part of the commander's vision articulation. The mission statement provides information about the mission, time, place, forces, end state and purpose. The concept provides the method and means to harmonize the operation to leverage doctrine, equipment, training and procedures. By adding intent, these three statements give subordinates the commander's vision of the battle. A statement of intent is where the commander provides his insights about possible problems during the battle and what actions subordinates should take. Intent should be geared to specific situations rather than general doctrine. For example, the commander might tell a subordinate to bypass a hill he would normally secure, because the commander sees that enemy possession of the hill will not cause failure. Would Washington have won the Battle of Germantown if his intent statement had included "bypass houses because they won't affect the battle"? With intent, the commander presents his thoughts on how he sees the battle unfolding and how subordinates should react to battle situations. This helps

maintain vision unity.

War is so simple in concept, yet so difficult in application. To study and master war, a student needs tools to bring its vast complexity into focus. As he learns about the art of war, the student might discard old tools and develop new ones. I do not expect everyone to agree with my thoughts on battle command. In fact, I hope this article raises enough "red flags" to regenerate much-needed debate and continued dialogue on the subject of battle command and battlefield leadership. Please challenge me! The new definitions I have proposed are a tool for studying and discussing the human dimension of war. Using the battle command model presented here, examine the roles of Lee, Jackson and Longstreet in their army. More important, examine the information RMA using this same model. What can it do? What can't it do? How best can you use what it offers? These are questions battle commanders must answer before they cross the line of departure. ***MR***

NOTES

1. US Army Field Manual (FM) 100-5, `Operations` (Washington, DC: US Government Printing Office [GPO], 14 June 1993), 2-14 and 2-15.

2. Ibid., Glossary-1. Why the battle command definition is buried in the glossary of FM 100-5 instead of being presented and discussed within the body of the manual is puzzling.

3. FM 22-102, `Command`, initial draft (Washington, DC: GPO, undated), 1-1.

4. FM 100-5, 2-14.

5. GEN Frederick M. Franks Jr., "Battle Command: A Commander's Perspective," `Military Review` (May-June 1996), 4-5.

6. Carl von Clausewitz, `On War`, edited and translated by Michael Howard and Peter Paret (Princeton, NJ: Princeton University Press, 1976), chapter 3.

7. Draft FM 22-102, 1-5.

8. In chapters 2 and 3 of Book II, Clausewitz discusses knowledge, capability and ability. His "capability" and "ability" clearly refer to making events happen on the battlefield. For clarity, I have substituted the word "do," because its current use within our Army has the same meaning as capability and ability.

9. Ibid., 102-103.

10. Vincent Esposito and John Elting, `A Military History of the Napoleonic Wars` (Westport, CT: Praeger Publishers, 1964), biographical sketches.

11. Draft FM 22-102, 1-6.

12. For a discussion of command by influence, command by plan and command by direction, see Martin Van Creveld, `Command in War` (Cambridge, MA: Harvard University Press, 1987).

13. I prefer the term "harmonize" to "synchronize" to describe what we want to achieve on the

battlefield. Synchronization implies all parts mirror one (as in "synchronize your watches"), usually in a set, predetermined order. Harmony, on the other hand, is the combining of parts into a pleasing whole. Like a symphony, battlefield actions should be combined into a whole that feels or looks right but which may not always follow the plan. Leaders should be able to have a battlefield "jam" session with the vision supplying the beat. Harmony is the essence of command by influence, because it allows individuals to judge and act based on a common understanding of the required results.

14. Battle Command Battle Laboratory (Leavenworth) [BCBL(L)], `Battle Command Techniques and Procedures` (Fort Leavenworth, KS: BCBL(L), undated), 2-32.

15. Ibid., 2-37 and 2-38.

16. Clausewitz, 84-86.

17. FM 101-5, `Commander's Intent`, final draft (Washington, DC: GPO, undated), 5-17.

18. BCBL(L), 2-17 to 2-18 and 2-27 to 2-29.

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Military Review, March-April 1997

General Headquarters Exercise Insights

by Lieutenant Colonel John C. Dibert, US Army

FORMER CHIEF OF STAFF of the Army (CSA) General Gordon R. Sullivan was right about many things during his tenure, especially regarding the command post exercise (CPX) program. Under his direction, the program was integrated with the Louisiana Maneuvers (LAM) process to look at the Army's future and provide needed training to the Army Staff (ARSTAF).

Training the ARSTAF in crisis-action procedures was long overdue. Sullivan did not rely on the Joint Staff to provide this training through its annual worldwide CPXs on the chance the exercises would be canceled. As it turned out, the Chairman, Joint Chiefs of Staff exercises PRIME DIRECTIVE 93, POSITIVE DEPLOYMENT 95 and POSITIVE FORCE 96 and 97 were canceled. Sullivan foresaw that his three general headquarters (GHQ) exercises would provide valuable staff training-training that actually resulted in 17 insights and many lessons learned.

This article tells the GHQ story from inside the Army's CPX branch. These exercises improved the ARSTAF's crisis-action procedures and prepared us for several real-world operations. The exercises and insights continue to provide lessons the ARSTAF can use for many years.

In July 1993, I joined the infamous Operations and Contingency Plans Division, known as the ODO (its office symbol) Division. The division is one of nine in the Operations, Readiness and Mobilization Directorate, which is one of three major directorates in the office of the deputy chief of staff for Operations and Plans (ODCSOPS), Headquarters, Department of the Army (HQDA).

The ODO Division is made up of current operators, who represent the ARSTAF's "dial 911" point and are the nucleus for the HQDA Crisis Action Team (CAT). They conduct daily desk-side briefings for the CSA and weekly briefings for the secretary of the Army. The exercise branch is part of this division.

When I joined the exercise branch, it was knee-deep in actions aimed at preparing for the first GHQ exercise (GHQ 93), scheduled for August 1993, and planning for the follow-on GHQ 94. A group of experienced, exercise-savvy Systems Research Applications Corporation contractors were helping.

The GHQ exercises were the CPXs associated with the LAM process. The CSA formed the LAM Task Force (TF) to help him and the Army manage change and look to the future. LAM TF officers and their contractor support had a difficult job deciding where they fit in. The LAM TF formed an exercise coordination branch at Fort Leavenworth, Kansas, to work all exercise-related actions with ODO. The branch tried to link GHQ exercises with every exercise and every simulation. It probably would have linked the GHQ exercises to a shuttle launch to the moon if US Space Command, Peterson Air Force Base, Colorado, had permitted it.

The "general headquarters" exercise name originated with the 1941 theme associated with the actual LAM. In addition to these large field exercises conducted by General George C. Marshall before World War II, staff exercises called "GHQs" were conducted. Now we were doing the same thing. Lieutenant General John H. Tilelli Jr., deputy chief of staff for Operations and Plans (DCSOPS) from 1993 to 1994, and Lieutenant General Paul E. Blackwell, DCSOPS in 1995, organized and conducted GHQ 93, 94 and

95.

GHQ Exercise Design

The GHQ exercises provided a timely and complex training venue for the ARSTAF and participating major commands (MACOMs). All three exercises had two main features:

- Each was played in two geographical theaters to stretch the Army's scarce resources.
- CAT members had to adjust for a projected 1999 force structure and the predicted 10-division force before the Army announced the 10-division force list in December 1994.

In an attempt to stretch resources, GHQ exercises did not cheat on real-world operations. All actual Army deployments were included to force the ARSTAF (actually Headquarters, US Army Forces Command [FORSCOM], Fort McPherson, Georgia) to find replacement forces when executing the operations plan (OPLAN). The exercises pointed out the existing "tug of war" for Army resources.

CAT members had no problem predicting the 10 divisions, but no one could come up with lists of combat support (CS) or combat service support (CSS) units for 1999. This predictive aspect of the exercise design was hard to explain to new players or to develop data for. Current operators are not accustomed to making predictions. They prefer retrieving data and dealing with actual problems. Thus, the GHQ exercises became "studies" within an exercise.1

The exercise branch developed hundreds of events to drive ARSTAF participation. As we developed our master scenario events list (MSEL), we tried to identify as many realistic resource requests for Army personnel and equipment as possible to force participating senior leaders to see resource stress points and the decisions they would have to make. FORSCOM Headquarters would have to find the necessary forces and additional stress points and choose from either the Active Component (AC) or Reserve Component (RC) to source all requirements identified by exercise play.

GHQ 93

The first GHQ exercise was held from 12 to 28 August 1993.2 GHQ 93 was set in US Pacific Command and US Southern Command, with the ARSTAF linking up with two already-planned commander in chief (CINC) CPXs. The staff linked the requirements, without interference, to the CPX ULCHI FOCUS LENS in South Korea and to the annual Exercise FUERTES DEFENSAS in Panama. The staff stood up a full CAT and responded to CINC player reports and our MSELs, which were injected by exercise branch controllers at both locations.

Our after-action report following GHQ 93 was confusing. The LAM TF produced a written report, but it was useless. The TF tried to observe and evaluate the CAT, but the observations could not be translated into anything useful. To show progress, the LAM TF did its best to identify future issues. The best GHQ 93 result was that it forced the ARSTAF to participate in a demanding two-theater CPX. The staff worked hard and determined where they needed additional training.

Although GHQ 93 provided no real insights, the LAM TF developed some "framing questions" to entice senior leaders attending the semiannual LAM Board of Directors (BoD) meetings to discuss vital issues. The BoD, made up of a select group of senior Army leaders and chaired by the CSA, was formed to augment the normal decision-making process on issues deemed vital to the Army's future. The GHQ exercise status received about 30 minutes of agenda time at these meetings.3

GHQ 94

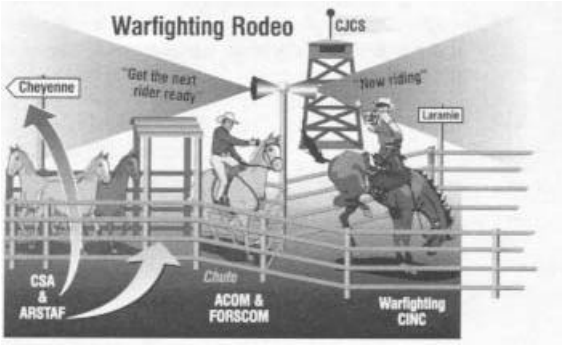
The second GHQ exercise was an exhausting eight-month CPX held from November 1993 to June 1994. A two-theater concept was used again to challenge the ARSTAF with as many requirements as possible. The ARSTAF stood up a full CAT for each of GHQ 94's four active phases, which consisted of four weeks of active play spread over the eight months. Before each active phase began, exercise branch briefed players on all the key events that had occurred between phases.

GHQ 94 started with deployment of a contingency corps "plus" of Army forces to Southwest Asia (SWA). After committing to support SWA's full OPLAN, we received requirements, during Phase II, for the second theater. Northeast Asia (NEA) erupted in February 1994, forcing us to deploy all remaining AC divisions. This increased our level of partial mobilization to more than 200,000.

To maintain realism during the eight months, all mobilization levels-first, the Presidential Selected Reserve Call-Up (PSRC), then partial mobilization-were replicated in real days. The corresponding transportation flow was verified by the US Transportation Command (TRANSCOM) player cell at Scott Air Force Base, Illinois.

We needed a war to drive the intelligence staffs and replacement systems. The Concept Analysis Agency (CAA) modeled simulated wars in both theaters. War results were sent to players by message. CAA produced a detailed list of casualty and equipment losses to further drain Army resources. The CAA modeling results and casualty data then became decisions portrayed by US Army War College (AWC) faculty cells playing both warfighting CINCs from Carlisle Barracks, Pennsylvania.

For the third active phase, in May 1994, the Army CAT stood up for warfighting. Because this GHQ exercise phase coincided with Exercise PRAIRIE WARRIOR 1994 (PW 94), the US Army Command and General Staff College's (USACGSC's) end-of-course student exercise at Fort Leavenworth, GHQ 94 was linked to PW 94.



ARSTAF members participating in this warfighting phase understood where they fit into the big picture and how they support a warfighting CINC. They learned the ARSTAF can, at best, deploy personnel and equipment only as fast as TRANSCOM can move them. The CINC fights-we just watch. During this GHQ exercise week, the famous "warfighting rodeo chart," depicted in the figure, was born.4 Then Major General Joseph W. Kinzer, director of operations, ensured all CAT representatives understood their focus: the rear, not the rider in the ring. We understood that we had to plan for the next conflict. Kinzer often used the rodeo chart to explain the ARSTAF's Title 10 responsibilities and to teach CAT members.

The ARSTAF played this third active period with the same forces as those modeled by CAA for PW 94. Unfortunately, we could not link to the results of any student engagements, which used state-of-the-art simulation packages combined into what was called the Confederation of Models.5 This inability to link results was due to the shortened exercise-planning cycle and our decision in October 1993 to use different CAA models and then compare results. We did not want the rest of our exercise to be affected if PW 94 were canceled.

For the fourth and final active week of the GHQ exercise, in June 1994, the Army CAT dealt with the difficult problem of supporting a CINC and the Army component for the reconstitution of deployed forces. In addition, we reviewed the ARSTAF's role in preparing forces to deploy from one theater to another. As it turned out, we did not have big demands for equipment reconstitution in SWA. The CAA modeler for our GHQ exercise war had either good experience at what wins in simulation or "perfect" intelligence.

The First Seven Insights

After the July GHQ 94 exercise, we faced the final LAM BoD outbrief. At two previous LAM BoD meetings, we failed to get senior leaders to discuss issues, even when we used the "framing question" format. We were frustrated by lack of access to BoD minutes and lack of an official record to drive additional work. We wanted the last GHQ 94 BoD meeting to be more structured. Working with the contractor, we developed a format with some meat. We took the old reliable problem, discussion and recommendation format and modified it to "insight, findings and recommendations." We used the recommendation portion to task, through the ARSTAF director, the appropriate office for action.

The BoD meeting was held at the AWC. Kinzer, the Army's main player for GHQ 93 and 94, reworked our seven draft insights, which combined what we learned from GHQ 93 with several issues from the GHQ exercise portion of the BoD meetings. For exercise branch, this was productive because the board accepted all of Kinzer's recommendations. Later, I briefed the GHQ 95 concept, which was quickly approved for execution.

The seven GHQ 94 insights follow:

- Force projection requires proactive decision making. The Army must forecast its critical decision points by expanding the industrial base for critical Army supplies and determining "when" to expand the training base. The ARSTAF developed a decision matrix to identify those decisions it must influence in order to provide timely support to the CINCs.
- Force projection with a two-MRC strategy requires priority decision making and balanced force structure. Support of two MRCs requires that National Command Authority (NCA) decisions weigh in favor of one MRC over another. In the exercise, we had a 254-unit CS/CSS shortfall which we could not source for the second MRC, because there was not enough CS/CSS structure to support both MRCs. The AC/RC "mix" should be reviewed as part of the entire Force XXI redesign process.
- Continuous staff interface is required to influence NCA/CINC decisions to effectively allocate scarce Army resources. In a crisis, the ARSTAF must be proactive with its Army component headquarters to ensure their draft courses of action (COAs) requiring Army forces will not adversely affect our total support of other vital worldwide missions. All CINCs must be supported. We must interface with the Army component headquarters before the Joint Staff receives the CINC COAs. This will save time and may help to more efficiently use all Army resources.
- Early access to RC forces is essential in support of a force-projection Army. In a crisis, a major problem for the Army is not having access to individuals once there is a declared PSRC, which only mobilizes units. We must prevent individuals from being pulled from late-deploying units, which should not be broken up to support early-deploying units. In the exercise, we identified the need for partial mobilization authority to access Individual Ready Reserve (IRR) members. Legislation now before Congress may solve this problem.

- Total Army asset visibility is essential in support of a force-projection Army. The ODCSOPs, office of the deputy chief of staff for Personnel and office of the deputy chief of staff for Logistics (ODCSLOG) keep track daily of units, personnel, supplies and equipment worldwide. Together, they prepare weekly "balcony" briefings for the secretary of the Army and CSA on Total Army visibility. In a crisis, the ARSTAF must quickly interface with the Joint Staff, US Atlantic Command and the Army component headquarters to make our service recommendation for Army forces.
- Projected available deployment dates for RC combat forces are inconsistent. We found that the National Guard enhanced brigades received different deployment standards. Their "availability date" after C-day was different in various planning documents. We have since specified that the Army's Mobilization and Operations, Planning and Execution System (AMOPES) is the "standard," and all other documents listing enhanced brigade availability dates should match it.
- Some units identified for MRC 1 could not initially meet AMOPES deployment criteria. We found that 180 combat units and 273 CS/CSS units (all battalion and above) from the contingency force pool could not initially meet AMOPES deployment criteria. Because installations did not participate in the exercise, we could not determine the effects of cross-leveling. We must continuously review force readiness and not rely on cross-leveling following a crisis. Commanders and staffs conduct readiness reviews every day.

Real Operations

The ARSTAF got a CPX-style summer break to institutionalize the training lessons learned from GHQ 94 just in time to use them for real operations Uphold Democracy in Haiti and Vigilant Warrior in Saudi Arabia. These operations other than war (OOTWs), which occurred between November 1994 and January 1995, required a full CAT, which performed very well. The CAT team chief, Colonel Edward Mitchell, affirmed that the GHQ exercises prepared him and the CAT for real-world actions. Because the CAT was accustomed to the rigors of the GHQ exercise two-theater scenario, these two OOTWs were not big challenges. Moreover, Mitchell kept a GHQ 94 MSEL at his desk as a checklist to help him be more proactive and anticipate applicable actions for the actual operation.

GHQ 95

Armed with lessons learned from two earlier GHQ exercises and recent experience from two real operations, the ARSTAF began the final GHQ exercise in February 1995. Like previous exercises, it played a two-theater scenario set in 1999.

Before GHQ 95 began, we conducted a stand-alone "demobilization workshop." This superb event, hosted by the CAA, brought in more than 90 people from various installations. The objective was to review and recommend fixes to the Army's primary mobilization and demobilization guidance documents: AMOPES and the FORSCOM Mobilization and Deployment Planning System.

We learned several key things at this workshop. The two most noteworthy were:

- In an era of dwindling Army resources, we cannot afford to waste time and resources demobilizing as we did following Operation Desert Storm.
- All installations participating in a demobilization must follow a common set of guidelines. At the end of Desert Storm, too many installations had their own ways of demobilizing.

Our new director of Operations, Major General Robert H. Scales Jr., chaired the workshop outbrief and promised that all workshop recommendations would be incorporated into our mobilization planning documents. He kept his promise.

The GHQ 95 exercise had three weeks of active play spread over five months. Before Phase I began, we scripted in a major commitment of Army forces for a European peacekeeping (PK) force. After scripting our way past the point of no return for the force, we started the phase by receiving OPLAN requirements for NEA, our second theater.

The second active GHQ 95 period coincided with PW 95, and linkage to PW 95 was nearly seamless. We ensured that the start of the PW counteroffensive phase and PW forces matched perfectly with the forces and war in GHQ 95. CAA modeled the PW 95 war to match the precise counteroffensive starting conditions requested by the USACGSC faculty planners. This same war was then portrayed from February to May to the ARSTAF and participating MACOMs as a simulated war in NEA.

The tremendous amount of work required to link PW with GHQ 95 had little payoff. PW 95 required some "restarts," and the PW casualties officially reported to HQDA one day would "return to life" the next day for instructional purposes. The PW exercise also played a futuristic Mobile Strike Force in the year 2010, which again posed a problem for current operator players. They could not find any data for their Title 10 work. Although it was a "neat" idea to fully link GHQ 95 to the PW experiment, any CAA model can provide the necessary data to satisfy Title 10 mission requirements.

In the final active week of GHQ 95 in June, we exercised the ARSTAF's planning requirements for a six-month rotation of the Army forces sent to the PK mission. This rotation requirement further stretched resources. The rotation was scripted and justified as necessary while US forces stayed fully committed elsewhere in the NEA theater. With this last rotation phase, the exercise became a study of satisfying one MRC "plus" requirements and two major OOTWs-one division-size force coming back home and committed and one rotation replacement force.

The Second 10 Insights

GHQ 95 insights were briefed following Phase I and at the end of the last phase. Because our director had last-minute schedule conflicts, I briefed the 1 March 1995 BoD meeting on six insights. The BoD members were pleased with the results and accepted all recommendations. The six insights follow:

- With a 10-division force, we must accept greater risk to meet global demands. Because of the Army's worldwide commitments and reduced force structure, we may have to tailor our support-with CINC approval of less than what is initially requested-always with an "eye out" for an MRC. The Army can provide forces for OOTWs but must constantly plan for the MRCs. Our current structure requires us to accept greater risk to an MRC as we fill the many commitments for large OOTWs, such as the ongoing operation in Bosnia, now called Operation Joint Guard.
- Authorized levels of organization (ALO) structure may no longer be valid in a 10-division force. The Army is now structured with 15 different ALO. In our smaller force-projection Army, we must respond faster than ever before. In a time of crisis, low ALO units must be filled with individuals from either the AC or RC. We are finding this takes time and complex decision making. A possible solution is to design modular units that can then be "plugged in" as needed.
- Funding has emerged as an essential planning factor. A large OOTW mission costs

billions of dollars. This money must be in the Army's operations account before deployment. We cannot repeat past mistakes when we had to take the OOTW costs and "spread them out," thereby adversely affecting the entire Army's readiness. Today, the Army's financial management staff officer provides cost estimates during the initial stages of any crisis.

- Selective Reserve Augmentation (SRA) enhances Total Army capabilities. Partial mobilization is now the only way the Army has access to the IRR. The exercise proved the need for SRA authority. As part of a PSRC, this new SRA program could give us access to up to 30,000 individuals. Also, by portraying a 1999 scenario, the exercise identified that the SRA concept (1995) should be changed to include combat military occupational specialties (MOSs). It was, and combat MOSs were added in time for the proposal now before Congress. The term "SRA" is being changed to the Volunteer Early Access Ready Reserve Program.
- Some commodities pose problems in supplying the force. In the exercise, ODCSLOG picked three areas of concern for the 1999 force: forecasted numbers and types of helicopters, the aging fleet of wheeled vehicles and ammunition stocks to support two MRCs. Because the industrial base cannot gear up in time for these and many other critical items, the Army must monitor its declining stocks and assets more than ever.
- Both OOTWs and MRCs generate high demands for intelligence support. The exercise proved that large OOTWs require nearly as much intelligence support (people and equipment) as a full MRC. We must design modular intelligence units capable of forward in-theater, split-based or tactically tiered support.

The last four insights were to be briefed to the final meeting of the BoD-later named the Army Commanders Conference-in July. However, because the BoD agenda ran over the time allotted, it was postponed to an office session for CSA General Dennis J. Reimer on 27 July. He approved the insights, bringing the grand total to 17-seven from GHQ 94 and 10 from GHQ 95. These four additional insights follow:

A single MRC plus a large OOTW place significant stress on Total Army resources. The final GHQ 95 rotation phase highlighted that when combined with an MRC, an OOTW requiring the rotation of a division with its complement of supporting RC forces causes stress similar to having a second MRC. In reality, we would probably not rotate an OOTW force during an ongoing MRC. On the other hand, if we needed the deployed OOTW force for another MRC, we might be asked to replace it. The exercise also identified the need to "contract out" much of the CSS requirement using the Logistics Civil Augmentation Program. This can free up valuable AC/RC CSS units and make them available for an MRC deployment.

- We must develop a rapid reconstitution plan for Army War Reserve-3 (AWR-3). The exercise identified that once AWR-3, a pre-positioned brigade set of equipment, is offloaded from ships, we have no approved plan to replace it or other contingency stocks. We are now addressing the question of how it can be replaced if necessary.
- Rotation planning must be integral to initial force planning. The exercise pointed out that no OOTW rotation plans were developed. The Joint Staff, working with the CINC planners, must deal with the issue of rotation early-when they request their initial force. If a deliberate plan for a large OOTW "is on the shelf," the services should identify all AC and RC forces for the initial force plus two rotations. Identifying a complete rotation concept spurs long-term training plans and leads to many other benefits.
- Enhanced brigades provide strategic flexibility in a post-MRC/OOTW environment. In a smaller 10-division force, Army National Guard enhanced brigades become vital, because they can be used at the end of their 90 days to either fight in the MRC or be employed in post-MRC

missions. We must decide to mobilize them early. Their deployments may give early-deployed AC forces the opportunity to reconstitute or respond to a second MRC.

All 17 insights, including a detailed explanation of each, are available with a current "status of action" from HQDA's Remedial Action Project Program.6

In the fall of 1995, peace was established in the former Yugoslavia and Bosnia-Herzegovina. US Army Europe faced deployment of a large PK force to the region. Training during GHQ 95 and a short, regionally focused ARSTAF mini-exercise playing a similar scenario prepared the ARSTAF to handle Title 10 support to Operation Joint Endeavor.

Our Army's future success depends heavily on using lessons learned from training. This is an undisputed fact of Army life. A lesson learned, an issue discovered or, in the case of GHQ exercises, CPX insights make a difference. They help us take a more knowledgeable look ahead as we develop our 21st-century force. ***MR***

NOTES

1. This "study" phrase was coined by COL P.T. Mikolashek, chief of the Operations and Contingency Plans Division.

2. General Headquarters (GHQ) Exercise Directive (Washington, DC: Headquarters, Department of the Army, 1 July 1993).

3. COL Jack Le Cuyer, chief of the Army Initiatives Group, office of the deputy chief of staff for Operations and Plans, developed and coordinated all Louisiana Maneuvers (LAM) Board of Directors (BoD) agendas and was instrumental in much of the success of early Force XXI development.

4. The warfighting rodeo chart was designed by then BG Peter J. Schoomaker, deputy director of the Operations and Contingency Plans Division during GHQ 94. He was assisted by Army Staff (ARSTAF) war planners LTC Mike Cuff and CPT Jack Kammerer. The two rodeos in the chart represent two major regional conflicts. The rodeo rider represents a unit in Southwest Asia. The idea is that while everyone wants to watch the rodeo rider, the ARSTAF should be focusing on sending more riders to the first rodeo and preparing for the next rodeo in Cheyenne. The chart was a big hit at the 19 July 1994 LAM BoD meeting.

5. The Confederation of Models consisted of the Corps Battle Simulation, the Air War Simulation Model, the Joint Electronic Combat Electronic Warfare Simulation and the Combat Service Support Training Simulation. Confederation support was organized by the National Simulation Center, Fort Leavenworth, Kansas.

6. The Army's Remedial Action Project Program (ARAP) is the Army's formal program of taking action on lessons learned from a real operation or exercise. Observation reports are prepared in the standard Joint Universal Lessons Learned format and submitted to HQDA for resolution. A review committee, chaired by the director of operations, Readiness and Mobilization, meets quarterly to assign action to the appropriate Army staff. Observation reports involving more than one service or that have clear Joint Staff action are forwarded by the Army review committee to the Joint Staff Remedial Action Committee. All open observation reports are recorded in an ARAP data base and monitored at quarterly meetings. General officer approval is required to close, or stop work, on a particular observation report.

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Military Review, March-April 1997

Air Mech Strike: Revolution in Maneuver Warfare

by Major Charles A. Jarnot, US Army

The author proposes a revolutionary maneuver warfare concept he calls Air Mech Strike, which would use rotary-wing aircraft to project a combined arms force. He speculates that Air Mech Strike will maneuver at significantly greater speed, increasing air assault agility and lethality through improved situational awareness enhanced by battlefield digitization and information technology. His article further discusses how helicopter technology has greatly improved the AH-64A Apache, the AH-64D Longbow Apache and the "next-generation" RAH-66 Comanche. This article is a "quick read" worthy of consideration by force planners and developers alike.

Air Mech Strike is a revolutionary maneuver warfare concept that displaces the current heavy-mechanized doctrine as the dominant land combat form for the next century. The concept uses rotary-wing aircraft to project a combined arms force that maneuvers at significantly greater speed and depth than current heavy-armored formations. It solves the limitations in ground mobility, protection and firepower of current light-force designs and maximizes the benefits of the digitized battlefield and precision weapon advances. The Air Mech Strike design gives a theater-wide force the air assault agility and lethality to destroy heavy armor and retain a substantial mechanized combat capability. This concept heralds the end of the land battleship-heavy-tank doctrine-fully integrating air and ground maneuver.

50 Years of Maneuver Warfare

Heavy mechanized warfare has dominated land combat for more than 50 years. While of great concern, guerrilla or insurgency warfare has not affected the overall balance of military power to the extent that armored warfare has. Since the Germans introduced it in World War II, mechanized warfare has remained the primary influence in land force structures in most armies. Although nations have developed airborne, air assault and light infantry forces, these forces have largely remained subordinate to mechanized warfare. Light organizations often use aircraft to gain positional advantage; however, they generally lack the ground mobility, protection and firepower to compete in direct-fire confrontations with heavy armor. Thus, they are primarily used as early-entry forces or against a nonmechanized enemy in rough terrain. History has abundant examples of light airborne forces suffering badly in direct operations against heavy armor, as the British and Polish airborne units did in Operation `Market Garden` during World War II.1

Armies have attempted to build light armored vehicles that can be transported by air and address the mobility, protection and firepower deficiencies of air-inserted forces. The best examples are the Russian BMD airborne combat vehicle and the German Wiesel light-armored vehicle, both capable of being paradropped and transported by helicopter-the BMD via the massive Mi-6 and Mi-26 aircraft. While these lightweight vehicles have remarkable capabilities, they are no match for heavy armor in a direct-fire engagement.2 An armored vehicle and aircraft combination usually consists of many light vehicles of limited capability moved by large helicopters or a few heavy vehicles of significant capability moved by enormous cargo aircraft to prepared landing areas.

Mechanized warfare enjoyed great success when first introduced against the slower infantry foot soldier. The early German victories with this Blitzkrieg warfare resulted from applying a new maneuver doctrine rather than simply introducing tanks on the battlefield. Many Allies had better tanks than the Germans but suffered early defeats, partly because they viewed tanks and artillery as supporting the infantry. To achieve a combined arms force with mechanized speed, the Germans modified the roles of infantry and artillery to support the tank's advance.3 The Air Mech Strike concept takes a similar approach by modifying the traditional roles of ground maneuver and artillery to achieve a combined arms force that supports the advance of rotary-wing aircraft.

Modes of Maneuver

Today, there are three basic maneuver warfare modes: dismounted, mechanized and air assault. Each has an optimal operating time and space factor. Combat commanders all seek to move as fast as possible on the battlefield to gain and then exploit positional advantage over the enemy. However, the price of increasing speed is a corresponding reduction in close-combat capability. Tanks move much faster than foot infantry but are vulnerable in forest, mountain or urban terrain. Helicopters move much faster than armor but are ill-suited to duel with dug-in tanks. Ideally, a force structure should avoid committing to combat out of mode. Light infantry should not be used to quickly cover tens of kilometers in open terrain; tanks should not be fought in dense cities; and helicopters should not fly within direct-fire reach of enemy defenses. Unfortunately, maneuver mode mismatches do occur and are sometimes driven by tactical necessity. Of course, such mismatches on the enemy's part are desirable. However, for friendly forces, they often result in high losses or mission failure. The Air Mech Strike concept will reduce mismatches by fielding a force that is capable of maneuver in all three modes and by providing the ability to move the entire force in the fastest mode-air assault.

The US Army's current force structure and warfighting philosophy are dominated by the heavy-mechanized doctrine. Our combat power is in heavy divisions that have nearly 600 tanks and infantry fighting vehicles.4 These forces are designed to use mechanized maneuver to gain positional advantage and then destroy the enemy with massed direct fires. Artillery, combat engineers, air defense and aviation are in supporting roles to set the conditions for a favorable direct-fire fight. Long-range fires or deep-fight operations shape the close battle.5 To fight and survive in the direct-fire crucible, the US Army has fielded the world's heaviest and most thickly armored tank and infantry fighting vehicle combination: the 70-ton M1 Abrams tank and the 30-ton M2 Bradley Fighting Vehicle.6 These vehicles are designed almost exclusively for dueling with other armored vehicles. The M1 mounts a massive 120mm high-velocity direct-fire cannon and the M2 Bradley carries a high-velocity 25mm auto cannon and direct-fire heavy antitank missiles.

The remaining US force structure consists of light units organized as air assault, airborne and light infantry divisions designed for dismounted action in close terrain. They employ aircraft to gain a positional advantage in either airborne or air assault operations, but like their heavy-force counterparts, their ultimate goal is to close with the enemy in a direct-fire engagement. Light-force artillery, engineers and aviation are designed to support the light infantry to this end. Generally, these divisions are easier to move strategically and are often used as early-entry forces. Due to its large helicopter fleet, the air assault division is the most difficult to move. However, more air assault division combat power can be moved per Air Force sortie than heavy division power-four UH-60 Black Hawks or AH-64 Apaches per C-17 sortie, as opposed to one M1 Abrams tank.7

Heavy and Light Division Drawbacks

Direct-fire fight rigors have increased the liabilities of modern US heavy forces. Armored and mechanized divisions have lost their early maneuver advantages over mobile foot forces because most armies today have mechanized or motorized capabilities. Even the Somali warlords use armed pickup trucks.8 Tank and infantry vehicles have greatly increased in size and weight to accommodate necessary thick armor and weapon size increases. The added weight has reduced strategic mobility, because large numbers of heavy cargo aircraft are needed to move a relatively small armored force. To compensate, the Army has invested in additional heavy division sets of equipment and pre-positioned them in potential conflict theaters or on ships near trouble spots. The only other option is to move the heavy force by sealift, which typically takes about a month. The weight of heavy-armored vehicles also requires that they be transported by heavy tractor trailers from the port or storage site to the battle area to reduce vehicle wear and prevent road destruction.

The M1 tank's weight and limited main gun elevation reduce its effectiveness in the urban, mountainous and wet terrain typically found in potential theaters of operation such as Korea. Heavy armor often requires extensive engineer assistance to cross natural and manmade obstacles. For example, it took three days of intense bridging efforts to get M1 tanks across the Sava River in Bosnia.9 Finally, the heavy division, with limited infantry and helicopters, is seldom tasked for operations other than war because it has difficulty projecting presence beyond road networks or valleys.

Despite their relative strategic mobility, light divisions are not the preferred force against an armored enemy. Although they possess varying levels of air assault agility, they lack the ground mobility, protection and firepower to compete in direct-fire fights with heavy mechanized units. Typically, light formations have hand-held weapons, some light vehicle weapons and small-caliber towed artillery for firepower. With no armored protection, they are extremely vulnerable to indirect fire and lack mobility when attacked by enemy mortars or artillery. Only the air assault division has significant numbers of attack helicopters to meet an armored threat. Historically, attack helicopters have proved highly effective against attacking armor. Unfortunately, the attack helicopter is limited when engaging enemy forces in close terrain or in defensive positions. Light divisions use troop helicopters to offset their infantry's foot mobility, but this has drawbacks as well. Because the light infantry are on foot, landing zones must be very close to, if not on, the objective. This significantly reduces aircraft survivability, even against modest air defenses or small arms. Light forces faced with an armored threat will attempt to prepare defensive positions for protection. However, even if they succeed with this, enemy armored forces often can simply bypass the dug-in infantry.10

Air Mechanization

Even before World War II, theorists envisioned using aircraft to project land power over the ground. In the early 1930s, Soviet Marshal M. N. Tukhachevsky published ideas about `air mechanization` that favored ground combat vehicles moving by aircraft.11 British Brigadier Richard E. Simpkin promoted a modern version of air mechanization in his 1985 book `Race to the Swift`. Simpkin built on the main battle air vehicle concept, which was originally the brainchild of Germany's General Frido von Senger.12 In the early 1990s, the German army fielded three "air mech" brigades equipped with the helo-transportable Wiesel armored vehicle.13 Retired US Army Colonel Wallace P. Franz promoted a similar concept in his February 1992 `Military Review` article, "Airmechanization: The Next Generation."14 In the 1960s, the Russians developed the light-weight armored BMD for use by airborne and air assault units and the huge helicopters to transport the vehicles. The term `airmechanization` has come to be understood as some form of air mobility with a ground mechanized capability. Despite their advantages in ground mobility, protection and firepower over US light-force designs, the German and Russian airmechanized units cannot compete in a direct-fire confrontation with heavy armor. The 4-ton

Wiesel and 8-ton BMD armed with light cannons and antitank missiles are no match for the 70-ton M1 tank and its heavy direct-fire cannon. In addition, both nations have had difficulty fielding the requisite numbers of heavy-lift helicopters to facilitate airmechanized doctrine.15

Air Mech Strike Concept

The Air Mech Strike concept charts new ground in airmechanization by departing from the force design assumption that the direct-fire fight is the ultimate way to defeat the enemy. The explosion in information technology is already digitizing the battlefield, leading to far greater situational awareness. Even at company level, ground and airborne sensors with radio and nonjammable fiber-optic links will make it nearly impossible for a large enemy armored formation to approach undetected. Heavy mechanized units will be tracked at great distances and destroyed by indirect precision munitions attacks (PMAs), rendering large-scale direct-fire fights between massed armored formations obsolete.16 During Operation `Desert Storm`, both precision and nonprecision indirect fires destroyed far more Iraqi armor than tank-to-tank direct-fire engagements.17 If massed direct fire is no longer maneuver's prime objective, armored vehicles no longer need huge direct-fire cannons and heavy depleted uranium armor plating that balloons their weight to 70 tons. Armor protection will be designed to meet small arms, shrapnel and hand-held weapon threats. Armored vehicles, no longer used for tank-to-tank duels, will be made light enough to be used in the air assault mode but still possess highly lethal high-tech indirect weapons to destroy massed armor.

Air Mech Strike armor will move away from the current heavy "Iowa Battleship" model to the light "Aegis Cruiser" design. Air mech armor provides the close terrain combat force missing in pure attack helicopter operations and the ground mobility, protection and firepower missing in light infantry units. This force's air assault agility will allow units to quickly gain positional advantage against armored formations from any direction or flank. Once air-inserted, this force will use its mechanized capacity to maneuver into battle positions. Using exact targeting data from organic and higher-echelon sensors, air mech armor will execute PMAs from safe stand-off positions. Following the PMAs, air mech infantry will maneuver in close to destroy the enemy. Direct fire between armored vehicles will be a relatively rare occurrence involving only a few participants. To win these few direct-fire engagements, air mech vehicles (AMVs) will rely on improved situational awareness for first-shot kills via packs of hypervelocity missiles similar to the current line-of-sight antitank missile. Even against an enemy entrenched in prepared defensive positions, air mech armor units will be able to air assault to a positional advantage, dismount their infantry and reduce enemy defenses.

In Air Mech Strike warfare, artillery's traditional role of directly supporting ground maneuver changes to a main artillery effort. Artillery rocket and missile systems will team up with attack helicopters to form an aerial strike force that engages large, heavy-armor formations at great distances. Air mech artillery will use rocket missile platforms rather than cannon systems. The proposed trailer-mounted artillery rocket system (T-MARS) marries the multiple launch rocket system pod to a one-use trailer elevation and launch platform. T-MARS will be sling-loaded by UH-60L helicopters to give the artillery air assault agility.18 The systems will be issued as a unit to eliminate the need for heavy-launch vehicles. This concept would allow the artillery commander to air-insert T-MARS anywhere on the battlefield, including enemy rear or flank areas, and then fire them via data link. Enemy counterbattery would be useless because it would only destroy an unattended, empty trailer.

T-MARS would greatly increase the ability to mass fires because all available T-MARS could be fired at

once. Artillery's air assault agility would be used in conjunction with attack helicopter deep attacks and would provide most of the massed firepower. This would free attack aircraft to engage softer high-payoff targets, carry more fuel for greater range and endurance and provide artillery targeting and battle damage assessment data. For close support of maneuver forces, the economy and precision of cannon-fired munitions would come from lightweight 155mm howitzers, also sling-loaded by UH-60s.19 Initially, these cannon units would be organized as battalions directly assigned to the maneuver regiments. Eventually, the cannon battalions would be replaced by heavy 155mm mortars mounted on future AMVs and assigned as batteries to each maneuver battalion.

Command and Control (C2) Redefined

Air Mech Strike forces would operate at a speed and depth requiring a new delineation of C2 responsibilities. Air Mech Strike warfare divides the battlefield according to battlespace rather than traditional linear partitions. The strike force of attack helicopters, air assault-capable artillery and air defense, which conducts nearly all operations in the air-space medium, is responsible for all air space. Aircraft agility, long-range rocket and missile artillery responsiveness and the need for quick air defense reaction demands a responsive controlling authority. A division staff cell, which does not directly control air-space users, would not meet the needs of a fast-paced PMA. Other nonstrike elements would coordinate for air space use with the strike force. In this case, a small lag in responsiveness would be acceptable. The air mech armor force, which conducts most of its operations on the ground, would be responsible for tactical terrain management. This will greatly simplify the clearance of fires and ground maneuver speed because all ground warfighters would be part of the air mech armor force. Finally, the air mech strike force would use functional regiments rather than traditional separate battalions and companies. This would free division staffs to concentrate on planning. Rather than loose supervision by a chief of staff, a full colonel would "command" various supporting efforts.

`Air Mech Division.` The air mech division is proposed as an interim, then objective, model for the US Army. The interim design uses currently available equipment, vehicles and aircraft and could be fielded by the year 2000. The objective design, fielded by about 2010, would feature specially designed vehicles and aircraft to facilitate self-deployability to any theater. Each air mech model would be organized as a 3-D force, with one air mech brigade, one strike brigade and one support brigade, each commanded by a brigadier general. The interim design would typically operate to a depth of 300 km, and the objective design, out to 700 km.

`Interim Air Mech Brigade.` The interim air mech brigade is organized with one air mech infantry regiment and one air mech cavalry regiment, both equipped with the German-designed Wiesel armored vehicle. The Wiesel is light enough to be sling-loaded by UH-60L Black Hawk helicopters and comes in infantry-carrier, fire-support and antitank-missile versions. The Wiesel provides tracked mobility and armored protection up to 7.62mm for its crew of six soldiers or two soldiers and heavy weapons.20 Because landing zones for Wiesel airlift can be well-distanced from the objective, the Wiesel greatly enhances air-assault survivability. Each regiment has its own lightweight 155mm howitzer battalion for direct support, and the brigade has an assault helicopter regiment to provide the lift for the air mech infantry and cavalry regiments. The assault regiment provides supplemental fires with OH-58D Kiowas and UH-60s armed with Hellfire missiles and Hydra 70 rockets. As the division's anvil, the brigade blocks positions against enemy armor and conducts follow-on fire and maneuver to complete the destruction of the enemy following the strike brigade's PMAs.

`Interim Strike Brigade.` The interim strike brigade is organized with one attack cavalry regiment with three squadrons of 24 AH-64D Longbow Apache helicopters each. The attack cavalry regiment has

its own reconnaissance squadron equipped with OH-58Ds, unmanned aerial vehicles (UAVs) and ground scouts mounted in Wiesels. The brigade has one air mech rocket and missile artillery regiment organized into three battalions of 18 T-MARS prime movers each. An internal assault helicopter regiment provides lift for the T-MARS and aerial resupply for the attack helicopter regiment. In addition, the assault helicopter regiment can supplement the attack cavalry regiment's aerial fires. The brigade operates as an attack helicopter/rocket artillery team that can quickly execute an overwhelming PMA on an armored force out to more than 300 km. As the proponent for the division's air space, the brigade also employs the air defense battalion, which uses Avenger systems that can be sling-loaded by UH-60L helicopters.

`Interim Support Brigade.` The support brigade has one logistics regiment organized with a base support battalion and two forward support battalions tailored for the air mech and strike brigades. Company-size support organizations in each combat battalion provide additional logistic capabilities. Most brigade resupply will be provided by the assault helicopter regiments organic to each brigade. The division will operate nonlinearly from remote assembly areas separated by long distances. Thus, aerial resupply is the primary means of supporting the air mech division. The brigade also has support responsibility for the intelligence regiment, which, with its own aerial reconnaissance squadron, works directly for the division commander and provides the necessary intelligence gathering, analyzing and distribution to the combat elements. The brigade has an organic assault helicopter regiment to provide aerial logistics to the brigades, reinforce major air assaults and supplement aerial fires.

Future Air Mech Aircraft (FAMA)

The FAMA would replace the UH-60 and CH-47 Chinook helicopters in the Army inventory beginning in 2010. The aircraft would most likely resemble an improved version of the current V-22 Osprey tilt-rotor aircraft. Using close terrain flight and traveling at more than 200 knots, the FAMA

would be able to transport internally a 10- to 15-ton vehicle more than 700 kilometers and then return without refueling. The V-22 can already almost meet this parameter-it can transport a 6-ton load.21 The FAMA would use bomb bay-type doors to "winch" the AMVs to the ground. This combines the advantages of internal and external loading, thus allowing greater range and stealth and eliminating the requirement for prepared landing areas. The FAMA's cruising speed of 250 knots and aerial refueling ability would make it self-deployable worldwide. The attack aircraft in the objective air mech division would be an improved RAH-66 Comanche helicopter modified as a compound helicopter and designed to cruise at 250 knots. The modification would involve applying the Piasecki Vectored Thrust Ducted Propeller concept and result in a pusher tail configuration similar to the AH-56 Cheyenne.22 This higher cruise speed, combined with aerial refueling, would make the Comanche self-deployable.

Future Air Mech Vehicle (FAMV)

The FAMV would be about the size of an M113 armored personnel carrier but would use advanced composite armor. Dual engines and tracks would be employed to keep the vehicle operable if hit by mines or antitank weapons. Internal blast shields would also be used to limit armor penetration damage, and the unmanned pedestal weapons turret would provide hull defilade attacks without exposing the crew. Externally, all FAMVs would look the same to confuse the enemy. However, the vehicles would be configured internally as tanks, personnel carriers, C2 vehicles, self-propelled mortars or air-defense platforms. The FAMV tank would have a crew of two and a two-scout dismount team. Personnel would sit at the rear and use virtual reality visors to observe and identify targets seen by vehicle-mounted sensors or reported by higher echelons. Millimeter-wave radar and thermal-vehicle sensors would be

supplemented by direct-view periscopes. A bank of vertically launched antitank, antipersonnel, antiaircraft and reconnaissance missiles would provide the long-range eyes and indirect firepower to execute PMAs. The pedestal turret would feature a general purpose cannon of 30 to 50mm caliber and stations for direct-fire hypervelocity missiles or other weapons as required. The FAMV personnel carrier would have infantry seating in its center instead of the bank of vertically launched missiles.

Operations Concerns and Limitations

Although air defenses are a great concern in all military aircraft operations, recent history has shown that with proper planning and preparation, they can be defeated. Western air power planners learned enemy air defense lessons from Vietnam and, especially, the 1973 Arab-Israeli War. Since then, few aircraft, either fixed wing or rotary wing, have been lost in combat operations. This is particularly significant, given the increased sophistication of hostile air defenses and the number of missions flown. For example, during `Desert Storm`, only one AH-64 Apache was shot down, and in Somalia, no AH-1 Cobras were lost after a year of operations. Recent losses that did occur resulted from accidents during combat conditions or high-risk special operations. Recently, Israeli Cobra and Apache attack helicopters have conducted attacks in Southern Lebanon with no reported losses, despite several daylight missions.23 Today, aviation commanders routinely exploit air defense limitations, such as terrain relief, radar dependence, vulnerability to countermeasures and static firing modes. In the future, air mech strike commanders will continue to have serious regard for enemy air defenses but will have enhanced survivability thanks to displaced landing zones, stand-off weapon platforms and mechanized air assault forces. In the final analysis, antiaircraft weapons are similar to antiarmor systems: they cannot be ignored, but their effectiveness can be negated by proper tactics, techniques and procedures. They will seldom stop determined air or armor maneuver forces.

Helicopter technology has greatly improved over the past decade. The Vietnam vintage aircraft such as the AH-1 Cobra and UH-1 Huey are grounded if winds exceed 35 knots or visibility is less than one-quarter mile, and they have only night-vision goggles for night operations. The AH-64A Apache is capable of operations in up to 45-knot winds and can fly in near-zero visibility, day or night, using its unique flying Forward Looking Infrared (FLIR) system. However, the Apache's laser-guided Hellfire missile needs much better visibility. The AH-64D Longbow Apache, which will be available next year, can use its millimeter-wave radar to attack targets at maximum range with no visibility requirements.24 The RAH-66 Comanche will further improve on this with the added capability to fly in up to 80-knot winds.25 The all-weather attack helicopter era is quickly approaching. Lift aircraft have also shown great improvements in weather tolerance. Helicopters such as the newly fielded special operations MH47E Chinook, equipped with radars and FLIRs, already have significant capabilities to operate in poor weather. The air mech division will never be completely "all weather," but there are very few places on the globe where winds exceed 80 knots for very long. Even in such extreme circumstances, the air mech division has a significant mechanized capability, allowing it to continue maneuvering. Contrast these brief weather holds with the extended delays to heavy-armored maneuver units caused by seasonal thaws, rains and flooding.

The Air Mech Strike concept offers a force that can operate in all three maneuver modes: dismounted, mechanized and air assault. This agility allows the force to better exploit the improved situational awareness that is gained through battlefield digitization. The force has the speed advantage of air maneuver to act on the information without sacrificing ground mobility, protection and the firepower necessary to defeat heavy forces. Air mech strike maneuver doctrine will render the world's heavy tank armies obsolete. The concept capitalizes on the advantages in US air power and uses rapid force projection strategy from bases in the Continental United States. The Air Mech Strike division will be a

force for all seasons that can defeat armored formations or employ its aircraft, light vehicles and infantry in disaster relief operations. In this era of shrinking defense budgets, the US Army cannot afford to maintain a large heavy-force structure that is effective in only a few deployment scenarios. The choice for future force developers is clear: either use new technology to enhance the old land combat "battleship" model or apply it to enable the next revolution in maneuver warfare. ***MR***

NOTES

1. John Keegan, `Second World War` (New York: Viking Penguin Books, 1989), 437 and 438.

2. US Army Field Manual (FM) 100-2-3, `The Soviet Army: Troops, Organization and Equipment` (Washington, DC: US Government Printing Office [GPO], 1991), 4-144 and 5-37.

3. Kenneth Macksey, `Guderian: Panzer General` (London: Greenhill Books Inc., 1992), 57-97.

4. US Army Student Text (ST) 100-3, `Battle Book` (Fort Leavenworth, KS: US Army Command and General Staff College [USACGSC], 1995), 3-1 and 3-9.

5. FM 100-5, `Operations` (Washington, DC: GPO, 1993), 6-14.

6. `Jane's Armour and Artillery 95-96`, edited by Christopher F. Foss and T. Cullen (Coulsdon, UK: Jane's Information Group Ltd., 1996), 137 and 142. A review of tanks and infantry fighting vehicles reveals that the US M1 Abrams tank and M2 Bradley Fighting Vehicle are the heaviest vehicles fielded in significant numbers by a major military power.

7. US Army ST 100-3, `Battle Book` (Fort Leavenworth, KS: USACGSC, 1995), 3-1 and 3-9. The total numbers of key weapon systems counted for each division model compared with the lift capacity of the C-17 Globemaster III are found in `Jane's All the World's Aircraft 1996`, edited by P. Jackson (Couldsdon, UK: Jane's Information Group Ltd., 1996), 584-88.

8. MAJ Emmett Shaffer, member of 160th Special Operations Helicopter Regiment planning staff, interview by author, 12 November 1995.

9. CNN report on crossing the Sava River in Bosnia, 12 January 1995.

10. This is based on my experience as an observer/controller for 28 rotations at the National Training Center, Fort Irwin, California, from 1989 to 1990.

11. Richard E. Simpkin, `Race To The Swift, Thoughts on Twenty-First Century Warfare` (London: Brassey's Defence Publishers Ltd., 1987), 119.

12. Ibid., 123.

13. Bundeswehr, organizational document received from the German liaison office (Fort Leavenworth, KS: USACGSC, February 1996).

14. Wallace P. Franz, "Airmechanization: The Next Generation," `Military Review` (February 1992), 59-64.

15. International Institute for Strategic Studies, `The Military Balance 1995-1996` (London: Institute for Strategic Studies, 1996), 45 and 115.

16. BG Huba Wass de Czege, lecture on advanced warfighting in the early 21st century (Fort Leavenworth, KS: USACGSC, 10 January 1996).

17. Dale R. Steinhauer, resident expert on Middle East wars, interview by author, 6 April 1996, Army Knowledge Network, USACGSC, Fort Leavenworth, KS, 6 April 1996.

18. `Jane's Armour and Artillery 95-96`, 675. The weight of the pod is 5,600 pounds, allowing for a 2,400-pound trailer. Total weight=UH-60L external limit, 8,000 pounds.

19. Ibid., 675.

20. Ibid., 364 and 365.

21. `Jane's All the World's Aircraft 1996`, 497.

22. Ibid., 621.

23. CNN footage showing Israeli AH-1 and AH-64s firing at Hezbolla positions in daylight, 19 April 1996.

24. This comes from my personal experience in training with the AH-64, AH-1 and UH-1 helicopters at Fort Rucker, Alabama, while assigned to the Aviation Training Brigade from 1993 to 1995.

25. CW04 Ronald Ferrell, US Army Aviation Center resident expert on RAH-66 capabilities, interview by author, Fort Rucker, Alabama, 6 April 1996.

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Military Review, March-April 1997

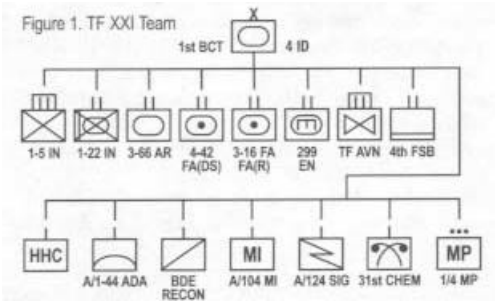
Task Force XXI: An Overview

by Colonel Thomas R. Goedkoop, US Army, and Captain Barry E. Venable, US Army

CHANGE, inspired by a wide variety of factors-including technology, international relationships and national economics-is part of our military. US Army leaders recognized this long ago and started developing the Force XXI Campaign Plan, which incorporates three complementary and interactive efforts. The first and most important of these is Joint Venture, the redesign of Army operational forces. The Joint Venture axis has three intermediate phases, each oriented on an operational Army echelon and culminating with an experimental objective. Since early 1995, the brigade-level experiment-the Task Force (TF) XXI Advanced Warfighting Experiment (AWE)-has been rapidly reaching its culmination: National Training Center (NTC) Rotation 96-07 in March 1997 at Fort Irwin, California. During this rotation, the experimental, digitized brigade will take its new technologies and redesigned units into battle against the vaunted NTC opposing force (OPFOR).

Viewed from many different perspectives, there are numerous meanings and explanations for the TF XXI AWE's significance. From the unit commander's perspective, the meaning and significance can be boiled down to three essential elements: the unit, the experiment and the training event. This article discusses all three elements. Grouped together, they convey TF XXI's substance.

The first element of TF XXI is the unit. Built around the 1st Brigade, 4th Infantry Division, (Mechanized) (4th ID[M]), Fort Hood, Texas, the Brigade Combat Team (BCT) consists of more than 5,000 soldiers organized into eight battalions, six separate companies and a separate platoon, as depicted in Figure 1. Neither the unit nor the soldiers were "hand picked." Built around a typical heavy brigade, TF XXI includes a light infantry battalion-the 1st Battalion (Bobcats), 5th Infantry Regiment, 25th Infantry Division (Light), Fort Lewis, Washington.



The second TF XXI element is the AWE. As the Army's only brigade-level experiment, this AWE represents first phase line passage of the Force XXI Campaign Plan Joint Venture axis. The AWE involves a BCT from the Experimental Force (EXFOR)-the 4th ID (M)-trained and organized to exploit the advantages of experimental and developmental information-age technologies. The TF XXI AWE involves experimentation with 72 separate initiatives which refer to the individual equipment, concepts and organizational changes undergoing experimentation, to improve lethality, survivability and operation tempo.

TF XXI's third element is the actual training event and the opportunities it offers. The BCT is training extensively with new equipment to learn how digital and information-age technologies can enhance lethality and effectiveness. As units train, they are experimenting with diverse initiatives and developing new tactics, techniques and procedures (TTPs) that optimize warfighting capabilities. After executing a challenging and comprehensive training plan, the BCT will deploy to the NTC to fight the OPFOR. This will complete the training cycle and provide an opportunity for expanded data collection during live experimentation. In addition to this challenging training event, the BCT must also maintain combat readiness to deploy and conduct operational missions.

The Unit

The 4th ID (M) has a long and proud lineage. Organized in 1917, it has served the nation well through two world wars, Vietnam and the Cold War. Relocating to Fort Hood from Fort Carson, Colorado, the division became the Army's EXFOR with the dual missions of maintaining combat readiness and conducting large-scale experimentation. The 1st (Raider) Brigade, 4th ID (M), is the core of TF XXI. It is the first unit in the Army to train as an information-based force using the latest information-age equipment and technology.

Once you look around the TF, you quickly discover that any similarity to conventional units is hard to find. Everywhere you look, there is something different happening. Significant portions of the BCT have been redesigned for the AWE, but many tables of organization and equipment remain unchanged. Each team member has some unique characteristic or capability, primarily driven by each unit's experimental initiatives.

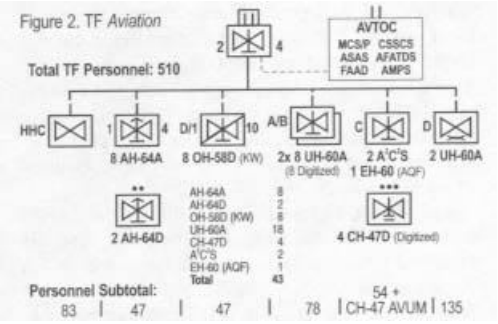
The Headquarters and Headquarters Company (HHC), with more than 150 soldiers, is organized much the same as other HHCs. Because of the critical need for Tactical Internet (TI) management, an entirely new platoon-the tactical automation platoon-was added to the HHC. The platoon has a warrant officer platoon leader who serves as the brigade automation technician, and 32 tactical automation specialists. The tactical automation platoon provides System Integration Vehicle (SIV) team members to each BCT subordinate element.

The BCT has an organic reconnaissance troop for the AWE. This 77-man troop was formed by combining two existing scout platoons from the division with a company headquarters. It operates under the brigade commander's direct control. Each scout platoon has a headquarters element and six scout squads mounted in high-mobility multipurpose wheeled vehicles (HMMWVs). The headquarters platoon gives the troop an unprecedented degree of organic service and support. In addition to a sheltered command post (CP) mounted on a HMMWV, the troop also has a supply and maintenance section.

TF 1/5th Infantry is the BCT's light infantry component. Organizationally unchanged, 1/5th Infantry will carry its habitual combat support (CS) and combat service support (CSS) slices to Fort Hood for training and to the NTC for the TF XXI rotation.

The 3d Battalion, 66th Armor Regiment and the 1st Battalion, 22d Infantry Regiment (M) are the BCT's mounted maneuver forces. Each battalion has undergone several organizational changes and received several pieces of new equipment. Both no longer have traditional headquarters companies. Except for the staff and scouts, the CSS assets of both units have been moved to the Forward Support Battalion (FSB). The infantry battalion retained its organic mortar platoon, but the armor battalion did not. The 1/22d Infantry also added 60 infantrymen who are organized into 12 machinegun teams-one per infantry platoon.

One of the most radically redesigned units of the BCT is TF Aviation. Built around the 2d Battalion, 4th Aviation Regiment, TF subelements include B Company, 1st Battalion, 4th Aviation Regiment and D Troop, 1st Battalion, 10th Cavalry Regiment. TF Aviation has two general support aviation companies, an attack helicopter company, reconnaissance troop and a new organization-the command, control and communications (C3) company, as illustrated in Figure 2.



The direct-support (DS) field artillery (FA) battalion, 4th Battalion, 42d FA Regiment, is equipped with the M109A6 Paladin howitzer, FA Ammunition Supply Vehicle and Advanced FA Tactical Data System (AFATDS). It recently converted to a 3x6 (three batteries of six howitzers apiece) configuration. This 675-man battalion is experimenting with numerous initiatives. The battalion also has one of the first FA fire support warrant officers, who serves as the targeting officer in the brigade fire support element. Another digitized FA CP from the 3d Battalion, 16th FA Regiment will serve as the reinforcing FA battalion during the NTC rotation.

Another radically redesigned unit is the 299th Engineer Battalion. Organized with an HHC and three multifunctional companies, the engineer force features modularity and versatility. The two line companies have three multifunctional platoons, and the maneuver support company has two engineer platoons and an assault platoon. Within the HHC are the staff and CPs, support platoon, maintenance platoon and a HMMWV-equipped recon section which normally operates with the recon troop.

A Battery, 1st Battalion, 44th Air Defense Artillery (ADA) Regiment has the only Linebacker-equipped platoons in the Army, and the Stinger platoon has been replaced by a six-system Avenger platoon. Additionally, a Stinger platoon is attached to the light infantry battalion.

However, the most radical organizational experiment within TF XXI is the brigade CSS structure redesign whereby the 4th FSB grew from 434 soldiers to 836. By transferring the CSS elements from the maneuver battalion HHCs to the FSB, two entirely new, multifunctional organizations called Forward Support Companies (FSCs) were established. These FSCs enjoy a habitual DS relationship with their supported maneuver battalion, comparable to the FSB's relationship with the BCT.

FSCs provide all classes of supply-except medical supplies-to their supported maneuver battalion. They also conduct forward tactical maintenance and provide echelon I and II combat health services. C Company (Medical) remains essentially unchanged, while D Company (Base Support) is a new organization that absorbed the mission elements of the FSB's former maintenance and supply companies. The Base Support Company provides DS maintenance and supplies to the FSCs and other brigade units. Finally, the HHC, 4th FSB provides command, control and administrative support for organic and attached units.

Other TF XXI elements include A Company, 104th Military Intelligence (MI) Battalion; the DS MI company, which provides the brigade with aerial reconnaissance intelligence using links to unmanned aerial vehicles (UAVs); the Joint Surveillance Target Attack Radar System (JSTARS) and Advanced Quick Fix, as well as the Improved Remotely Monitored Battlefield Sensor System (IREMBASS) and the Analysis and Control Team (ACT). The 124th Signal Battalion supports the brigade with Mobile Subscriber Equipment (MSE), Enhanced Position Location Reference System (EPLRS), Global Broadcast System-Battlefield Awareness Data Distribution system (GBS-BADD) and net control stations. The 31st Chemical Company provides the brigade slice of nuclear, biological and chemical (NBC) recon, smoke and decontamination, and the 1st Platoon, 4th Military Police (MP) Company provides route security and MP support.

Supporting TF XXI are several echelon-above-brigade units. The 4th ID (M) tactical command post (TAC) provides division-level command and control (C2). The 124th Signal Battalion; the 104th MI

Division Support Command will also directly participate in the AWE. Additionally, a medium truck company (Palletized Load System [PLS]) (Corps) will deploy to the NTC, and intelligence data from the

The final members of the TF XXI
the NTC to provide maintenance and technical support to the brigade.

The Experiment

Prime Directive
establishing the 4th ID (M)-formerly the 2d Armored Division-as the Army's EXFOR. The EXFOR idea

mechanized force of the 1920s, the 11th Air Assault Division in the 1960s and the high-technology testbed in the 9th Infantry Division in the 1980s. What makes the EXFOR different from earlier

TF XXI DESERT HAMMER,
FOCUS and , which contributed to the growing body of knowledge about digitization and increased situational awareness.

XXI is the center of gravity AWE within the
axis for early Force XXI design experimentation. The TF XXI
BCT to demonstrate the potential force effectiveness increases achieved by force digitization. This digitization includes adding new information-age systems; incorporating new concepts, organizational

information for Force XXI on operational and organizational concepts and materiel acquisition opportunities and assess the doctrine, training, leadership, organization, materiel and soldier impacts of

Hypothesis.
all battlefield operating systems (BOS) and functions within and up to a brigade TF, then significant increases in lethality, survivability and tempo will be achieved."2 Testing the validity of this hypothesis

Analysis. XXI is the subject of a comprehensive analytic effort to address the hypothesis with

help them make decisions about our future Army. The AWE will address hypothesis testing and initiative assessment with constructive and live means. Two problem areas will be addressed in the TF analysis:

- The value of digitization.
-

The task of collecting data from live simulations at Forts Hood and Irwin is the responsibility of the US Army Test and Experimentation Command (TEXCOM), Fort Hood, Texas, in partnership with various

matter experts from TRADOC and US Army Forces Command and NTC observer/controllers are manually collecting data. Techniques to collect digital data include over-the-air collection, on-vehicle

instrumentation and "taps" of local area networks. TEXCOM has already provided valuable insights on many initiatives. In several cases, the information has been immediately applied to the ongoing experiment. Collected data is analyzed and then used to calibrate the constructive modeling and simulation that follow the live experiment. Data gathered during NTC Rotation 97-06 will be measured against performance data from previous "base-line" NTC rotations to determine if TF XXI achieves net increases in lethality, tempo and survivability.

Although often associated only with the NTC rotation, the experiment has been under way since July 1996, when the 1st BCT began initial connectivity training. Data was collected daily throughout the summer and fall, and insights gained and lessons learned were constantly evaluated and applied to the next event. This constructive, dynamic and evolutionary approach to the experiment has leveraged the value of the Army's investment significantly and resulted in an information windfall about the hypothesis and experiment's methodology.

Initiatives

TF XXI has three categories of initiatives: prototypes, fieldings and concepts. Prototype initiatives involve materiel in various stages of development and testing, before purchase and fielding decisions are made. Fieldings are Army-tested, approved and purchased materiel included in the experiment to give the EXFOR the most modern equipment available to determine interoperability with prototype and concept initiatives. Concept initiatives primarily involve design and force training. Each initiative generally supports a specific BOS. This article will discuss many of these initiatives, highlighting several under each BOS.

Battle Command. Although all the initiatives are important to the Force XXI development process, the experiment's focus is digitization. Two initiatives that reach across all BOS and most fully support improved situational awareness and C2 are the TI and Appliqué. Together, they form the experiment's centerpiece.

TI is a concept for interconnecting the Army's three primary tactical communication systems-Single-Channel Ground and Airborne Radio System (SINCGARS), EPLRS and MSE-into a data network. TI provides tactical communications at brigade level and below to support situational awareness and C2. It is the digital conduit that transports information to improve lethality, increase tempo and enhance survivability.

Essentially a router-based communications network, the TI comprises an EPLRS net for transmitting and receiving digital signals, SINCGARS/SINCGARS Improvement Program radio nets for voice and digital communications and a Surrogate Data Radio (SDR) net for data communications. Two types of commercial Internet Protocol routers at various echelons throughout the BCT integrate all radio nets into a seamless communications network.

Because of TI's complexity and scale, the SIV, another initiative, provides a platform for TI management. To operate the TI, the brigade headquarters company formed the tactical automation platoon. The platoon's network management specialists are highly trained for this unique work.

TI fully supports battle command with software commonly known as Appliqué. Appliqué provides vertical and horizontal integration of near real-time situational awareness and seamless digital C2 capabilities at brigade level and below, and consists of computing hardware, an installation kit and system and applications software. The software provides a point-and-click menu for operating

Appliqué. TF XXI is experimenting with the Appliqué computers in the four different versions illustrated by Figure 3. At end-state development, Appliqué will support battle command tactical mission requirements, such as:

- Real-time situational awareness for the commander, staff and soldiers.
- Shared common picture of the battlefield.
- Graphical displays.
- Friendly and enemy unit locations.
- Target identification.
- Communications electronics interfaces with host platforms.
- Enhanced battle command by providing seamless C2 capability through interfaces with Army Battle Command Systems (ABCS).

Other initiatives within the battle command BOS include expanded capability-more fully integrated Army Tactical Command and Control System (ATCCS) systems-which give automated C2 support to the commander and staff by providing a common battlefield picture and operations plan (OPLAN) and operations order (OPORD) support. GBS-BADD provides large volumes of tactical information, including weather, imagery, warning and video over dedicated satellite circuits.

Maneuver. Several prototype systems are undergoing experimentation within the maneuver BOS. The battle command vehicle is the brigade and battalion commanders' fighting vehicle. Both an M1 Abrams tank and M3 Bradley fighting vehicle configuration are undergoing experimentation. The brigade commander and the mechanized infantry battalion commander use the M3 variant, while the armor battalion commander uses the M1. The main gun in the M1 tank has been removed to accommodate the large quantity of C2 equipment. Both prototype vehicles have four SINCGARS, EPLRS, SDR, flat panel display, Maneuver Control System/PHOENIX (MCS/P) and Appliqué. These systems' capabilities allow commanders to conduct C2 on the move while linked to their tactical operations centers (TOCs). The C2 vehicle (C2V), based on a Multiple Launch Rocket System (MLRS) chassis, serves as a battalion TOC vehicle and as the brigade TAC. Each C2V has three ATCCS workstations: MCS/P, All-Source Analysis System (ASAS) and AFATDS.

A Family of Computers and Systems to Support the Warfighter

Appliqué V1—This commercial-off-the-shelf notebook computer features an Intel 80486 DX2, 75 MHz processor with a 80487 numeric co-processor. It has 24MB of RAM, a 540MB hard disk, internal diskette drive and internal 9.5-inch color display on the flip-up lid.

Appliqué V2—This "fuggedized" computer features an Intel Pentium P54C, 90 MHz processor. It has 32MB of RAM, internal hard disk with 500MB of storage and external 9.4-inch color VGA monitor.

Appliqué V3—This "militarized" computer features an Intel 486 DX4 processor. It has 32MB of RAM, removable hard drive with an expandable 1.02GB of storage, external diskette drive and external 10.4-inch color video monitor.

Phoenix Group International (PGI)/Position Navigation (PosNav) Device—This militarized computer features an Intel 80486 DX2, 100 MHz processor. The PGI is the dismounted soldier system computer component. In its mounted configuration, the same computer serves as a PosNav device. It has 24MB of RAM, internal hard disk with 1.08GB of storage and external 7-inch liquid crystal display.

The Battlefield Combat Identification System (BCIS) is an active radio frequency (RF) interrogation system that discriminates friend from foe and displays the information in the gunner's sight to prevent fratricide. A variety of 1st BCT vehicles are BCIS-equipped, including tanks, Bradleys, howitzers and engineer vehicles. When task-organized for combat, TF 3/66 Armor Regiment has a total of 64 systems.

The Long-Range Advanced Scout Surveillance System and Hunter Surrogate Sensor Suite are two line-of-sight systems used by scouts for reconnaissance of terrain and surveillance of objects of tactical interest. They provide near all-weather reconnaissance, surveillance and target acquisition capability with integrated second-generation FLIR, low-light-level TV, eye-safe laser range finder, digital compass and Global Positioning System (GPS).

TTPs for the digital force are being developed to provide doctrine for operating in an environment of widespread battlefield automation. To date, the BCT is using more than 60 draft field manuals (FMs) and numerous graphic training aids. These FMs and training aids are dynamic, living documents.

Periodic updates ensure new lessons and insights are captured as training progresses.

Dismounted forces are testing several initiatives. The light infantry battalion has replaced its organic 81mm mortars with towed 120mm mortars outfitted with the mortar fire control system, which digitizes the fire control system by placing a GPS on each gun, eliminating the need to lay them with an aiming circle. The mechanized infantry battalion has augmented its dismounted strength with a light machinegun section in each platoon. Termed the "2x9+5" initiative, each platoon has received two M60 machinegun-equipped crews and a section leader to increase the dismounted infantry's firepower. A total of 18 Javelin antitank weapons are being fielded in the light infantry battalion, significantly upgrading its antiarmor capabilities.

Perhaps the most visible dismounted initiative is the Dismounted Soldier System (DSS), designed to provide the same situational awareness and C2 capabilities to light forces that heavy forces possess. A total of 101 DSS units are in the BCT; 57 are slated for the 1st Battalion, 5th Infantry Regiment's light fighters; the remainder, for heavy scout, infantry and engineer units. The DSS consists of a PGI computer, a helmet-mounted display, a hand-held control unit (mouse), a Position Ground Location Reference (PGLR) system, a video capture card and a hand-held SINCGARS radio. A subcomponent is the video camera.

TF XXI has an impressive array of aviation maneuver initiatives and fieldings, including OH-58D(I) Kiowa Warrior and AH-64D Longbow Apache helicopters. The Aviation Mission Planning System is a planning and battle synchronization tool that automates aviation mission planning tasks and is compatible with other ATCCS systems. The Aviation TOC provides automated TOC command, control, communications and intelligence by incorporating horizontal and vertical interoperability between BOS and command echelons. The Army Airborne C2 System, based on the UH-60 Black Hawk, will give commanders a highly mobile, airborne C2 platform with ATCCS connectivity.

Intelligence. TF XXI will gain significant advantages from the intelligence systems supporting the AWE. The ASAS Remote Workstation supports collateral intelligence processing at maneuver echelons below division level. The UAV provides near real-time intelligence, target acquisition, battlefield damage assessment, reconnaissance and surveillance. The Common Ground Station-Prototype is an enhanced ground station module with capabilities that include near real-time moving-target indicators/synthetic aperture radar and receipt and analysis of UAV imagery and secondary imagery data. The Integrated Electronic Warfare Common Sensor is a suite of systems, including Ground-Based Common Sensor-Heavy and Light and Advanced Quick Fix, which provide near real-time targeting, identification and precision location reports. The IREMBASS consists of unattended ground sensors that detect, classify and determine direction of movement of personnel and vehicles.

The ACT is the DS MI company hub. It provides the brigade with intelligence connectivity, fusion, analysis and the ability to maintain the intelligence data base. The ACT provides the brigade S2 with automated intelligence processing, analysis and dissemination capabilities and "top-down" feeds through digital links established with airborne and space-based digital sensors.

Fire Support. Supporting the maneuver force will be a totally digitized fire support system built around the AFATDS and the M109A6 Paladin. Two Paladin platoons will have a prototype Fire Direction Center (FDC)-Vehicle, a retrofitted M992 with AFATDS, SINCGARS, Appliqué and FDC equipment. Two other system fieldings, the AN/TPQ-36(V8) Firefinder Radar and the AN/TQM 41 Meteorological Measuring System, enhance the capability and accuracy of fires. Fire support execution will get a boost from the X-FIST (experimental fire support team [vehicle]), a Bradley fighting vehicle

for fire support coordinators at company through battalion levels. Assisting in fire support execution are HMMWV-mounted Striker teams, formed by combining combat observation and "lazing" teams and

Lightweight Laser Designator and Rangefinder surrogate will enhance light force fires.

Mobility, Countermobility and Survivability The engineer force has received several enhancements. The DS battalion has been reorganized by the creation of a maneuver support company

engineer platoons into multifunctional organizations that allow platoons to independently support mobile operations. The Wide Area Munitions Trainer (Hornet) is a training system of the developmental Wide

remote control.

The Automated NBC Information System, a software program, is imbedded in MCS/P to automate NBC

operations. TF XXI

Air Defense.
Area Air Defense C2 (FAAD C2) System, which provides integrated air defense C2 and enhances engagement operations support to FAAD weapon systems and maneuver forces. Avenger is a

"slew-to-cue" capability. The Bradley-Linebacker is an M2A2 on which the TOW missile system has been replaced by the Stinger system to provide all-weather, 24-hour, short-range, on-the-move air

Stinger Operation Desert Storm
providing 3-D air track data against fixed-wing, rotary-wing, UAV and cruise-missile targets. It also has an Identify Friend or Foe function with active decode identification of friendly aircraft.

CSS. XXI will have a host of CSS enhancements. The CSS Control System provides C2 and

decision support tools and roll-ups of CSS activities within subordinate units. The CSS C2 initiative represents the CSS functions, which collect CSS information from the platform to the provider and provide the capability to task on the move and give feedback to CSS nodes and supported

Automated Reader Cards and computers. The Personnel Service Support Control System, loaded on a laptop computer, gives the commander near real-time critical information concerning the force's combat

The Armored Transport and Treatment Vehicle is an armored ambulance built on an MLRS chassis to increase soldier survivability and push treatment forward. The Digital Medical Assistant, a hand-held

record. Telementoring is a voice-only communication link between a medic and a physician or physician's assistant to provide enhanced treatment. Telemedicine is a direct voice/data/video link

at a higher level. For TF XXI
Army Community Hospital at Fort Hood.

The PLS-Enhanced (PLS-E) consists of three subsystems: the Movement Tracking System, Driver Vision Enhancer and a PLS truck platform designed to provide enhanced battlefield distribution. RF tags and interrogators provide in-transit total asset visibility to transportation managers. RF tags, attached to containers, allow materiel tracking through the distribution system. The religious support initiative will provide comprehensive religious support for the commander on the digitized battlefield. Outfitted with Appliqué, unit ministry teams will be at the right place and time with the right information.

The Training Event

The third and final facet of the TF XXI AWE is the training provided to the units and soldiers. When the 1st BCT arrives back at Fort Hood and Fort Lewis after the NTC rotation, the overall combat readiness of those units and the Army will be increased, and the Army will have completed its first full cycle of digital training. The experiment will yield significant insights on how to train Force XXI soldiers and units. Additionally, more than 5,000 soldiers will have a digital knowledge base they can spread to the rest of the force. The TF XXI AWE, held from January 1996 through May 1997, will be one of the most lengthy, sustained and intensive training events the Army has ever conducted.

TF XXI began training on 8 January 1996 when the first of 150 soldier trainers began learning Appliqué so they could train the rest of the BCT's soldiers. Except for these 150, who were instructed by contractor personnel, the BCT trained itself on Appliqué.

The "Digital University." To meet this training challenge, the BCT created a "digital university," using the trained personnel and the central technical support facility to establish a rigorous training schedule. Appliqué training was held night and day for 10 weeks in two shifts, resulting in more than 2,700 soldiers able to use the software.

Because of the fieldings of new and prototype equipment, almost every BCT soldier had to learn to operate one or several pieces of equipment. Due to the enormous challenge of training some 8,600 soldiers, more than 90 classrooms were set up and more than 28 motor pool areas were used for hands-on training. More than 11,000 soldiers attended the "digital university."

The "Factory." While undergoing training, the BCT was also transforming its vehicle and equipment fleet from analog to digital. Almost overnight, an old motor pool with World War II-era buildings became the construction site of the future Army. Operating continuously for 205 days and nights, the "factory" installed nearly 5,000 pieces of new equipment on existing platforms and vehicles, including 873 Appliqué packages, 764 PGLRs, 336 EPLRS, 1,550 SINCGARS, 62 BCIS and 1,386 other types of Force XXI equipment.

This operation's complexity was immense. In many cases, disassembly was the only way a particular piece of equipment could be installed, and commonplace items, such as wiring harnesses and radio mounts, often had to be replaced. Also increasing the complexity was the need to experiment with different equipment configurations. After the installation operation, 42 different vehicle types had new equipment and 931 vehicles had 175 different configurations of equipment.

Most of the equipment being tested is commercial off-the-shelf equipment. Various contractors spent months designing the necessary mounts and installation kits because the vehicles were not designed for digital equipment installation. "User juries" made up of soldiers and sergeants studied alternative installations for their particular vehicles. Although this did not result in "perfect" equipment placement, it produced designs that interfered the least with vehicle and equipment operation and optimized digital

Connectivity training was the first major training event. The training, which started in July 1996, exercised the communications and systems architecture. The intent was for every BCT digital platform

need for a connectivity exercise to transition a digital unit from individual to low-level collective training was a major lesson learned from previous AWEs. Soldiers quickly learned how to operate TF 's sophisticated equipment.

The BCT conducted platoon lanes training in August and September 1996 to transition units from the

under realistic field conditions. Platoon lanes also gave BCT units and slice elements an opportunity to train their -equipped platoons and exercise battle staff and logistics systems. Units focused on developing "killer" platoons while refining the digitized unit's TTPs. An important training goal was to

TF XXI
youth, lack of tactical experience and unfamiliarity with the new equipment. By the exercise's completion, significant tactical skill improvement and progress in integrating into tactical operations were evident.

an enhanced training opportunity for commanders and staffs in preparation for the NTC. The BCT conducted a tactical exercise without troops on NTC terrain, using a digitally produced brigade OPORD.

counterparts on the digital orders process and conduct coordination with the installation staff to further an understanding of the AWE's unique nature.

warfighting skills and digital TTPs. Because the latest software upgrade included the redesigned architecture incorporating the new FSB organization, this exercise was the first opportunity to fully

Following company/team lanes, the BCT participated in both company- and brigade-level JANUS simulations. 1st Battalion, 5th Infantry Regiment's CP and staff traveled to Fort Hood for brigade Appliqué was overlaid on the JANUS system to enable the digitized

tactical decision-making process; plan for and conduct a deliberate attack, movement to contact and defense in sector; exercise the internal C2 operating procedures; and integrate the expanded C4I

it represented the first step in integrating all BCT assets into a warfighting scenario.

Following the JANUS simulation, TF conducted a brigade-level field training exercise in December 1996 to prepare the 1st BCT, including 1/5th Infantry, for NTC Rotation 97-06 in March 1997. The

training environment while employing TF XXI
organizations. The BCT conducted three offensive missions, two defensive missions and one mission attempting to replicate the conditions of TRADOC Pamphlet 525-5, . Battalion and brigade JANUS simulations were held in January 1997.

Because of its unique systems, the BCT planned to ship almost all of its vehicles and equipment to the NTC rather than draw from pre-positioned NTC equipment. Once at the NTC, the BCT was to reinstall its digital equipment and conduct a shakeout/connectivity exercise in the desert before actually beginning the rotation on 15 March 1997.

As with any unit's NTC rotation, the results will represent the sum of all that has happened before. Perhaps the most difficult question to answer for the TF XXI AWE is determining success. Success will occur on many different levels. The soldier in the tank or foxhole will gain confidence in his warfighting abilities and will come to understand that the digital system in his hands or on his tank now may very well be the decisive warfare tool of the next century. Commanders will gain the satisfaction of guiding their units through a tough transformation to a digital force. Most important, however, the Army will gain a knowledge base about the AWE's 72 initiatives, the organizational design and doctrine for the next century force and the TTPs for a digitized force. Armed with this information, Army leadership can begin to make the investment decisions necessary to create Force XXI.

An outstanding feature of this experiment is how everyone involved-including the acquisition community, materiel developers, contractors, TRADOC schools and analytical agencies-has been fused with the user during testing and development. The synergy generated by these teams has resulted in a real-time system of "develop, train, evaluate and fix." We have peered into our own decision cycle and developed a new paradigm of how to equip the force. The TF XXI process is simultaneously integrating advanced technology into existing platforms, developing appropriate TTPs and training soldiers to use new technology and equipment effectively. Remarking on the experimentation process, former Secretary of Defense William Perry said, "During my visit to Force XXI, I saw the future-and it works!"

A tremendous number and variety of challenges are inherent in the Force XXI experimentation process. The most notable is the balance of the experiment, the unit and the training binding them together. As the Army's first large-scale, digitized AWE, TF XXI will finish the AWE better trained and will provide the Army with many lessons for further experimentation. The TF XXI experiment will have a significant and positive impact on Army readiness and our ability to meet our projected security needs in the year 2010. ***MR***

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Military Review, March-April 1997

Technology: Achilles' Heel or Strategic Vision?

by Major Daniel S. Roper, US Army

This article received an Honorable Mention in Military Review's 1995 Annual Writing Contest.-Editor

he victorious strategist seeks battle after the victory has been won, whereas he who is destined for defeat first fights and afterwards looks for victory."1 Sun Tzu's wisdom applies equally on the battlefield; in new system research, development and acquisition; and in the development of a viable joint warfighting doctrine that optimizes each service's unique capabilities. The US military stands at a significant juncture in the evolution of the conduct of war-a change significant enough to be called a revolution in military affairs (RMA) encompassing information, sensing and precision-strike technologies integrated with doctrinal innovations.2 This revolution is under way as the US military moves from industrial to information age warfare. By carefully assessing its capabilities and limitations, the US Army will secure victory on future battlefields and continue to significantly contribute to preserving America's security well into the 21st century.

With the Warsaw Pact's dissolution and the Cold War's end, the Army must anticipate and adapt to the challenges of tomorrow's battlefields and the nation's needs. The Army has already changed from a forward-deployed Cold War force focused on the Soviet threat to a Continental United States (CONUS)-based power-projection force that is actively shaping the future battlefield as it modernizes its systems, institutions and doctrine. Challenged by former Army Chief of Staff General Gordon R. Sullivan, the US Army is evolving into Force XXI, a power-projection instrument for the 21st century.3 Force XXI's strategic goal is to become "a force for the 21st century that is more lethal, survivable, capable of sustained operations, deployable, versatile and sustainable, with increased joint and combined connectivity.4 Force XXI will significantly change the way the Army operates while maintaining the fundamental principles essential to success in combat and operations other than war (OOTW). As Alfred Thayer Mahan said of advanced technology's impact on naval tactics in The Influence of Seapower on History, "From time to time, the superstructure of tactics has to be altered or torn down, but the old foundations of strategy so far remain, as though laid upon a rock."5

The Issue

While Force XXI's capabilities will be significantly greater than those of Industrial Age forces, forecasts of its capabilities may be overly optimistic. For example, US Army Training and Doctrine Command (TRADOC) Pamphlet (Pam) 525-5, Force XXI Operations, predicts that "21st century commanders will have the capability to see the entire battlefield in depth, identify key targets-and attack with a wide choice of joint, as well as Army systems, whenever and wherever the commander desires."6 While this may be the case in most situations, it probably will not be the norm as the statement implies. Army leaders must understand Force XXI's limitations and exploit its capabilities to achieve success in 21st-century operations.

This article's intent is to point out that the US Army must thoroughly anticipate and compensate for the inherent limitations of Force XXI and its joint and combined counterparts. Leaders should not focus too much on technological solutions, especially to nontechnological problems. Force XXI is not an end state. As Sullivan stated, "Force XXI is not a destination but a journey." It is a process, a mechanism allowing

the Army to continuously learn. Thus, attempting to draw conclusions about the force's effectiveness on the future battlefield is pure speculation. As the eminent historian Sir Michael Howard said, "The best that even the best historians can do, on the basis of their knowledge of the past, is to pose questions and issue warnings about the future."7 The military must continue to ask the right questions and not arbitrarily accept old solutions for new challenges.

Andrew W. Marshall, director, office of Net Assessment, Office of the Secretary of Defense (OSD), has been at the forefront of the US military's approach to RMA. Marshall has said, "Most discussion of strategy and defense programs is, if anything, too focused on technology and not enough on the other factors that often dominate actual warfare."8 This article discusses some of the "other factors" that will be important in realizing the Force XXI vision.

Combat's Nature: Past, Present and Future

Past. Perhaps the most widely accepted view on the nature of war was provided by Carl von Clausewitz, who described war as a situation clouded by fog, disrupted by friction and often controlled by chance. Throughout history, this "Clausewitzian trio" has been the norm in battle. Fog is created by incomplete and inaccurate information about what is truly happening; friction results from the small, sometimes seemingly insignificant events that collectively drag down performance, throw off timetables and result in failure to attain objectives. Chance is just plain luck. Clausewitz stated that in war, even the simplest things are difficult to accomplish and that one must "not expect a standard of achievement in his operations which this very friction makes impossible."9

Efforts to mitigate the trio's effects have often proved difficult and only marginally successful. Leaders' realization of the inherent state of battlefield confusion and their subsequent compensation for the trio's effects have been far more effective. In Command in War, Martin Van Creveld points out that "whereas Napoleon's opponents sought to maintain control and minimize uncertainty by keeping their forces closely concentrated, Napoleon chose the opposite way, reorganizing and decentralizing his army in such a way to enable its parts to operate independently for a limited period of time and consequently tolerate a higher degree of uncertainty."10 Count Helmuth von Moltke also dealt with this inherent uncertainty by building strong and independent forces and by reducing the amount of needed information, not by imposing strict controls.11

TRADOC Pam 525-5 recognizes that "success on past battlefields has resulted not so much from technological advances but from innovative ways of considering and combining available and sometimes new technologies as they apply to warfighting."12 Van Creveld alludes to this when he concludes that battlefield success has historically depended on leaders' recognition of their capabilities and limitations. "As happened in Napoleon's day, that army proved superior that had recognized the limitations of the technical means at its disposal, and rather than allow those limitations to shape and confine its methods for waging war, had found a way to go around them, even to make use of them."13

Present. The Army fights as part of a joint team. It rarely operates without close integration with its sister services in support of a joint commander and is frequently part of a combined multinational effort. Joint Publication 1, Joint Warfare of the US Armed Forces, declares that "the nature of warfare in the modern era is synonymous with joint warfare."14 The move toward joint operations has been necessitated and accelerated by technology's impact on the battlefield. The telegraph, the "wireless" and sophisticated devices involving fiber optics and satellites have progressively enhanced the combat commander's ability to instantly influence operations across the battlefield's depth and breadth. Past

commanders could not attain this level of immediacy. With the introduction of faster, longer-range weapons comes an increasing challenge in requisite command and control procedures. The quantum increase in the ability to detect and engage enemy forces requires that joint coordination be an integral aspect of modern combat operations. These challenges must be met with coordinated interservice planning in combat system development and acquisition and in the peacetime training and doctrinal development. This is the realization in General Dwight D. Eisenhower's observation that "separate ground, sea and air warfare is gone forever. If ever again we should be involved in war, we will fight in all elements, with all services, as one single concentrated effort."15

`Future.` According to Andrew W. Marshall and other experts, the future battlefield will be characterized by smaller, more professional forces that fight from a distance; stand-off weapons that blur distinctions among air, sea and land warfare; more targeting intelligence; and less hierarchical military formations with significant reductions in midlevel staff.16 TRADOC Pam 525-5 forecasts that the dominant aspects of the future conventional battlefield will be battle command, extended battlespace, simultaneity, spectrum supremacy and the rules of war.17 This "revolutionary" future challenges the Army and the entire US military complex to "respond to the forces that will transform the nature of the next war before that war begins."18

Requirements for Decisive Victory

To win future battles, US forces will have to rely on war's time-tested principles. Leaders will need to assemble an accurate battlefield picture. To do this, their intelligence must be clear, relevant, timely, anticipatory and precise. Organization and delivery of relevant information to commanders and units will be critical. Commanders will still rely on the fundamentals of combined arms and joint operations. They will integrate operations in time, space, resources and purpose to confuse, demoralize and destroy the enemy. They will adhere to the tenets of initiative, agility, synchronization, depth and versatility to set the course of battle by action, react faster than the enemy, extend operations throughout the depth of the battlefield, arrange activities in time and space to mass at the decisive point and demonstrate the ability to meet diverse mission requirements. The US military is actively leveraging technology so it can maximize available combat power at the decisive point, because "battle should not be a fight between two relatively equal foes."19

Force XXI is predicated on the premise that "information age technology may provide commanders a comprehensive view of the situation, reduce uncertainty and provide the means to more clearly and rapidly transmit intent and orders."20 Its central and essential feature will be its ability to exploit information to attain synergism among systems and organizations.21

Challenges and Vulnerabilities

TRADOC Pam 525-100-1, `Battle Command,` declares that in future warfare, "Advantage will derive from quantity, quality and usability of information" or more simply that "the high ground is information."22 Information dominance will be, or at least significantly influence, the Force XXI Army's center of gravity-that from which a force derives its freedom of action. The US military can make information warfare work if its practitioners fully consider its inherent limitations. Through its Force XXI process, the Army has already taken significant strides toward understanding how to fight and win decisively in 21st-century operations.

Experiences of other services with technological leaps. While the RMA and its technologies will give US forces unprecedented capabilities, the military must heed becoming overly dependent on technology and its promises, leveraging technology to the fullest without letting it drive military doctrine or strategy. This pitfall befell the US Air Force during the Cold War. With its emphasis on nuclear weapons, the Air Force let technology drive its strategy, resulting in too much "emphasis in making war fit a weapon-nuclear air power-rather than in making the weapon fit the war. It was a weapons strategy, wherein the weapons determined the strategy rather than the strategy determining the weapons."23

Historically, the military has often failed to appreciate that "technological advantage is a fragile, perishable and elusive quantity."24 Regarding those pre-World War II air power advocates who predicted the airplane had rendered all other weapons obsolete, one historian wrote, "We are left with one clear reminder of a painful truth: the laws of war applied as much to the strategic air offensive waged over Europe's skies . . . as they did to the sailors and soldiers on the distant seas or in the mud and sand below."25

New technologies and their implications. Experience has taught that technology alone is seldom decisive. After extensive research on command systems, Van Creveld concluded that regardless of the technology of the age, combat success could be traced to the basics mastered several thousand years before. "By far the most successful of these solutions, the only one that consistently produced victory over a period of centuries and almost regardless of the commander's personality, was the Roman one: that is, a command system, not based on any real technical superiority, that relied on standardized formations, proper organization at the lowest level, a fixed repertoire of tactical movements and the diffusion of authority throughout the army in order to greatly reduce the need for centralized control."26

With Force XXI being heavily dependent on the integration of technological advances into Army systems and processes, its Achilles' heel may be overreliance on technology. This dependence creates a potential vulnerability that may be exploited by adversaries or adversely affected by inherent systemic problems. "Any given technology has very strict limits. Often, the critical factor is less the type of hardware available than the way it is put to use. Specifically, since a decisive technological advantage is a fairly rare and always temporary phenomenon, victory often depends not so much on having superior technology at hand as on understanding the limits of any given technology, and on finding a way in going around those limitations . . . dependence on technology inevitably creates vulnerabilities that an intelligent enemy will not be slow to exploit."27

A potential vulnerability is electromagnetic pulse (EMP) effects on Force XXI systems as a result of a nuclear detonation. There appears to be a void in the literature about this, which may be due, in part, to our warming relations with Russia and the easing of superpower tensions. While the threat of a massive nuclear exchange is extremely remote, the threat of a rogue nation or group attaining a nuclear capability is at an unprecedented level.28 Even a crude nuclear weapon can have significant adverse effects on sophisticated electronic components. Compounding this vulnerability is the Department of Defense (DOD) initiative to maximize procurement of off-the-shelf items to minimize costs. While this lowers procurement expense, commercially obtained items are seldom hardened to the extent that they could continue to function under EMP conditions.

Leveraging technology enables forces to "do more with less" and reduces the risk of US casualties because technology is a force multiplier. In Making Strategy, however, Dennis Drew and Donald Snow lay out some potential pitfalls of increased dependence on technology.

- Possession of superior technology does not ensure its effective use.
- Given time, it can be equaled by the enemy.
- It can be countered-for example, chaff used against radar.
- Nonbattle-tested equipment may not perform to expectations.
- It may not produce a decisive advantage.
- Technology is expensive.29

Regardless of the dramatic technological advances not yet realized, both military and political leaders must realize that "instruments alter, principles remain; a fact which those who would so loosely talk of the new weapons-the submarine, the aircraft and the mine-having `revolutionized' warfare would be wise to bear in mind."30 As the military modernizes its forces for the future, it should heed Edward N. Luttwak's observation that as new systems evolve, "their impact on the prior balance of military power will increase only up to the culminating point."31 Even without enemy countermeasures, incorporating high-technology systems poses challenges. Corporate America recognizes that "high tech" has its limitations because "formal systems, mechanical or otherwise, have offered no improved means of dealing with the information overload of human brains"32 Formal systems can certainly process more information, but they cannot internalize, comprehend and synthesize it.33

Historical Imperatives: What is Important

While the Army is tackling RMA challenges and making significant progress toward Force XXI dominance on the future battlefield, we should remain moderately skeptical. It is healthy to challenge and revalidate some of the underlying principles of Force XXI and the RMA. While a great deal of study, experience and analysis have already been applied to develop Force XXI, analysis must continue to ensure the learning process continues. Force XXI leaders should consider the following imperatives as guideposts:

- The US Army should continue to educate sister services, joint commanders, civilian leaders, the American public and its allies on technology's capabilities and limitations.
- Army leaders must `understand` and `exploit` Force XXI's limitations and capabilities to achieve success in the 21st century.
- Leaders should `avoid a myopic focus` on technological solutions or seek technological solutions to nontechnological problems.
- The Army must `continue to ask` the right questions and not arbitrarily accept old solutions to new challenges.
- Consider innovative ways to combine new technologies as they apply to warfighting to increase the probability of future battlefield success.
- Understand that superior armies recognize technology's limitations and, rather than allow those limitations to shape and confine their methods for waging war, find a way to go around and even make use of them.
- Recognize that "modern technology will not eliminate friction, chance or uncertainty from military undertakings."34
- Internalize and put into practice the reality that "To know what one can do on the basis of available means, and to do it; to know what one cannot do, and refrain from trying; and to distinguish between the two-that, after all, is the very definition of military greatness, as it is of human genius in general."35

The US Army must continue to look toward the future with an open mind. Changes are not obstacles,

but opportunities. Mindful of past lessons learned, and keeping an open eye toward the future, the Army can adapt and prosper because "throughout history, the best armies have been those who anticipated the future and adapted themselves, not merely to survive change, but to capitalize upon the opportunities that change presented."36 The Army will continue to be a proactive, forward-looking institution as embodied by Force XXI. Learning from its collective experiences, taking nothing for granted and staying focused on the future will ensure that the Force XXI Army will be able to attain decisive victory whenever and wherever it is called upon to compel, deter, reassure or support. MR

NOTES

l. Sun Tzu, The Art of War, translated by Lionel Giles, in Roots of Strategy, edited by BG T.R. Phillips (Harrisburg, PA: Stackpole Books, 1985), 18.

2. Michael J. Mazarr, The Revolution in Military Affairs: A Framework for Defense Planning (Carlisle, PA: US Army War College Strategic Studies Institute, 10 June 1994), 2; and US Army Training and Doctrine Command (TRADOC) Pamphlet (Pam) 525-5, Force XXI Operations (Washington, DC: US Government Printing Office [GPO], 1 August 1994), 2-7.

3. Louisiana Maneuvers Task Force, Office of the Army Chief of Staff, Force XXI, America's Army of the 21st Century (Washington, DC: GPO, 15 January 1995), 13; and GEN Gordon R. Sullivan and COL James M. Dubik, "War in the Information Age," academic paper (Carlisle, PA: US Army War College Strategic Studies Institute, 10 June 1994), 1.

4. Force XXI, America's Army of the 21st Century, 22.

5. Geoffrey Till, Strategy and the Nuclear Age (New York: St. Martin's Press, 1980), 9.

6. TRADOC Pam 525-5, 3-10.

7. Sir Michael Howard, "How Much Can Technology Change Warfare?," academic paper (Carlisle, PA: US Army War College Strategic Studies Institute, 20 July 1994), 1.

8. Andrew W. Marshall, "Strategy as a Profession for Future Generations" in On Not Confusing Ourselves: Essays on National Security Strategy in Honor of Albert and Roberta Wohlstetter (Boulder, CO: Westview Press, 1991), 310.

9. Dennis M. Drew and Donald M. Snow, Making Strategy (Maxwell Air Force Base, Alabama: Air University Press, August 1988), 149-161.

10. Martin Van Creveld, Command in War (Cambridge, MA: Harvard University Press, 1988), 101.

11. Ibid., 146.

12. Ibid. and TRADOC Pam 525-5, 1-5.

13. Van Creveld, 188.

14. US Joint Chiefs of Staff Publication (Pub) 1, Joint Warfare of the Armed Forces (Washington, DC: GPO, November 1991), 2.

15. Armed Forces Staff College Pub 1, The Joint Staff Officer's Guide (Washington, DC: GPO, 1991), iv.

16. Thomas E. Ricks, "Warning Shot: How Wars are Fought Will Change Radically, Pentagon Planner Says," Wall Street Journal (15 July 1994), 1.

17. TRADOC Pam 525-5, 2-8.

18. Force XXI, America's Army of the 21st Century, 4.

19. US Army Field Manual (FM) 100-5, Operations (Washington, DC: GPO, June 1993), 2-12.

20. TRADOC Pam 525-100-1, Battle Command (Washington, DC: GPO, 1 December 1994), 1.

21. Force XXI, America's Army of the 21st Century, 6.

22. TRADOC Pam 525-100-1, i.

23. Robert Futrell, "The Influence of the Air Power Concept on Air Force Planning, 1945-1962," academic paper quoted in America's Defense, edited by Michael Mandelbaum (New York: Holmes & Meier, 1989), 256.

24. Drew and Snow, 161.

25. Anthony Ferrier, The Bomber Offensive (London: B.T. Batsford, 1968), 327, quoted in Williamson Murray, The United States Air Force: The Past as Prologue, in Mandelbaum, 246.

26. Van Creveld, 56.

27. Ibid., 231.

28. Daniel S. Roper, "The Impact of the Presidential Nuclear Initiative on Deterrence and the United States Army," Association of the US Army (AUSA) Land Warfare Paper #16 (Arlington, VA: AUSA Institute of Land Warfare, September 1993).

29. Drew and Snow, 149-61.

30. H.W. Richmond, Naval Warfare (London: Ernest Benn, 1930), 65, quoted in Geoffery Till, Maritime Strategy and the Nuclear Age (New York: St. Martin's Press, 1980), 162.

31. Edward N. Luttwak, "An Emerging Postnuclear Era?," The Washington Quarterly (Winter 1988), 9.

32. Henry Mintzberg, "The Fall and Rise of Strategic Planning," Harvard Business Review (January-February 1994), 111.

33. Ibid.

34. Joint Pub 1, 4.

35. Van Creveld, 102.

36. Michael P. Stone and GEN Gordon R. Sullivan, `Army Posture Statement` (Washington, DC: GPO, 1993), 2.

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--Insights--

Adapting Doctrine to Knowledge-Based Warfare

by Major Steven J. Mains, US Army

THE REVOLUTIONS in information technologies (IT) and knowledge-based systems hold almost unimagined promise for the army that grasps them. IT will be a breakthrough in warfighting as important as the stirrup, gunpowder or the tank. Discriminating sensors providing information on enemy and friendly forces will link to computers that display relevant information in real time in digestible bites. Using IT more than explosive weapons, forces will maneuver against and defeat their enemies more quickly and with less risk. Targeting the enemy's fighting forces and, more decisively, his command and control facilities, will provide an unprecedented ability to defeat him.

IT revolutions have happened at least twice before: in the early 19th century with the Popham Signal System and in the middle 20th century with the radar and communications system used during the Battle of Britain. The Popham System provided a huge advantage in naval warfare by allowing fleets to change formations under the admiral's command during a battle.1 The system was a factor in winning the Battle of Trafalgar when orders were signaled to the British fleet after the ships' captains were on board. The extensive radar and communications system used to direct interceptors in the Battle of Britain allowed the British commander to know, within limits, the size of the attacking German force. He then tailored the defensive force's size to avoid wasting assets. Both of these systems used available information-rich technologies that were adapted to cause a "step-function" increase in combat effectiveness.

The tools to provide this increase in fighting power are available off the shelf today, as is the technical knowledge base to use them.2 We do not need new "Star Wars"-type technologies.3 What is missing is the key to unlocking their potential. The British navy in 1814 and air corps in 1940 had the keys they needed. They developed a doctrine to leverage information's potential. Integrating IT is not like issuing a new truck. To fully realize IT's power, the Army must change the way it operates. This means a changed doctrine. To determine the required changes, it is important to understand the nature of IT's effects on warfare.

`Purpose and means.` The plethora of articles on IT in `Military Review` and other military journals makes it unnecessary to list the many IT systems available to the Army. This article outlines their effects on future combat to identify the doctrinal changes required to positively leverage their impact. Although it is difficult to separate doctrinal changes from the other training, leadership, organization and materiel domains, a complete review of all IT effects would take volumes. This article's thrust is to analyze the doctrinal changes needed to effectively use IT.

`IT's battlefield effects.` Through better use of information, IT allows us to overmatch the enemy. To make IT effective, two preliminary battles must precede combat between main forces: a battle for electromagnetic spectrum supremacy and a battle for intelligence.4 They are both in progress now. Every day, our national assets monitor and map potential adversaries' critical information nodes and frequencies, as well as troop movements and other intent indicators. When hostilities break out, the battles become offensive to gain electromagnetic spectrum dominance so the enemy cannot use his

sensors and communication systems. This lets us collect more detailed intelligence on the enemy while forcing him to use 18th-century intelligence and communications.

Using radiation-seeking missiles, the multiple-launch rocket system, aircraft fires and direct action by Special Operations Forces, as coalition forces did against the Iraqis in Operation Desert Storm, armies will attempt to find and neutralize enemy command, control, communications and intelligence (C4I) systems.5 Software "bugs" introduced through unauthorized electronic entry (hacking) into enemy systems, high-powered radiation, micromachines or direct action will cripple enemy C4I systems.6

The desired effect is like playing chess against a blind person. The side that loses its ability to detect the enemy and friendly situation will lose maneuver freedom.7 With "no stray leaf to determine which way the wind is blowing," he will become indecisive and lose the means to react to the enemy.8 Causing imperfect knowledge of the situation is one of Carl von Clausewitz's methods of forcing the enemy to suspend military operations.9

Simultaneously, detailed reconnaissance over the length and breadth of the enemy's force will produce a picture of the enemy unparalleled in history. This "recognized ground picture" will be broadcast across the friendly force.10 Each commander will tailor the picture to display his area of interest (AI) and threats.

This preliminary reconnaissance/counterreconnaissanc e phase of combat will be followed by a short, violent eruption of combat. Like the 13th-century Mongols, dispersed units will mass their effects at the critical time and place.11 Just as quickly, the force will disperse again and move to the next battle. The enemy's reaction will be late and inappropriate. He will attack thin air or expose other vital points that fast-reacting friendly forces can attack.

A minimum sufficient fixing force will provide a compelling threat, while another force - dispersed to avoid detection - maneuvers to strike. Threatened on his front, unable to learn his own situation or gain contact with higher headquarters, and faced with a threat attacking his very heart, the enemy commander will have no choice but to surrender or be destroyed.

Simply overlaying IT on the current Army will not, in itself, increase combat effectiveness. In fact, if not handled correctly, it may decrease it. American business found that automating manual functions without changing the corporate structure and ethos decreases efficiency.12 The US Army must change its doctrine to obtain the IT benefits.

Doctrinal changes. The use of open, supporting, but not necessarily contiguous, units focusing their effects on the enemy's weak spots instead of on "dressing the line" dictates that the Army adopt maneuver warfare not only as its doctrine and fighting style but as its very ethos. Mission command, issuing effects-oriented orders and allowing subordinates leeway to execute them, will be paramount. Our decision-making process must incorporate subordinates' improved situational awareness that is provided with an improved relevant common picture of the enemy. Decision making cannot get bogged down in paralysis of analysis or oversupervision or it will prevent exploitation of opportunities. Horizontal linkage with other units that allows integration of the common ground picture will be as important as direct communications with the higher commander.13 Spectrum dominance will become as important a precursor for operations as air superiority is now, but, like air superiority, we must be ready to fight with something less. As information becomes as important as logistics or fire support, commanders must be experts in its availability, importance and use.

Classic maneuver warfare is outmaneuvering an enemy by presenting him with multiple threats while limiting his ability to respond and forcing him to surrender. Maneuver warfare means isolating and threatening the enemy or destroying his center of gravity (COG). Historically, maneuver warfare, compared with attrition warfare, is more likely to avoid high casualties.

Because knowledge-based warfare increases the ability to wage maneuver warfare, it removes attrition warfare from consideration as an alternative. Our 20th-century wars, particularly World War I and World War II in Europe, Korea and Vietnam reinforce our attrition warfare roots.

The Army must embrace maneuver warfare doctrine by teaching it in every tactical and operational school, especially the Combat Training Centers and Battle Command Training Program (BCTP). Doctrinal manuals and those focused on tactics, techniques and procedures (TTPs), should be rewritten to emphasize the requirement to use maneuver warfare principles. Even BCTP's scenarios and models reward linear, attritional attacks and defenses. This orientation needs to be changed using new scenarios and models.14

Mission command is required to make knowledge warfare effective. Knowledge systems reduce chance and uncertainty but do not eliminate them. No system is perfect. Even with advanced C4I systems, it will be impossible to always know every enemy location and plan for every contingency. The enemy will be smart, tough, unpredictable and uncooperative and will try to attack our COGs from unexpected directions. Subordinate commanders must have the flexibility to extemporize as the situation develops. Otherwise, a commander will become swamped with requests for decisions that would require familiarity with subunits far below his level of interest. Meanwhile, he risks missing the key decisions he must make.

The danger of oversupervision increases as IT improves. President John F. Kennedy directed individual ship movements during the 1962 Cuban Missile Crisis blockade.15 In Vietnam, battalion, brigade and even division command helicopters circled over platoon and company fire fights. The Army has already seen division staff officers issue orders to battalions and companies through E-mail. The specter of brigade commanders moving individual tanks and infantrymen looms large with this newfound electronic capability. The danger that subordinates must explain every vehicle movement and every status report to an overwatching commander is acute. Built-in limits on access can be overridden. Indeed, even the consideration of placing limits on access is antithetical to fielding information systems. Commanders must understand where each level's focus should be and maintain discipline. They must define an electronic, informational AI for commanders and staffs. Once designated, it will take focus and discipline to stay within it. Technology cannot be uninvented or modified to compensate for or prevent poor leadership.

As commanders become experts in the advantages and disadvantages of different information types and become comfortable with the changed availability of data to higher and lower levels, they will find that IT makes it unnecessary for them to oversupervise. The unprecedented "topsight" of subordinate commanders makes mission command easier to execute.16 As the situation changes, every commander can see not only what his mission is but also how it fits into the higher plan. He can accurately watch the progress of fellow units and better coordinate his efforts to fit the total scheme. Detailed control would give up the advantages gained by IT's introduction.17

The decision-making process must adapt to leverage IT and knowledge-based tools. It must be fast. Intelligence preparation of the battlefield automation will help speed the process, but IT's speed advantages will be undone if commanders wait for the "last" piece of intelligence that never

comes-paralysis of analysis. The key to success will be commanders who understand the available information, given the "coarseness" of the collection means in a given environment. This understanding will allow them to accurately assess the situation and plan to mitigate the risks.

Orders produced in this knowledge environment will be very different. They will focus on desired operational effects without bogging down in detail. They will emphasize initiative and not limit action. IT will allow consultation and rehearsals involving widely separated commanders and staffs. This will eliminate misunderstandings. Manned and unmanned reconnaissance will focus forces on enemy weaknesses. Commanders will not direct detailed maneuver against preconceived, templated weaknesses. Fire coordination measures-vital today to prevent fratricide and coordinate efforts-will lose importance. Improved unit situational awareness will become the procedural method for preventing fratricide. Topsight will improve coordination of maneuver and fires.

All armies acknowledge the need to maintain communications with the flanks and higher formations. In practice however, the link to higher is jealously guarded, while the flanks assume lesser priority. This is understandable in a hierarchical system, because all orders and most intelligence flow from higher. If communication is lost, there is no alternative other than to re-establish it. In a networked system, commanders must maintain communications with the flank units, and, through them, to other units in the AI to update the common ground picture and topsight. This allows the system to be self-healing, bypassing destroyed or ineffective nodes by rerouting communications links. Doctrine must address the added importance of flank communications and drive the combat, materiel and force developers to develop and resource it.

Information warfare depends on electromagnetic spectrum dominance -destroying the enemy's ability to use the electromagnetic spectrum for communications and targeting while maintaining our ability to use it. This is as important as air superiority to our ability to fight. Doctrine must drive our combat developers to develop systems to attain this dominance. Like air superiority, however, we may fight without it. Doctrine must address operations with local spectrum dominance and in a degraded environment.

Just as they must do with any other weapon, commanders must became experts on using information. They must understand how to produce, move and use it. By knowing the limitations of a sometimes coarse system and the opportunities provided by IT, they can use IT as a combat multiplier. The use of IT must become a required enabling skill in tactical and operational schools. Commanders will then maximize the advantages and plan to cover limitations.

The choice is not whether to use IT. IT is not something that will go away or be outlawed as the Pope tried to do with the crossbow. When Zapatista rebels in Mexico use the Internet and Third World commanders give CNN press conferences to influence public opinion around the globe, the only question can be, "How can we best use IT?" As in previous military information revolutions, technology is not enough. It must be complemented by doctrine that leverages its advantages.

Our doctrine must embrace maneuver warfare. We must change our individual and collective training accordingly. We must develop the tools to execute and train the new doctrine. Our process must be faster to create timely, effects-oriented orders. We must banish oversupervision and expect-demand-initiative from subordinates based on improved situational understanding. We must dominate the electromagnetic spectrum and understand information's essence.

IT has transformed the face of society and the face of battle. It can be a positive force that prevents

needless battle and saves lives. It cannot be ignored. The US Army stands on the edge of a warfighting revolution. We must change our doctrine to grasp this new capability, fully develop it and exploit IT on future battlefields. ***MR***

NOTES

1. The Popham Signal System was the first standard flag system naval commanders could use to send orders to the fleet while it was in action. Previously, commanders relied on squadron drills and individual initiative to maneuver against an enemy. The Popham System gave the commander control over emergencies. See Michael Lewis, The Navy of Britain-A Historical Portrait (London: George Allen and Unwin Ltd., 1949), 541-42.

2. A technical knowledge base must exist to make these technologies work effectively. The Army education system provides this base, as evidenced by the number of computer-literate soldiers. The lack of widespread technical education in potential adversary countries prevents their effective use of IT and knowledge-based systems. Adversaries may buy equal or superior equipment, but the widespread educational level required to use it well is a much tougher problem for them.

3. President Ronald Reagan proposed the idea of a space shield against intercontinental ballistic missiles before major portions of the required advanced technology were even on the drawing board. IT tools are commonplace today. Networking over radio, as a battalion task force must do, is less common but not such a technological leap.

4. BG Morris J. Boyd, "Force XXI Operations," Military Review (November 1994), 22.

5. History is replete with examples of a force stripping the enemy of reconnaissance assets. The Prussian cavalry was expert at this in 1870. Operation Desert Storm, however, was the first time an entire enemy C4I system, from strategic to tactical information systems, was targeted and comprehensively eliminated.

6. Alvin and Heidi Toffler, War and Anti-War, Survival at the Dawn of the 21st Century (New York: Little, Brown & Co., 1993), 120.
7. John Arquilla and David Ronfeldt, "Cyberwar is Coming," Comparative Strategy, vol. 12 (1993), 141-65.

8. COL George A. Furse, Information in War (London: William Clowes & Sons Ltd., 1895), 9.

9. Carl von Clausewitz, On War, translated by Michael Howard and Peter Paret (Princeton, NJ: Princeton University Press, 1976), 84.

10. This concept is analogous to what is called the "recognized air picture," which is the radar picture with all radar returns confirmed as hostile or friendly. North American Air Defense and the United Kingdom Air Defence Ground Environment maintain this continuously from Air Force, Navy, civilian air traffic control and allied input. The recognized ground picture would be a similar picture for ground forces.

11. A detailed description of the Mongol war machine can be found in James Chambers' The Devil's Horsemen (New York: Atheneum, 1985), 50-67. Arquilla and Ronfeldt have used this very apt example as a model of what information warfare may evolve into.

12. Comparisons of business to military organizations can be deceptive due to the fundamental difference in effectiveness measures. Our experience of automating unit reports with the Maneuver Control System confirms this comparison, however. The system does not operate on the move, requires more men to operate than the manual system and consumes half the cargo space of an M577 command post vehicle.

13. This purposely avoids saying "flank" units. Units must pass information not just to the flanks but to all units operating in the area of interest. With sensors, this could include more than the adjacent units and even extend across the services.

14. The point is not to change our models to fit a preconceived outcome. The models should, as well as possible, model actual combat. If we believe in maneuver warfare, we believe that the indirect approach and the effect on the enemy's psyche is at least as important as the simple loss-exchange ratio. Our models are purely attritional, with only transitory advantage given to maneuver or attacking key command and control nodes.

15. Martin Van Creveld, `Command in` War (Cambridge: Harvard University Press, Massachusetts, 1985), 237.

16. Arquilla and Ronfeldt, 141-65. `Topsight` is a term borrowed from software design. It refers to the requirement to keep in mind what the software package is supposed to do while writing the low-level code. Without this, modules may not integrate with others or contribute to the overall package pattern.

17. Detailed control, as an accepted translation of the German `Befehlstaktik,` is used here to define the opposite of directive control-`Auftragstaktik`, the heart of mission command. Detailed control was practiced most notably by the Soviet army. It is characterized by detailed tasks and missions and unquestioned compliance with orders and tactical norms.

Major Steven J. Mains is a ground maneuver analyst for Army Program Analysis and Evaluation, Office of the Chief of Staff of the Army, Washington, D.C. He received a B.S. from the US Military Academy and an M.S. from the University of Denver and graduated from the British Army Command and Staff College, Camberley, England. He has served in a variety of command and staff positions in the Continental United States and Europe, including company commander, 1st Squadron, 11th Armored Cavalry Regiment, Fulda, Germany; G3 plans officer, V Corps, Frankfurt, Germany; S3, 2d Brigade, 1st Armored Division, during Operation Desert Storm; and S3 and executive officer, 2d Battalion, 70th Armor Regiment, Erlangen, Germany. As an operations research analyst, he was responsible for cavalry and AirLand Battle future analysis in the Directorate of Combat Developments, US Army Armor Center, Fort Knox, Kentucky.

Military Review, March-April 1997

--Review Essay--

An Army Manual for Civilian Business

by Colonel Jerry D. Morelock, US Army

HOPE IS NOT A METHOD: What Business Leaders Can Learn From America's Army by Gordon R. Sullivan and Michael V. Harper. 294 pages. Random House, New York. 1996. $25.00.

After the Soviet Union's collapse and the Cold War's end, the US Army faced its greatest challenge since the Vietnam War. Fortunately, the Army chief of staff was the right man at exactly the right time. Earlier, when the Southeast Asian conflict ended, the turmoil induced by "muddle-headed" politicians and well-meaning, but disastrous, policies within the military nearly destroyed the Army as an institution. It was saved by collaboration among a generation of Army officers who, quite literally, reinvented it.

By 1991, the professional, All-Volunteer Force that made such short work of the Iraqis in Operation Desert Storm had about as much in common with Vietnam's draftee units as it did with Pershing's World War I American Expeditionary Forces or with the Civil War's Army of the Potomac. One of the reinventors who came of age during the "bad old days" of the 1970s and then helped lead the Army to a smashing victory in the Gulf War was a visionary, military intellectual who became the 32nd chief of staff in 1991-General Gordon R. Sullivan.

Sullivan inherited an Army poised on the brink of an abyss. With its raison d'être-the Soviet Union-in shambles, the US Army began standing down for the first time since the end of World War II. The Army drawdown that began in 1946 was rudely interrupted in the summer of 1950 by communist aggression in Korea. Subsequently, nearly half a century of Cold War ensued, and President Harry Truman's plans for disassembling the Army were put on indefinite hold. Seven chief executives later, however, the Army was stranded in the midst of a "new world order," bereft of "evil empires," with a domestic electorate wondering why the only superpower in the world needed an Army nearly as large as the one capable of fighting the Soviets in northern Europe. The obvious answer seemed to be that we really did not need such a force. After one last round of self-congratulatory victory parades in the summer of 1991, the monumental task of dismantling the Cold War Army began in earnest. That was the abyss Sullivan peered into when be became Army chief of staff.

Sullivan's true genius and lasting legacy was his masterful management of what could have been a monumentally disastrous downsizing. During his tenure from 1991 to 1995, the Army contributed to its share of the so-called peace dividend by reducing by an astonishing 40 percent, bringing down the troop count to roughly what we mustered in the pre-Pearl Harbor days of late 1939 to mid-1940. The last time the Army's strength was that low, General George C. Marshall was the chief of staff. Even in the summer of 1950, when Task Force Smith was being overrun in the Korean hills north of Osan, creating the most poignant example of the wages of the sin of unpreparedness, overall Army strength was about 590,000 - significantly larger than today. Yet, incredibly, the global operational mission requirements of today's Army have increased by more than 300 percent since Desert Storm.

The complexity of these operations has grown enormously, involving the Army not only in traditional combat missions but also in missions ranging from riot control, refugee support, disaster relief and counterdrug interdiction, to combating terrorism and the full range of peacekeeping duties. For the most part, this drastically increased mission load has been accomplished with tremendous success, despite all the distractions of troop reduction, nuclear and chemical weapons redeployment and base closures and realignments. That all of this was accomplished so well is a tribute to the vision, leadership and organizational skills of Sullivan and the Armywide team he created and led.

In Hope is Not a Method, Sullivan and Mike Harper, former director of Sullivan's Army Strategic Planning Group, share with the business world the lessons learned from restructuring and re-engineering the Army. The book gives business leaders a training manual on how to effectively lead and manage their organizations to remain competitive and prosperous in a world characterized by incredible change and daunting challenges.

Anticipating critics who may wonder how a public institution such as the Army can serve as an example to private industry, Sullivan and Harper write: "We discovered that not only must we [the Army] change, we must change the way we change. We think our experience tackling problems like these on behalf of the Army can shed some light on the similar problems business leaders face. Think of it this way: If the Army were a private enterprise, it would be a US-based multinational corporation with nearly 1.5 million employees, annual revenues of $63 billion, branch offices in more than 100 countries and strategic alliances in virtually all the major nations of the world, under intense pressure to perform more effectively every day. The problems we faced as military leaders have much in commonwith those faced by the leaders of IBM, General Motors, McDonald's, Wal-Mart and Microsoft."

In a straightforward, clear and concise manner, the authors set out principles, techniques and examples business leaders can use as their corporations continue to undergo the same type of re-engineering, downsizing, cost cutting and reinvention the Army

under Sullivan experienced. This book is a training manual for corporate leadership at all levels, not merely chief executive officers, and can be a valuable and useful tool for businessmen whose minds are open enough to realize that something can be learned from their military counterparts.

This book is also useful for those of us still serving. Although written for the civilian businessman, Hope is Not a Method is valuable to military leaders perceptive enough to realize that Sullivan's work was necessarily unfinished when he retired. The "business" of reinventing the US Army must, of course, continuec indefinitely, and change is the only permanence we are likely to encounter. In this regard, Sullivan's perceptive advice, as encapsulated in this excellent book, will continue to serve us as well as did its visionary author. MR

Colonel Jerry D. Morelock is the director of the History Department, Combat Studies Institute, US Army Command and General Staff College (USACGSC), Fort Leavenworth, Kansas. He received a B.S. from the US Military Academy, an M.S. from Purdue University and an M.M.A.S. from the USACGSC and was a National Defense University Research Fellow at the Industrial College of the Armed Forces. He has served in a variety of command and staff positions in the Continental United States, Europe and Vietnam, including branch chief, Russia and Republics Branch, and politico-military planner, NATO Branch, Director for Strategic Plans and Policy, J5, the Joint Staff, the Pentagon, Washington, D.C.; and branch chief and personnel staff officer, Leadership Division, Department of the Army, Washington, D.C. He has written numerous book reviews for Military Review.

Military Review, March-April 1997

--Digest--

Capturing 21st-Century Technology to Reduce Costs and Improve Training

Major James Meadows and Neil Sleevi
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It is fitting that the future senior leaders of our 21st-century Army recently experienced a face-to-face, bigger-than-life, "virtual" meeting with Chairman of the Joint Chiefs of Staff General John Shalikashvili, through a relatively inexpensive and little-known technique-dial-up videoteleconferencing (VTC). This technology was first introduced to a large venue audience at the 13 December 1996 Brigadier General (BG) Training Conference hosted by Army Chief of Staff General Dennis Reimer and the Combined Arms Center (CAC) at Fort Leavenworth, Kansas. The conference concluded with an open question and answer period with Shalikashvili. This interactive video, using dial-up VTC capability, was displayed on a 10-foot by 10-foot screen which gave the images a larger-than-life appearance.

This article will take a closer look at an enabling telecommunications technology that made this conference so successful and unlike any other held to date by the US Army. This article will also explain some of the technical terms used and the rationale that led CAC to use it at the BG Training Conference.

Dial-up VTC. Dial-up VTC refers to simultaneous interactive image and voice communications between two or more locations. Dialing for this form of VTC is no different than using your home phone. What is unique with dial-up VTC is that audio and video signals are digitized and compressed to reduce the amount of bandwidth required for transmission. By combining audio, video and data, dial-up VTC allows people in different locations to conduct business as if they were in the same room. It not only offers the benefits of face-to-face communications but provides many advantages over in-person meetings. A key benefit is allowing a user, on the spur of the moment, to dial virtually anywhere in the world that has a standards-based dial-up VTC system.

Based on telephone installation records, dial-up VTC is CAC's fastest growing communication means. There has been a 1,500-percent increase in lines and users in the past six months. No longer considered a future technology at Fort Leavenworth, it is having a positive impact on the way activities conduct business today. Dial-up VTC provides both quantifiable and qualitative benefits for tenant agencies and activities Armywide.

Using Dial-up VTC for the BG Conference. Dial-up VTC offers the benefits of face-to-face communication and provides many advantages over in-person meetings. VTC using Integrated Services Digital Networks (ISDN) is consistent with the US Army Training and Doctrine Command's (TRADOC's) IS architecture with extensive network connectivity to support its required information flow as follows:

- Horizontally among all installations.
- Vertically between Headquarters TRADOC and all installations.
- Internally at installations among the activities developing TRADOC products and providing

installation support.
- Externally from TRADOC installations to joint and Army organizations, including units, Department of the Army Headquarters and other major commands.
- Externally to academia, industry and other mission-related organizations.

Dial-up ISDN VTC also conforms to the Army's Technical Architecture, providing seamless interoperability among all VTC systems. Using ISDN, dial-up VTC dramatically reduced total cost for the BG Conference. Since it was used and demonstrated live, it influenced the direction of training and leader development which is consistent with CAC's mission to prepare the Army for war.

`Capabilities-based system.` Dial-up VTC provides the capability to dramatically reduce cost, development time and fielding time for improved systems, and allows dial-up, on-demand services to meet several mission-critical TRADOC and Army applications. It provides the technical capability for many warfighting and power-projection improvements for the Army, including:

- Reducing travel costs.
- Enabling distance learning.
- Establishing communication infrastructure among multiple TRADOC and Army sites.
- Improving internal CAC communication.
- Maintaining high quality and efficiency standards at remote sites.
- Attracting and retaining Exercise `PRAIRIE WARRIOR` and Advanced Warfighting Experiment "customers" for simulations, training and exercises.
- Offering a wider variety of courses, incorporating academic resources from other sites into cooperative programs, including the war colleges and civilian universities.
- Integrating National Training Center, Combat Training Center and Joint Readiness Training Center operations into using ISDN CAC.

Until this dial-up VTC capability was installed for the BG Conference, CAC did not have a local method of setting up short-notice conferences without relying on the expensive and often unavailable Defense Commercial Telecommunications Network video facility. When face-to-face meetings were required, a considerable amount of unproductive time was spent traveling. According to the Mid-America Regional Council, Kansas City International Airport's largest customer has been the US Army. Many trips are for the express purpose of attending Army-sponsored meetings. Additionally, due to the expense involved in air travel, meetings that should otherwise be accomplished are sometimes not being held at all. This leads to lack of coordination, failures in mutual understanding and lost efficiency.

DOD can use dial-up VTC to provide the technical means for reducing travel costs; enabling distance learning; establishing communication infrastructure among multiple Army sites; improving internal and external communications; accessing academic remote lectures and speakers; maintaining high quality and efficiency standards at remote sites; attracting and retaining customers for simulations, training, experiments and exercises; offering a wider variety of access means for courseware; and incorporating academic resources from other sites into cooperative programs. Dial-up VTC can help build preparedness by integrating live National Training Center, Combat Training Center and Joint Readiness Training Center operations into the Army's daily activities.

Short-term objectives are to reduce project time and bring more projects to closure sooner. The dial-up VTC capability will also help us better manage DOD's worldwide activities. It helped us speed our response to support power projection operational requirements such as Operation `Joint Endeavor` and the ongoing Operation `Joint Guard` in Bosnia.

For the midterm, it will help us develop our work force by substituting internal video teleconferencing for expensive outside training, reducing overall training costs. CAC has customers within the US Army Forces Command, Army Materiel Command and other organizations, that this technology will allow us to get closer to.

Long-term objectives include obtaining returns on investment through two methods:

- DOD can reduce its operational travel and temporary duty costs through video teleconferencing.
- CAC will use this technology to add value to the warfighting capabilities of operational forces through collaborative training and simulation from military installations extending to an operational theater's deployed force.

Dial-up VTC provides a central resource for any installation and its tenants. It will provide technical compatibility with the DCTN-Low Bit Rate Video Program, Long Term Life Cycle Cost Systems Program, Federal Telecommunications Services 2000 ISDN and commercial ISDN deployments. This investment will allow DOD to serve its clients more efficiently and effectively by reducing the "dead time" used for traveling, redirecting that time toward bringing more projects to closure.

`Future 21st-century Army possibilities.` ISDN-based VTC may make it more economically feasible to bring subject matter experts, including deployed field commanders, into the classroom and to remote users. For example, on a "slow" day in Bosnia, any deployed commander may be available to discuss current operations with a Tactical Commanders Development Course class face-to-face. Dial-up ISDN will allow us to bring economical simulations and live NTC after-action reviews into the classroom and to more remote users as well.

The BG Conference's cost for dial-up VTC use was $24.00, far less than anyone could have thought possible only two or three years ago. The senior leaders who attended the conference will be instrumental in implementing this technology, because they saw, up close and personal, dial-up VTC in use. Because dial-up VTC provides the capability to dramatically reduce cost, development time and fielding time for improved systems, CAC will continue to use it to prepare the Army's combat and combat support forces for war.

Even as resources decline, the quality of training provided by CAC will not. The means and techniques might change, but Fort Leavenworth's mission to provide quality services to support distance learning will not. This new technology, and other developments like it, will enable CAC to radically improve and deliver communication advances to better serve America's Army.

AMSC Designs New Curriculum

With rapid changes taking place in America's Army, future leaders will be responsible for major decisions that affect Force XXI. In this time of change, the Army Management Staff College (AMSC) is keeping pace to ensure its graduates are prepared to make those critical leadership decisions.

In 1995, AMSC faculty interviewed 169 general officers, senior executive service and political appointee US Army, DOD and selected federal institution executives to determine characteristics that senior leaders need. Following these interviews, AMSC leaders began a curriculum rebuild to incorporate their suggestions. Starting with Class 96-3, which began in September 1996, the AMSC Sustaining Base

Leadership and Management Course remained a 14-week program of study but changed to 12 weeks in residence. Prior to arrival, students must devote an equivalent of two weeks of study to fulfilling reading and writing requirements, taking a diagnostic test and completing self-assessment forms. Accomplishing these tasks beforehand develops a common base line of knowledge among students.

There will be little change to the program's content, but changes to the methodology have taken place. Students will engage in more small-group seminar activity, research and writing. The recharged curriculum emphasizes knowledge of Army missions, organizations and functions raised through a front-loaded pre-AMSC package. This offers two advantages: it meets Army overall goals to save money by shortening time in residence; and it allows students to share program insights with their supervisors, co-workers and subordinates. Force XXI topics addressed include: generating requirements; generating the force; developing and resourcing the force; sustaining the force; and decision making in action.

Interested candidates should contact their local Civilian Personnel Office for application deadlines and information, or call the AMSC Registrar Office at (703) 805-4756/4757 or DSN 655-4756/4757.

Upcoming AMSC Classes
97-2: 20 May 97 to 8 Aug 97
97-3: 23 Sep 97 to 12 Dec 97
98-1: 12 Jan 98 to 3 Apr 98

Senior Officer Logistics Management Course

The Senior Officer Logistics Management Course (SOLMC) is specifically designed to update battalion and brigade commanders, primary staff officers and Department of the Army civilians (DACs) working in the logistics field. The course encompasses maintenance, supply, readiness and transportation, as well as hands-on experience with vehicles, unit-level logistics and computer, ammunition, medical, communication, NBC, missile and quartermaster equipment. The course is open to all branch officers in the rank of major or above in the Active, Reserve or National Guard components, US Marine Corps and allied nations. DACs in the grade of GS-11 or above are also eligible to enroll. This one week course is conducted 10 times each fiscal year at Fort Knox, Kentucky. Class quotas may be obtained through normal US Army Training and Doctrine Command channels. Any problems encountered obtaining class quotas, or for more information about the course, should be directed to the SOLMC Branch Chief, DSN 464-8152/3411 or Commercial (502) 624-8152/3411. Scheduled classes for the balance of Fiscal Year 1997 are shown below. For more information, call either Captain Greg Nicholls or Chief Warrant Officer John Bingle at (502) 624-8152/3411 or DSN 464-8152/3411.

SOLMC Classes
97-06: 12-16 May 97
97-07: 16-20 Jun 97
97-08: 21-25 Jul 97
97-09: 18-22 Aug 97
97-10: 15-19 Sep 97

Battlefield Visualization Seminar

Robert J. Bunker
Adjunct Professor, National Security Studies Program, California State University, San Bernardino, California

Technology Training Corporation's "Battlefield Visualization" seminar was held last fall in San Diego, California, and was attended by 20 representatives from the US and Canadian armies, industry and academia. This informative seminar was conducted by retired Lieutenant General Ronald L. Watts, US Army, former VII Corps commander and 2003 Board and Army Science Board member.

Central seminar themes focused on: Battlefield Visualization Master Plan requirements, managing battlefield information, terrain mapping, improving mission planning and simulation, and analysis of operational needs. The presentation was based primarily on a combination of Force XXI documents, US Army Training and Doctrine Command (TRADOC) Pamphlet (PAM) 525-5, `Force XXI Operations`, and TRADOC PAM 525-70, `Battlefield Visualization Concept`, and Watts' notional projection of early 21st-century warfighting needs and requirements.

`Battlefield visualization` refers to "The process whereby the commander develops a clear understanding of the current state with relation to the enemy and the environment, envisions a desired end state which represents mission accomplishment and then subsequently visualizes the sequence of activity that moves the commander's force from its current state to the end state." Dominant concepts and perceptions raised during this seminar included:

- The view that the revolution in military affairs (RMA) is principally a revolution in battle command. Commanders at all echelons can have a near real-time, relevant common picture (RCP) of the battlespace via internetted information.
- Dominant future battlefield components will include battle command, extended battlespace, deep and simultaneous attack, spectrum supremacy and challenges to our modern rules of war.
- Future battle command operational requirements will center on empowering commanders to concentrate effects not forces, increasing lethality and survivability, controlling increased operation tempo, providing an RCP, adapting to commander's style and situation and ensuring joint interoperability.
- An "electronic staff" will likely be created to aid future commanders. It will be composed of a "knowledge bank" consisting of several data processing technologies such as information storage sites in the form of digital data bases or text, data transmission networks connecting the storage sites, advanced search and retrieval software to obtain needed data and expert system and artificial intelligence routines to translate the data retrieved.
- Battlefield Visualization System Requirements may likely be based upon the display of "3-D" map data modified by an overlay of weather/environmental effects, the acceptance of near real-time imagery products and updates, an integrated mission planning system and mission rehearsal capability.
- Data fusion, correlation and updates will initially pose an immense obstacle to seamless battlefield information integration. Specific sensors will report to their own battalion, brigade and division commands, which will result in target location and sighting time discrepancies. Data base adjustment/management will become a crucial means of ensuring that warfighters are provided with accurate information.
- Force XXI will likely be moving away from contour to profile plot maps. These maps will become increasingly digital and will be supported by "John Madden" light pens for ease of mission planning and rehearsal. Holographic maps will provide a 360- degree view of the full-dimensional battlefield as technology progresses.

Battlefield visualization has been ranked by the Joint Requirement Oversight Council as its primary candidate for an Advanced Concept Technology Demonstration during Fiscal Year 1997. The 4th Infantry Division's "Experimental Force," Fort Hood, Texas, employed battlefield visualization in its

advanced warfighting experiment conducted during March 1997. MR

Military Review, March-April 1997

Book Reviews

MAN OF THE PEOPLE: A Life of Harry S. Truman by Alonzo L. Hamby. 760 pages. Oxford University Press, Inc., New York. 1995. $35.00.

Following the publication of David McCullough's award-winning Truman, one may ask, "Why do we need another biography of the 33d president?" Alonzo L. Hamby provides the answer in Man of the People, in which he analyzes Harry S. Truman in light of the world in which he lived. The result is a highly favorable biography, set against the background of the Great Depression, World War II, the Democratic Party's changing nature and the emerging Cold War.

Hamby presents his subject not only as a historical figure in whose career one finds an interesting individual but also portrays the evolution of American social and political democracy in the 20th century's first half. He succeeds admirably in relating the Truman White House to the larger Cold War themes and the redefinition of liberalism in the post-Franklin Roosevelt years.

It is in Truman's world that the author makes his greatest contribution. Hamby's pre-presidential years' account, particularly his subject's early political career, is the best to date-as is his analysis of Truman's political acumen in garnering bipartisan support for the Truman Doctrine and the Marshall Plan. To concentrate on bailing out Western Europe, Truman de-emphasized the East Asian mainland. To spend on economic recovery, he used the defense establishment as the principal bill payer. As Hamby notes, both decisions later boomeranged on the administration.

To his credit, Hamby provides the reader with a balanced assessment of Truman's life. He takes Truman to task for the latter's muddled sense of the Democratic Party in the postwar world. Truman's foreign policy also eventually came to grief because of its inherent contradictions. And Truman's politics of liberal promise and conservative gridlock damaged his credibility. At times, the president could be downright petty, as in his relations with his successor as president and with Adlai Stevenson, who Truman felt undercut his personal efforts to ensure the Roosevelt-Truman era legacy. Small wonder he departed office one of the most unpopular chief executives on record.

In sum, however, Truman's successes far outweighed his debits. The decisions to drop the atomic bombs and to develop the hydrogen bomb, the formation of NATO, the economic recovery of Western Europe and recognition of Israel were all monuments to Truman's willingness to wield the instruments of presidential power. Moreover, Truman was correct on the two fundamental issues of his time: the nature of the Soviet threat and civil rights.

Like Eisenhower, whom he came to loathe, Truman attracted his share of detractors during his lifetime, but like Eisenhower, a subsequent generation has reversed the popular interpretation of his contemporary observers. To Hamby, Truman has evolved to the status of an American icon, a modern Horatio Alger traveling from humble beginnings on the American frontier to the corridors of power in our nation's capital. If we feel good about Truman, concludes the author, it is because Truman represents the values that made this country great. To celebrate Harry Truman is to celebrate ourselves.

COL Cole C. Kingseed, USA, US Military Academy, West Point, New York

KINCAID OF THE SEVENTH FLEET: A Biography of Admiral Thomas C. Kincaid, U.S. Navy, by Gerald E. Wheeler. 531 pages. Naval Institute Press, Annapolis, MD. 1996. $37.95.

There are two good reasons for a biography of this US Navy admiral. The first reason is historical. The second reason is he serves as a role model for military academy students graduating in their classes' lower halves. One can study how Kincaid made the most of his average talents, made a major World War II contribution and ended up with four stars on his shoulder. He deserved every one of them.

Thomas C. Kincaid was a Navy "brat," the son of a US Naval Academy graduate and admiral. He knew the Navy system, how to work it and how to work in it. Graduating 136th in a class of 201 from the US Naval Academy, Kincaid succeeded not by brilliance or innovation but because of his professionalism and ability to get along with associates above and below him.

He first served as a very junior officer in noncombat roles during World War I, then began a long list of assignments in Washington, D.C., where he and his attractive wife became well known in naval social circles. The first quarter of this book traces how Kincaid, with an absolute minimum of sea duty, slowly worked up the promotion ladder. Author Gerald E. Wheeler spent 16 years writing this book. Much of his source material came from Mrs. Kincaid, which lends particular insight into how a junior officer's career can be helped by a supportive wife. They knew the right people in higher command and were at the right places at the right times.

When the United States entered World War II, Kincaid was a captain with just enough seniority to obtain a sea command. He was promoted to rear admiral and given a cruiser division in the Pacific, effectively directing his forces in the Coral Sea and Midway battles. His big break came when Admiral Chester W. Nimitz named him as the carrier USS `Enterprise`'s commander to support the invasion of Guadalcanal and subsequent carrier battles east of the Solomons. His performance was again satisfactory, although he was the last nonaviator to command a carrier task force.

He was then assigned to the Aleutians to solve a bitter interservice squabble between Army and Navy commanders, which he did with his customary low profile and laid-back managerial style. He believed in close communication among all parties and generously delegated responsibilities to his juniors. A glaring weakness of this biography is the lack of firsthand comment on Kincaid's managerial style. The reader can only infer that his steady rise in command responsibility was due to his senior officers' respect for his managerial accomplishments.

When General Douglas MacArthur recalled his Seventh Fleet commander, Kincaid was a natural to take his place. He won MacArthur's respect as a loyal subordinate who did his job well, interfered not at all and did not object to being in charge of "MacArthur's Navy." Without complaint, he let MacArthur take credit for the South West Pacific Area accomplishments. He soon had his third star.

Kincaid's final combat command was at the Battle of Leyte, where again, he was in a difficult command position with Admiral William F. "Bull" Halsey Jr. in equivalent dual command at the time of the Philippine landings. Halsey, without Kincaid knowing it, left the invasion forces' right flank wide open. Only good luck kept the US forces from suffering enormous losses. In the minds of most historians, Kincaid was not at fault for this error.

Although this book cannot be considered an insightful study of a great naval commander, the stories of the World War II Pacific naval battles are superbly written in a concise but understandable style.

Sometimes it requires a half-century to make all pieces of an enormously complicated campaign fit in place. The book is superbly documented, but more important, the editors did not let historical annotation interfere with the telling of what still is America's most exciting and interesting naval history.

RADM Ben Eiseman, USNR, Retired, Englewood, Colorado

SARAJEVO: A War Journal by Zlatko Dizdarevic. 193 pages. Fromm International Publishing Corp., New York. 1993. $19.95.

Zlatko Dizdarevic's nation of Bosnia-Herzegovina is the site of armed conflict. His book, Sarajevo: A War Journal, written from a city besieged by Serbian forces, is a firsthand account of daily life in the once cosmopolitan city that has become a sinkhole in hell. It is the story of life continuing against all odds, against all the weapons and death that an enemy force can rain down on an old city which is his home.

Dizdarevic is Moslem. His wife is the daughter of a "mixed" marriage of a Serb and a Croat (40 percent of the marriages in Sarajevo are mixed). Therefore, his views are not balanced.

The journal consists of 54 columns that appeared from April 1992 to August 1993 in Sarajevo's only functioning newspaper. The early columns focus on the insanity of the war. How could this happen? Who is responsible? Dizdarevic concludes that with the fall of communism, "madmen" leaders of the former Yugoslavia turned to a perverted idea of ethnic-based nationalism as the basis for their continued hold on power. Their army consists of poor, uneducated peasants whipped into a frenzy by calls to construct a "greater Serbia." This is the army that now surrounds Sarajevo.

Dizdarevic puts to rest the notion that the siege is a fight between Serbs, Croats and Moslems. He contends this fight is between sophisticated Sarajevo urban dwellers and other city and rural Bosnian Serbs who call themselves an army, but who are no more than terrorists. Their targets are simply those who remain in the city, without any distinction based on religion, nationality, age or sex. In his view, this is not a civil war but one of aggression initiated by Serbian President Slobodan Milosevic and executed by his henchman, Radovan Karadzic, head of the Bosnian Serbs.

The impotency of UN protection forces becomes his focus as the siege continues. Why won't the "blue helmets" do something? No one expects them to engage the Serbs, but surely they could get food into the city. To do less is to reward aggression and to punish its victims. It is simply not right to equate the innocent victims of terrorism with those who engage in it. Yet, this is the result when the UN protection force operates under rules of engagement that mandate absolute neutrality. With these rules, he writes, protection is only an illusion.

Throughout the book, he portrays the suffering people of Sarajevo, who attempt to maintain some semblance of normalcy in the most abnormal of times. The author rejects any negotiation with those he believes responsible for the bloodshed because to negotiate with the "ringleader of snipers who shoot at children . . . is a crime in itself."

Clearly the people of Sarajevo hope for some type of Western intervention. Should the United States become embroiled in this conflict, its soldiers must understand the depths of feeling that exist there. Whether as peacekeepers or peacemakers, there will be a tortuous path to mission accomplishment for those charged with putting out the flames.

LTC H. Wayne Elliott, USA, Retired, Charlottesville, Virginia

COURAGE AND AIR WARFARE: The Allied Aircrew Experience in the Second World War by Mark K. Wells. 240 pages. Frank Cass Publishers, London. 1995. $40.00 hardcover. $22.00 paperback.

In his new work Courage and Air Warfare, Mark K. Wells provides refreshing insight into the day-to-day experiences of individual bomber and fighter aircrews in the Combined Bomber Offensive. Throughout the study, he interweaves two useful and interesting comparisons. First, he exposes both the differences and similarities between the US and British experiences during the "most sustained and intensive air battle ever fought." Second, since strategic air forces contained fighter aircraft in their inventories, he covers the differences between air warfare in a high-performance, single-seat fighter and the lumbering, crew-served bomber.

Wells begins his study with a detailed section on aircrew selection, followed by a chapter on air combat's danger and violence. The long missions at high altitude and severe temperatures added to the stresses of fending off German fighters and dodging heavy flak. The fear of sudden death-in a campaign that cost the Allies 81,000 aircrew dead and more than 18,000 aircraft-played no small role in the combat effectiveness of the Allied bomber and fighter units. Later chapters examine combat stress and treatment, morale, leadership and the emotive subject of "lack of moral fiber."

Wells addresses topics such as why the aircrews enlisted in their respective air forces, what they went through, how they responded to stress and anxiety and how they were medically treated. Wells concludes that the American approach to selecting airmen and treating psychological casualties was both more scientific and somewhat more lenient than the British approach. Bomber Command faced a manpower crunch and needed to keep the highest possible number of combat-ready aircrewmen. This led to policies occasionally characterized as harsh.

Throughout the work, the author explores the organizational and medical philosophies of the Allied military bureaucracies. The author asserts that each air force's system, while different, was ultimately successful in prosecuting a strategic bombing campaign under very arduous conditions while keeping individual aircrews combat effective.

Despite a wealth of material published about air combat operations during World War II, no other work deals with the human dimension of air combat as thoroughly as Courage and Air Warfare. Other than in memoirs, few have made such an effort to explore the hardships and violence faced by the young Anglo-American aircrews prosecuting the Combined Bomber Offensive. This study in aircrew cohesiveness, effectiveness and morale is not only useful to the career airman and military historian, but also to sociologists and psychiatrists wishing to expand their knowledge of "man in battle."

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A GOOD YEAR TO DIE by Charles M. Robinson III. 346 pages. Random House, Inc., New York. 1995. $27.50.

Author Charles M. Robinson III superbly covers the Indian Campaign from 1876 through 1890. He focuses on 1876 and 1877 as the campaign's crucial years, recalling how the Indians endured broken treaty after broken treaty and were finally left with no alternative but to fight. It was a struggle not only for their lands, but also for their very survival as an Indian Nation. Routes through the Indian lands to the

Pacific Northwest, the discovery of gold in the Black Hills and the insatiable quest for more land only speeded up the inevitable results.

Most Americans recall Lieutenant Colonel George Armstrong Custer's last stand at the Little Bighorn in Montana Territory, but Robinson digresses to the beginning of the unrest among the various Sioux, Northern Cheyenne and Arapaho tribes.

The US government was totally unprepared to conduct a campaign against the Indians as it was still recovering from the Civil War. The US Army was undermanned, underfinanced and unprepared to conduct or counter the hit-and-run warfare the Indians knew only too well. Even with the assistance of the various Crow, Shoshone, Ute, Pawnee, Nez Percé and Bannock Indian tribes, the Army was inept, leading to Custer's defeat at the Little Bighorn. The author points out that Custer's defeat is called a massacre, yet the Indian defeats at Sand Creek, Colorado, in 1864 and along the Washita River in Oklahoma in 1868, in which mostly Indian women and children were killed, are called "military campaigns."

A Good Year to Die provides an in-depth review of this period's main characters-Sherman, Sheridan, Terry, Miles, Custer, Reno, Crook, MacKenzie, Sitting Bull and Crazy Horse. The accounts of the clashes and races for glory of these strong personalities are excellent. Robinson ably points out the political hindrances from Washington, D.C.; the battle between the Army and the Indian agencies; and the infighting within the Army.

After Custer's defeat, the US government and Americans finally focused on the problem, funneling men, materiel and money into the campaign, thus spelling the Indians' ultimate defeat. The campaign came to a gruesome end at a cost of $2 million and 283 Army personnel killed. I recommend this well-researched and well-written book for anyone's reading pleasure, but I particularly recommend it to the American and military history enthusiast.

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CLOSING WITH THE ENEMY: How GI's Fought the War in Europe, 1944-1945, by Michael D. Doubler. 354 pages. University of Kansas Press, Lawrence, KS. 1994. $40.00.

In 1982, Martin Van Creveld published Fighting Power: German and US Army Performance, 1939-1945. In it, he asserts that the German fighting man produced significantly superior results on the battlefield until virtually the war's end as compared with his US opposite number. He says his conclusions are valid for defensive combat and offensive combat.

According to Van Creveld, US soldiers were poorly led by officers who did not know their profession and were inadequately trained for the demands of combat leadership; they were hesitant in offensive action, which led to poorly coordinated attacks that frequently bogged down in confusion and disorganization; and they too often relied primarily on their superior firepower as a substitute for an aggressive maneuver.

Van Creveld's evidence for his conclusions are primarily based on a "Combat Effectiveness Table" of 78 US and German World War II engagements prepared by writer-historian Trevor Dupuy. Most of the 78 engagements are from the Italian Campaign, where the terrain was as much an enemy as the Germans were. The northwest European battles primarily are from the miserable, rain-soaked battles of attrition in the Lorraine Campaign. The table excludes, for the most part, the July-August battles in France and, according to Van Creveld, excludes prisoners from casualty counts. The table does not include any battle

after 7 December 1944. Therefore, the Battle of the Bulge-the US Army's greatest battle and the culminating US war engagement in Europe-and subsequent fighting in the Rhineland and central Germany is omitted.

Van Creveld's conclusions of nearly innate German superiority throughout the war and across the spectrum of combat do not ring true. One feels uncomfortable with the proposal that, somehow, the better, most capable team lost; that Americans blundered and "rumbled" their way to victory on the strength of the world's greatest economy and the backs of millions of sturdy Russian infantrymen with little or no help from their own, supposedly inferior "fighting power."

At last, after nearly 12 years, Michael D. Doubler articulates what many European Theater students have felt for a long time. He produces a convincing, well-supported counterargument that effectively and decisively challenges Van Creveld's conclusions. His is an outstanding examination of how the US Army not only learned from its early mistakes and gained valuable experience in combined arms tactics, but also was competent enough by 1944's end to decisively defeat German fighting power in head-to-head combat.

Doubler's main premise is that the US Army, especially at the small-unit level, proved to be an incredibly adaptable and innovative organization, learning hard lessons on the battlefield and turning those lessons into positive changes in organization, tactics and combat techniques that contributed significantly to final victory. Created from only a few hundred thousand soldiers in 1940, the US Army, less than five years later, globally deployed nearly 8 million men in 89 divisions. The United States fought the war with essentially citizen-soldiers and temporary officers (the 15,000 prewar regular Army officers were swamped by 100,000 National Guard; 180,000 wartime Reserve Officers' Training Corps; 100,000 direct commission; and 300,000 Officer Candidate School officers). The US Army learned its trade on the battlefields of North Africa, Sicily, Italy, France and Germany, adapting as it went.

Doubler's book is an excellent counterpoint to the works of Van Creveld and others-including S.L.A. Marshall's `Men Against Fire` and Russell F. Weigley's `Eisenhower's Lieutenants`-that condemn the US soldier for taking advantage of the Army's inherent strengths founded on superior materiel, overwhelming firepower and unmatched mobility. For example, the US units' preference for waiting until their artillery and tactical airpower had pounded German positions into rubble before they advanced, presumably suffering fewer casualties, is incredibly listed as a US weakness. The fact that the German army was, by 1944-if it ever was at all-incapable of massing such firepower is ignored.

Similarly, some critics take many senior US commanders to task for failing to wage a war of encirclement and massive maneuver, as if the enemy, terrain, troops available and the logistic state, possibly most important, were irrelevant to the Allied commanders' decisions. Doubler's argument is a logical, reasoned perspective that adds a healthy dose of common sense. He concludes that, despite entering the war at a running start, the US Army learned well and quickly, becoming extremely proficient by war's end. "Perhaps the greatest lesson the Army learned from World War II," writes Doubler, "was that the learning process itself is an integral part of any conflict and can spell the difference between victory and defeat." The highly readable narrative and excellent analysis of Doubler's book superbly support his reasoned conclusions.

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`THE REBIRTH OF THE HABSBURG ARMY: Friedrich Beck and the Rise of the General Staff` by Scott W. Lackey. 253 pages. Greenwood Publishing, Inc., Westport, CT. 1995. $59.95.

The army of the Habsburg emperors has rarely attracted the attention of US readers, yet this army has always played a pivotal role in Europe's history. In his book, Scott W. Lackey examines the Austro-Hungarian army during a critical time in European warfare-the 19th century's last half. This period saw the introduction of railroads, rapid-fire small arms and artillery, telegraphs, mobilization plans and the rise of the general staff system. Lackey shows how the Austro-Hungarian Empire successfully maintained its great power status by assimilating these changes and that this success was due to one man-Friedrich Beck.

Lackey opens by briefly discussing the army from 1848 through the 1866 Austro-Prussian War. He quickly makes his case for an army in decline. He then introduces Beck as a young lieutenant in 1848. The rest of the book is the story of Beck and the military reforms he implemented throughout his career.

The centerpiece of Beck's reforms is his introduction of a general staff system into the army. The author contends that peacetime war planning provided by a general staff system was essential for the dual monarchy's survival. This reform enabled Beck to identify other weak areas within the army and initiate further improvements.

I had difficulty judging from the book the validity of Beck's reforms. Two critical events setting the army on its reform path-the 1859 and 1866 wars-are never examined in enough detail to expose the nature of the army's flaws. This is also true of the problems facing the army in the 1880s and 1890s. Beck's reforms are superficially stated, with little detail on why they met the army's needs. It is hard not to compare this book with Bruce Menning's Bayonets before Bullets, which covers the Russian army during the same period. Menning brings the reader into the debates raging within the Russian army, detailing all facets of the problems before them, whereas Lackey presents the issues within the Austro-Hungarian army as right or wrong, with little information to support his judgments.

What Lackey does well is show how one exceptional individual imposed his vision upon an army. Beck influenced army decisions for 34 years. His struggle to improve the Habsburg army against opinionated individuals and an entrenched system is well presented. Beck was able to survive in the dual monarchy's political world. What Lackey does not show is whether it was Beck's survival ability or his unique vision that allowed him to implement reform.

I recommend The Rebirth of the Habsburg Army for the specialist but not the general reader. Without taking the reader into the years after Beck's retirement-1906 to 1918-to assess his achievements, Lackey can never show whether Beck reached his goal. The ultimate test for an army is war, and this army's performance was uneven in World War I. Did Beck actually prepare the army for war, did he overlook a critical flaw or was the army fated to lose? The reader needs more information to answer these questions.

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EVERY INCH A SOLDIER: Augustine Warner Robins and the Building of U.S. Airpower by William Head. 289 pages. Texas A&M University Press, College Station, TX. 1995. $45.00.

Over the last 10 years, aviation historians have focused their attention on military biography. Although William Head's paean to the father of Air Force logistics, Augustine Warner Robins (1882 to 1940), is another addition to the genre, it is not what it pretends to be. Every Inch a Soldier is a scholarly,

well-crafted history of the US Army's aviation arm before 1941, with a particular emphasis on logistics. It is not, however, a three-dimensional portrait of Robins as an individual, nor does it describe in concrete detail the logistic reforms he began at the Air Corps Materiel Division and related organizations.

In 1919, Robins orchestrated the postwar Army Air Service demobilization. Because of his efforts, his future was set. For most of the 1920s, he commanded the Fairfield Air Depot near Dayton, Ohio, which supported the supply, repair and engineering requirements of 24 bases. Subsequently, Robins served as the Air Corps Materiel Division's deputy commander (1931 to 1933) and commander (1935 to 1939). The division developed and tested new equipment; distributed and maintained needed parts; formulated industrial mobilization plans for future war; and fulfilled many other requirements. According to Head, all these activities flourished under the watchful eye of Robins, who established the logistic foundation for air power's World War II success.

So what were Robins' reforms? According to the author, the airman developed and standardized a supply accountability system lasting 30 years; introduced a spot-check system, markedly increasing aircraft safety between general overhauls; formalized aircraft procurement, eliminating the past ad hoc methods; emphasized new concepts of national defense planning, which involved identifying war-essential equipment, maintaining a strong military-industrial base and ensuring a wartime production surge capability; and stressed research and development to remain technologically current while waiting for larger procurement budgets.

Unfortunately, there are sins of omission in the text. Robins increasingly disappears as the Air Corps' story unfolds; the author confuses the general's bureaucratic support for innovation with his being an innovator, especially in matters of technology; and last, the everyday mechanics of Air Corps logistics remain a mystery. Despite these limitations, `Every Inch a Soldier` remains a fine evocation of the interwar air arm from a broad logistic perspective.

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