THE REVOLUTION IN MILITARY AFFAIRS AND ITS EFFECT ON THE FUTURE ARMY

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There is general consensus within the Department of Defense and the Department of the Army that we are in the early stages of another Revolution in Military Affairs (RMA). A RMA occurs when the application of new technologies into military systems combines with innovative operational concepts and organizational adaptation to fundamentally change the character and conduct of conflict by producing a dramatic increase in the combat potential and military effectiveness of armed forces. This project involved an extensive review of published and unpublished material on the RMA and the synthesis of that material into appropriate recommendations about future Army doctrine, technology, and force structure which have the potential to significantly increase the Army's combat power. In order for the RMA to achieve its potential, senior military and civilian leadership must make a solid commitment to changing Army doctrine, operational concepts, and force structure to enable a transformation from the current maneuver warfare paradigm to a new Knowledge Warfare paradigm.

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EXECUTIVE SUMMARY

There is general consensus within the Department of Defense and the Department of the Army that we are in the early stages of another Revolution in Military Affairs (RMA). A Revolution in Military Affairs occurs when the application of new technologies into military systems combines with innovative operational concepts and organizational adaptation to fundamentally change the character and conduct of conflict by producing a dramatic increase in the combat potential and military effectiveness of armed forces. This RMA is based on emerging information technologies and the effect they have on increasing visibility and lethality on the battlefield.

Revolutions in Military Affairs have affected the U. S. military establishment several times in recent history. Railroads, telegraphs, and rifled musket and artillery changed the Civil War battlefields from those of the American Revolution to ones presaging World War I. During the interwar years, the internal combustion engine, radio and radar, and aviation technology resulted in major changes in the character of warfare from World War I to World War II. After World War II, nuclear weapons brought another fundamental change to warfare.

One of the key lessons of earlier RMAs is that each country involved has its view of how to best take advantage of new technologies, but those countries which have done the better job of developing appropriate operational concepts and

of instituting the necessary organizational changes have achieved a decisive edge on other military establishments. The purpose of this project is to discuss the current RMA in terms of its effect on the Army circa 2010, emphasizing what doctrine, operational concepts, and types of forces I believe may provide the best capability to take advantage of emerging technologies.

The project involved a review and analysis of selected current writings on the subject of the Revolution in Military Affairs itself as well as the related subjects of technology's impact on the conduct of the Gulf War and on new organizational theories. Additionally I attended the U.S. Army War College's Fifth Annual Conference on Strategy, whose topic this year was the Revolution in Military Affairs. At the conference I was able to exchange ideas on the RMA with many of the attendees, several of whom had written books and articles which I had already reviewed. Based on those reviews and discussions, I synthesized a wide variety of opinions and approaches concerning the RMA into what I considered to be appropriate recommendations about future Army doctrine, technology, and force structure.

I believe that the Army has begun to take appropriate steps to realize the potential of the current Revolution in Military Affairs with its acknowledgement, at least in its modernization and acquisition strategies, that winning the information battle is essential to success in future wars,

conflicts, and operations other than war. That shift in emphasis to include information warfare in the same priority as maneuver and firepower is a critical first step which must be followed by its acceptance by senior military and civilian leadership, especially those considered to be the "warfighters."

With the acceptance of information warfare as a key element of combat power, I believe that it is necessary and possible to change the Army's operational paradigm from the Industrial Revolution-based maneuver warfare to the Information Revolution-based Knowledge Warfare. Knowledge Warfare uses the capability to exploit information to increase the combat potential of the force. It enables the future Army to fight smarter, to really do more with less.

The new Knowledge Warfare paradigm leads to a new doctrine of Knowledge Warfare whose operational concepts are Information Warfare, Precision Strike, and Decisive Maneuver. Knowledge Warfare operations will occur in a battlespace in which the traditional strategic, operational, and tactical levels of war will be blurred because of technology.

The Army's modernization and acquisition strategies are already oriented toward this new paradigm, but the emphasis on developing and fielding information and integrative technologies into the combat force must be continually stressed. When budget reductions occur, history tells us that the tendency will be to protect short-term incremental

improvements to the existing force rather than to invest in the long-term revolutionary changes in military potential associated with Knowledge Warfare. The will result in maintaining an Army capable of executing the old maneuver warfare paradigm but not fully prepared to operate in the twenty-first century.

Organizational changes must be made in the Army force structure in order to maximize the potential of Knowledge Warfare. Reorganizing the Army's basic units rather than reducing the size and number of today's units is a highly contentious issue, and it is here that I believe the Revolution in Military Affairs faces its biggest challenge. Changing from the World War II-era divisional structure to one which is based on a brigade structure and which recognizes Information Warfare units as combat arms instead of combat support will require significant changes in attitudes throughout the Army.

The Army has begun to move in the right direction to take advantage of the current Revolution in Military Affairs, but it is essential that senior military and civilian leadership make a solid commitment to supporting what will surely be significant changes to the established Army culture. If the right choices are made to change doctrine and force structure to best take advantage of and integrate the potential of emerging information technologies, then the Army circa 2010

will be capable of meeting the challenges of the twenty-first century.

THE REVOLUTION IN MILITARY AFFAIRS AND ITS EFFECT ON THE FUTURE ARMY

CHAPTER I

INTRODUCTION

As the world approaches another millennium and prepares for the challenges of the twenty-first century, swift and radical changes are occurring in all dimensions of society. The pace of those changes is ever increasing, particularly in the area of technology. The result of all these changes is the creation of not just a transition but rather a transformation of civilizations and cultures, a potentially chaotic revolution instead of an orderly evolution.

Just as society is undergoing revolutionary change, so too is the U.S. military establishment. The dismantling of the Soviet armed forces and the battlefield of the Gulf War have left the United States as the unquestioned world military leader, due in large part to our demonstrated technological superiority. But as current events are already proving, other military forces can also obtain technologies that challenge our own. The key factor is not just obtaining new technologies. Rather it is developing appropriate doctrine, operational concepts, and force structure in which that technology is integrated to produce operational superiority on the battlefield.

The Department of Defense has recognized that we are in a period of revolutionary change in the way wars are fought and

other military operations are conducted. It has formed a Senior Steering Group, chaired by the Deputy Secretary of Defense, to explore the potential for exploiting emerging technologies, as well as new operational and organizational concepts, to enable revolutionary changes in theater warfare and smaller-scale operations.[1] The Steering Group created five task forces to study the Revolution in Military Affairs (RMA) in detail. Four of the task forces are examining the operational concepts of combined arms/maneuver warfare at the theater level, deep/precision strike and attack, forward operations, and smaller-scale operations like special operations and peace keeping. The fifth task force is to develop specific proposals on ways to foster innovation in technology, doctrine, operational concepts, and organizations within the Department of Defense.

A Revolution in Military Affairs occurs when the application of new technologies into military systems combines with innovative operational concepts and organizational adaptation to fundamentally change the character and conduct of conflict by producing a dramatic increase in the combat potential and military effectiveness of armed forces.[2] Past

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[1]John A. Deutch, then Under Secretary of Defense for Acquisition and Technology, to Secretaries of the Military Departments et al., "Revolution in Military Affairs Project--Formal Authorization of Task Force Activities," 2 March 1994, Washington, DC.

[2]Andrew F. Krepinevich, Jr., "The Coming Revolution in the Nature of Conflict: An American Perspective" (Washington, DC: Defense Budget Project, [September 1993]), 3.

Revolutions in Military Affairs have caused major changes in both the nature of the peacetime competition between states and their military organizations and in the ways wars are deterred, fought, and resolved. They have often devalued dramatically formerly dominant elements of military power, to include weapons systems and platforms and doctrines. RMAs have also seen the unexpected and sometimes rapid decline of dominant military organizations that could not adapt in a rapidly changing competitive environment.

Examples of past Revolutions in Military Affairs abound.[3] In ancient time the invention of the stirrup resulted in the creation of armed cavalry which could be used as an elite shock force against massed infantry formations. During the early years of the Industrial Age, railroads, telegraphs, and rifled muskets and artillery dramatically changed the Civil War battlefields from those of the American Revolution and presaged the extended trench warfare of World War I. At sea, wooden sailing ships armed with short-range cannons gave way to metal-hulled ships powered by steam turbine engines and armed with long-range rifled artillery. Later the submarine and the torpedo led to the introduction in World War I of entirely new military operations, the submarine strategic blockade and commerce raiding and antisubmarine warfare.

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[3]Sir Michael Howard, "How Much Can Technology Change Warfare: Lessons from History," lecture, 27 April 1994, Fifth Annual Conference on Strategy, U.S. Army War College, Carlisle Barracks, PA.

By the end of World War I, however, another round of operational concepts was developed to counter the effects of the dominant military systems and operational concepts. On land, massed frontal assaults preceded by long artillery preparations gave way to brief artillery preparation fires, infiltration tactics, and the use of the light machine gun as the dominant weapon of the German storm trooper assault. At sea elaborate convoy operations were established to counter the submarine threat and to ensure that needed men and materiel reached the battlefield.

During the interwar years, the internal combustion engine, radio and radar, and aviation technology resulted in major changes in concepts of operations and the creation of new military organizations to exploit new capabilities. The character of warfare in World War II was very different from that of World War I and there were changes in almost all areas of warfare. Blitzkrieg, strategic bombing, and carrier aviation were all true revolutionary changes. After World War II, nuclear weapons, especially when carried by medium and long range ballistic missiles, brought another fundamental change to warfare.

The United States is now changing from a Second Wave society based on technologies of the Industrial Revolution to a Third Wave society based on technologies of the Information

Revolution.[4] Those information technologies are the foundation of the current RMA, in which knowledge will dominate the battlefield rather than massed maneuver and firepower. While many analyses of Operations DESERT STORM/SHIELD conclude that it was the precursor for the new style of warfare brought about by the RMA,[5] I would argue that it was rather a better example of a war fought using the Second Wave doctrine of maneuver warfare.

What made the war in the Gulf appear to be different was the overlaying of new technology onto existing organizations and operational concepts. Smart weapons and improved platforms enabled coalition forces to mass and maneuver forces and fires at a higher tempo over an expanded battlespace than ever before. But in the final analysis, coalition forces won because they were able to achieve Second Wave warfare attributes of massed combat power on the battlefield in a very effective manner but which was still essentially the same style of warfare as that of World War II. Third Wave warfare would have used knowledge to achieve victory by efficiently reducing the time and the resources needed by coalition forces.

One of the key lessons of earlier RMAs is that each country involved has its view of how to best take advantage of

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[4]Alvin and Heidi Toffler, *War and Anti-War: Survival at the Dawn of the 21st Century* (New York: Little, Brown, 1993), 22.

[5]Alan D. Campen, ed., *The First Information War.* (Fairfax, VA: AFCEA International Press, 1992), ix-xii.

new technologies, but those countries which have done the better job of developing appropriate operational concepts and of instituting the necessary organizational changes have achieved a decisive edge on other military establishments. In an attempt to ensure this outcome for the U.S. Army, this paper will discuss the current RMA in terms of its effect on the Army circa 2010, emphasizing what doctrine, operational concepts, and types of forces I believe may provide the best capability to take advantage of emerging technologies. While my approaches are certainly not the ultimate solution, it is clear that the Army must take a new azimuth to realize the full potential of the RMA rather than attempting to overlay new technologies onto existing doctrine and force structure.

CHAPTER II

TOWARD A NEW PARADIGM

A paradigm is the common set of beliefs shared by members working in any given field. In any military the current dominant paradigm is the basis of doctrine, strategy, tactics, techniques, force structure, and weapons systems. The military establishment has a significant amount of resources invested in its dominant paradigm and consequently is reluctant to change it in any way. Evolutionary changes are made within the context of the current dominant paradigm, but revolutionary changes, i.e., a Revolution in Military Affairs, require a new paradigm and a willingness to accept the fact that the process of transformation may well involve a high degree of instability and uncertainty.[6]

Military establishments get into trouble when they fail to review the appropriateness of their current paradigm in view of the total political, military, and technological environment in which they are operating. Paradigms that work fine in one environment, usually the one in which they were developed, often prove disastrous in other environments. If the paradigm is wrong, then doctrine, strategy, tactics,

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[6]Richard J. Dunn III, *From Gettysburg to the Gulf and Beyond: Coping with Revolutionary Technological Change in Land Warfare* (Washington, DC: National Defense University, Institute for National Strategic Studies, 1992), 5-6.

techniques, force structure, and weapons systems will be flawed.

If the price of holding on too long to an outdated warfighting paradigm is very expensive with regards to resources and lives, the advantage of being the first to shift to a more effective paradigm can be just as enormous. Nations that have successfully changed their dominant paradigm have achieved significant advantages on the battlefield, leading frequently to military preeminence that lasted at least until their opponents adapted to the new nature of warfighting. For example, during the interwar years, Great Britain, France, and Germany all recognized the potential capabilities of the internal combustion engine, radio and radar, and aviation technology to change the character of warfare from that of World War I, but only Germany was able to operationalize the process and to execute a new paradigm of maneuver warfare, *blitzkrieg*. Germany achieved stunning success against Great Britain and France during the early days of World War II, and only a combination of circumstances bought the Allies sufficient time to adapt to this new paradigm and to defeat the German armed forces.

The process of changing paradigms has three steps. First, some technological developments must be able to provide previously unavailable battlefield capabilities that, taken together, have the potential to fundamentally change the nature of warfare. Second, individuals or groups with both

vision and practical military experience must recognize opportunities provided by these technological changes and must advocate a strategy for seizing these opportunities. Third, individuals or groups with the authority to effect change within the military must force timely changes to take advantage of the new technology and to reorient the force on a new, more effective paradigm.[7]

The Army is currently operating under the paradigm and doctrine of maneuver warfare. This paradigm dates to World War II. In its simplest terms maneuver warfare occurs when an attacker breaks though or bypasses enemy defensive positions at an unexpected time and place, penetrating into the enemy's vulnerable rear areas and rupturing the continuity of his defense before he can react. While technological changes have been integrated into the Army and have improved weapons systems to a great extent, the doctrine, operational concepts, and force structure have remained unchanged from that of the World War II army. The lessons we learned from Operations DESERT STORM/SHIELD validated the maneuver warfare paradigm but also set in motion the idea that a new paradigm is necessary to drive the Revolution in Military Affairs.

The technological changes of the Information Revolution are the basis for a new paradigm for the future Army, the paradigm of Knowledge Warfare. In Knowledge Warfare the central thesis in that the ability to collect, analyze,

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[7]Ibid., 17.

disseminate, and act on battlespace information is the dominant factor. Knowledge Warfare uses the capability to exploit information to increase the combat potential of the force. By operating in the battlespace in a much smarter manner, the future Army will be able to really do more with less.

Under Knowledge Warfare, the commander will exploit the vastly improved ability to see the battle and to analyze and communicate information throughout the battlespace. He will act on that information by rapidly identifying the decisive point at which the battle will be won or lost and other critical points that require focusing of effort and will communicate his vision of the battle to his subordinates and superiors automatically. He will employ long range, precision fires from all the Services to neutralize the enemy's total capacity to wage war. He will avoid decisive engagements unless absolutely necessary by concentrating weapons effects rather than physical forces. When it is necessary to mass forces, he will do so only briefly and then disperse them again to reduce their vulnerability.

With Knowledge Warfare as the dominant paradigm for the future Army, there will be significant implications for how that Army fights. Increased battlespace visibility will allow the commander to obtain and decide on information much more rapidly and precisely. Increased lethality will allow the commander to engage targets much more precisely and at

extended ranges, making it possible to react to the information even more quickly. The synergism between increased visibility and increased lethality results in increasing the pace and tempo of warfare. Battlespace is thus immensely compressed in time and extended in space.

Knowledge Warfare will result in decreased battlespace losses because the commander will be able to determine when it is necessary to become decisively engaged with what specific enemy forces, avoiding unnecessary and highly lethal direct-fire engagements. Because he can engage only those targets that are really essential to accomplishing the mission, the commander will be able to reduce the total amount of combat to which his forces are exposed. This will tend to minimize both friendly and enemy casualties.

One of the key factors in a force's combat potential is its ability to get the right forces fighting at the right place at the right time.[8] With Knowledge Warfare that potential will be greatly increased because of greater certainty in the battlespace. Greater certainty also will allow the commander to concentrate his combat effects on the decisive points in the battle while at the same time dispersing his forces to reduce their vulnerability to enemy weapons systems. This increased combat potential means that the commander can accomplish much more with fewer forces. Not

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[8]Lieutenant General (Retired) W. A. Shoffner, interview by author, 20 April 1994, Dallas, TX.

only the size and number of forces, but also the structure of those forces will be affected.

For example, the number of indirect-fire weapons systems required to provide a given level of support can be reduced considerably. If the probability of hitting a target is increased by a factor of two, then the number of weapons systems needed can be reduced by half. If the number of targets that must be engaged can be reduced to only the really critical targets, then the number of weapons systems can be further reduced. Lower numbers of weapons systems and munitions means that combat service support requirements also decrease. Further reductions in combat service support can result from the commander's being able to predict the time and place of demand much more accurately. Because smaller, more lethal forces with a reduced logistical tail will result from the new paradigm, tactical, operational, and strategic agility will increase.

CHAPTER III

KNOWLEDGE WARFARE DOCTRINE AND OPERATIONAL CONCEPTS

Doctrine is the tool which harmonizes all aspects of the U.S. Army. It is based on the realities of current capabilities, but it anticipates intellectual and technological developments that will bring victory now and in the future. FM 100-5 is the Army's capstone doctrine in that it describes how the Army goes about accomplishing its mission of deterring war and, when deterrence fails, by achieving quick, decisive victory anywhere in the world. FM 100-5 also furnishes the authoritative foundation for subordinate doctrine, force design, materiel acquisition, professional education, and individual training.[9]

For the potential of the Revolution in Military Affairs to be realized in the future Army, sound doctrine based on the Knowledge Warfare paradigm must guide the employment of new capabilities in a manner than maximizes their advantages. In an ideal world, that doctrine would be developed first and would be the basis of all other decisions, dictating what kinds of forces need to be deployed and what equipment they require. In reality, that process is interactive. Only by knowing what technologies will be available, both now and in the future, can the authors of doctrine know what future

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[9]Department of the Army, *Operations* (Washington, DC: 14 June 1993), iv-v.

capabilities their forces might have and devise operational concepts to take advantage of those capabilities.

Current Army doctrine as described in the 1993 edition of FM 100-5 has begun the process of transitioning from the paradigm of maneuver warfare to the new paradigm of Knowledge Warfare.[10] It states that the Army must be capable of full-dimensional operations, that is of employing all means available to accomplish any given mission across the full range of possible operations in war and in operations other than war and that it must be able to do so decisively and with the least cost possible. It recognizes that most operations will be joint, if not combined, operations and that they will be originated from and supported from the continental United States. Combat power is created by combining the elements of maneuver, firepower, protection, and leadership. Overwhelming combat power is the ability to focus sufficient force to ensure success and deny the enemy any chance of escape or effective action.

As in past editions, FM 100-5 clearly states that doctrine drives the development of technology. Doctrine must be sufficiently broad and forward looking so that it can rapidly accommodate major technological opportunities. Implicit in this view is the fact that even as the current national strategy calls for a policy of global engagement, the CONUS-based projection force coupled with a simultaneous

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[10]Ibid., 1-1 - 2-21.

decrease in resources necessitates the optimization of developing technologies.

Current doctrine has strong ties to the past, retaining the orientation of offensive actions and the tenets of synchronization, agility, initiative, and depth. In response to the changing international environment versatility, the ability to perform in many roles and environments during war and operations other than war (OOTW), has been added. Operations other than war can involve combat missions ranging from strikes and raids to peace enforcement and peace keeping as well as noncombat missions that could include disaster relief and civil support both at home and abroad. Force projections in such an environment might include entirely different successive missions for a unit, involving non-combat operations in wartime or actual combat in operations other than war.

The fundamental doctrinal construct for FM 100-5 is the three levels of the vertical continuum of war--strategic, operational, and tactical. These levels apply to war and to OOTW and are not concerned so much with the level of command or the size of the unit as with the planned outcome of the operation. Regardless of the mission, the primary focus of the current doctrine is warfighting and how commanders put all the elements of combat power together to achieve a decisive victory in a short time with minimum casualties.

The Revolution in Military Affairs will change the framework of the vertical continuum of war.[11] In the past the operational level connected the strategic and tactical levels, and operational art orchestrated tactical events to form the military conditions at the operational level that achieved strategic objectives. Information technology has caused all three levels to overlap and to blur somewhat. There will be a larger operational interaction with both strategy and tactics because of technological advances, but the decision cycle of the operational commander working at magnified tempo in extended battlespace will be technologically compressed.

The compression of the three levels has the potential to increase decisiveness in the vertical military continuum from the tactical to the national military strategic level, especially against a technologically inferior opponent. But the technology that has streamlined and compressed the vertical continuum has also added a horizontal dimension that includes political, psychological, and economic means. This horizontal dimension provides the potential for the military at any level of war to influence national strategy directly. In the Information Age wars and operations other than war will occur in real time for both the American people and their policymakers. This can have both positive and negative

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[11]David Jablonsky, "The Owl of Minerva Flies at Twilight: Doctrinal Change and Continuity in the Military Technical Revolution," lecture, 27 April 1994, Fifth Annual Conference on Strategy, U.S. Army War College, Carlisle Barracks, PA.

results and implies that understanding the full impact of current and planned operations will be even more critical than it is now.

The operational commander will be faced with a growing complexity with a shorter decision time. At the same time future war will add to the emptying of the battlefield even as that battlefield expands in spatial and intellectual terms. At the tactical level the individual soldier will be able to have a greater impact on events in this expanded battlespace because of increased weapons lethality and an increased ability to direct long-range precision fires with extreme accuracy. This, in turn, will offer more opportunities for the operational commander by increasing the connection between the tactical battlespace and the operational area, either a theater of war or a theater of operations. Battles and engagements far beyond the forward line of friendly forces can decide major operations and campaigns.

The RMA will enable technologically enhanced maneuverability and nonlinear warfare, i.e., warfare in which there are no continuous front lines, in which smaller, more agile, and more independent ground and air units will maneuver around a battlefield, concentrate the effects of organic and supporting weapons systems to attack enemy forces and functions, and then disperse into smaller component parts to reduce vulnerability to smart weapons or weapons of mass destruction and prepare for follow-on operations.

In order to complete the transition to Third Wave Knowledge Warfare from Second Wave maneuver warfare, future doctrine must take into account the criticality of information as a key element of combat power and must address the concept of information dominance. To do so I propose that the doctrine of Knowledge Warfare will be executed through the operational concepts of Information Warfare, Precision Strike, and Decisive Maneuver. As does the current doctrine, future doctrine must provide the framework for full-dimensional operations in order to ensure that the National Command Authority has the full range of options available to implement national strategy.

Key to Information Warfare are the ideas that information is an element of combat power and that information dominance will allow the use of less physical resources in many cases. Information Warfare means maintaining an information and communications system that interconnects all friendly forces within the battlespace and disrupting if not destroying the information and communications systems on which an enemy relies in order to know itself. It means knowing everything possible about an enemy while preventing the enemy from knowing much about yourself. It also means knowing everything possible about yourself and your forces while preventing the enemy from knowing much about himself.

Information Warfare is a new battlespace in which the commander must force the enemy to do something he otherwise

would not do. Information Warfare will be waged in peace, conflict, and war and will involve the acquisition, enhancement, dissemination, and protection of all forms of information--military, economic, social, political, technological, etc. It will be waged on financial institutions, world markets, and telecommunications networks. If done successfully, Information Warfare may deter combat or war by reducing an opponent's will to fight or by convincing an opponent that the price of conflict is too expensive. When ground combat is necessary, Information Warfare will allow the commander and his forces to share a common view of battlespace and will prevent the opponent from knowing anything other than what we desire.

Precision Strike is the result of wide-area multi-spectral sensor systems linked to smart weapons systems and brilliant munitions. Precision Strike will allow the commander to attack enemy battlefield systems at will, through either lethal or non-lethal means. The capability to execute Precision Strike from either the United States, forward bases, or the area of operations will provide the commander great flexibility and will result in disengaged combat being preferred over direct combat.

When direct combat is necessary to defeat the enemy force or to control enemy territory or population, the commander will use Decisive Maneuver. Decisive Maneuver is the movement of overwhelming military force to the decisive point in time

and space against the enemy's center of gravity so that the engagement or threat of engagement forces the enemy beyond his culminating point. Overwhelming force is relational and is the right size, type, and combat power that will ensure the catastrophic defeat of the enemy. It could range from a small special operations direct action team capturing the enemy's senior leadership inner circle to a joint combined arms task force attacking enemy second echelon forces, but in every instance Decisive Maneuver will apply that force with great certainty and precision because of a common view of battlespace.

Knowledge Warfare will provide for the simultaneous and multidimensional application of all the elements of combat power through the concentration of joint and combined arms effects as opposed to the actual massing of forces. These effects, lethal and nonlethal, will be directed toward the precision attack of critical information nodes, key strategic assets, and enemy fighting systems. Knowledge Warfare operations will be deliberately designed to control--regulate, accelerate, or moderate--battlefield events, pace, and tempo to achieve decisive victory at the least cost. Operations will occur throughout the operational width, depth, and height of a given battlespace using a wide variety of means--surface, space, sea, air, electronic, psychological, and special operations and will appear as one seamless, fully

synchronized, and multifaceted strike involving all elements of American military power.[12]

[12]Department of the Army, Training and Doctrine Command, *Future Full-Dimensional Operations: A Concept for the Evolution of Full-Dimensional Operations for the Strategic Army of the Early Twenty-First Century* (Fort Monroe, VA: 25 February 1994), 3-30.

CHAPTER IV

TECHNOLOGY AND MODERNIZATION

The United States is today the unquestioned world leader in military technology. The Gulf War clearly demonstrated that American forces had a decisive edge in combined arms combat power that came not just from advanced technology but from the ability to imbed that technology in a style of warfare that could not be matched by the Iraqi armed forces and cannot be matched by a potential enemy today. Foreign observers highlighted American capabilities in mobility, sustainability, intelligence, command and control countermeasures, communications, and the capacity to conduct joint operations and a combined arms campaign that define us as the only global military power.[13]

Advances in information technologies and smart weapons systems are the foundation for the current Revolution in Military Affairs, and, as discussed earlier, the Department of Defense has created the RMA Task Force to explore and direct the potential for exploiting those and other emerging technologies. By the year 2010, it is likely that there will be revolutionary improvements, i.e., several orders of magnitude, in technologies that impact on warfighting

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[13]Patrick J. Garrity, *Why the Gulf War Still Matters: Foreign Perspectives on the War and the Future of International Security* (Los Alamos, NM: Los Alamos National Laboratory, Center for National Security Studies, July 1993), 6.

capabilities. Several of these are under development now and include long-range, wide-area surveillance; high-speed information processing; precision target acquisition; brilliant munitions; new families of explosives and propellants; stealth/low observability; advanced robotics; digitization of the battlefield; and genetic engineering and biotechnologies.

The Army has a methodology in place now to develop those required new technologies and to transform them into fielded weapons systems for execution of Knowledge Warfare doctrine. That methodology is detailed in the *Army Modernization Plan*, the *Army Enterprise Strategy*, and the *Army Science and Technology Master Plan*. For the most part the Army's strategy, which is defined in the *Army Modernization Plan*, is the correct one to modernize and equip a smaller future Army with highly technical systems. Those systems must enable the Army to maintain a decisive edge in winning the information war, projecting and sustaining the force, protecting the force, conducting precision strikes throughout the extended battlespace, and conducting dominating maneuver.[14]

From the Knowledge Warfare perspective, the *Army Enterprise Strategy* is the most important of the three modernization documents because it describes what the Army must do to win the information war. A key concept is the

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[14]Lieutenant General William H. Forster, "Modernization Is the Key to Readiness," *Army*, October 1993, 102.

acquisition strategy of horizontal technology insertion, whereby common technology will be integrated into different systems to enable them to fight together effectively as a force.[15]

The *Army Enterprise Strategy* focuses on identifying, supplying, and implementing information and other command, control, communications, and computer technologies needed to support the Army through ten principles.

(1) Focus on the Warfighter: Provide systems to meet validated needs.

(2) Ensure Joint Interoperability: Provide C4I systems that interoperate in joint and combined operations.

(3) Capitalize on Space-Based Assets: Provide assured access to mission-essential military and commercial space-based systems that support the Army across the entire operational spectrum.

(4) Digitize the Battlefield: Provide an integrated digital information network that supports warfighting systems and assures command and control decision cycle superiority.

(5) Modernize Power Projection Platforms: Provide a modern power projection platform to support peacetime operations, training, mobilization, force projection, split-base operations, and redeployment.

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[15]Department of the Army, *Army Enterprise Strategy* (Washington, DC: 20 July 1993), 8-10.

(6) Optimize the Information Technology Environment: Provide more efficient information support for combat and peacetime operations.

(7) Implement Multi-Level Security: Provide the ability to access and exchange information at needed levels of classification using a single C4I system.

(8) Ensure Spectrum Supremacy: Provide electromagnetic spectrum supremacy in order to maximize the benefits of maneuver and tempo in conjunction with firepower.

(9) Acquire Integrated Systems Using Commercial Technology: Provide synchronized C4I capabilities that leverage commercial technology.

(10) Exploit Modeling and Simulation: Provide cost effective training, testing, and rapid prototyping through state-of-the-art modeling and simulation.

The *Army Enterprise Strategy* provides a strategy for the Army to exploit current and future information technologies required to implement Knowledge Warfare doctrine. The capabilities discussed in the strategy will enable the Army to fight smarter, to do more with less. It is essential that senior leadership maintains its emphasis on the exploitation of information technologies and continues to give this area priority for resources if the Army in 2010 is to be fully capable of executing Knowledge Warfare doctrine.

The *Army Scientific and Technical Master Plan* defines the strategy and funded program to provide the technological

capability for the future Army. With the current acquisition cycle of twelve to fifteen years, the technology and systems in the current plan will for the most part be available for the Army in 2010 to use for Knowledge Warfare, provided that acquisition programs are executed wisely and in consonance with doctrinal requirements. The framework which guides the Army's technology investment is the Department of Defense S&T Thrusts.[16]

S&T Thrust 1 is Global Surveillance and Communications, which will develop the global, seamless exchange of information required for extensive, shared knowledge and a common view of the battlefield.

S&T Thrust 2 is Precision Strike, which will develop integrated multi-service capabilities for locating, identifying, targeting, and neutralizing time-sensitive and important military ground targets. These capabilities must be executed in adverse weather, day or night, with extremely high accuracy and minimal collateral damage, in a responsive manner which supports the commander's operational needs.

S&T Thrust 3 is Air Superiority and Defense, which will develop improved and new capabilities to defend against and engage tactical ballistic missiles and stealthy manned and unmanned aircraft, cruise missiles, and helicopters.

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[16]Department of the Army, *Army Science and Technology Master Plan* (Washington, DC, November 1993), II-11 - II-20.

S&T Thrust 4 is Sea Control and Undersea Superiority, which will develop capabilities to defend against advanced, stealthy, nuclear and non-nuclear submarines and undersea mine warfare threats in the open ocean and in coastal and regional areas of the world. There are no current Army programs in support of this thrust.

S&T Thrust 5 is Advanced Land Combat, which will develop more deployable and capable ground systems designed to operate in a joint, combined arms environment. This thrust will provide new capabilities for both vehicles and the individual soldier by focusing on computers, software, signal processing, sensors, communications networking, electronic devices, advanced materials, artificial intelligence, and simulation. Land forces will use signature reduction technologies to reduce the chances of being detected or targeted by the enemy and new survivability techniques using integrated suites of sensors and countermeasures to reduce the chances of being hit.

Land forces will be able to see and identify enemy targets at extended ranges and to engage them with precision, non-line-of-sight weapons systems and will minimize fratricide through increased situational awareness. Ground systems will have superior combat capabilities at weights and sizes that enhance deployability and sustainability, and crew size reductions through increased automation will add to deployability and sustainability. Individual, dismounted

soldiers will be better integrated into the force, with the ability to see and understand the battlefield, report tactical information, and bring appropriate weapons to bear quickly. Land forces will have a countermine capability which allows them to detect and neutralize the widespread and increasingly sophisticated mine threat.

S&T Thrust 6 is Synthetic Environments, which will use very realistic, internetted simulations to create virtual environments of increasing size, complexity, and utility and the mechanisms for forces to enter those environments. Synthetic environments will cause fundamental changes in training and operations, especially in politically and environmentally sensitive areas, and have the potential to reduce costs in functions ranging from training to systems acquisition to actual operations.

S&T Thrust 7 is Technology for Affordability, which will use advances in integrated design and development, manufacturing processes, and sustainment to reduce unit and life cycle costs of future weapons systems. Key areas include advanced manufacturing systems, integrated product and process design tools, advanced process control technology, application of emerging technology into existing manufacturing processes, and enhancement of logistics support processes. This thrust has the potential to produce low cost, high quality, and rapid response weapons systems through the use of flexible and agile multi-use manufacturing systems to implement the Third Wave

concept of mass customization instead of the Second Wave concept of mass production.

The Army has in place a well-defined plan coupled with an adaptable acquisition process to exploit the technologies required to execute Knowledge Warfare doctrine. Enhanced weapons systems incorporating those technologies will be available for the future Army provided that senior leadership continues to emphasize developing revolutionary long-term potential over procuring incrementally improved short-term capabilities, a difficult task in light of constantly increasing current missions with reduced resources to support those missions.

As a cautionary note regarding the impact of new technologies on military capabilities, it is possible that potential enemies could develop pieces of the Revolution in Military Affairs of their own given the availability of many of these technologies for purchase through commercial and military sources by anyone with the resources. While it is not likely that any potential enemy could develop or purchase the full array of capabilities which the United States already has or will probably achieve, there are individual technologies which could threaten our military superiority. For example, nuclear, chemical, and/or biological warheads mated with ballistic and cruise missiles and guided by Global Positioning System receivers to targets developed from commercial and military satellite reconnaissance imagery can

be purchased today. Such weapons systems can threaten not only American forces in a theater of operations but also potential allies and the continental U.S. itself.

CHAPTER V

FORCE STRUCTURE FOR KNOWLEDGE WARFARE

The future Army which will conduct Information Warfare, Precision Strike, and Decisive Maneuver under the doctrine of Knowledge Warfare will be smaller and have new and diverse missions and increased capabilities due to technological advances. Because structure is so intimately bound up with strategy, lasting changes caused by the Revolution in Military Affairs will necessitate major organizational change. General Sullivan, the Army Chief of Staff, has begun that change process to create a new force for a new doctrine, a force that he calls Force XXI. The goal of Force XXI is to create new formations for a new wave of warfare, not just to overlay more computer networks over today's Army.[17]

General Sullivan's vision is key to the Army's taking full advantage of the Revolution in Military Affairs. It is critical that senior officers and civilian leadership support that vision in order to survive the extreme turmoil which will be generated by making major organizational changes. It is in the area of organizational change that the potential of the RMA is at most risk to be achieved.

There are several key trends in doctrinal and technological changes of the RMA which combine to produce the

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[17]General Gordon R. Sullivan, "A New Force for a New Century," *Army*, May 1994, 26.

Army of Force XXI which will be smaller, rapidly deployable, highly survivable, lethal, agile, mobile, modular in design, and equipped to respond to the full range of military operations. These are invisibility and detectibilty, lethality and dispersion, volume and precision of fire, integration, and mass and effects.[18]

Information technology will continue to expand the commander's detection range and improve the resolution of the information gathered and will provide more accurate and timely dissemination of that information to the proper echelon, greatly expanding the battlespace of committed forces. At the same time electronic and physical deception means will contribute to invisibility of forces. The battlefield will become more transparent to the commander and more opaque to his opponent.

Detectibility and smart weapons have already greatly increased lethality on the battlefield. New types of weapons systems and munitions will continue that trend by increasing the volume and precision of fires on the future battlefield, allowing combat forces to apply overwhelming firepower within their battlespace. As lethality at even greater ranges increases, increased dispersion of units and individuals will be necessary to increase survivability. Land forces will become more mobile, creating the requirement to communicate on

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[18]Sullivan and Lieutenant Colonel James M. Dubik, *Land Warfare in the 21st Century* (Carlisle Barracks, PA: U.S. Army War College, Strategic Studies Institute, February 1993), 12.

the move over greater distances, to maneuver more quickly, and to use fires from all the Services that are dispersed over greater distances.

The commander will need to make decisions quickly, his staff will need to synchronize the movements of those dispersed units, and subordinate leaders will need to make independent decisions within the commander's intent. Integration of forces through digitization of the battlefield will provide those capabilities as well as significant challenges. Integration will provide situational awareness and a common view of the battlefield and will enable the commander to rapidly mass combat power to achieve decisive results. Integration will provide the opportunity to flatten hierarchical command structures and increase agility and flexibility throughout the organization. At the same time integration will increase the capability for centralized decision making and tighter control of execution, and the challenge for the commander will be to continue to emphasize decentralized decision making and initiative at lower levels.

These trends reinforce the requirement for smaller combined arms units which are capable of massing effects to achieve decisive battlefield results. Smaller units which can concentrate the effects of all elements of combat power are more deployable, sustainable, and survivable and give the commander greater flexibility and agility.

The current Army force structure is a product of the World War II-era paradigm of maneuver warfare, optimized to defeat the heavy combined arms forces of the Soviet threat. While that force was able to achieve decisive victory in the Gulf War, several deficiencies were exposed to observation by potential allies and enemies. The critical deficiency, particularly for a force projection Army, was the amount of time it took to deploy sufficient combat power to the theater of operations. Once deployed, Army forces required a large logistics effort for sustainment, much of which required reserve force mobilization and deployment to attain even basic capabilities. Although the intelligence system contributed much to overall success, it was not structured or resourced to provide timely comprehensive support to echelons lower than corps, and at the start of the war, much of the eventual structure existed only in concept, if at all.[19]

The future Army will be built around brigades of approximately 4,000-5,000 soldiers capable of operating independently or in a joint or combined environment.[20] In keeping with Knowledge Warfare doctrine, these brigades will be organized around the functional areas of Information Warfare, Precision Strike, and Decisive Maneuver. All vehicles will be digitally interconnected to automatically

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[19]Garrity, 54-55.

[20]General (Retired) Donn A. Starry, telephone interview by author, 26 March 1994, Fairfax Station, VA.

share friendly and enemy information and will use low-observable design and multi-spectral deception operations, i.e., information-based protection, to enhance new types of physical protection systems. Each brigade will have distributed air defense capabilities. Each will employ a self-contained logistics concept, which in combination with its greater ratio of combat power to size as compared to the current division, will provide for a much more rapid and robust build-up of combat power than what was achievable in Operations DESERT SHIELD/STORM.

The Information Warfare Brigade will change from today's intelligence brigade in that it will incorporate deception and electronic warfare capabilities and precision strike assets in addition to collection and analysis capabilities. The brigade will be connected to the network of space-based and fixed station collection and analysis systems and will supplement that coverage with organic long-range, long-endurance unmanned aerial vehicle systems and human intelligence assets.

The Precision Strike Brigade will be the primary ground-based killing force based on desirability of disengaged combat over close combat. It will consist of an attack helicopter regiment, a surface-to-surface missile/rocket regiment capable of firing brilliant anti-armor, anti-personnel, and mobile mine munitions, and an information warfare regiment specializing in targeting, battle damage assessment, and electronic warfare.

The Decisive Maneuver Brigade will be the principal ground close combat force. The Army will require both heavy and light maneuver brigades in its force structure to give it the flexibility to operate in all terrain and in all levels of conflict. The heavy maneuver brigade will be similar to today's armored cavalry regiment and will consist of a maneuver regiment composed of ground combat vehicles much lighter than today's M1 and M2/M3 and attack and scout helicopters. The light maneuver brigade will consist of a maneuver regiment composed of light wheeled and tracked ground combat vehicles and attack, utility, and scout helicopters. A precision strike regiment and an information warfare battalion will be organic to the maneuver brigades to provide the capability to fully execute all the operational concepts of Knowledge Warfare.

If divisions are desired in the force structure, they will be primarily command and control elements and have the responsibility to conduct sustained logistics operations over and above what the three types of brigades are capable of performing. Information technologies will enable a division headquarters to perform the command and control functions that today are done at corps, field army, and joint task force levels and will result in a division headquarters becoming an effective operational echelon headquarters.

Special operations forces will continue to be required in the future Army and may play an even greater role than they do

today. Particularly in those situations where Information Warfare operations can be conducted to achieve victory prior to the need for Precision Strike or Decisive Maneuver operations, the capability of special operations forces to collect information, to conduct psychological warfare operations, and to train indigenous forces will significantly enhance Information Warfare operations.

Through the use of synthetic environments and virtual reality, units from all Services will be able to be brought together into virtual organizations for training and for actual operations. It will be possible to integrate specialists from Army schools and support organizations into these virtual organizations to provide a highly customized and tailored unit for a specific operation, thereby reducing some of the infrastructure required to support today's Second Wave forces.[21] Additionally organizational design must maximize the use of technologies that will allow functions to be performed from home stations or from remote stationary locations. This will reduce deployability requirements, provide for continuity of operations, and reduce personnel requirements.

Regardless of the actual force structure of the future Army, conduct of Knowledge Warfare operations will demand the same high-quality soldiers, noncommissioned officers, and

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[21]Shoffner, interview.

officers of today's Army.[22] Sophisticated weapons systems operating at high tempo in extended battlespace will require a greater leader-to-led ratio than do current systems. Soldiers and their leaders will participate in continual professional development and education to maintain necessary technical and tactical proficiency. Simulations and synthetic environments will be used to provide virtual battlefields on which to conduct realistic training and to prepare for operations other than war and for combat.

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[22]Frederick J. Brown, *The U.S. Army in Transition II: Landpower in the Information Age* (New York: Brassey's Inc., 1993), 107-124.

CHAPTER VI

CONCLUSIONS

The Revolution in Military Affairs holds the potential to change the way the Army of the early twenty-first century executes its mission to protect and defend the Constitution of the United States. While technological change will continue to occur at an ever increasing pace and while world events will unfold in ways over which we have little control, the Army must stand true to that standard.

Emerging technologies are key to future military capabilities, but they must be integrated into an appropriate force structure which has been designed according to the framework of a viable doctrine. Without a coherent doctrine as the *sine qua non*, the Army will not be able to achieve the full potential of the current RMA. The Army has traditionally placed great faith in its doctrinal underpinnings and has developed a robust methodology to ensure that its doctrine is applicable to the current environment. What is needed now is for the Army to accelerate the process of developing its future doctrine in some specificity to guide the technology and force development efforts. In this respect we may gain valuable insights from the interwar period, when the Army and the Navy both successfully exploited the potential of a previous RMA.

As the Army transforms maneuver warfare doctrine to Knowledge Warfare doctrine, it will be critical to use technology to assist in that process. Through the use of simulations and synthetic environments it is possible to test operational concepts to ensure that they are feasible and executable. In the same manner technology can assist in the force development process by providing a virtual battlefield on which new types of forces can operate against a variety of threats under widely differing environmental conditions.

The stage has been set for another Revolution in Military Affairs, and the Army for the most part has begun to take the right steps in doctrine development, technology acquisition and integration, and force development to turn its potential into actual combat power. A major challenge will be to remain focused on the long-term goals associated with a new style of warfare and to develop innovative approaches to achieving those goals. It is in that way that the Army will be prepared to respond to uncertain threats with forces as good and as survivable as they can be.

Although the Army is moving in the right direction to take advantage of the RMA, it is essential that the other Services and the Department of Defense follow suit. Future conflicts and operations will require joint and combined ground, air, sea, and space power just as do today's. It will be necessary to have a coherent joint doctrine for Knowledge Warfare to harmonize and integrate all Service

capabilities into a seamless, multi-dimensional application of force to ensure that the United States does retain its qualitative edge in military power and does remain the world's superpower in all areas in the twenty-first century.

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