WAR IN THE INFORMATION AGE

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PREFACE

We are beginning to realize the emergence of a new age--the information age. On the one hand, the full dimensions of this new age, if indeed it is such, are unknown. On the other hand, the authors argue that enough is known to conclude that the conduct of war in the future will be profoundly different. Paradoxically, however, they claim that the nature of war will remain basically the same. In this monograph, General Sullivan and Colonel Dubik examine that paradox and draw some inferences from it.

When societies and states changed from an agrarian base to an industrial base, the way they made war also changed. Industrial nations furnished their armies with tools very different from those produced by agrarian nations: the machine gun, steam and petroleum powered engines, the railroad, telegraph, radios, aircraft, and much more. Furthermore, industrial armies changed in organization. Their leadership requirements were different and they developed new operational concepts.

The nature of war, however, did not change. In spite of the "new" industrial technology, war remained a human endeavor and very much as Carl von Clausewitz described it in the early 18th century; subject to emotion and characterized by death and destruction. Human fears, bravery, sacrifice and courage operated within the realm of fog, friction and uncertainty. Great captains were masters of both the science and art of war.

The root causes of war also stayed the same. People, whether heads of states or leaders of other kinds of groups, still started wars as a result of fear, hatred, greed, ambition, revenge or a host of other "nonrational" considerations.

The authors of this study suggest that today we stand at what many consider the threshold of the information age, an age that has already begun to transform the conduct of warfare just as the industrial age did earlier. New weapons systems, organizations, and operational concepts will emerge, just as they did in response to industrialism. No one knows the full details of what the information age will bring, but the authors demonstrate that the future is sufficiently clear to move the Army in the right direction. Also clear is the fact that Clausewitz is still relevant to the study of war because while the conduct of war will change, the nature of war will be the same.

This monograph explains the governing concepts of the industrial age and how they affected the concept of war. Then it describes the concepts emerging to govern the information age and suggests ways in which these concepts may affect the conduct of war. Finally, the monograph discusses those steps that the Army is taking to position itself to exploit what are becoming the dominant military requirements of the information age: speed and

precision.

Specifically, the authors discuss the ways in which the Army has changed its strategic systems over the past several years so that the Army operational and tactical forces will be able to "see" a situation, decide, adapt, and act faster and more precisely than their opponent. These changes will give strategic planners, and operational and tactical commanders, a new set of information age tools to use in theater and on the battlefield. The net result: more flexibility, more versatility, faster decision making, and broader scope of weapons systems at their immediate disposal.

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BIOGRAPHICAL SKETCHES OF THE AUTHORS

GENERAL GORDON R. SULLIVAN, Chief of Staff, United States Army, was commissioned a second lieutenant of Armor and awarded a Bachelor of Arts degree in History from Norwich University in 1959. He holds a Master of Arts degree in Political Science from the University of New Hampshire. His military schooling includes the Armor School, the Command and General Staff College, and the Army War College. He has served in a variety of command and staff positions including four years in joint and allied assignments. His overseas assignments include four tours in Europe, two in Vietnam and one in Korea. General Sullivan also served in assignments on the Army Staff in Washington, DC, including a tour as the Deputy Chief of Staff for Operations and Plans and as the Vice Chief of Staff of the Army. General Sullivan has commanded at platoon through division level. In United States Army, Europe he commanded the 4th Battalion, 73d Armor and the 1st Brigade, 3d Armored Division, followed by an assignment as 3d Armored Division's Chief of Staff and the VII Corps Operations Officer (G-3). Subsequently, he served as the Assistant Commandant of the Armor School at Fort Knox, Kentucky, on the NATO staff as the Deputy Chief of Staff for Support of Central Army Group in Germany, and as the Deputy Commandant of the Command and General Staff College at Fort Leavenworth, Kansas. He also served as Commanding General of the 1st Infantry Division at Fort Riley, Kansas. In June 1991, General Sullivan became Chief of Staff of the United States Army. He also serves as a member of the Joint Chiefs of Staff.

COLONEL JAMES M. DUBIK currently serves on the personal staff of the Army Chief of Staff. A former philosophy instructor at the Military Academy, he earned a Bachelor's degree from Gannon University and a Master's degree from Johns Hopkins University. He also holds a Master of Military Arts and Science Degree in Theater Operations from the School of Advanced Military Studies. He has written extensively in military and civilian journals. Colonel Dubik's operational assignments have included service with the 82d Airborne Division, 1st Ranger Battalion, and 2d Ranger Battalion. He also commanded the 5th Battalion, 14th Infantry in the 25th Infantry Division, and will assume command of the 2d Brigade, 10th Mountain Division, in July 1994.

WAR IN THE INFORMATION AGE

The developed world may well be at a watershed between the eclipse of the industrial age and the start of the information age.[1] This transformation will affect every aspect of human life, just as the advent of the industrial age influenced many parts of Europe and North America nearly two centuries ago. Almost imperceptible at first, the transformation began in many industrialized countries almost two decades ago.[2] The United States is well into the information age, and the Army is changing to accommodate this new epoch. America's Army must meet the challenge to change itself from an industrial age army of the cold war into an information age, power projection instrument.

The future, of course, is not entirely clear. But "the one thing we can be sure of," says Peter Drucker, "is that the world that will emerge from the present rearrangement of values, beliefs, social and economic structures, of political concepts and systems, indeed, of world views, will be different from anything anyone today imagines."[3] Equally certain is this: the U.S. Army will jeopardize its position as the world's best army if it is satisfied with maintaining the status quo or caters to internal institutional prerogatives. Thus, despite not knowing the full details, the future is sufficiently clear to move the Army in the right direction.

To provide historical context, this monograph will first survey the last great socioeconomic transformation, that from the agrarian to the industrial age and its effect on military forces. Then it will discuss the new age--the information age--and the kind of army it may shape.

The Industrial Age.

From the late 18th through the end of the 19th and into the 20th century, the Industrial Age changed almost every aspect of life in Western Europe, the United States, and parts of Asia.[4] In Europe, where it began, economies regulated by guilds and home industries turned to capital investment as free enterprise developed. By the 20th century, inventions and machines proliferated. Large farms, using machinery, chemistry, and mechanical power replaced small, family-tilled plots. Faster communication and transport systems, the rise of the middle class and urban centers, increased productivity and purchasing power, and the importance of secular and scientific explanations of reality accelerated industrialization. Nations which flourished during industrialization and then colonized or conquered other nations and peoples to serve as markets and a source of raw materials altered the world map. Societal mores changed. Individuals questioned "right" and "good," and tested the limits of permissible thoughts and behavior. New theories on everything from human rights to the very tenets of how mankind appeared abounded.[5] Industrialism "rent the fabric of society, then rewove

it in an entirely different pattern. The structures of everyday life changed forever; and with them the nature of families, governments, cities, and farms, language, art, even our sense of time."[6] Even family structure changed from a norm of extended units to that of nuclear families.[7]

Standardization, specialization, professionalization, synchronization, concentration, maximization, and centralization characterized the industrial age. These principles gave us the kind of social, political, economic, and military world into which all of us were born and in which we all matured. Applied, these traits resulted in the mass production, mass consumption, mass education, mass government, big bureaucracies, "scientific" management, and corporate leadership with which we are all familiar.[8]

As the industrial age developed and matured, the U.S. Army refined and applied these principles. Over the decades, particularly after the Second World War, they became the framework within which the Army conceived its ideas and solved its problems. Distinct industrial age "governing concepts" emerged, concepts consisting of at least three major elements.

The Machine as Model. Machines are mechanical systems. They consist of standardized, interchangeable parts, each with a single, special function. The parts fit together into a synchronized whole. When the machine is turned on, it works automatically, grinding out its products efficiently. Using this model, management simplified work to the point where labor performed repetitive tasks and productive workers often performed only one task. Efficiency became synonymous with effectiveness. Work became rote, management rigid.[9] Machine-like organizations--corporate, political, social, as well as military--often created ponderous bureaucracies composed of standardized, interchangeable parts (people), each with a specific function or specialty that, when put together in departments would automatically grind out its product (integration and control) using an approach eventually dubbed "systems analysis."[10]

Paced, Sequential, Continuous, Long-Run Production. Machines run at a preset, regular, "conveyor-belt" pace. If one increases or decreases the pace beyond the machine's set parameters, one risks breaking the machine or producing imperfect goods. Most of the machines of the industrial age, and the organizations modeled after them worked in sequence. Henry Ford's famous assembly line became the model not only for manufacturing but also for government, business, and most other organizations. Business processes were sequential. Concept development, design, production, marketing, and sales followed sequentially with a centralized decision-making apparatus monitoring and approving movement through various departments. Retooling any manufacturing line to produce a different product was a major operation which sometimes entailed closing down parts, if not all, of a plant for weeks or months.

Mass Output. Perhaps the most recognizable characteristic of the industrial age was mass: mass production, mass media, mass markets, mass advertising, mass communication, mass education, mass distribution and mass movements of all kinds.[11] Products of the industrial age--whether corporate, political, economic, social-welfare or military--required and demanded uniformity. Some changes resulted from debate; other changes followed conflict; still others, war.

These governing concepts provided the context within which Western social, political, economic and cultural life evolved. Indeed, within each "industrialized" nation, a new political architecture emerged. The transition to the industrial age, however, was not without turmoil.

Industrialism also changed the way military forces were organized, as well as how they fought. Industrialized nations could furnish their militaries with "tools" very different from those that an agrarian nation could provide. In most industrialized countries, the armed forces developed operational concepts to accommodate a more mechanistic way of war. Just as industrialism altered social, political, and economic aspects of life, it also changed the conduct of warfare.[12]

In Europe, during the 18th century, the "strategy of a single point was the dominant military paradigm." Even though the industrial age was in its infancy, Napoleon Bonaparte's decisive battle epitomized this paradigm.[13]

Decisive victory during the industrial age, required the destruction of the enemy's army as well as his war-making capability and resources: infrastructure, manufacturing base, and raw materials. No army could achieve these expanded objectives in one decisive battle. Thus, over time, distributive campaigns became the new way of making war.

Commanders of these kinds of armies needed a different set of skills than their predecessors used. Just as the industrial age fostered a managerial elite in business, the military underwent a managerial revolution. Specialization took effect and a staff system evolved to supplant the old leadership based upon the feudal, landed aristocracy. Service in the military had become a profession.[14] In the industrialized nations, beginning in Prussia, military education systems emerged to ensure that officers had the conceptual, technical, and organizational skills necessary to synchronize the efforts of the disparate parts of their military machines.[15]

Mixed in with the development of a new set of conceptual, technical, and organizational skills came an explosion of technical innovations: the rifled musket, the repeating rifle, and the machine gun, steam and then gasoline powered engines, breach loaded artillery, the railroad, the telegraph, and heavier

than air flying machines. All affected the conduct of warfare. Other innovations, like administrative and accounting procedures, preprinted forms, maps, the technical means to coordinate large numbers, accurate portable clocks, the telescope, and many other nonmilitary inventions, proved to have substantial military applications. The fighting front and the supportive rear were united first by rail and ship and then by air. This unification of front and rear allowed for the continuous flow of personnel, units and supplies. Thus, large and geographically separated formations, under the control of ever-larger staffs, could act as one unified force in what was often a war of attrition.[16] The ultimate result: war, conducted and sustained over years, first in the multiple theaters of global combat, and then in a half-century global "cold" war.

Simply put, industrial armies differed from their agrarian predecessors. Industrial age military objectives were distributed between enemy forces, infrastructure, manufacturing base, and resources. Thus, industrial armies had to be raised, equipped, trained, educated, and organized to conduct sequential, distributed operations throughout the depth of a theater, or multiple theaters, and sustain such activities over time. Industrial armies were characterized by continuous logistics and mobilization, from rear to front and back; centralized communications; an enlarged, bureaucratically organized staff; and large, durable formations.

The First and Second World Wars epitomized industrialism's governing concept as the major powers in each war became "war machines" capable of continuous, long-run production and mass output of arms, soldiers, units, and equipment. Historian Forrest Pogue describes the plan for victory in World War II as one in which the United States would "create air superiority, strengthen naval forces, create industrial production sufficient to arm the defenders of the Western Hemisphere, outfit task forces for operations in the Atlantic and in the European Theaters, and furnish weapons and supplies for friendly powers wherever they might be."[17] Appropriate for its time, the World War II model included an industrial base and training base; long runs of mass produced equipment, people, and units that were distributed from the base to the front, and returned to the base if need be; and sequential campaigns and operations. World War II was an attritional war in which Allied forces attempted not only to destroy Axis armies but also to destroy the war-making capabilities of Germany and Japan by attacking their resources and, when possible and through the use of air power, attacking their industrial war-making facilities. The World War II model reflected the governing concepts of the industrial age. Furthermore, this model for making war continued through the 1980s. It is how the U.S. Army, along with the other services, have been raised, equipped, deployed, trained, educated, sustained, resourced, and commanded for over 50 years.

The end of the cold war and the transition from the

industrial age to the information age has made this model obsolete. The information age has been colliding with the institutions of the industrial age for almost two decades. While the result will not be complete elimination of industrial age structures and institutions, over time the information age will dominate the industrial age just as the Industrial Revolution overtook agrarian Europe and America. This transformation will be as profound and, some scholars believe, as conflict ridden and violent as the shift from an agricultural society to an industrial society.[18]

In the current historical watershed, capital and wealth are again shifting, but this time the move is to knowledge.[19] Knowledge enhances the ability to use tangible items and processes to create wealth. In the information age, the path to wealth will be knowledge. Thus, Peter Drucker explains, every one of the assumptions upon which the economic theory of industrialism is based flies in the face of today's realities.[20] Indeed, many contend that the information age has arrived.

The "capital" of the information age is the organizational capacity achieved by less hierarchial "learning organizations." The ideas, skills, and abilities of well-educated workers and leaders also are primary economic assets; part of the capital of the information age.[21] The information age brings with it a host of new inventions: computer networks, internetworks, digital information, information technologies and architectures, and cellular communications; electronic fiscal transactions, information "highways"; shrinking factories and industrial work forces. Even as quality and productivity increase, new reliable energy generating, storing and transmitting technologies are transforming the work place. As the information age matures, other yet-to-be-conceived inventions will continue this transformation and accelerate its pace.

This transformation is not just an economic one. The information age, like the industrial age, will affect social, political, and corporate structures as well as most other public institutions and organizations.

In many nations the economic structure is changing to accommodate the information age. A new set of principles and new governing concepts are beginning to take shape.[22] The details remain partially obscured, but the outline is clear. The governing concepts of the information age are taking the following shape.

The Network as Model. A network is a nonmechanical system. "In the machine model...things can be taken apart...then put back together without significant loss."[23] A more holistic approach, one in which relationships among the parts gain in importance, is replacing the old model. Processes, not tasks, determine the ability to be effective and compete in the information age. Hierarchies will remain, but their efficacy will not. Rather,

information sharing networks will gain in prominence.[24] This will require

> a sophisticated information network that gathers
> precise and exhaustive data on markets and customers'
> needs combining it with the newest design methods and
> computer-integrated production process, and then
> operating this system with an integrated network that
> includes not only highly skilled employees of the
> company but also supplies, distributors, retailers, and
> even customers.[25]

Success will depend upon high quality, sophisticated workers and managers.

Workers in an information age corporation are not standardized, interchangeable parts with little to contribute other than their single, specialized function along an assembly line or in a bureaucracy. Rather, workers are becoming collaborators, communicators, and contributing members of the team in many successful corporations. In information age corporations, training and education are paramount along with worker longevity and loyalty. Quality is the key.

Middle management positions are disappearing as two of their main functions, information transfer and worker supervision, decline in importance. Computers "talking" to themselves by digital transfer of information and workers becoming more self-regulated make much of middle management obsolete. Staffs, as they have developed during the industrial age, are changing dramatically. Bureaucracies will not vanish, but spans of control will grow larger while organizations become flatter and "process action teams" play an increasingly important role.[26]

Decision making under these kinds of conditions will also change. Many decisions will be decentralized. Of those decision-making processes that remain centralized, most will be structured in a participative way; fewer decisions will be made by a single leader or manager. Successful corporations will become adaptive organizations, constantly learning and "self-renewing" in response to external realities, internal changes, and market considerations.[27] But, however decisions are made, successful corporations will have to speed through the decision cycle faster than their competitors. One of the most important advantages of the network over the machine is speed.

Near-Simultaneous, Continuous, Short-Run Production. The preset, regular, "conveyor-belt" pace of the machine age is over. Only fast-paced, adaptive organizations will succeed in this new era of competition. Today, competition comes not only from traditional adversaries in traditional sectors, but also from disintegrating barriers to previously insulated and protected markets. Few corporations can now predict from where their next "peer" competitor will come. Competition now arises unexpectedly,

from anywhere.[28]

To deal with this degree of uncertainty, information age corporations seek "to compress product development time, to shrink the interval between identification of the need for a new product and the beginning of its manufacture."[29] Again, the time between observed need, through decision, to action will get shorter and shorter. Thus, speed in identifying, then meeting new market needs grows in importance. The inflexible machines and bureaucratic processes of the industrial age justified their expense through mass, but the speed of an information age corporation will turn this industrial world inside out.

Information age corporations beat their competition by compressing time, expanding market share, and increasing productivity. They also try to eliminate the "assembly line mentality" while, simultaneously, trimming their bureaucracies. These are keys to success in the information age. The most basic and common feature of an information age business will be the absence of an assembly line attitude and the presence of many formerly distinct jobs and tasks integrated and compressed into one.[30]

Mass-Customized Products, Precisely Targeted, Near Instantaneous Distribution. Advertising and marketing were the tools to convince the customer to accept mass products. Low prices and sheer abundance helped make this acceptance complete. But what is becoming known as "*de*massification" is becoming *de rigueur*, with the niche market replacing the mass market.[31] Corporations must be able to make a product or provide a service in response to a particular customer's demand. Cost effective, mass-customized products and services are now available. Custom design, rapid delivery, a product or service adapted to the customer, not vice versa, are the hallmarks of business in the information age.[32]

Customers will be served, ultimately, by the products of information age machines. Production machines in the information age will be able to reset themselves, thus allowing continuous-flow, fully-customized production. Mass production will continue to have a place in history, albeit a small one. In the information age, profitability will not result from mass but from precision: precision first, in identifying the needs of a particular market segment; second, in developing and producing a product or service customized to that specific segment; and third, in delivering that product or service. The successful information age corporations will be those that do all of these things faster than their competitors. Constant innovation and speed will become two of the important ways to retain one's competitive advantage.[33]

As the information age matures, corporations will not simply spend money on new technology and then use it in old ways. They will not simply ask how they can do things faster and better.

These are actions that will have already been taken in the early stages of the information age.[34] The fundamental question will be, "Why do some things at all?" Success will come to corporations that can exploit the full potential of computer technology within new organizations, new attitudes toward workers and work processes, new ways of operating and new management concepts. That is, success will come to those who unlearn the rules of the industrial age and adopt the new practices of the information age the fastest.

Ultimately, the information age will surpass and then dominate the industrial age. The dominance, however, will not be absolute. Around the globe, vestiges of the industrial and agrarian ages will remain. While some parts of the world will become information-based, others will remain industrial- based, and still others will be agrarian. In some nations, all three ages may exist. The result will be at least a "tri-sected" world in which many changes run together in a world of increased complexity and uncertainty.[35] And in this very complex world, the concept of war will change fundamentally.

The Information Age and America's Army.

With respect to change, some like to compare today's Army to its cold war self. In the spring of 1990, the Army had nearly 6100 soldiers operating in 45 countries. Now it has 21,000 operating in over 70 countries. This represents a 300 percent increase in operational tempo. During the same period, the size of the Army was reduced by 25 percent--Active, Guard, and Reserve--from 2.0 to 1.5 million. The force structure has been cut from 5 corps to 4, 18 active divisions to 12, and 10 National Guard divisions to 8. Over 100,000 soldiers have returned to the United States from their bases overseas; and the budget was cut by about 40 percent. Further, about half of all base closings and personnel reductions accomplished so far by the armed forces have come from the cold war army. But the real story of America's Army is not how it compares to the past, but in how it is transforming for the future.

This transformation from a cold war Total Force to America's Army of the 21st century is, in a very real sense, growth. America's Army has a tradition as a power projection force going back to the Spanish American War; this is a tradition it must reenforce and continue so that it can be the kind of power projection force capable of establishing land force dominance quickly any place it is sent. The Army must grow into the information age, but this is not growth in the sense of increased size, rather it is developmental growth.

Such a transformation is not new to an Army which has reinvented itself before.[36] The Army leadership, understanding the enormity of the challenge, believes that intellectual change must lead physical change. From the early 1970s, intellectual debate

has been welcomed in the Army as a way of fostering a better understanding of the problems and challenges facing the nation and its military services.[37] From the very top down, Army leaders are preparing America's Army for the information age.[38]

War is, as it has been and will remain, the most complex of human undertakings. Warfare conducted by an information age army will be as distinct from warfare conducted by an industrial age army as that form of warfare was from war made by an agrarian age army.

To succeed against an industrial state generally requires the destruction not only of its army, but also of the military infrastructure, resources, and manufacturing base of the total war-making capability. Achieving victory against an information-based state will entail destroying that country's armed forces, as well as destroying its war-making capability (which may well include industrial and information-related targets) and its information system.

The above description, while generally correct, is incomplete because it addresses only wars conducted by the armies of one nation-state or group of nation-states fighting another. Nation-states, however, do not have a monopoly on war making. A variety of entities can use violence in the pursuit of specified goals. Throughout history, tribes, religious groups, and city-states bound by economic interests have made war. More recently, ideologically-motivated guerrilla groups often have achieved their goals through a combination of political and military initiatives. In the last 30 years, first, terrorist organizations and, then, some drug cartels have engaged in violence to achieve political purposes. While the variety of threats will stay basically the same during the information age, the available weaponry may increase in variety. Entities from an agrarian age army to a drug cartel can purchase information age weaponry and, thereby, blur the distinction between "war" and "operations other than war."[39] Military competitors may arise unexpectedly, and the conditions for victory may differ with each conflict.

In the world where agrarian, industrial and information age nations exist, threats from a great many different sources may confront the United States simultaneously. America's Army will engage in joint operations, sometimes as part of a coalition and sometimes alone. There will be interagency operations combining the armed forces with other government entities. Rules of engagement are likely to be precise, perhaps voluminous, and operations will take place under the watchful eye of a media that will be on the cutting edge of the information age. Furthermore, the public may have unreasonable expectations about casualties. America's Army will find itself engaged quickly with decreased time between the observed "crisis" and "troops on the ground" more the rule than the exception. Above all, each use of military force will be unique; the leaders of America's Army must truly be

masters of the art of war, not merely information age gurus or military "techno-wonks."

Information age "tools," to include speed and precision, are already a part of the battlefield. Only the highest quality soldiers, leaders, staffs, and organizations who understand the importance of speed and precision in information processing and applications will be able to succeed in this kind of environment. America's Army is developing the ability now to fight and win in the information age.

The kind of army that can use information age "tools" and succeed under a variety of these conditions differs from the mass production army of the industrial age. Already, successful information age businesses and corporations have dispensed with industrial practices and applied new principles and concepts to their organizations, processes and operations. The Army, too, has reached this conclusion. Certainly, the application in the military will be different from that in the corporate world; however, the information age paradigm will change army organizations, processes and operations. Furthermore, and more to the point, it will change the way wars are fought.

The utility of distributive campaigns that delivered decisive victory during the industrial age will fade. In the information age, armies will conduct operations resulting in the near-simultaneous paralysis and destruction of enemy forces, war-making capability, and information networks throughout the depth of a theater. Armies in the information age will develop a shared situational awareness resulting from having common, up-to-date, near-complete friendly and enemy information distributed among all elements of a task force. First, an information age army will be able to locate enemy forces quickly and precisely, whether those enemies are agrarian war lords, industrial armies, or an information age peer. Second, information age armies will know where their own forces are, much more accurately than before while denying that kind of information to their foes. Finally, information about enemy units and friendly formations will be distributed among all committed forces--land, sea, air, and space--to create a common perception of the battlefield. This shared situational awareness, coupled with the ability to conduct continuous operations, will allow information age armies to observe, decide, and act faster, more correctly and more precisely than their enemies. All the elements of the battlefield, armor, artillery, infantry, air platforms and command centers will be linked digitally in information age armies. Furthermore, in the future, warfare will be conducted jointly with the whole of any force being greater than the sum of its parts. Speed and precision are becoming the dominant military requirements.

Additionally, direct fire will be redefined in the information age. Armies will be able to shoot or move directly against enemy forces or specific targets even though they may be

tens of thousands of kilometers away.[40] Finally, all of these capabilities will be exercised under the watchful eye of an independent, global, and instantaneously transmitting media.

America's information age Army must be able to use these capabilities to defeat enemies whether they be from agrarian, industrial or informational nations. Therefore, it must be prepared to destroy or control armies--whether conventional armies of nation-states or those of feudal lords, religious groups, drug cartels, ethnic groups, crime syndicates, transnational corporations, or other entities that may emerge in the information age of the 21st century--as well as the infrastructure, production, base, and information grid--again whether in agrarian, industrial, or information societies. The military sector will come to reflect the variety of the information age social, economic, political, and private sectors. Because the threats will be so diverse, information age armies must be more flexible and versatile than those of the present. America's Army will be smaller but more capable, but only if it is equipped with modern technology, is well-trained and led, uses up-to-date doctrine, and has organizations that "fit" its technology and doctrine. The processes required to create and sustain America's Army in the information age will also differ from those required for the cold war U.S. Army. For example, force structures that can exploit and maximize speed and precision will replace those now in use; force allocation "rules," as well as personnel and equipment replacement factors, will change; and acquisition processes that can keep pace with technological innovation will replace current industrial age processes. Decision-making processes will also change. They will include a mix of artificial and human intelligence and become much less sequential and more simultaneous.

Many nations will approach the use of military force differently. In the United States, the hyper-diversity of conditions under which America will employ its information age army will require very close strategic and operational level coordination. This requirement is clear when nations conduct what has been traditionally recognized as war; that is, organized, properly sanctioned and directed violence to achieve a predetermined political objective. The requirement is less clear, but no less important, in operations other than war. The information age will not allow the luxury of this artificial distinction, however. Any use of America's Army in a situation in which one or more of the parties is using violence to compel others to do its will requires that the nation approaches the situation as "war" and very strong civil-military and interagency links must be forged.

Much will change in the way wars are conducted in the information age. Paradoxically, however, some elements of war will not change significantly. Even in the information age, war will remain a human endeavor, subject to emotion and characterized by the shedding of blood and the effects of chance.

Information age war will not be remote, bloodless, sterile or risk free--it will still be war. Death and destruction, traditionally the currency of war, will remain so in the information age. Despite all the technology of the information age, what Carl von Clausewitz described as the fog of war, uncertainty and ambiguity, may be intensified. That is why military leaders must be masters of the art of war in the traditional sense of understanding history and philosophy--the foundations upon which strategic thinking and the operational art are, and will always be, grounded.

Finally, the root causes of war remain constant. People, whether political leaders in the traditional sense, or heads of other organizations, will start wars as a result of fear, hatred, greed, ambition and revenge. People will fight when they believe that they can accomplish their objectives by resorting to force, or when they think that they have no other alternative, or when pride, principles, or religious convictions demand it. Although the conduct of war will be different in the information age, the nature of war will remain remarkably the same.

The information age is not yet fully upon us. Some of the ideas described above are abeyant. Others, however, are clearly visible and currently viable. Nevertheless, it may take another decade or two before the United States is fully into the information age.

But the time to anticipate the coming information age is now. America's Army is committed to change as it grows in understanding of the kind of organizations and processes that will be needed to fight to win in the information age. The challenge is to translate that commitment to change into reality.

Implications and Conclusions.

Although it may be tempting to do so, strategists must be careful not to idealize the information age. By the same token, military professionals, including military strategists, cannot afford to ignore the obstacles that stand in the way of transforming America's Army. It is an ambitious journey upon which the Army has embarked during this time of shrinking resources. The Army must balance its dollars among funding current operations; recruiting and retaining good people; financing training and leader development, and base operations; as well as developing those programs involved in moving into the information age. Below a certain floor, however, balancing becomes nonviable. The Army's leadership understands this challenge and knows that there are no "time outs" from training and preparedness. The Army must forecast as accurately as possible the military requirements for the information age, then make policy and program decisions that meet those requirements.

For the present, the task is to develop a menu of forces and

capabilities within America's Army, a menu that will provide today's and tomorrow's National Command Authority and the Commanders-in-Chief (CINCs) what they need. The digitized battlefield is happening now. The Army is in the process of upgrading its intelligence capabilities, as well as maneuver, fire support, sustainment, and command and control platforms, by use of advanced technologies that can gather, sort, and distribute information among themselves. The technological insertions and upgrades will allow our task forces to observe, decide, and act faster and more precisely than before. In the future, soldiers will be able to mass the effects of fire support or maneuver forces from dispersed locations and do so nearly simultaneously. Speed and precision, lethality and versatility-- these are the capabilities that the Army is building into its forces today. These are the capabilities that CINCs will find useful in a variety of conditions.

Doctrinal adaptation continues. The next edition of FM 100-5, *Operations*, will capture the variety of the information age, describe the flawed distinction between war and operations other than war, and flesh out the principles governing the conduct of warfare in the information age. Additionally, FM-101-5 will adjust the decision-making processes and describe staff functions, duties and relationships for a digitized force. Other doctrinal manuals will follow suit.

The Army's Force XXI initiative will study the organizations of battalions, brigades, divisions, and corps to determine how they may evolve to a size and composition that will provide the versatility needed to succeed on the variety of information age battlefields. That evolution will proceed as the Army finds the right mix of soldiers, leaders, skills, functions and equipment needed to employ information age technologies.

The organization of the institutional Army will also change. Throughout the industrial age, and culminating with the cold war, the Army created, then refined a set of policies, programs, procedures, and models upon which it based its personnel, mobilization, training, education, equipment sustainment, deployment, employment and command and control processes. The Army then built a set of organizations around these processes and created industrial style bureaucracies to run them. While appropriate for deterring war with the Soviet Union and preparing to fight the Soviet Army and Warsaw Pact forces along the Fulda Gap, these processes, and their accompanying organizations and bureaucracies, are rapidly becoming outmoded by the accelerating pace and variety of the information age.

Four basic forms of information will form the core upon which America's information age Army procedures and organizations will be built. First is *content information*, the simple inventory of information about the quantity, location, and types of items. Second is *form information*, the descriptions of the shape and composition of objects. Third is *behavior information*, three

dimensional simulation that will predict behavior of at least physical objects, ultimately being able to "wargame" courses of action. Finally, *action information* is the kind of information that allows operations to take the appropriate action quickly.[41] Leveraging these forms of information will allow army organizations to maintain quality and increase "productivity" and effectiveness, even while reducing in size.

New training strategies are also emerging. Hands-on, performance-oriented training will remain valid, useful, and essential. So will range firing and field exercises. Practicing under stressful, realistic, field conditions will never go out of style, nor should it. But more and more, a variety of simulations and other computer assisted programs will precede or follow hands-on and field practice. Simulations, often distributed, will form an essential part of the information age training strategy. Simulations will intensify individual leader and collective training. Soldiers, leaders and organizations can be "immersed" repetitively, and to increasing degrees of difficulty, in a variety of simulated scenarios.[42] If these scenarios are the appropriate ones, this immersion will provide preparatory, remedial, and reinforcement training; all excellent augmentations to the kind of hands-on, field training essential to producing a trained and ready army.

The weapons and materiel of the information age army will look almost the same as that of the late industrial age army. But, the tanks, infantry fighting vehicles, artillery pieces, rocket launchers, helicopters, command and control, engineer and logistical support vehicles and trucks will all be "smarter." They will derive their intelligence from computers and other advanced technologies. These systems will be linked to those of other services. The joint, digitally-integrated force that results will need supply, maintenance, and service systems different from those that supported the mass army of the industrial age. Ultimately, the Army will have to alter the rules by which combat, combat support, and combat service support are currently associated. Otherwise, a gap between operational potential and sustainment capability will develop. As the information age progresses, and inventions not yet conceived become reality, the Army must be ready for whatever will follow the current set of maneuver, fire support, logistics, and command vehicles.

Finally, leadership development programs must shift to accommodate the new conceptual, technical, and organizational skills required of information age officers and noncommissioned officers. Leaders of the information age Army must think differently than those of the industrial age. They will have more information made available to them over increasingly compressed spans of time. They will have to make decisions quicker and execute those decisions over greater distances and in decreasing time. They will have to orchestrate fire and maneuver under more diverse conditions while maintaining cohesion among more

dispersed units.

Success in the information age will go to those who have the courage to challenge themselves, who constantly innovate, and who learn to adapt as they go. Positioning America's Army today so that it will succeed in the information age is a historic task; one the Army has taken on. No one has a clear picture of the future; no single conception of what the information age will bring is entirely complete and correct. But the foregoing description, drawn from a number of diverse sources, is an accurate enough forecast for the purposes of action. One thing is known for sure; America's Army is marching toward the 21st century. The final objective may not be completely known, but the line of march is obvious.

ENDNOTES

1. Among the many books that discuss this topic are the following: James V. McGee and Laurence Prusak, *Managing Information Strategically*, New York: John Wiley & Sons, Inc., 1993; William H. Davidow and Michael S. Malone, *The Virtual Corporation*, New York: Harper Collins Publishers, 1992; Peter Drucker, *Post-Capitalist Society,* New York: Harper Collins, 1993 and *The New Realities,* New York: Harper & Row, 1989; Robert B. Reich, *The Work of Nations,* New York: Alfred A. Knopf, 1991; Michael Hammer and James Champy, *Reengineering the Corporation,* New York: Harper Business, 1993; Alvin Toffler, *The Third Wave,* New York: Bantam Books, 1980 and *Powershift,* New York: Bantam Books, 1990; Alvin and Heidi Toffler, *War and Anti-War,* New York: Little, Brown, and Company, 1993; John Naisbitt, *Megatrends*, New York: Warner Books, 1982; John Naisbitt and Patricia Aburdene, *Megatrends 2000*, New York: William Morrow and Company, Inc., 1990; and Don Tapscott and Art Caston, *Paradigm Shift: The New Promise of Information Technology*, New York: McGraw-Hill, Inc., 1993. Although he does not talk in terms of the information age, Hedrick Smith, in *The Power Game,* New York: Random House, 1988, describes the effects that information age technologies and attitudes are having on the way our government conducts business. This list is neither exhaustive nor authoritative. Rather it merely represents growing body of literature that describes the information age into which we are moving, and have been for a number of years.

2. McGee and Prusak, *Managing Information Strategically,* pp. 1-4; Naisbitt, *Megatrends*, pp. 1-33; Toffler, *The Third Wave*, pp. 139-141 and 186-204.

3. Drucker, *Post-Capitalist Society*, p. 5.

4. Toffler, *The Third Wave*, pp. 21-23.

5. Will and Ariel Durant, *Rouseau and Revolution*, New York: Simon and Schuster, 1967, pp. 680-683. Alasdair MacIntyre, *A Short History of Ethics*, New York: The MacMillan Company, 1966,

pp. 146-248. To understand the intellectual groundwork of the industrial revolution see: "Foundations of the Modern World View" in Richard Tarnas, *The Passion of the Western Mind,* New York: Ballantine Books, 1991, pp. 282-290.

     6. Toffler, *The Third Wave,* pp. 21-23.

     7. Davidow and Malone, *The Virtual Corporation*, p. 1.

     8. Toffler, *The Third Wave,* pp. 26-82. See also Drucker, *Post-Capitalist Society*, pp. 20-47, and Davidow and Malone, *The Virtual Corporation*, pp. 1, 11, 28, 73, 90, 162-167, 178, 239, and 244.

     9. Davidow and Malone, *The Virtual Corporation*, pp. 28, 162-167, and 244-245.

     10. *Ibid.*, pp. 166-167.

     11. Alvin and Heidi Toffler, *War and Anti-War*, p. 19.

     12. That different cultures have distinct ways to make war, even distinct concepts of what war is, is a major theme in John Keegan's *A History of Warfare*, New York: Alfred A. Knopf, 1993, see pp. 386-392 for a summary.

     13. James J. Schneider, "Vulcan's Anvil: The American Civil War and the Emergence of Operational Art," unpublished paper, School of Advanced Military Studies, Fort Leavenworth, Kansas, June 16, 1991, p. 1.

     14. Martin van Creveld, *Command in War*, Cambridge, Massachusetts: Harvard University Press, 1985, pp. 103-188, and van Creveld, *Technology and War*, New York: The Free Press, 1989, pp. 137-149; T.N. Dupuy, *A Genius for War*, Fairfax, Virginia: Hero Books, 1984, pp. 44-69.

     15. Schneider, "Vulcan's Anvil," pp. 9-10.

     16. J.F.C. Fuller, *The Conduct of War: 1789-1961*, New York: Da Capo Press, 1961, pp. 86-94; van Creveld, *Technology and War,* pp. 111-123 and 153-166; and Schneider, "Vulcan's Anvil," pp. 2-9.

     17. Forrest C. Pogue, *George C. Marshall: Ordeal and Hope*, *1939-1942*, New York: Viking Press, 1965, pp. 139-165; quoted p. 157; see also Russell F. Weigley, *Eisenhower's Lieutenants*, Bloomington, Indiana: Indiana University Press, 1981, pp. 2-7.

     18. Naisbitt, *Megatrends*, p. 9.

     19. Toffler, *Powershift*, pp. 35-68 and *The Third Wave*, pp. 127-130 and 349-361; Drucker, *Post-Capitalist Society,* pp. 1-47 and 181-218; McGee and Prusak, *Managing Information*

Strategically, pp. 1-4.

20. Drucker, *The New Realities*, pp. 160-161.

21. Robert B. Reich, *The Work of Nations*, New York: Alfred A. Knopf, Publisher, pp. 154-196; Toffler, *Powershift*, p. 60; Peter M. Senge, *The Fifth Discipline*, New York: Doubleday Currency, 1990, pp. 3-11; Davidow and Malone, *The Virtual Corporation*, pp. 162-216.

22. For other ways of looking at the principles and "governing concepts" of the information age corporation, see "Seven Key Drivers of the New Business Environment" in Tapscott and Caston, *Paradigm Shift*, pp. 6-10; "The Corporate Identity Crisis," in Toffler, *The Third Wave*, pp. 226-243; "A New Kind of Business," in Davidow and Malone, *The Virtual Corporation*, pp. 1-19; or "Labor, Capital, and Their Future," and "The Productivity of the New Work Force" in Drucker, *Post-Capitalist Society*, pp. 68-96.

23. Margaret J. Wheatley, *Leadership and the New Science*, San Francisco, California: Berett-Koehler Publishers, 1992, pp. 8-9. See also pp. 25-45.

24. Naisbitt, *Megatrends*, pp. 211-229.

25. Davidow and Malone, *The Virtual Corporation*, p. 6, see also pp. 139-161 and 217-238; Hammer and Champy, *Reengineering the Corporation*, pp. 50-101; Toffler, *Powershift*, pp. 180-189.

26. Drucker, *Post-Capitalist Society*, pp. 68-74, especially pp. 83-109 and *The New Realities*, pp. 207-231; Davidow and Malone, *The Virtual Corporation*, pp. 167-174 and 184-216; Toffler, *Powershift*, pp. 204-232; and Tapscott and Caston, *Paradigm Shift*, pp. 10-13.

27. Wheatley, *Leadership and the New Science*, pp. 75-99; Toffler, *Powershift*, pp. 190-203.

28. Tapscott and Caston, *Paradigm Shift*, pp. 4-5.

29. Davidow and Malone, *The Virtual Corporation*, p. 89.

30. Hammer and Champy, *Reengineering the Corporation*, p. 51.

31. Toffler, *The Third Wave*, pp. 155-207 and 349-361.

32. Davidow and Malone, *The Virtual Corporation*, pp. 4, 3-7, 24, 42, 49, 107, 137, 141, 157-158, 162, 219, and 222.

33. Toffler, *The Third Wave*, p. 184; Davidow and Malone, *The Virtual Corporation*, pp. 219-221, 223-229, and 235-238.

34. Naisbitt, *Megatrends*, pp. 19-25. The author describes

the three stages of technology: first, application of technology in ways least threatening to existing organizational norms; second, using technology to improve what we already have; last, new directions. He then goes on to argue that we are in the last stage of technological innovation--the most threatening, yet the most productive and innovative stage.

35. Alvin and Heidi Toffler, *War and Anti-War,* pp. 18-25; Davidow and Malone, *The Virtual Corporation*, p. 12.

36. Alvin and Heidi Toffler, *War and Anti-War*, pp. 9-12 and 44-56.

37. Lieutenant General Frederic J. Brown, *The U.S. Army in Transition II,* New York: Brassey's (US), Inc., 1993, esp. pp. ix-17 and 160-165.

38. General Gordon R. Sullivan and Lieutenant Colonel James M. Dubik, *Land Warfare in the 21st Century*, Carlisle Barracks, PA: Strategic Studies Institute, February 1993, esp. pp. 12-25.

39. Martin van Creveld, *The Transformation of War,* New York: The Free Press, 1991, pp. 192-227; Alvin and Heidi Toffler, *War and Anti-War,* pp. 81-85.

40. For a more complete description of the technological changes and trends already at work in land combat, see Sullivan and Dubik, *Land Warfare in the 21st Century*, esp. pp. 12-25.

41. Davidow and Malone, *The Virtual Corporation*, pp. 67-72.

42. Brown, *The U.S. Army in Transition II,* pp. 99-106, 116-124, and 137-144.