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LAND WARFARE IN THE 21ST CENTURY

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PREFACE

Land warfare in the 21st century will be shaped by the cumulative effects of many revolutionary changes that have yet to merge in a clear or predictable pattern. This paper identifies three elements of change that are likely to have the greatest impact on the Army and the joint conduct of land warfare.

First, the international system is undergoing its third major transition of the 20th century in response to the end of the cold war. The bipolar world has disappeared, replaced by uncertainty and instability. The United States as the world's sole superpower is debating its role and responsibilities in such a world, a debate that is greatly influenced by domestic pressures to resolve a complex set of economic and social issues at home. Together these trends are forcing a dramatic shift in strategy from the Soviet global threat to regional crises that require collective applications of military power in "operations other than war." These include humanitarian relief, peacekeeping, peace-enforcement, and peace-building (nation assistance) that will require a wide range of forward presence/peacetime engagement operations.

Second, changes in military technology are culminating in what many believe will be a "military-technical revolution" that brings unprecedented depth and transparency to the battlefield. Five of this "revolution's" most significant technological developments for land warfare are lethality and dispersion; volume and precision of fire; integrative technology; mass and effects; and invisibility and detectability. These developments will drive adjustments in tactics, organization, doctrine, equipment, force mix, and methods of command and control. The authors believe that these innovations indicate that smaller land forces can create decisive effects *IF* technology is used by high-quality, well-trained and well-led troops employing proper doctrine. Implicit in this analysis is the assumption that there is a line below which technology can no longer compensate for cuts in force structure. That line will ultimately be determined by the capabilities of our adversaries and the will of the American public.

Finally, this paper cautions that change will inevitably coexist with at least three constants--the root causes of war, the nature of war, and the essence of fighting power. Preparation includes traditional non-quantifiable factors as much as technology. Leadership, courage, self-sacrifice, initiative, and comradeship under extreme conditions of ambiguity, fog, friction, danger, stark fear, anxiety, death, and destruction--all remain the coins of war's realm and no amount of technological advance will degrade their value.

A central message of this paper is for strategists to carry the best of the present forward as we adapt to the revolutionary changes on the horizon. Land warfare will remain a vital component in the national military strategy, but only if we understand and respond to the forces that are shaping the battlefields of the 21st century.

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, D.C., 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, 73rd Armor and the 1st Brigade, 3rd Armored Division, followed by an assignment as 3rd 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.

LIEUTENANT 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. Lieutenant 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.

LAND WARFARE IN THE 21ST CENTURY

INTRODUCTION

The collapse of the Soviet Union and the end of the cold war have given rise to a national debate unmatched since the end of World War II. Dramatic changes in the international system have forced policymakers to reevaluate old strategies and look for new focal points amidst the still unsettled debris of the bipolar world. At issue is the role of the United States in a new world order and its capabilities to defend and promote its national interests in a new environment where threats are both diffuse and uncertain and where conflict is inherent yet unpredictable. The degree of uncertainty in the global security environment parallels revolutionary changes in military technology and in the traditional concepts of how we employ military forces. Together, these trends require greater flexibility in U.S. military strategy and significant departures from cold war concepts of deterrence and war fighting. This paper examines their cumulative effect on land warfare of the future. Only by dealing with these questions today will we be able to make the investment and force structure decisions to best position ourselves for tomorrow.

These are times of both continuity and change, and must be understood as such. Complex changes are never complete breaks from the past;¹ evolutionary and revolutionary changes coexist, each shaping the other. This relationship between continuity and change is discussed in the introduction to A.T. Mahan's famous work, *The Influence of Sea Power Upon History*. There he tells strategists, "While many of the conditions of war vary from age to age with the progress of weapons, there are certain teachings in the school of history which remain constant."² Then he cautions: "It is wise to observe things that are alike, it is also wise to look for things that differ."³

This paper follows Mahan's advice. It will describe how much in the realm of warfare is changing and where those changes are headed. The essay is developed in three steps: changes in the context within which war is fought; technological changes in the conduct of land combat; and, continuities in the nature of warfare. Change and continuity, when taken together, provide a foundation for examining 21st century warfare.

CHANGES IN THE CONTEXT WITHIN WHICH WAR IS FOUGHT

Warfare cannot be understood properly if viewed in isolation; international and domestic realities form its context and must be understood as well. A survey of some of the important

changes in these two arenas, therefore, is the appropriate starting point for understanding how warfare is and is not changing.

International Trends: Integration and Fragmentation.

The end of the cold war has unleashed contradictory trends. On the one hand there are fledgling democracies and market economies that clamor to be incorporated in regional and global systems; the increased importance of transnational organizations, information and communication networks, and financial structures; heightened awareness of transnational problems like environmental, health, migration, and monetary issues; and the readjustment of alliances and relationships among the major industrial nations as well as among these nations and their lesser-developed neighbors. As these changes generate movement toward greater global integration, multinational organizations assume more importance as actors in foreign affairs and international relations. In turn, greater integration results in partial erosion of the traditional concept of national sovereignty. The Secretary General of the United Nations refers to this trend when he says,

relationships among nations are increasingly shaped by the continuous interaction among entire bodies politic and economic. Such activity almost resembles a force in nature, and indeed may be just that. Political borders and geographic boundaries pose slight barriers to this process.⁴

Accompanying the movement toward global integration in some parts of the international arena, however, is a countervailing trend toward fragmentation in other parts.

Ethnic and religious hostility, weapons proliferation, power struggles created by the disappearance of the Soviet Union, elimination of the fear of regional conflicts escalating to superpower confrontation, radicalisms of a number of varieties, rising expectations of democracy and free markets coupled with the inability of governments to meet these expectations--all are forces that generate fragmentation, not integration.⁵ For example, "in the three years since the cold war ended, some 4.5 million new refugees have fled their native lands to escape the civil wars and ethnic cleansing that too often have followed the collapse of communism."⁶ Anyone who reads the newspaper or watches television news knows that these forces of fragmentation are as present around the world as are the forces of integration.⁷

For many, the world is growing more dangerous, albeit the

dangers are different and more subtle than those of the cold war. Local and regional "bullies" are emerging following the collapse of the former Soviet Union, and they are amassing more and more military force. International arms sales make high-tech weapons available to any customer who can afford them. These sales significantly increase a third world military force's ability to fight at extended ranges with increased accuracy and lethality, thereby compounding the problems of an intervention force. A sampling of this proliferation includes China's sale of short-range theater ballistic missiles to Iran, Libya, Syria, and Pakistan; North Korea's sale of similar missiles to Iran, Libya, and Syria; the Commonwealth of Independent States' sale of T-72s to Syria, SA-16s to North Korea, submarines to Iran, and T-80s, ATGMs, and SAMs worldwide. Currently 18 countries have advanced precision guided munitions; by early in the next century, that number is expected to grow to over 40. Those who would consider threatening U.S. global interests are hard at work buying the hardware that they will need and learning their lessons from the Gulf War. Future adversaries will try to deny American forces information, prevent buildup, inflict mass casualties, and prolong the conflict.⁸ They will seek to deny us the minimal cost, decisive victory that we achieved in Panama and the Gulf and which we seek to achieve elsewhere in the future.

Domestic Realities: New Threats to U.S. National Security.

As the forces of integration and fragmentation push and pull to create international challenges different from those of the cold war, our nation also faces a particularly difficult and complex set of domestic problems. The victory in the cold war did not come without costs to the United States, and America is only now confronting some of those costs. By maintaining a primarily outward focus for the last 45 years, America and its allies defeated their main external threat--the former Soviet Union. Nearly 50 years of external focus, however, has resulted in two new sets of threats to U.S. national security.⁹

The first set consists of threats to our economic security, which stem from both internal and external sources. The internal threats involve declining competitiveness and productivity, loss of jobs base--and its corresponding tax base, erosion of the manufacturing base, fiscal and trade deficit, decline of the middle class wage and standard of living, low savings and investments, the savings and loan crisis, and the eroding infrastructure, as well as others.¹⁰ Some of the major external threats to the economic pillar of America's national security involve our reliance on foreign oil, much of which is located in areas of the world controlled or threatened by regional hegemony; our foreign debt which will top \$1 trillion before 1995;¹¹ our loss of market share and manufacturing base to other industrial

nations;¹² and political instability in areas that could offer overseas markets for U.S. goods or opportunities for expansion of U.S. companies.

To assess what these threats to American economic security entail, strategists must understand that the rules governing U.S. economic recovery have changed. The American economy will not heal merely by the actions taken at home. Domestic action is necessary, but not sufficient. "If this century has taught one lesson," says Peter Drucker, it is that

no part of the developed world prospers unless all do .
. . . it is to the self interest of every single
participant in the world economy to restore as fast as
possible the economic ties that war has cut, to restore
transnational confidence, and to restore the
transnational flow of goods and investments.¹³

In this sense, foreign and domestic policy are two sides of the same coin; they cannot be viewed as two separate problems.

Adverse economic trends, however, are not the only dangers to American national security that gestated as we fought the cold war. During that period's extended external focus, a second set developed: threats to the nation's political and social cohesion. These involve "the disuniting of America"--to borrow Arthur M. Schlesinger, Jr.'s, term.¹⁴ The problems of drug abuse and the resultant disregard for the rights of other citizens and disrespect for democratic values and institutions; the increasing gap between the rich and the poor; the decline of public education, the disintegration of the family, and the disregard for the basic rules of civil behavior; the rise of crime and of welfare dependence; the acceptance of vulgarity as "the norm"--these problems have led author and sociologist Professor James Hunter to conclude that America is in the midst of what he termed a "culture war."¹⁵ In most major American cities, people of comfortable circumstance live peacefully together, enjoy quality schools, and live the American middle-class dream; those afflicted by poverty do not. This ever-growing divergence is not healthy for a democracy. Regardless of Hunter's description of this condition as a "culture war," this much is clear: these and other problems constitute a threat to the ultimate foundation of our nation's security--an educated, civic-minded, participative polity that is the basis of a democratic government.¹⁶

On the surface these two sets of threats--economic and cultural--seem unrelated to the military or the nation's military power; they are, however, relevant in at least three ways. First, the United States must attend to the internal economic, social, and cultural issues threatening the ultimate foundation of its

security. Heeding these threats should not, however, push the nation to the extremes of isolationism. U.S. economic recovery, for example, requires success both within the nation and

around the world. But solving internal threats will require resources. Military strategists, therefore, must expect that America will both reduce the military budget and, simultaneously, ask that its military contribute to the challenges of domestic regeneration.

Second, U.S. military strategists can expect that their political leaders will seek ways in which to use the military element of national power--in conjunction with, and usually subordinate to, other elements of national power--to promote an environment conducive to political and economic stability abroad. Such uses of the military element of power follow from the fact that American economic security is tied to the world at large, a world in which the cold war's veneer of stability has been lifted, thus revealing significant unrest, fear, hatred, and jealousy. Thus the U.S. military should expect to conduct operations, usually in conjunction with allies and friends, that are aimed at creating or restoring conditions favorable to economic development and trade.

When one thinks of "military operations," the image usually includes combat forces. While such operations may be required, strategists must begin to think differently about the use of the military element of national power. Operations linked to strengthening or restoring conditions favorable to global trade, investment, and economic development may include combat operations, but not necessarily.

The United States has established markets in nations with whom it has alliances or friendships. America must maintain these economic relationships and keep the normal, free-market competition between the United States and these nations free from instability or confrontation. Here, military operations might mean continued presence in existing alliance organizations, combined exercises, refinement of common operating procedures, and continuation of exchange programs.

Many of the markets that might become available for global economic investment, development, and integration are threatened by regional instability. America--in conjunction with allies and friends, as well as global and regional organizations--must do what it can to promote the conditions in which corporations will invest, products can be sold, and economies prosper.

The important point is: domestic actions alone will not result in U.S. economic recovery; the current global economic

conditions require action abroad to complement domestic policies. American military presence and operations can contribute--again, in conjunction with and usually subordinate to other elements of national power as well as regional and global organizations--to setting the conditions under which economic interests can flourish. There are no historical precedents for long-term economic prosperity absent a security umbrella that provides the stability in which economic strategies succeed.

Third, although the cold war is won, America must remain prepared to protect its global interests. Local and regional power struggles were created by the lifting of the Iron Curtain. Once restrained for fear of sparking a superpower confrontation, a variety of bullies--some known and some yet-to-emerge, some armed with advanced technology weapons and some not--await opportunities to establish or expand their power, sometimes to the detriment of U.S. national interests. When committed to prevent a crisis from developing or to resolve one that has arisen, America will expect its military to accomplish the mission assigned--*decisively* and at the least cost in American lives and resources.

Decisive use of military force does not necessarily entail total war. Rather, it means overwhelming use of the military element of national power relative to the strategic aims, military mission, specifics of the situation, and threat conditions. While preserving the principle of proportionality, decisive force is the opposite of incrementalism or gradualism. Thus, in those crises or conflicts involving U.S. military forces, the action will be characterized by military power employed in an overwhelming way with as much precision as possible to complete the mission in the shortest time possible and--again--at the least cost in lives and resources.

In sum, American political leaders are requiring the military to *contract* in both size and budget, *contribute* to domestic recovery, *participate* in global stability operations, and *retain* its capability to produce decisive victory in whatever circumstance they are employed--all at the same time. What these four simultaneous requirements mean to military strategists is this: (a) leverage quality in terms of soldiers, units, training, and doctrine as well as technological superiority to counterbalance reductions in size, (b) maximize the benefits of maneuver and tempo used in conjunction with firepower, (c) synchronize the contributions of all the services in ways that were previously not achieved, and (d) maintain maximum flexibility and balance in force structure and capabilities.

Simply put, international and domestic realities have resulted in the paradox of declining military resources and

increasing military missions, a paradox that is stressing our armed forces. The stress is significant. It requires fundamental changes in the way the nation conducts its defense business.

TWO CONCEPTUAL SHIFTS

Before even discussing the ways in which the conduct of land warfare is changing, one must realize the extent of the shift in the paradigm used by the last three generations of U.S. strategists. The strategic paradigm of the cold war--preventing the spread of communism--does not fit the realities of today's world; to use it to solve new problems is to guarantee failure.¹⁷ This is the first--perhaps the most important and most difficult--conceptual shift that affects the way the conduct of land combat is changing. America needs a different model by which to raise, equip, deploy, organize, educate, train, fight, coordinate, and sustain her armed forces. Containment and our "traditional" concept of deterrence--elements of America's cold war strategic defense--require rethinking in light of current realities. The United States no longer has a negative aim--to prevent the spread of communism.¹⁸ It has a positive aim--to promote democracy, regional stability, and economic prosperity. What some are calling "collective engagement" is coming to replace containment. Deterrence has retained some of its meaning, but "prevention" is beginning to emerge as a complementary, and possibly alternative, strategic concept. This is a significant conceptual shift from that of the cold war, but it is not the only shift required.

The second conceptual shift involves refining the understanding of how to use military force. The concept of "war" is usually understood in terms of conventional combat: the armies of one nation-state or alliance of nation-states fighting those of another. Every other act of violence, use of force, or form of hostility is categorized as "operations other than war."¹⁹ Using these kinds of distinctions, some go so far as to draw the following kinds of categories of violence: peacetime activities with very low levels of violence, crises, conflicts, war, and war termination activities.

These kinds of categories are quite useful, for they allow a strategist to plan for the use of military force under a variety of graduated circumstances. Further, they demonstrate that not all uses of military force involve "going to war." Thus the categories provide a convenient conceptual distinction and an important political one. Politically, the United States, whether acting unilaterally or in conjunction with friends and allies, must be able to distinguish the use of military forces in "war" from other uses. As Bernard Brodie explains,

As American citizens we expect and desire that our

nation will involve itself in war only...for political ends that are reasonably consistent with [America's] basic political philosophy....We...also expect that the ends for which we fight are...sought through the kind of war that is reasonable to fight,..[and has a] possibility of success....[otherwise] resorting to war is simply wanton destruction of life and goods on a vast scale.²⁰

The expectations that Brodie outlines remain part of the American military, social, and political psyche. When the nation wages "war," all understand that defining clear, achievable political aims; raising and sustaining the required means to attain those aims; and ensuring the support of the nation--i.e., national will, are absolutely vital to success. Without these conditions, "resorting to war is simply wanton destruction." Thus, military doctrine appropriately codifies the distinction between "war" and "operations other than war."

As useful, convenient, and important as these categories are, however, their simplicity can be seductive. Categorizing "war" as separate from all other uses of military force may mislead the strategist, causing him to believe that the conditions required for success in the employment of military force when one is conducting "war" differ from use of military force in operations "other than war." For example, when planning for war, no serious strategist would fail to ask, "Should we have clearly stated, achievable political aims? or Should the nation allocate the necessary means to attain its political aims? or Should we have some assurance that the nation supports the war?" Yet, when debating the use of military force in "operations other than war," just such questions may not always arise.

As the nation begins the 21st century the strategist should take seriously Michael Howard's suggestion. "It is quite possible," Howard says,

that war in the sense of major, organized armed conflict between highly developed societies may not recur, . . . Nevertheless violence will continue to erupt within developed societies as well as underdeveloped, creating situations of local armed conflict often indistinguishable from traditional war.²¹

Strategists must refine their understanding of how to use military force to correspond with the realities of the day. Clausewitz defined war simply as "an act of force to compel our enemy to do our will" which "springs from some political purpose."²² "No one," he says, "starts a war--or rather no one in

his senses ought to do so--without first being clear in his mind what he intends to achieve by that war and how he intends to conduct it."²³ While his definition of "war" is less applicable given today's political realities, his admonitions concerning using military force are instructive. They apply aptly to the kind of violence that Michael Howard describes as "often indistinguishable from traditional war."

One way a nation might use its military force is to compel its adversary, sometimes by resorting to or threatening violence, to do its will. Such uses are both consistent with what Clausewitz called "war" and, as Howard says, are "often indistinguishable from traditional war." American and allied forces in Somalia, and their possible employment in Bosnia provide two excellent examples. When a nation so uses its military forces, a contemporary Clausewitz would caution that nation *not* to begin without first being clear about its political aims and how those objectives are to be achieved. Objectives and concepts must be supported by allocating sufficient military sources and by mustering the national (or international) will to attain the political aim.

No doubt, today's global realities are different from those that Clausewitz contemplated. Contemporary strategists confront representatives of feudal lords, religious groups, ethnic groups, drug cartels, crime syndicates, even transnational corporations using force or threats of force to achieve their objectives. Furthermore, nations now use operations other than war--e.g. peacekeeping, peace-enforcement, supervising cease-fires, assisting in the maintenance of law and order, protecting the delivery of humanitarian assistance, guaranteeing rights of passage, and enforcement of sanctions--to compel adversaries to do their will. While these endeavors do not qualify as "war" in today's military-politico parlance, they are examples of acts "of force to compel our enemy to do our will" which spring "from some political purpose."

Once again, Brodie's ideas are applicable:

Those who talk abstractly...[about war] find themselves matching discourse with those who speak of dead bodies, burnt villages....The euphemisms of the strategists can be counterproductive....the manipulators use jargon that the man in the front lines...can hardly consider relevant to his conditions.²⁴

As useful and necessary as the distinction between "war" and "operations other than war" is, strategists cannot allow these conceptual categories to become the kind of euphemisms to which Brodie alludes. Leaders and strategists must recognize the

requirements essential to success whenever military force is employed: identifying clear, achievable political aims; planning and employing strategic measures for achieving those political aims; raising and sustaining adequate means to implement the strategic measures; and ensuring the support of the nation (or coalition).

Expanding the traditional understanding of the use of military force in war to "operations other than war" makes both politicians and military leaders uneasy, for they find it is difficult--albeit no less important--to identify clear, achievable strategic aims. There is an emotional temptation to want to "do something" without first

clearly understanding what political purpose that "something" is supposed to accomplish. Yet, as Brodie reminds us, this requirement remains paramount, else what we do is "simply wanton destruction of life and goods."

Changes in the international and domestic political systems have altered the context in which military force will be applied. Reviewing these changes is important. Changes in the conduct of land warfare result from the interaction of a multiplicity of events, conditions, policies, beliefs, and even accidents.²⁵ Some of the changes occur in the international and domestic arenas, others are rooted in history and technology. The changes in military technology are as dramatic as those in international politics.

TECHNOLOGICAL CHANGES IN THE CONDUCT OF LAND WARFARE

Technological innovations, many of which were dramatically demonstrated in the Gulf War, are giving rise to what is being called a "military-technical revolution." This "revolution" will have a dramatic effect on the Army and land warfare through five dominant trends: lethality and dispersion; volume and precision of fire; integrative technology; mass and effects, and invisibility and detectability.

Lethality and Dispersion.

Over time, weaponry has become more lethal and individuals and units more dispersed. Lethality and dispersion are linked.²⁶ Rifling, introduced in mass during the mid-19th century, extended the range and accuracy of the individual weapon and artillery piece. This development forced individuals to go to ground and disperse. As rifles and artillery became more effective, units could no longer deploy in the dense, shoulder-to-shoulder formations that marked the age of the musket.²⁷

Throughout the history of land warfare, tactics, organizations, doctrine, equipment, force mix, and methods of command and control all changed in response to increasing lethality and dispersion. These changes, in turn, had a corresponding effect on training, soldiers, and leaders.²⁸

The Gulf War saw an even greater increase in dispersion and improvement in the ability to deliver long-range lethal fires. Table 1 indicates that this increase can no longer be described geometrically for the changes witnessed in the Gulf were exponential changes. MRLS, Apache, Patriot, Lance, ATACMs, Abrams, Bradley--especially in conjunction with space-based platforms, the weapons delivery and maneuver systems of other services, and equipment like the laser designator and the position guidance system--all confirm that the trend toward increased lethality at greater ranges and increased dispersion of individuals and units are still at work. Furthermore, the trend will result in changes in tactics, organization, doctrine, equipment, force mix, and methods of command--just as it did in the past.

| Area occupied by deployed force 100,000 strong | Antiquity | Napoleonic Wars | U.S. Civil War | World War I | World War II | October War | Gulf War* |
|--|-----------|-----------------|----------------|-------------|--------------|-------------|-----------|
| (square km) | 1.00 | 20.12 | 25.75 | 248 | 2,750 | 4,000 | 213,200 |
| Front (km) | 6.67 | 8.05 | 8.58 | 14 | 48 | 57 | 400 |
| Depth (km) | 0.15 | 2.50 | 3.0 | 17 | 57 | 70 | 533 |
| Men per sq km | 100,000 | 4.790 | 3,883 | 404 | 36 | 25 | 2.34 |
| Sq meters per man | 10 | 200 | 257.5 | 2,475 | 27,500 | 40,000 | 426,400 |

*All figures except Gulf War column from COL DuPuy, *The Evolution of Weapons and Warfare*, p. 312. The area data for Gulf War came from LTG Pagonis, *Moving Mountains*; the rough number of 500,000 soldiers was used for the number deployed within this area.

Table 1. The Expanding Battlefield.

Post-industrial land forces will become more mobile, creating the requirement to communicate over greater distances, to maneuver more quickly, and to use fires from platforms of all services that are dispersed over greater distances. This trend will place a great premium on the commander's ability to make decisions quickly, the staff's requirement to synchronize the movements of greatly dispersed units, and the subordinate

leader's responsibility to make on-the-spot decisions within a senior commander's intent.

Greater dispersion will also place a great premium upon unit cohesion. Long acknowledged as one of the most fundamental, if not the most essential, building blocks of fighting power,²⁹ unit cohesion will be much harder to sustain in widely dispersed units, but no less required. One could build a good case, in fact, that the importance of quality soldiers and leaders and the need for excellent unit cohesion grows in parallel with the level of dispersion.

Volume and Precision of Fire.

The second trend concerns two factors: first, volume of fire (tonnage delivered in a given time) and precision. The volume of fire was low during the age of muzzle-loading individual weapons and artillery. The rate and volume of fire began to increase, however, with the introduction of breach-loading rifles, smokeless powder, magazines, belts, and other automatic loading devices. The move from muscle to machine--i.e. mechanization, motorization, and aviation--also contributed to the increased rate at which fire could be delivered. Not only could weaponry produce more lethal effects, but also produce them more frequently. "Ultimately the net effect of the progress in weapons technology," Martin van Creveld points out,

was to increase enormously the volume of fire that could be delivered, the range, at which it could be delivered, and the accuracy with which this could be done. The combination of all three factors meant that . . . the battlefield became a more deadly place than ever before.³⁰

The trend in increased volume of fire culminated in an Army's ability to deliver tactical nuclear weapons.

Of course, with the increase in fire volume came corresponding changes in other areas of land combat: the use of entrenchments, the development of protected spaces on the battlefield like the tank and infantry fighting vehicles, and organizational changes like the U.S. Pentomic division of the 1950s and the flexible divisional structure of the 1970s and 80s. These evolutions affected not only weapons, equipment, organization, and tactics but also planning factors like casualty rates, logistic resupply rates, and the balance among combat/combat support/combat service support forces.

Along with an army's ability to deliver an increased volume of fire came the rise in precision. Dragons, TOWs, laser-aimed

individual weapons; precision aiming systems such as those on the Abrams and Bradley; longer range precision weapons systems like Apache, LANCE, ATACMS, and MRLS; laser designators that guide artillery rounds as well as the bombs delivered by aircraft of other services; "brilliant" munitions now in development--all confirm the trend toward increased precision accompanying increased volume.

As was the case with the growth in the volume of fire, the rise in precision will change the weapons, equipment, organization, and tactics of 21st-century land forces. Planning factors will be as different for the armies of the 21st century compared to the 20th century as 20th century armies differed from those of the 19th.

The introduction of high-energy weapons, electro-magnetic rail gun technology, super conductivity, and other yet-to-be-identified technological improvements will continue the upward trend lines of fire, volume and precision. The greatly dispersed land forces of the 21st century will continue to increase their ability to deliver a high volume of precisely aimed fires with a very high first-round-hit probability. This ability will be increased even further when one considers the result of integrative technology.

Integrative Technology.

Integrative technology will introduce a level of precision to the overall force, not just to individual and massed fires, that has been impossible up to this point in the history of land combat. In the 21st century, the systems of land forces will become an integrated circuit that is, in turn, part of a network of combined land/air/sea/space forces. With this integration network will come improved precision at the point of battle.

Napoleon introduced a "visual telegraph," called the Chappe, as a rapid means to transmit his orders. Under the right conditions, he could communicate with his subordinates 120 miles away in about an hour. This innovation increased his ability to coordinate the actions of his subordinate forces.³¹

Modern integrative technology, however, started with the telegraph and railroad--two systems that, when joined, revolutionized warfare.³² The telegraph moved information around the battlefield quickly. Information assisted command and control, improved unity of effort, and increased the potential for coordinated effort and agility throughout the theater of operation or of war. The railroad provided the means to realize the potential that the telegraph offered. Rail made it possible to move large numbers of troops, equipment, supplies, and weapons

systems quickly. Furthermore, the management and organization of the railroad--from the operation of loading docks to the computation of time/distance factors necessary to schedule rail use--integrated the information system of the telegraph, the delivery system of the railroad, and the command and control system of the military.³³

First by field wire, then by the introduction of radio and aviation, the use of integrative technology expanded in scope. Each improvement widened the ground commander's ability to orchestrate all the intelligence assets, weapons systems, maneuver forces, and logistical units at his disposal. Complexity accompanied this growth, making staffs more necessary and synchronization of functions more important. Interestingly, two false beliefs accompanied each improvement: first, that some extraordinary technological advance yet to take place would result in the land commander acquisition of "perfect, real-time" information upon which to base his decisions and direct his subordinates; second, that greater centralization in decision making would yield greater combat effectiveness at the point of battle.

Realities on the battlefield, however, proved otherwise. The very nature of war consists of fear, fog, danger, uncertainty, deception, and friction--these are not conditions that can ever generate "perfect information."³⁴ Reports that a commander receives are often incomplete and incorrect. An enemy commander strives to deceive his adversary, hiding what he does as best he can; what one sees on the battlefield, therefore, must be interpreted. Interpretation faces the same impairments that we noted above in connection with obtaining information. Certainly, advanced technologies, multiple collection methods, and other means can increase the reliability of information and aid in decision making. The realities of what goes on in combat, however, will frustrate forever those searching for "perfect, real-time" information. To hope for technology that will be capable of gathering and using such information to feed a centralized military decision making system is to hope in vain. Developing subordinate commanders who are able to make decisions on-the-spot within the intent of their higher commander--that is, decentralization not centralization--will remain vital even into the 21st century.

Withal, the search for integrative technology on today's battlefield goes on. The links between scout and attack helicopter, between JSTARS and weapons delivery platforms (air and ground), between forward ground elements and rear positioned indirect fire systems, between tanks of an M1A2 unit--all have produced a quantum leap in the use of integrative technology. Like the leap produced by the increased volume of precision fires

and greater battlefield dispersion, increased integrative technology is important in its effects. Extensive, near-real time communications among a number of intelligence gathering systems, maneuver systems, fire systems, and logistical support systems provide the ground commander with a potentially revolutionary opportunity and with monumental challenges.

The opportunity is the integration of the reconnaissance and intelligence gathering systems (technological and human) with command and control, fire delivery, and maneuver nodes. Once all are linked digitally to logistical support centers, these task forces will become combined arms task forces qualitatively different from the ones we now have. The degree of situational awareness that a commander will have under these conditions will be orders of magnitude better than he has now. It would not be too bold to claim that his perception of the battlefield will change. The computation of combat power and logistical planning factors, the determination of the proper ratio among combat, combat support, and combat service support, as well as a definition of each of the operating systems and their interrelationships--will require rethinking. Significant further adjustments in doctrine, organization, and command and control, as well as service relationships, also will be necessary.

The digitization of the battlefield is a major leap-ahead in the conduct of warfare, but not a break from the past. The limiting factor in the quest for making maximum use of integrative technology will not be the hardware, it will be human and organizational. Integrative technologies will enhance the ability of commanders and their units to fight with scarce assets. The complete use of integrative technologies will revolutionize command and staff procedures. Software will allow much of the information now transmitted by radio and synchronized on acetate and charts to be self-synchronized automatically, computer to computer. Smart command and control systems will create a common perception of the battlefield and the theater among members of a joint task force. This perception, in turn, will facilitate the rapid massing of combat assets--precise weapons systems and maneuver forces--to attain objectives decisively. Such a development will not eliminate the necessity for staffs and commanders, but the art and science of decisionmaking and staff synchronization will change radically.

The challenges that accompany such revolutionary advances in information gathering and use remain as before: increasingly capable integrative technology may, once again, generate the false belief that centralized decision making will result in greater combat effectiveness at the point of battle. As explained previously, however, realities of the battlefield and the nature of war demonstrate otherwise.

Using an earlier leap-ahead technology, the telegraph, Moltke knew that the flow of information would still never reach him fast enough and in enough detail to allow him to command from his headquarters. The cycle of action-reaction-counteraction on the battlefield unfolded much faster than a headquarters could gather information, process it, make a decision, then transmit that decision to those who must execute. Rather than impose new and stricter demands for information to feed a centralized decision and command system, Moltke created units and chose commanders who were able to operate under the conditions of uncertainty and succeed with less information.³⁵ Integrative technology will increase the tempo of action-reaction-counteraction on the post-industrial battlefield; thus, it will continue to emphasize decentralized decisionmaking and initiative at lower levels of command.

The effects of the first three trends--lethality and dispersion, volume of fire and precision, and the use of integrative technology--join in reinforcing a fourth: the trend toward the ability of smaller units to create decisive effects.

Mass and Effects.

Smaller units are able to create decisive effects in three ways.³⁶ The first is simply physical. The repeating rifle and machine gun, in conjunction with increasingly accurate indirect fires of artillery, began to allow fewer soldiers and smaller units to concentrate the effects of more firepower than their numbers alone would suggest. This is a natural outcome of the first two trends. The volume of deadly fire "emptied" battlefields, but those left on them were far more capable. As motorization, mechanization, aviation, and communication developed and improved, this capability increased. Ground forces not only had at their disposal more lethal weapons that could shoot more often and more accurately, but they could employ weapons systems that were physically located at some distance from the point of battle. Furthermore, ground forces developed the capability to move across, or over, the battlefield much faster, more easily, and with more safety than had their predecessors.

The second way that smaller units can create decisive effects is organizational: mixing arms within a formation. The 19th century version of this phenomenon began with separate infantry, artillery, and cavalry divisions being combined under a single corps headquarters. Over time, mixing arms descended from corps level to combat teams--that is, mixing arms within divisions and regiments like those of the World War II era. The next development produced what came to be called combined arms

teams as low as company and troop level. The development of these teams at lower levels gave commanders the opportunity to incorporate direct and indirect fires more easily. As the inclusion of the weapons systems of fixed and rotary wing aviation became a standard and essential element of the combined arms team, commanders were able to add the effects of air platforms to those of the armor, infantry, and field artillery. The result was smaller units being able to produce decisive effects.

Maneuver is the third way that smaller units can create decisive effects. Initially maneuver resulted from muscle power--the foot and horse. However, machine-powered ground systems--the rail, truck, tank, armored personnel carrier, infantry fighting vehicle, self-propelled artillery, and protected combat support and combat service support vehicles--greatly increased land maneuver. When land forces began to include machine-powered air systems--the utility, cargo, scout, and attack helicopters--the conditions were set for another leap in land maneuver. Like the score of a great symphony, each of these movements--first from muscle to machine-powered ground systems then to machine power air systems--began quietly and developed gradually. Each increased mobility, improved opportunities for maneuver, and resulted in greater agility. At each step, improved maneuver capability contributed to the land combat commander's ability to move over increasingly dispersed areas and converge quickly at the decisive point, thus concentrating effects of both fires and maneuver. Each move thus increased the land force commander's ability to operate at a faster tempo than before.

The history of land warfare reflects the manner in which various arms have been integrated into the combat team. Initially land combat moved from being conducted by unitary armies to being fought by combined arms, ground-based formations. The second step took place when combined arms, ground-based formations became combined arms, ground/air-based units. Land combat units are currently at this point; however, the movement is not over. The third step will take place when land combat is waged by formations consisting of combined arms, air/ground-based units. This is the direction land combat is now taking. At each step, decisive effects have resulted from ever smaller units.

This development is reinforced by the increased use of integrative technology. Recent integration of land combat units has been primarily, but not exclusively, internal. Internal integration includes the ability of members of a combined arms task force to talk and coordinate among the combat, combat support, and combat service support units of the task force. This integration was, and remains, absolutely essential. In the 21st century, however, internal integration will not be sufficient. To

maximize the benefits of maneuver and tempo, increase the firepower available to a land force commander, and synchronize the contributions of all the services, land forces must be fully integrated with air and naval forces. Only then will the commander be able to leverage completely the complementary powers of the joint force.

Thus, when one includes the trend toward increased use of integrative technology, another element in the trend toward a smaller unit's capability to produce decisive effects can be postulated: the evolution of combined arms into joint arms. The result will be fully integrated joint task forces, including combined arms task forces of multiple services, that can be tailored to fit the specific set of geographic, political, and threat conditions existing in a given situation. In such fully integrated joint task forces, true qualitative change is possible--the whole of such a force will be greater than the sum of the parts. Based upon the situation, an Army brigade task force in conjunction with a Marine Expeditionary Unit, Air Force squadron, and Navy task force--fully integrated under the command and control of a joint task force headquarters--could produce the effects that required, during the World War II era, a much larger force.

In sum, these trends indicate, and the Gulf War as well as Operation JUST CAUSE corroborate, that as the size of the unit decreases, there can be a corresponding increase in the effects it is able to produce if it is equipped with the right technology used by high-quality, well-trained and well-led troops employing proper doctrine. These trends verify that smaller or fewer units will be able to produce decisive effects because of the vast array of weaponry they have at their disposal and the speed with which they will be able to acquire targets, maneuver, employ fires, and relocate. Think of the maneuver possibilities that could be generated for ground or air commanders by very dispersed special operations forces or of the potentially decisive effects these very small forces--integrated into the forces of all services--have when equipped with secure satellite communications, laser designators, and position guidance systems. Small teams in the right place, at the right time, and linked in with the right systems have the potential to produce, or at least contribute to, decisive results.

Once again, a paradigm shift is developing. Many of the old rules of land warfare that concern the calculation of combat power have been shattered already. Individually and collectively, the implications of these moves toward compressing greater firepower in smaller unit packages will require significant adjustments in doctrine, leadership, organization, and command and control as well as service relationships. The limiting factor

will not be technological, it will be human and organizational.

Invisibility and Detectability.

The final trend helping to paint the picture of land combat in the 21st century concerns a land force's ability to hide from the enemy while being able to detect that enemy at greater ranges. In the mid-19th century, invisibility--the ability to hide from the enemy--took the form of movement at night, and the use of trenches, vegetation, and terrain to cover the deployment of troops, equipment, and supplies. Detectability was limited to line of sight--scouts, spies, and cavalry. The balloon and field glasses added range to the human eye as did the aircraft when it was first introduced, but line of sight remained primary.

Electronic intelligence gathering and countermeasures as well as electronic deception developed in the early-to-mid 20th century. This added a new dimension to detectability and invisibility. Electronic means, especially when employed as part of a ground-air-space based system, also provide the ground commander the capability to detect the enemy even beyond the horizon. Using electronic means correctly, land forces can become invisible to their enemy by appearing to be at one place while actually being at another. General Patton's "dummy" headquarters used to reinforce the German's belief that the invasion of Europe would occur at the Pas de Calais and to cover Patton's Third Army's deployment into France is but one of many examples of how electronic means can produce "invisibility." Mock equipment, dummy headquarters, phoney messages, faints, ruses, and other deception operations also contribute to a land force's invisibility.

Holography, virtual reality, the use of micro-electromagnetic systems, nano-technology, televideo, and other information networks have the potential to increase the land force's invisibility to the enemy. Integrating the information available from AWACS, JSTARS, UAVs, as well as other currently available systems and those yet-to-be-developed further increase the land force commander's ability to detect the enemy at extended distances. Advanced technological and human intelligence systems will continue to expand the commander's detection range, improve the resolution of the information gathered, and disseminate the data to the proper levels via near real-time, digital transfer. The battlefield will become more transparent to the commander of such a force and more opaque to his adversary.

Taken together, these trends enable one to forecast what land combat in the 21st century may be like. That forecast has two parts. First, how will political leaders use land forces? Land forces of the 21st century will be involved in preventing

crises from occurring or from developing into conflicts; resolving conflicts before they spread or become war; or ending wars decisively on terms favorable to the United States and its allies.

Preventative measures will include alerts or deployment of forces before a crisis occurs; exchanges and contacts to promote confidence-building; and operations that nurture stability or defuse instability--e.g. peace enforcement, supervision of cease-fires, assisting in maintenance of law and order, protecting the delivery of humanitarian assistance, and the enforcement of sanctions.

Preventative measures also include those long-term relationships that build or sustain strong regional friendships. In many cases, the demonstrated ability and will to deploy forces that are technologically superior and fully capable of decisive victory in a variety of conditions contribute to preventing crises from occurring or from developing into conflicts.³⁷ Such capability itself contains deterrent value.

While political leaders will use land forces, as well as naval and air forces, in a preventative way whenever they can, to focus solely on preventative measures would be wrong. American land forces also will be called upon to end hostilities, decisively and on terms favorable to the United States and her allies.

Second, how will land combat be conducted in the 21st century? Regardless of how land combat forces are used, they will be capable--operating as part of a joint force--of detecting the enemy at extended, over-the-horizon distances while remaining invisible to that enemy; delivering fires--also over the horizon--to facilitate maneuver; thus destroying the enemy force and disintegrating his cohesion throughout the depth of the theater or battlefield. Further, land combat forces of the 21st century will be raised, equipped, deployed, organized, and trained to achieve overwhelming success in both traditional war and those "operations other than war" that Michael Howard accurately described as "often indistinguishable from traditional war."³⁸

Each of the five trends is important in its own right. The synergism they create, however, reinforces the changes occurring in the international and domestic context where wars are fought and military force is used. Together, the changes occurring in so many areas that affect the conduct of land warfare result in a crescendo of change.

The projections identified for each of the trends and the resulting forecast concerning the conduct of future warfare are

not the result of Buck Rogers-type speculation or Star Wars science fiction or radical breaks with the past. Rather, they are extrapolations--sometimes linear, sometimes not--of forces that have come together, like natural forces combine into a thunderstorm. In the midst of such change, one can only begin to understand the scope of the paradigm shift required.³⁹ However, the details provided by the trends--lethality and dispersion, volume and precision of fires, integrative technology, mass and effects, and invisibility and detectability--and the background provided by the conceptual shifts outlined earlier--the passing of the cold war strategic paradigm and the refining of the understanding of how to use military force--provide a forecast clear enough to begin positioning the Army for these developments.

CONTINUITIES IN THE NATURE OF WARFARE

As this positioning takes place and the Army of the 21st century emerges, strategists should not be mesmerized either by the amount of change taking place or by the expectations of advanced technology. As much as the conduct of warfare will change in the future, at least three aspects will remain the same. First, the future will differ little from the past with regard to the root causes of war. People--whether political leaders of a nation-state or leaders of some other kind of organization--still fight wars as a result of fear, hatred, greed, ambition, revenge, and a host of other quite human and ever-present emotions. They still fight when they perceive that they can accomplish their objectives by resorting to force, or that they have no other alternative, or that honor or pride or principle or "the gods" demand it. In other words, they fight for what are to them fundamental reasons, even if others do not share or understand their rationale. Therefore, strategists must clearly and completely think through the use of countervailing force and its possible unintended consequences.

The future will also be similar to the past with respect to a second important aspect of war: its nature. The nature of war, even in "operations other than war"--peacekeeping, humanitarian assistance, or enforcement of sanctions--remains a contest of wills where one group attempts to force its will on others. Ambiguity, uncertainty, fog, friction, danger, stark fear, anxiety, and chance as well as leadership, courage, comradeship, self-sacrifice, and honor--continue to describe accurately the conditions with which military forces have had to contend and will continue to contend. Death and destruction remain the coins of war's realm, and no amount of technology or euphemistic labels will alter their weight. As much as one would like to think that simple solutions are possible, the reality is that wars are messy.

Perhaps the most important constant is this: war demands both science and art from the leaders who wage it. To think that one without the other will solve the problems posed by war is to err and err seriously. The future will find predictive modelling, integrative technology, precision guidance systems, and other high technology increasingly useful--necessary, but not sufficient. The artistic side of war will remain: creativity, intuition, leadership, motivation, decisionmaking under conditions of limited information. These will never lose their importance, for they describe war's essence. Technology contributed greatly to victory in the Battle of Britain for example, but technology alone cannot account for British success.

Finally, the future will resemble the past with respect to the essence of fighting power. Technology is important to the process of generating combat power, but one must not let the glitter of technology obscure other sources of fighting power. "An army's worth as a military instrument," van Creveld explains,

equals the quality and quantity of its equipment multiplied by [its] fighting power. The latter rests on mental, intellectual, and organizational foundations; its manifestations, in one combination or another, are discipline and cohesion, morale and initiative, courage and toughness, the willingness to fight, and the readiness, if necessary, to die.⁴⁰

The root causes of war, the nature of war, and the essence of fighting power--these are several of the immutable elements concerning war. As absolutely essential as maintaining technological superiority is, especially in helping offset reductions in size, the simple truth is that technology will not solve all the problems associated with war. Prosecuting war requires both science and art. Judgment, trust, cohesion, creativity, flexibility, and just plain guts also are absolutely necessary. Again, van Creveld is instructive,

When the chips are down, there is no `rational' calculation in the world capable of causing the individual to lay down his life. On both the individual and collective levels, war is therefore primarily an affair of the heart. It is dominated by such irrational factors as resolution and courage, honor and duty and loyalty and sacrifice of self. When everything is said and done, none of these have anything to do with technology, whether primitive or sophisticated.⁴¹

Those who would seek "silver bullets" must first acknowledge that land warfare under Napoleon, Grant, Pershing, Patton,

Ridgway, Westmoreland, Thurman, Stiner, Schwarzkopf, and Hoar is surprisingly similar. War is a matter of heart and will first; weaponry and technology second. Thus, while strategists must understand the role that technology plays in changing how land combat will be conducted in the 21st century, so too must they acknowledge the ways in which the nature of warfare remains constant.

Political and military strategists would also be wise to remember what General Sherman wrote of General Grant's campaign plan to end the Civil War. In April 1864, just one month prior to starting his final campaign, Grant had sent Sherman a map upon which was sketched the general plan for the 1864-65 campaign. Seeing the map, Sherman understood what was in Grant's mind. In response, he wrote: "this was as far as human foresight could penetrate."⁴² Sherman knew that it would be folly to plan in detail too far into the future, for there were too many variables and too many unknowns. Grant and his subordinates would have to remain flexible, ready to react to situations and events that they had no way to predict. On one hand, Grant's overall vision remained fixed throughout the campaign. On the other hand, the specifics remained flexible.

Sherman's words provided good advice at the dawn of industrial warfare, and they are equally instructive at the dawn of post-industrial warfare. By understanding the two conceptual shifts that have and are taking place relative to the context of war, the five trends that affect the conduct of post-industrial warfare, and what remains constant among all that is changing, one can forecast how land combat may be conducted in the 21st century. Like Grant's overall campaign plan, that forecast--albeit in outline form--can act as the goal to guide near-term plans.

One should be skeptical of any military strategist who claims certainty about the future of warfare, especially those who assert that technology changes the fundamental nature of war. One should be even more skeptical of the political strategist who believes that certainty in war is possible. "For precision cannot be expected in the treatment of all subjects alike...", Aristotle reminds us. "A well-schooled man is one who searches for that degree of precision in each kind of study which the nature of the subject at hand admits."⁴³ Good advice for political and military strategists alike.

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