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The Anatomy of Change: Why Armies Succeed or Fail at *Transformation*

Bryon E. Greenwald

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by

Bryon E. Greenwald

**The Institute of Land Warfare
ASSOCIATION OF THE UNITED STATES ARMY**

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Foreword

The U.S. Army today faces one of the most difficult peacetime challenges it has encountered in its 225 years of service. It must restructure, reshape and transform its weapons, its equipment and itself from a heavyweight Cold War champion to a lighter, more responsive expeditionary force. It must reinvent itself to meet an uncertain future of short-notice commitments that may occur anywhere around the globe. Such dramatic change does not come easily to any organization, but it is especially difficult for a large institution charged with the defense of a nation.

Over the many years of its existence, America's Army has seen many changes—some large, some small—but never has it undertaken such a sweeping change as is called for in its new Transformation initiative. The implementation of that initiative must be well thought out and the implications carefully weighed. An error in judgment could result in lost lives of soldiers, and possibly national defeat at the hands of an enemy.

To design and successfully implement change, it is essential to understand the nature of change, its processes and implications. This paper sets out a framework for doing just that. The author analyzes the nature of change in the context of military organizations, and identifies the internal and external factors involved in modernizing an army. He contends that only by understanding the anatomy of change can a military leader succeed where many others have failed. As our Army begins the complex task of transforming itself, this paper provides a thoughtful and clear approach to understanding the journey of change that lies ahead.

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September 2000

The Anatomy of Change: Why Armies Succeed or Fail at *Transformation*

Introduction

For the better part of the last decade, the Army has stared at its navel, stroked its collective chin, and grappled with how to fix itself. Three successive Army Chiefs of Staff (Generals Gordon R. Sullivan, Dennis J. Reimer, and Eric K. Shinseki) have each endeavored to move the Army forward under the rubric of FORCE XXI/EXFOR and now *Transformation*. Progress has been modest, as the Army has struggled with a myriad of internal and external issues that conspire to delay, if not derail, its quest for rapid deployment, sustainable lethality and strategic relevance.

But as the effort to *transform* the Army continues, concerns over the budget, far-flung deployments, personnel strength, the composition of the interim brigades, and worries by some over the future of the Armor Branch only serve to illustrate what students of military history and some members of the armed forces already understand—that modernization (“reorganization,” “innovation” or “transformation”) is an oft-invoked but ill-understood phrase.¹ Moreover, it is never easy to accomplish. The difficulty arises from a natural resistance on the part of military organizations and the societies they serve to change the way they operate.

As Eliot A. Cohen and John Gooch note in *Military Misfortunes*, militaries have failed on occasion to anticipate, learn and adapt to changes in the nature of warfare.² The danger in simply maintaining the status quo, of course, is that failure to change has usually led to defeat on the battlefield. Currently, the U.S. Army faces the daunting task of adjusting its organizational and doctrinal foundations to accept rapid technological change and meet the demands of warfare and near-warfare in the post-Cold War, postmodern Information Age. But Cohen and Gooch simplify and understate the problem significantly for a peacetime military serving a pluralistic, democratic society. To meet the challenge of transforming the Army, senior leaders and other agents of change must break the long tethers that bind the Army to the past and move it forward. To do so, they must not only compel those within the service to alter the way they think about their traditional roles and branch missions, but also win support for their efforts to change the Army from the people and the nation’s political leaders.

Some of the external factors that inhibit change include the level of popular and political support given to the military as represented by the nation’s willingness to pay for and employ its armed forces. These are derived from a complex set of interrelated strategic determinants that include geography, threat perception, history, ideology, culture and economics. Further complicating the path to successful change is the uneven

pace of technological advances, which often lead, sometimes follow, and usually confound thinking and hamstring budgets supporting Army modernization.

The internal factors affecting the ability of the military to change are equally complex. They include aspects of historical experience, a naturally conservative outlook toward change, an inability to evaluate adequately new ideas, an awareness of the tremendous cost of defeat, and a desire by some within the organization to preserve the status quo for fear of losing either personal or professional power and prestige within the organization. At times, any combination of these factors may prevent meaningful change from occurring in a military organization in time to prepare the force to win the next war or military operation other than war.

One of the benefits of the study of history is that it informs contemporary conceptual thought. By analyzing the theoretical structure of military innovation as well as the external and internal factors that affect modernization in the military, this paper offers today's leaders a historical perspective on the dynamics of transformation and change in military organizations.

A Theoretical View of the Factors Affecting Peacetime Modernization, Innovation and Reform in the Military

Just as time marches forward, so too must the Army. The effectiveness of peacetime modernization is central to the future success of the Army in battle. Unfortunately, military modernization is never easy and never cheap. It often runs afoul of bureaucratic prerogatives both inside and outside Army. Moreover, modernization normally costs more than a peacetime society may deem appropriate to spend when not threatened or aroused to some passionate cause. This in turn may force decisionmakers inside the Army to choose between dedicating funds to maintain current readiness or proceeding with plans to modernize the Army for the future. Finally, even after navigating through the shoals and sandbars of professional, political and popular opinion, there is always a chance that the proponents of reform are all wet. As in the case of the French Army prior to World War II, there are times when those advocating reform misdiagnose the conditions of the next war and prescribe changes to doctrine and equipment that exacerbate the potential for future asymmetry between forces.

The Dialectic Nature of Warfare

In a general sense, any changes that occur in doctrine, technology and force structure during an interwar period are driven by a desire on the part of the military to perfect its ability to defend the nation and defeat the enemy on the next battlefield. Unfortunately, warfare is not a one-sided affair but, as Clausewitz remarked, "the collision of two living forces."³ This increases the difficulty of correctly identifying future operational requirements on which to base changes in military doctrine, technology or organization. Hardly ever does the enemy conform to the friendly plan or sit idly by while one side enhances its capability to defeat the other. On the contrary, military innovation in both peace and war resembles a tennis match in which the opponents engage in a deadly game of serve and volley, each side seeking to overpower the other through a series of technological, organizational and doctrinal actions and reactions.

Within the realm of science, Isaac Newton defined this phenomenon in his third law of motion—“Every action has an equal and opposite reaction.” Philosopher Georg Wilhelm Friedrich Hegel expressed it in terms of an action–reaction dialectic, thesis acted upon by antithesis only to result in synthesis. Militarily, Clausewitz classified this process in war as an activity directed “against a living and reacting force.”⁴ The confluence of these descriptions yields a process where each action—be it a technological advancement, organizational redesign or doctrinal adaptation—causes a reaction. The reaction then becomes the catalyst for another reaction. This dialectic continues unabated until friction (both Clausewitzian and scientific) retards the action–reaction cycle and eventually wears the forces down until motion ceases, ideas and technology cannot progress any further, or one side defeats the other. While the development of nuclear weapons and nuclear strategy during the Cold War is perhaps the most vivid manifestation of this phenomenon, this dialectic relationship has been a recurrent theme throughout the history of warfare.⁵

Military Revolutions

Almost as a subset of this dialectic process, some scholars contend that certain changes in warfare are so acute from one period to the next as to constitute a revolution in military affairs. While the concept of a “military revolution” is not new, having first appeared in 1955, the belief that the U.S. military is on the cusp of a revolution in military affairs has received great attention of late.⁶

The concepts of the dialectic and military revolution are central to understanding why some military organizations seize upon opportunities to improve their warfighting capability, while others reject efforts at peacetime modernization. Assuming that a change does occur to alter the way wars are fought—the development of rifled weapons and the emergence of the airplane are two technological examples—the issue then becomes one of recognition and acceptance. If a military organization identifies the nature of the change, it must then decide if adopting elements of the new way of warfare will improve its military effectiveness. Often, however, military organizations neither perceive the nature of the change nor accept the need to change despite ample evidence to the contrary. If a change in warfare does occur, but goes unnoticed by the organization, then the chances are strong that the organization will not undertake any meaningful modernization prior to the start of the next war. A similar outcome may obtain if the military recognizes that a change has occurred, but chooses for whatever reason—political, bureaucratic or economic—not to pursue it. The danger, of course, is that an adversary may recognize and accept the change in warfare, modify its existing military organization, and capitalize on this new way of fighting when the next war starts.

External Factors That Influence Peacetime Military Innovation

Several external factors affect peacetime innovation and modernization in the military. While up to this point much of the discussion has focused on the theoretical aspect of change in the military, it is important to remember that the process of modernization extends beyond merely identifying the future condition of the battlefield and creating a doctrine to fit the new condition. The doctrine must be technically

feasible—if not immediately, then certainly at some point in the near future. It must also meet the political and strategic constraints of the nation. Finally, the cost of implementing the new doctrine—procuring new weapons and retraining the force while maintaining readiness—must be acceptable. In liberal democratic societies, each portion of this process is open for debate. Moreover, not only is every aspect of military modernization open for debate by, in this case, American society as a whole, but it is debated also in Congress and within the military. Thus, not only must each aspect of modernization be as correct as possible with respect to the future conditions of warfare, but it also must be technically feasible and affordable and must satisfy the external political and internal military bureaucracies as well. In light of these requirements, one occasionally wonders how effective modernization occurs at all.

National Strategy and the Direction of Innovation

A nation designs its military force structure to perform tasks that fit its concept of national strategy. Consequently, the operational requirements that form the foundation of a nation's military doctrine devolve from its concept of strategy. National defense strategy, however, constantly evolves and adapts to “shifting conditions and circumstances in a world where chance, uncertainty and ambiguity dominate.”⁷ While political objectives and diplomatic, economic and military resources all play a role in determining a nation's military strategy and its associated military force structure, national geography, history, ideology and culture also exert influence on the direction of strategy formulation and by extension the shape of military doctrine and force structure.⁸

Geography. Several aspects of a nation's geography, particularly its location, shape the way it views its security requirements. As Williamson Murray and Mark Grimsley point out in *The Making of Strategy*, the United States was for most of its history so removed from external threats that it ignored and rejected balance-of-power politics and involvement in overseas disputes.⁹ Even after World War I, America's separation from Europe and Asia continued to influence her attitude toward national defense. The inability of foreign powers to attack the continental United States was one of the factors that led American policymakers to limit defense expenditures. When Major General Frank W. Coe, Chief of the Coast Artillery Corps in the early 1920s, tried to use popular concerns about aerial bombardment as a springboard for increased funding for antiaircraft artillery, he was ignored because none of the professionals involved could envision an air threat capable of attacking America in the near future.¹⁰ Indeed, for most of the interwar period, the nation relied on naval patrols and the Army's Coast Artillery Corps and air forces to protect the coastline. Only in the late 1930s did policymakers become concerned with possible German economic and military penetration of South America and begin reinforcing the air, ground and sea defense of the Panama Canal and the Caribbean region.

Beyond mere threat-identification, geography also shapes the formation of military doctrine and procurement of specific types of weapons. As Murray and Grimsley highlight, throughout the interwar period, both British and American airmen emphasized the belief that air power could win wars independent of action by ground or naval forces. This led both nations to devote a large portion of their defense expenditures not only to aircraft, but particularly to bomber aircraft.¹¹

Per contra, faced with the threat of ground attack, Germany took the opposite approach. Instead of relying heavily on “strategic” bombing which implied some degree of sanctuary from direct land invasion, German air doctrine focused primarily on supporting the ground forces. To do otherwise might result in having German airfields, industry and countryside overrun. Conversely, given the Channel and North Sea obstacles to direct invasion, both the British and Americans could afford the loss of Belgium, the Netherlands or France and still keep fighting. Ironically, the Luftwaffe’s focus on relatively short-range fighter aircraft designed to support the Wehrmacht proved disastrous to German prospects for victory during the Battle of Britain.¹²

Today, of course, much has changed. Technology has advanced to the point where the American homeland may be subject to ballistic missile attack. Moreover, America’s national security strategy requires that the nation’s armed forces deploy more than ever before. This change has driven the need for the increased strategic mobility and greater sustainable lethality upon arrival that form the bedrock of the Army’s current transformation.

History. Along with geography, history also plays a large role in coloring the development of national strategy. While individual national historical experience influences strategic decisions almost as much as geography, the effect of historic periods on decisionmaking is just as profound. During the interwar period, the memory of the millions of dead, wounded and missing soldiers seared the national psyche of the Western democracies and left both their governments and peoples largely blind to the resurgence of German power. In Britain, the memory of World War I drove the adoption of the “Ten-Year Rule”—a defense budget and procurement program that assumed that Britain would fight no major conflict for the next ten years. The ten-year date rolled forward every year until the early 1930s and enabled the “government to evade any responsibility for providing a minimum base from which rearmament might begin.”¹³

Across the Atlantic, the historical experience of World War I drove Americans immediately after the war to call for a “return to normalcy” despite President Woodrow Wilson’s contention that “there can be no question of our ceasing to be a world power.”¹⁴ For the American Army, “normalcy” meant a rapid reduction in forces, a return to prewar constabulary duties, and protection of the limited American interests in the Philippines and China. It also meant severely reduced funding for research and procurement of weapons and equipment. In his 1945 “Biennial Report of the Chief of Staff,” General of the Army George C. Marshall characterized the effect of this lack of funding on anti-aircraft artillery procurement prior to World War II. He commented that the

highly efficient anti-aircraft of today did not materialize until long after the fighting began. The consequent cost in time, life, and money of this failure to spend the necessary sums on such activity in peacetime has been appalling.¹⁵

Today, as the lone remaining superpower after the 45-year political and military struggle that was the Cold War, America has entered a period of participation in “regulatory” wars and nonwars in which maintenance of the international status quo and preservation of stability are the norm. Unfortunately, our historical tradition of returning to “normalcy” and reaping the “peace dividend” has left the Army stretched to the

breaking point and underfunded to execute the transformation necessary to meet the needs of the new military strategy.¹⁶

Ideology and Culture. Historical experience often accords closely with national ideology and culture. In Germany following World War I, the misuse of history gave rise to the “stab-in-the-back” or *Dolchstoß* myth that subsequently reinforced the National Socialist propaganda program and led to Adolph Hitler’s rise and consolidation of power. In America, the history of the birth of the Republic has fueled an indigenous belief that the United States stands alone in the world as the unique “embodiment and protector of liberal democracy.”¹⁷ This view, when combined with America’s ideological, cultural and social abhorrence for large standing armies, has the potential to create a gap between the ends of national policy and the military means to accomplish them.

The Level of External Support and the Open Mind

All of these influences on strategy also affect decisions about military force structure and doctrine. In an era when the external pressures of geography, history, ideology and culture drive decisions on strategy that diminish the need for military preparedness, the likelihood that the military will attempt to modernize or seek innovation on its own is also limited. Indeed, the military works in a social environment that “is at best indifferent and at worst hostile to [its] activities.”¹⁸ In a majority of Western liberal democracies, the degree to which the public perceives a threat to its survival or well-being dictates the level of external support for the military. Typically, during interwar periods, the public does not perceive a threat to its existence. Thus, it does not find great utility in peacetime military forces. Unfortunately, the level of peacetime external support for the military has a direct effect on the ability of the military to achieve internal innovation. In other words, the less intellectual, psychological, economic and personal support the military receives, the less likely it will be to accept new ideas. If the military perceives it has little or no “freedom to fail” or margin for error, then it will find intellectual, psychological and physical sanctuary in maintaining the status quo. The less external support the military receives, the more it focuses inward and the more it fails to recognize emerging national and international political, social and technological trends that may affect the way it should operate in the future.¹⁹ Thus, a lack of external support may drive the military to resist innovation or to miss important opportunities to identify correctly the future conditions of battle.²⁰

The Military as an Ocean Liner

The military, particularly in the United States, is a huge bureaucratic organization and, like a large ocean-going vessel, it changes direction very slowly. To carry the analogy further, internal efforts to change direction are a function of the azimuth established by the captain and the propulsion created by the workers in the engine room. External efforts that force a change in the direction of the ship manifest themselves in the winds and tide emanating from the will of the people and embodied in Congress. By virtue of the Constitution, the Congress of the United States has great power to “raise and support,” “maintain” and “regulate” the military. Congress exercises this prerogative through hearings and legislation that affect the intellectual and physical development of

interwar operational requirements. Congress enforces its will through military budget appropriations and other directives.

Curiously, some scholars dismiss the impact of Congress on the process of military innovation as “at best, limited and indirect.”²¹ One has only to reread General Omar N. Bradley’s testimony as Army Chief of Staff before the House Committee on Appropriations to appreciate the high level of congressional influence over military innovation. Bradley commented that

in [its] calculations of what we shall spend for armed security and how we shall spend these funds . . . this committee is actually recommending to the Congress a military policy . . . for the long-run military plans must be reshaped within the budget allowed.²²

Bradley went on to emphasize that, due to congressional control of appropriations, “the military policy of the United States [was] shaped by Congress and not the armed forces.”²³ In addition to enforcing its will upon the military through budget appropriations, Congress also dictates reform to the military through specific legislation. The impact of the 1986 Goldwater–Nichols Act on the military’s attitude toward joint warfare is one example of the degree to which Congress can foster innovation.

The Effect of Social and Technological Currents

While the winds and tides of popular and political opinion exert a strong force on the direction of innovation in a military organization, they are fickle and subject to change. A few more stable forces influencing the direction of military innovation are the social currents and technological trends that can speed innovation, but just as often can carry military organizations in directions they do not intend to go. The history of the interwar period offers several examples of external trends influencing change within the military. The popular disdain for attrition warfare that emerged in Britain after World War I drove military theorists and reformers like J. F. C. Fuller and B. H. Liddell Hart to seek technological and doctrinal solutions to the stalemate that plagued the Western Front. Fuller and Liddell Hart proposed their ideas on mechanization and combined-arms warfare at a time when the Ten-Year Rule prevented even moderate modernization and many in the British Army discounted the value of mechanized warfare. Similarly, the popular enthusiasm for the automobile that gripped America in the 1920s and 1930s came at a time when many Army officers still regarded the cavalry as truly a horse-powered force. Nonetheless, the force of motorization proved unstoppable, driving the Army to put its mounts out to pasture and make the internal-combustion engine the new workhorse of the Army. Likewise, the civilian air industry provided the Army Air Service with both a public following and a technological foundation that allowed it to grow and prosper during a period when the development of equipment for the rest of the Army languished because it had no civilian application. Particularly in nontotalitarian states, a large portion of professional military knowledge and growth germinates from the seeds of ideas transplanted from the civilian world. Thus, it is the responsibility of the military to understand the trends, absorb the ideas, and translate the advances found in the civilian community into something with military utility.²⁴

The Army, however, cannot merely superimpose technological trends upon its institution without seriously risking combat readiness. Simply possessing a superior weapon is not

enough. It is essential that the military assimilate the tactical, operational and strategic effects of innovations in weaponry. Consider for a moment the example of European forces in the latter half of the 19th century. As Maurice Pearton points out, at Sadowa in 1866, the Prussian needle gun was less important to the outcome of the battle than the faulty tactics and organizational defects of the Austrian command. Moreover, close integration of doctrine and technology made the Prussian artillery more effective even though it was technically inferior to that of the Austrians. The trend continued four years later against France. There again German superiority rested as much on the tactical employment of the new Krupp cannon as in its technological quality. In both wars, the “opponents of the Prussian Army failed to assert their superiority in weaponry—the Austrian cannon at Sadowa and the Chassepôt rifle and mitrailleuse during the Franco-Prussian War.”²⁵

Furthermore, blindly altering doctrine or force structure for the sake of technological change invites disaster. Such was the case with the Pentomic Army of the 1950s, when the Army attempted to stave off institutional irrelevance by reequipping and reorganizing to meet the perceived needs of the nuclear battlefield. In doing so, it rushed off in pell-mell pursuit of nuclear technology only to build an Army that was, in the words of General George H. Decker, Army Chief of Staff from 1960 to 1962, “a jack-of-all-trades-and-master-of-none.”²⁶

Additionally, innovators must plan for countermeasures and not fall prey to Utopian beliefs in a superweapon. Military history is replete with examples of technological asymmetry and temporary advantage being offset and countered by other means. The mounted knight fell to the crossbow and pike. Surface ships suffered from subsurface torpedo attacks until the adoption of the convoy system and the invention of sonar. Soviet Hind helicopters ruled the skies over Afghanistan until the Mujahideen used American-made, shoulder-fired Stinger missiles to challenge their air superiority. These examples highlight the importance of understanding the applicability of military force within the context of its time and the need to integrate closely the development and use of new doctrine and technology. Failure to do so will result in the use of the extremely powerful, but proverbial, elephant gun to hunt fleas. Thus, it is essential that the hard thinking that defines the direction of reform occur prior to the beginning of modernization. “With inadequate thinking about operational requirements, the best technology and the biggest budget in the world will only produce vast quantities of obsolete equipment.”²⁷ Given the high degree of institutional inertia present in large organizations, only a great deal of forethought about the direction of innovation can help the Army to not get it “too badly wrong” when the next cannon sounds.

Internal Factors That Influence Peacetime Military Innovation

No effort to engender external support for innovation or any attempt to integrate emerging technological and social trends will succeed, however, unless the desired reforms pass internal military muster. Without support from within the military, most attempts at innovation will at the very least lose their effectiveness, if not fail completely. Unfortunately for proponents of modernization, the military, for reasons of organizational structure and professional culture, is largely resistant to change.

Military Conservatism

Military bureaucracies take a custodial approach toward their institutions and a conservative outlook to change. Their rigid, hierarchical organizational structure impedes the progress of new ideas. Formal information flows down the chain of command through orders and regulations and upward via reports from subordinates to superiors. In most organizations there is a tendency to protect the chief executive from undue disturbance. In the military, because formal rank and hierarchy are so clear-cut, informal access to senior leaders is cut off almost entirely. As a result, those in a position to support innovation within the organization only hear (or read) a small portion of the new ideas that exist at any moment. Moreover, because rank and seniority are the dominant characteristics of the organization, the military has great difficulty accepting outstanding original thinkers, particularly when these thinkers are young and have not “earned their spurs.”²⁸

Commenting on the relative difficulty between integrating changes in technology and those in tactics, Alfred Thayer Mahan wrote that “improvements of weapons [are] due to the energy of one or two men, while changes in tactics (or in this case the entire process of transformation) have to overcome the inertia of a conservative class.”²⁹ Mahan’s critique notwithstanding, there are valid reasons why the military as an institution hedges toward conservatism. In defense of its organizational rigidity and conservatism, the military differs from all other organizations in that its “business,” its stock-in-trade, is the employment of violence in support of national policy objectives. Therefore, the dangerous nature of the military profession counsels against incorporating unverified innovations into the organization. The cost of failure to the Army and the nation is so great that it warrants a conservative approach to new ideas.

The Military: A Pluralistic Community

Although the military’s rigid, hierarchical structure differs greatly from the structure of most organizations, it still reflects to some degree the pluralistic nature of the society it serves. In democratic nations, the military, like society, is not monolithic, but is a political community consisting of subunits, each with different views on how the Army or the military establishment as a whole should prepare to fight the next war. Just like other political communities, the various subunits within the Army—the branches (e.g., Armor, Infantry, Aviation) and the major commands (e.g., Forces Command or FORSCOM, Training and Doctrine Command or TRADOC, U.S. Army Europe or USAEUR, Eighth U.S. Army in Korea)—debate which method should dominate and how the “citizens” of their community, i.e., the soldiers, should live. Therefore, military modernization does not simply occur from a transfer of resources, but is the result of an ideological struggle that redefines the way the “citizens” live or, in this case, the way the Army fights.³⁰

The interwar period is replete with examples of such doctrinal debates. Following World War I, the military organizations in each of the major powers fought over the direction their military development should take in the future.³¹ Commenting on the German Army’s ideological struggle over doctrine, Michael Cooper concludes that not only did the German Army not wholeheartedly embrace what has since been called *Blitzkrieg* warfare, but that the entire

history of the German Army from the 1930s to the middle years of the Second World War [was] essentially the record of unresolved conflict

between the protagonists of a new strategy founded on the revolutionary use of armoured, motorised and air forces engaged in a mission of paralysis, and the adherents of the traditional strategy based on mass infantry armies, with the new arms at best treated only as equal partners, the cutting edge of the old decisive manoeuvre of encirclement and annihilation.³²

In the United States, a similar debate ensued over the development of aviation, its relationship to the Army and Navy, and the ability of anti-aircraft artillery to defend against it. On one side of the debate were elements calling for military aviation to remain integrated within the Army and Navy. On the other side of the issue were those supporting the unification of all air services and their separation from the Army and Navy. A key point in the debate concerned the utility of aircraft in military operations. Part of the Army's position to Congress against separating the Air Service from the Army rested on the argument that airpower alone could not win wars and that anti-aircraft artillery was a viable means to defend against air attack. At one point the Army Assistant Chief of Staff, Brigadier General Hugh Drum, testified before the House Select Committee of Inquiry on the Operations of the United States Air Services that with 12 three-inch anti-aircraft artillery guns he could stop "any bomber from doing serious destruction."³³

Conversely, Brigadier General William "Billy" Mitchell, testifying before the same committee, stated that with respect to stopping incoming aircraft "the problem of anti-aircraft . . . is almost an impossible one to solve." He commented that the United States had lost only "one-tenth of one percent of all missions" flown during World War I to German anti-aircraft fire and that the "method of firing [had] not improved perceptibly" since then.³⁴ Fiorello H. LaGuardia, then a congressional representative from New York, captured the tenor of this ideological struggle. In testimony before the House of Representatives Committee on Military Affairs in 1926, LaGuardia charged the Army General Staff with being "either hopelessly stupid or unpardonably guilty" in refusing to recognize the need for a separate air service. During his testimony, LaGuardia singled out the Coast Artillery Corps as an illustration of what he called "standpatism" or the failure to yield to the logic of airpower. He rebuked military authorities for having the "audacity" to ask Congress to fund coast defenses at a time when he believed coastal surface guns were outranged by their naval counterparts and anti-aircraft batteries were capable of hitting attacking aircraft only during rigged firing tests.³⁵

The Difficulty of Achieving Consensus

If the plurality of the military community exists, then it follows that for innovation to succeed, agreement on the new "ideology" must occur among the major parties involved. In short, the senior leadership must forge, through force of will and strength of ideas, a consensus on the future direction of the military. For a number of reasons, however, innovation in the military has usually met with strong resistance, making consensus as difficult to create there as in the civilian political community.

Uncertainty vs. Romanticism. Modernization, as defined by an innovation that alters the status quo, is difficult to achieve because of the uncertainty created by the method of evaluation and by the need for confidence in the existing equipment and doctrine. The military is naturally reluctant to discard historically reliable equipment and doctrine

before the battlefield advantages of innovations have received a full, complete and objective test. As stated earlier, the cost is too great if the innovators are wrong. One student of military organizations has observed that part of the rigor and realism demanded by the military in field-testing innovations arises from the historical romanticism infused in the profession. The utility of military history as a vehicle for inculcating soldiers with the military's professional ethic breeds a romantic attachment to the equipment and doctrine of its history. Thus, part of the military's resistance to change may stem from its efforts to instill pride, foster unit cohesion, and improve military effectiveness. This line of reasoning assumes, of course, that soldiers and officers actually *read* military history or use it for instruction in other than specialized staff colleges. The author is probably more accurate when he states that a soldier's faith in his weapons and doctrine is essential to the maintenance of *esprit de corps* and morale. Without such faith, no soldier will venture forth in battle. As a result, soldiers are reluctant to exchange proven battlefield equipment and techniques for innovative replacements unless they are convinced of their worth. This makes the need for open, objective and reliable field testing essential to building the consensus necessary to support changing the current doctrine or equipment.³⁶

A poignant historical example of such resistance lies in the efforts of 20th century armies to hold on to their horse cavalry despite indications for well over fifty years that there was no place for cavalry on a battlefield dominated by breech-loading rifles and machine guns. As early as 1870, when Prussian riflemen decimated the ranks of charging French cuirassiers, the evidence was clear—horse cavalry served no purpose on the modern battlefield. Evidence of the collapse of cavalry appeared again in World War I as machine guns and quick-firing artillery stopped cavalry charges in their tracks. The reluctance to abolish cavalry units continued, however, until it was swept aside by the onset of peacetime motorization in society and the wartime death of Polish horse cavalry in 1939.³⁷

Protectors of the Status Quo. Resistance to modernization also comes from those who have a vested interest in maintaining the status quo. "Often leaders who see their particular weapon becoming obsolete, and who see no approach to regaining their organizational dominance, are the most ritualistic and compulsive about the older forms of military command."³⁸ This phenomenon occurs in most military organizations regardless of the nature of the regime they serve. The father of German armored warfare theory, General Heinz Guderian, commented in *Panzer Leader* that neither the establishment of an independent air force nor the development of armored doctrine was adequately studied or appreciated by the General Staff because it was feared it might result "in the one case, in a decrease in the importance of the Army as a whole and, in the other, in a lessening of the prestige of the older arms of that service."³⁹

Age, Rank and Reluctance to Accept Change. Military sociologist Morris Janowitz contends that the tendency to resist organizational change rests in the middle officer ranks. At the bottom of the military hierarchy, the realities of combat force leaders to adapt. At the very top, leaders are selected because of their inclination to innovate. Moreover, they are susceptible to external pressure to innovate. Janowitz believes that in the middle ranks the pressures to innovate are absent. Additionally, midranking officers are often aware that their prospects for advancement are declining. Thus, these officers adopt a defensive

stance. “Instead of constructive problem solving, these officers are concerned with maintaining the formal prerogatives of their rank” and position. This, in turn, “leads to organizational rigidity, ceremonialism and a retreat from administrative responsibility.”⁴⁰

Janowitz’s conclusions are that of a military sociologist, not a historian, and may reflect more than anything else his study of the U.S. military in 1965. There is no evidence that middle grade officers are more or less innovative than senior officers or subalterns. While there may be some question as to how he defines the “middle officer ranks,” however, his characterization of resistance is nonetheless accurate.

Students of military innovation understand that resistance to change can occur at all echelons, including the highest levels of military service. One has only to read the history of the Root reforms, attempted and eventually instituted by Secretary of War Elihu Root, and the decade-long fight against them by Major General Fred C. Ainsworth, to appreciate the level at which opposition can occur. As the chief of the Army’s Office of Record and Pension in 1903 and later as The Adjutant General, Ainsworth stood to lose a great deal of personal and professional prestige if the War Department centralized administrative control of the bureaus and functional control of the various arms under the Office of the Chief of Staff. In an attempt to prevent this from occurring, Ainsworth fought a bureaucratic battle within the War Department until forced by General Leonard Wood and Secretary of War Henry Stimson to retire in lieu of being court-martialed for insubordination. He subsequently renewed his fight from Capitol Hill as an unofficial advisor to a sympathetic congressman. Only when the congressman retired and the nation entered World War I did the resistance cease.⁴¹

Norman Dixon, in his polemic *On the Psychology of Military Incompetence*, attributes the failure of senior leaders to innovate to “extremely weak egos” which result in schizophrenic behavior typified by an “insatiable desire for admiration” and the avoidance of criticism on the one hand and an equally “devouring urge for power and positions of dominance” on the other. Dixon concludes that in trying to avoid criticism, status-quo leaders shy away from innovation and delude themselves and others that current methods are adequate for the situation. This delusion is reinforced by their personal and positional power within the organization, which ensures that their vision, be it right or wrong, remains unchallenged.⁴²

Dixon may be more accurate in his contention that resistance to innovation is often born of ignorance or mental stultification. Although he applies it solely to senior officers, his theory works for all those who reach for and attain positions for which they are truly unqualified. According to Dixon, pontification follows as nature abhors a vacuum and the ignorant move to fill the vacuum by pontificating to conceal their lack of knowledge or because they are too ignorant of the facts to feel any concern about expressing ideas to the contrary.⁴³ In the military realm, this often leads to oversimplification or assumptions about the future that contradict emerging trends. British Field Marshal Archibald Montgomery-Massingberd, Chief of the Imperial General Staff from 1927 to 1933, is a perfect case in point. At one point during his tenure, Montgomery-Massingberd ridiculed J. F. C. Fuller’s works on tank warfare while simultaneously admitting that he had never actually read any of them.⁴⁴

Conversely, attempts to foster change in military organizations may occur as a result of the combined efforts of several individuals of varying rank and responsibility. The early history of the antiaircraft establishment during the interwar period is an excellent example of this phenomenon. As the Army demobilized following World War I, a relatively junior officer, Captain F.S. Clark, editor of the *Journal of the United States Artillery* (later the *Coast Artillery Journal*), recognized the impact that airpower had on that war and would have in future conflicts. In a telling comment in the May 1919 edition of the *Journal of the United States Artillery*, he challenged the leaders of the Coast Artillery Corps to take the initiative and lead the way in preparing a credible defense against the airplane.⁴⁵ Largely as a result of his prodding, articles discussing the performance of the Antiaircraft Service during the war began to appear. Soon other theoretical suggestions for organization and employment of the fledgling establishment surfaced in the *Journal*. Some of the authors were the “old men” and “founding fathers” of the antiaircraft artillery.⁴⁶ Others were more recent converts to the cause and reflected the growing realization among Coast Artillery officers that the antiaircraft artillery was a progressive, developing element of the branch with great potential for growth, opportunity and promotion. Progress continued throughout the 1920s as the Coast Artillery published a series of doctrinal “papers” to “coordinate the development and progress” of widely distributed antiaircraft units.⁴⁷

By the end of the decade, the combined effect of these publications together with continued education at the Coast Artillery School and the fielding of antiaircraft equipment and units propelled the antiaircraft artillery establishment to a position of equality with, if not primacy over, its seacoast artillery counterpart. In 1929, the War Department recognized this fact and changed the mission of the Coast Artillery Corps to include serving as the nation’s “first line of ground defense against enemy aircraft at sensitive points and vital areas.” The War Department also required that, “in addition to [their] permanent assignments . . . to fixed defenses, railway, or tractor artillery,” the Coast Artillery Corps train all troops to “serve skillfully and effectively [on] antiaircraft armament . . . [and] . . . equipment.”⁴⁸ By midyear, the intellectual and doctrinal revolution within the Coast Artillery Corps had progressed to the point that the Assistant Commandant of the Coast Artillery School was telling his various department directors that “[w]e must have another hour (day or week) out of your course for antiaircraft instruction.” The *Coast Artillery Journal* reported, “Directors and instructors weep as their pet courses are slashed and belittled by ruthless antiaircraft-minded authorities.”⁴⁹ Concerned about the impact of these developments on his officers, Major General John W. Gulick, the new chief of the Coast Artillery Corps, issued a statement denying the superiority of the antiaircraft artillery and telling seacoast artillery officers within the branch that neither their careers nor their subdiscipline within the Corps were in jeopardy of becoming obsolete.⁵⁰ Such was the impact of a small but varied group of visionaries on the psychology of the institution.

Mavericks as Agents of Change. Finally, reluctance to change the status quo manifests itself in hostility toward the agents of change. This is particularly true when the agents become mavericks and operate outside of the normal channels of communication. During the interwar period, three well-known mavericks sought to modernize their militaries and alter the status quo. In England, B. H. Liddell Hart and J. F. C. Fuller argued that

mechanized warfare and combined-arms formations would restore mobility on the battlefield and return the offensive to the dominant place in warfare. In America, Billy Mitchell polemicized for an independent air service to replace the Navy as the nation's first line of defense. While all began their efforts as mavericks railing against the established vision of their services, only Liddell Hart softened his rhetoric and endeavored to work within the system to achieve the changes he believed necessary. Conversely, Fuller retired in disgust and joined with Britain's Fascist Party, while Mitchell was court-martialed for insubordination and left the U.S. Army in 1926.

Interestingly, some scholars theorize that military mavericks lend expertise to civilians who then push the military toward innovation.⁵¹ In reality, these mavericks do more harm than good to the cause of innovation. By going outside the military, the mavericks alienate those within the organization who subsequently dig in their heels. Insulted and seething with indignation, the orthodox military becomes intransigent, defying or retarding civilian efforts to force innovation on the military.⁵²

One Path to Successful Military Innovation in Peacetime

Given the numerous internal impediments to innovation, one may wonder how any modernization occurs within the military. Despite indications to the contrary, modernization does indeed occur. When it happens, however, it is usually the product of several important elements brought together in a single, coherent strategy for change.⁵³

Timing

Assuming that a bona fide need for change exists and that the change in question is appropriate for the organization's future success, the first element of successful modernization is timing. While there is no optimal time to begin innovation, there are three periods that have served as stimuli for change in the past. Some authors contend that the period immediately following a defeat offers the best chance to initiate modernization. Capitalizing on the weakened preconceptions of senior leaders, the demonstrated fallibility of traditional methods, and the lack of confidence of the established order, innovators in these armies use their recent defeat as a lever with which to press for reform.⁵⁴ In this sense, defeat represents the greatest, most visible collection of anomalies to the current military paradigm and serves as a ready example of a paradigm crisis. The impact of Prussia's loss to Napoleon in 1806 on the military reform movement led by Gerhard Johann David von Scharnhorst and August Wilhelm von Gneisenau is a case in point.⁵⁵ Not all armies, however, recognize the need to reform following a defeat. Andrew F. Krepinevich, in his trenchant study *The Army and Vietnam*, considers the Army derelict in its duty because after its defeat in that low-intensity conflict "the Army made little effort to preserve the learning that had occurred during the war; rather, it expunged the experience from the service's consciousness."⁵⁶

Although less frequently observed, another period when history indicates innovation has occurred is following a major victory. Far from resting on their laurels, successful armies have used this occasion to modernize their doctrine and equipment both to deter potential aggression by an adversary and to ensure future battlefield readiness. Napoleon's development of *La Grande Armée* during the relative period of peace

between 1802 and 1805 is one example of a army introducing a new doctrine and organization after a major victory—in this case Marengo.⁵⁷ Most students of the current effort at *Transformation* would contend that, as an institution, the U.S. Army is following this model. Not all armies, however, feel compelled to attempt innovation during the period following a major victory. As discussed earlier, war weariness and isolationism prevented modernization from occurring in the British and American armies for over a decade after their victorious conclusion of World War I.

A third point in the life of an interwar army when conditions may support successful modernization occurs during the period immediately prior to a potential conflict. This is particularly true when leaders perceive the nature of war has changed and their force is not capable of meeting the new challenges ahead. As such, these leaders are attempting to alter their organizations to cope with a recognized crisis in their military paradigm. As Friedrich von Decken, a Hanoverian staff officer who later distinguished himself under Wellington in Spain, wrote in 1800,

Change encounters less obstacles shortly before the outbreak of a war. . . .
A danger sensed by all muffles the voice of intrigue, and the innovation appears as a smaller evil that must be accepted to avoid a greater.⁵⁸

Such was the case in both the United States and Great Britain in the mid-1930s as storm clouds formed over Europe. Of course, the danger in waiting until the period immediately prior to a new conflict to modernize is that the Army may get caught in a doctrinal, organizational or technological “Midway,” having completed only a portion of the planned change and operating with a mix of old and new methods when the next war starts. Shortly before its defeat in 1806, the Prussian Army reorganized along the divisional lines. While desirable, the reform came before anyone learned how to operate the new system.⁵⁹

What all of these time frames have in common is that they occurred when there was a period of what one author has called organizational slack or organizational distress in the life of the institution. Slack obtains when an organization possesses resources (money, personnel, time, political support) in excess of what it needs to meet its daily mission requirements. Slack supports innovation because it allows the organization to divert resources to develop, test and implement new ideas. Of the examples above, perhaps only Napoleon enjoyed the overabundance of resources necessary to foster modernization. Conversely, distress occurs when an organization faces budget decrements, a diminishing threat and an uncertain operational future. Under these pressures the organization must look for innovative methods to preserve its institutional vitality. It sets new goals, adopts new values and creates new supporting power structures. The U.S. Marine Corps is one example of a military organization changing as a result of distress. Until rearmament began in the mid-1930s, the Marine Corps was under acute organizational stress. It adapted to the conditions of the time, developed innovative ideas concerning amphibious warfare, and sustained its organizations in the face of overwhelming pressure. The Coast Artillery Corps, its adoption of the antiaircraft artillery mission, and development of supporting doctrine, organization and technology is another example of an institution adapting in times of distress to meet changing operational needs.⁶⁰

Continuity and Protection for Agents of Change

The second element of successful modernization concerns the architects of change. “The reform of any military organization . . . requires multiple paternity, a coalition of senior and junior officers who share a common vision” of both the past and the future.⁶¹ Moreover, these officers must possess the intellectual and political staying power to see the innovation through to implementation. Frequently, military innovations take a long time to complete. They represent more than anything else great campaigns against the status quo. Unfortunately, in the modern military, personnel turbulence virtually guarantees a rapid turnover of the individuals charged with stewardship of the innovation. At a minimum, career progression dictates the departure of key people before the changes are complete. Thus, it is essential that senior leaders establish continuity among the agents of change.⁶²

Equally important is the need for the current leaders to ensure the succession of like-minded officers into senior leadership positions within the military. If the intellectual and political chain of authority supporting the innovation is broken, then modernization will fall victim to traditional beliefs—the long threads that tether institutions to the past—and fail. Without a patron to shield the innovation from attack and shepherd both it and the innovators through hard times, the effort will collapse. Similarly, modernization will require a spokesman to sell the innovative ideas to the Army at large. The spokesman should not be a “maverick.” He should be either an individual with credibility both inside and outside the Army or, as General Donn Starry contends, an institution such as a staff college like the U.S. Army Command and General Staff College or a staff agency like the Training and Doctrine Command that can carry the innovation forward from within the bureaucracy.⁶³

Consensus, Incrementalism and Distributed Action

The third and most important ingredient to successful modernization is the creation of a consensus in support of the change. The architects of change must build support within the Army using the irrefutable logic of their ideas backed by empirical evidence obtained through realistic, objective trials. Only when the Field Army accepts the benefits of change and believes it has a stake in the modernization will the rank and file tear down the bureaucratic barriers impeding the progress of innovation and support the change.⁶⁴ As General Gordon Sullivan contends:

Leading change means doing two jobs at once—getting the organization through today and getting the organization into tomorrow. Most people will be slow to understand the need for change, preferring the future to look like today, thus displacing their lives and sense of reality as little as possible. *Transformational leadership requires a personal and very hands-on approach, taking and directing action, building the confidence necessary for people to let go of today’s paradigm and move into the future.*⁶⁵

In part, the nonlinear nature of military innovation assists in consensus-building. Friedrich von Decken offered the following analysis:

Such a close relationship exists among the separate components of the military estate . . . that in order to achieve anything many wheels must be set in motion that often seem far removed from one another.⁶⁶

Thus, several groups of innovators can work independently to build consensus for various elements of a planned modernization which if combined would alarm the purveyors of the status quo. By taking an incremental, distributed approach to modernization, innovators can avoid the kind of all-out ideological struggle that polarizes the military and retards reform.

Intellectual Surf Rider or Irrelevant Institution

Combined, these elements of successful modernization—good timing, continuity, patronage, salesmanship, nonlinearity and consensus-building—give the agents of change a fighting chance to defeat the traditional elements of resistance and see their *transformation* reach fruition. As demonstrated by several historical examples, successful innovation is the product of a diverse set of external and internal factors that continually intervene to alter the nature of any long-range modernization as well as the path taken to achieve it. Given the broad similarities between the past and the present, the lessons of earlier attempts at innovation bear consideration for the future. To return to the analogy of the ocean liner, the U.S. Army can no longer see itself as a large, lethargic vessel, fighting against the currents and winds of change and turning ever so slowly at the direction of the captain. Instead, to borrow from Sir Michael Howard, the Army must see itself as an “intellectual surf rider spotting the *essential* currents on which to ride” the crest of the breaking wave of social, political and technological trends that would dash a less flexible, versatile and adaptable organization on the rocks of irrelevance or beach it in the shallow waters of impotence.⁶⁷

Endnotes

1. Military modernization is an oft-invoked but ill-understood phrase. Within the context of this analysis, the terms “innovation,” “modernization” and “reform” are synonymous. Each connotes an action that represents a new and improved method or procedure for doing business and implies a clear break with the practices of the past. To avoid confusion, when used in a military context these terms characterize actions that result in one or more of the following: a change in the way an arm of the service fights; the creation of a new arm; a change in relative worth between arms of a service; the reduction or disuse of an older concept or formerly dominant weapon, or the addition of a new weapon. The doctrinal and organizational changes necessitated by the inclusion of antiaircraft artillery weapons in Coast Artillery units, the creation of the Air Corps, the emergence of armored warfare, the demise of horse cavalry, and the addition of the tank and airplane are all examples of military innovation. For the purpose of this analysis, the terms “military innovation,” “modernization” and “reform” do not refer to smaller changes in organizations or weapons such as the addition of a man to an infantry squad or a new telescope to a rifle. These represent evolutionary changes that are often imperceptible to others in the organization and normally do not run counter to the institutional status quo. See Stephen Peter Rosen, *Winning the Next War*, (Ithaca, N.Y.: Cornell University Press, 1991), pp. 7–8.
2. Eliot A. Cohen and John Gooch, *Military Misfortunes: The Anatomy of Failure in War* (New York: The Free Press, 1990).
3. Carl von Clausewitz, *On War*, ed. and trans. by Michael Howard and Peter Paret (Princeton, N.J.: Princeton University Press, 1976), p. 77.
4. Carl von Clausewitz, *On War*, ed. Anatol Rapoport (London: Penguin Classics, 1968), Bk. II, Ch. 3, pp. 202–203; The Howard and Paret edition of *On War* says, “In War, the will is directed at an animate object that *reacts*.” (Italics in original), p. 149.
5. For more on this phenomenon during the Cold War, see Lawrence Freedman, *The Evolution of Nuclear Strategy*, 2d ed. (New York: St. Martin’s Press, 1989). For the effect of nuclear weapons and strategy on U.S. Army doctrine, particularly in the 1950s and early 1960s, see A. J. Bacevich, *The Pentomic Era: The U.S. Army Between Korea and Vietnam* (Washington, D.C.: National Defense University Press, 1986). Several notable works—including *From Crossbow to H-Bomb*, by Bernard and Fawn Brodie; *Technology and War*, by Martin van Creveld; *Of Arms and Men*, by Robert O’Connell; *The Pursuit of Power*, by William H. McNeill; *Guns, Sails, and Empires*, by Carlo Cipolla; and *Gunpowder and Galleys*, by John Guilmartin—discuss various aspects of this ongoing relationship.
6. The concept of a “military revolution” first appeared in 1955 during a lecture by historian Michael Roberts on the impact of the military reforms of Swedish King Gustavus Adolphus on 17th century warfare. Roberts’ ideas went relatively unchallenged until 1976 when another historian of the Early Modern period, Geoffrey Parker, questioned several aspects of his thesis. Since then, several books and articles have used this concept to explain the dialectic nature of warfare during several periods of history. For a slightly amended version of Roberts’ lecture, see Michael

- Roberts, "The Military Revolution, 1560–1660," *Essays in Swedish History* (Minneapolis: University of Minnesota Press, 1967), pp. 195–225; for Parker's initial response, see Geoffrey Parker, "The 'Military Revolution,' 1560–1660—a Myth?" *The Journal of Modern History*, vol. 48 (1976), pp. 195–214. See also Geoffrey Parker, *The Military Revolution: Military Innovation and the Rise of the West, 1500–1800* (Cambridge: Cambridge University Press, 1988); Jeremy Black, *A Military Revolution? Military Change and European Society, 1550–1800* (Atlantic Highlands, N.J.: Humanities Press, 1990); Clifford J. Rogers, "The Military Revolutions of the Hundred Years' War," *The Journal of Military History*, vol. 57, no. 2, (April 1993), pp. 241–278; Andrew F. Krepinevich, "Calvary to Computer: The Pattern of Military Revolutions," *The National Interest* (Fall 1994), pp. 30–42.
7. Williamson Murray and Mark Grimsley, "Introduction: On Strategy," in Williamson Murray, MacGregor Knox and Alvin Bernstein, eds., *The Making of Strategy: Rulers, States, and War* (New York: Cambridge University Press, 1994), p. 1.
 8. *Ibid.*, pp. 1-3.
 9. *Ibid.*, p. 7.
 10. Coe, in his 1920 "Report of the Chief of Coast Artillery Corps," warned that it would take \$20 million to provide Boston with the same level of antiaircraft protection afforded Paris during World War I. Maj. Gen. Frank W. Coe, "Report of the Chief of Coast Artillery Corps," *War Department Annual Report, 1920* (Washington, D.C.: U.S. Government Printing Office, 1920), p. 308.
 11. Murray and Grimsley, "Introduction: On Strategy," p. 8.
 12. *Ibid.*
 13. Williamson Murray, "The Collapse of Empire: British Strategy, 1919–1945," in Murray, Knox and Bernstein, eds., *The Making of Strategy*, p. 407.
 14. Quoted in Eliot A. Cohen, "The Strategy of Innocence? The United States, 1920–1945," in Murray, Knox and Bernstein, eds., *The Making of Strategy*, p. 440.
 15. George C. Marshall, "Biennial Report of the Chief of Staff of the United States Army to the Secretary of War, July 1, 1943–June 30, 1945," *The War Reports of General of the Army George C. Marshall and Others* (New York: J.B. Lippincott Company, 1947), p. 299.
 - 16 Theodore G. Stroup, Jr., "The Ongoing Army Transformation," *ARMY*, July 2000, pp. 7-10.
 17. Murray and Grimsley, "Introduction: On Strategy," p. 13.
 18. Michael Howard, "Military Science in an Age of Peace," *RUSI, Journal of the Royal United Services Institute for Defense Studies* (March 1974), p. 4.
 19. *Ibid.*
 20. I. Bernard Cohen makes a similar point with respect to innovations and revolutions in science. While "revolutions in science are inevitable," Cohen contends that the pace or frequency of such revolutions varies with the degree of financial support given to the scientific community. A paucity of funds limits the possibilities for purchasing

and constructing research instruments, conducting expeditions, recruiting and training the next generation of scientists, and relieving scientists of excessive administrative and teaching duties so they can “reflect” on their discipline. For more on this subject, see I. Bernard Cohen, *Revolution in Science* (Cambridge: Harvard University Press, 1985), p. 21.

21. Rosen, *Winning the Next War*; Stephen Peter Rosen, “New Ways of War: Understanding Military Innovation,” *International Security*, vol. 13, no. 1 (Summer 1988), p. 167; Michael Meese, “The Process of Organizational Change,” in Richard Hooker, ed., *Maneuver Warfare: An Anthology* (Novato, Calif.: Presidio Press, 1993), p. 205.
22. Omar N. Bradley, quoted in Elias Huzar, *The Purse and the Sword: Control of the Army by Congress through Military Appropriations, 1933–1950* (Ithaca, N.Y.: Cornell University Press, 1950), pp. 132-133.
23. *Ibid.*
24. The author thanks Professor Roger Spiller, the George C. Marshall Professor of Military History at the United States Army Command and General Staff College, for his comments on the sources of professional knowledge and growth.
25. Maurice Pearton, *Diplomacy, War, and Technology Since 1830* (Lawrence, Kans.: University of Kansas Press, 1984), p. 27; see also Michael Howard, *The Franco-Prussian War* (London: Rupert Hart-Davis, Ltd., 1961).
26. For a complete analysis of the Pentomic Division and an extremely cogent argument on the debilitating effect an unquestioning acceptance of technology can have on a military institution, see Bacevich, *The Pentomic Era*; Bacevich quotes General Decker on page 135.
27. Howard, “Military Science in an Age of Peace,” p. 5.
28. Morris Janowitz, *Sociology and the Military Establishment* (New York: Russell Sage Foundation, 1965), pp. 102–103; Howard, “Military Science in an Age of Peace,” p. 5; Meese, “The Process of Organizational Change,” p. 202.
29. Alfred Thayer Mahan, *The Influence of Sea Power upon History, 1660–1805* (Novato, Calif.: Presidio Press, 1987), p. 20. This work is a combination of Mahan’s classic work *The Influence of Sea Power upon History, 1660–1783*, abridged, and extracts from his *The Influence of Sea Power upon the French Revolution*. Parenthetical comment added.
30. Kurt Lang, “Military Organizations,” in *Handbook of Organizations*, James G. March, ed. (Chicago: Rand McNally & Co., 1965), p. 843; Rosen, *Winning the Next War*, pp. 19–20.
31. For a superb discussion of the development of French Army doctrine during the interwar period, see Robert A. Doughty, *The Seeds of Disaster: The Development of French Army Doctrine, 1919–1939* (Camden, Conn.: Archon Books, 1985). For similar discussion with respect to the development of Soviet doctrine, see James J. Schneider, *The Structure of Strategic Revolution: Total War and the Roots of the Soviet Warfare State* (Novato, Calif.: Presidio Press, 1994). Likewise, for a

- discussion of the development of doctrine in Britain, see Brian Bond, *British Military Policy Between the Two World Wars* (Oxford: University Press, 1980).
32. Matthew Cooper, *The German Army, 1933–1945: Its Political and Military Failure* (Chelsea, England: Scarborough House, 1990), p. 149.
 33. For a particularly interesting argument on behalf of the Army’s position as well as a statement on the effectiveness of antiaircraft artillery, see testimony by Brigadier General Hugh A. Drum, Assistant Chief of Staff of the Army, before the Select Committee of Inquiry into Operations of the United States Air Services, in Congress, House, Select Committee of Inquiry into Operations of the United States Air Services, *Inquiry into Operations of the United States Air Services*, 68th Cong., February 1925, pp. 1791–1873. Drum’s comment about stopping any bomber may be found on page 1868.
 34. *Ibid.*, p. 1909.
 35. Congress, House, Committee on Military Affairs, *Department of Defense and Unification of the Air Service*, 69th Cong., 1st sess., 19 January to 9 March, 1926, pp. 383–386.
 36. Lang, “Military Organizations,” p. 857.
 37. Michael Howard, *The Franco-Prussian War* (London: Rupert Hart-Davis Ltd, 1961), pp. 115–119; see also Edward L. Katzenback, Jr., “The Horse Cavalry in the Twentieth Century—A Study on Policy Response,” *Public Policy, a Yearbook of the Graduate School of Public Administration* (Boston: Harvard University Press, 1958), pp. 120–149; and Dean A. Nowowiejski, “Adaptation to Change: U.S. Army Cavalry Doctrine and Mechanization, 1938–1945” (Monograph, School of Advanced Military Studies, U.S. Army Command and General Staff School, Fort Leavenworth, Kans., 1994).
 38. Janowitz, *Sociology and the Military Establishment*, p. 105.
 39. Heinz Guderian, *Panzer Leader* (New York: Ballantine, 1957), pp. 383–384.
 40. *Ibid.*, p. 103; Lang, “Military Organizations,” p. 857.
 41. For more information on the conflict between Major General Fred C. Ainsworth and Elihu Root and Major General Leonard Wood, see Philip Semsch, “Elihu Root and the General Staff,” *Military Affairs* 27 (Spring 1963), pp. 16–27; Graham A. Cosmas, “Military Reform After the Spanish–American War: The Army Reorganization Fight of 1898–1899,” *Military Affairs* 35 (February 1979), pp. 12–18; Mabel E. Deutrich, *Struggle for Supremacy: The Career of General Fred C. Ainsworth* (Washington, D.C.: Public Affairs Press, 1962); and Jack Lane, *Armed Progressive: General Leonard Wood*, (Novato, Calif.: Presidio Press, 1978).
 42. Norman Dixon, *On the Psychology of Military Incompetence* (New York: Basic Books, 1976), p. 115.
 43. A phrase recently communicated to this author by a general officer—“I may be frequently wrong, but I am never in doubt”—is an excellent example of this phenomenon occurring even among the U.S. Army’s rising stars.
 44. Dixon, *On the Psychology of Military Incompetence*, p. 112.

45. *Journal of the United States Artillery* 14 (Fort Monroe, Va.: Coast Artillery School Press, May 1919), pp. 325–327.
46. For an excellent discussion of the development of antiaircraft artillery during World War I, see Charles E. Kirkpatrick, *Archie and the A.E.F.: The Creation of the Antiaircraft Service of the United States Army, 1917–1918* (unpublished Ph.D. dissertation, Emory University, 1987).
47. War Department, Office of the Chief of Coast Artillery, Bulletin, “Anti-Aircraft Series,” No. A.A. 1.001, 25 November 1922, TM, Dec #300.53, Box 3, Entry #9, RG 177, NA.
48. Maj. Gen. Andrew Hero, Jr. “New Year Greetings from the Chief of Coast Artillery,” *Coast Artillery Journal*, vol. 72, no. 1. (January 1930), frontispiece.
49. “The Coast Artillery School: Antiaircraft—‘Cock o’ the Walk,’” *Coast Artillery Journal*, vol. 72, no. 5. (May 1930), p. 435.
50. “Seacoast versus Antiaircraft,” *Coast Artillery Journal*, vol. 73, no. 3. (September 1930), p. 263.
51. Barry Posen, *The Sources of Military Doctrine* (Ithaca, N.Y.: Cornell University Press, 1984), pp. 224–226.
52. Rosen, *Winning the Next War*, pp. 10–13. For a more positive view of “mavericks” within the military, see General Donn A. Starry, “To Change an Army,” *Military Review* 63 (March 1983), p. 22.
53. Several senior military officers and noted scholars have offered their view on how to achieve peacetime military innovation. The ideas that follow incorporate many of them, while at the same time perhaps offering something new.

General Gordon R. Sullivan (USA Retired), Chief of Staff of the United States Army, 1991–1995, and Colonel Michael V. Harper (USA Retired), former director of the Army Chief of Staff’s Staff Group, list nine “rules” with a “small r” for guiding change: 1) Change is hard work; 2) Leadership begins with Values; 3) Intellectual leads physical; 4) Real change takes real change; 5) Leadership is a team sport; 6) Expect to be surprised; 7) Today competes with tomorrow; 8) Better is better; 9) Focus on the future; 10) Learn from doing; 11) Grow people. Sullivan and Harper conclude with an admonition to leaders to spend time reflecting on three questions: a) What is happening? b) What is not happening? c) How can I influence the situation? For an outstanding view of the beginnings of the Army’s *Transformation* as well as an excellent primer on leadership, see Gordon R. Sullivan and Michael V. Harper, *Hope is Not a Method* (New York: Broadway Books, 1996).

Timothy Lupfer, the author of a minor military classic on the development of German tactical doctrine during World War I, lists nine steps to change: 1) perception of a need for change; 2) solicitation of ideas, especially from the battlefield units; 3) definition of the change; 4) dissemination of the change; 5) enforcement throughout the Army; 6) modification of organization and equipment to accommodate the change; 7) thorough training; 8) evaluation of effectiveness; and 9) subsequent refinement. (Timothy T. Lupfer, *The Dynamics of Doctrine: The Changes in German Tactical Doctrine During*

the First World War, Leavenworth Paper No. 4 [Fort Leavenworth, Kans.: Combat Studies Institute, U.S. Army Command and General Staff College, 1981], p. viii.)

General Donn A. Starry, former commander of the United States Army Training and Doctrine Command and an architect of the Army's 1982 edition of *Field Manual 100-5: Operations*, lists seven general requirements for successful military innovation: 1) an institution or mechanism to identify the need for change, draw up parameters for change, describe what must be done and how it differs from past practice; 2) rigorous educational background of officers responsible for change to produce a common cultural bias toward solving problems; 3) spokesman for change—it can be an institution or an individual; 4) building of consensus and gaining of converts; 5) continuity among the architects of change; 6) support at or near the top of the organization; and 7) conducting of field trials to test the validity of the proposed change. (Starry, "To Change an Army," pp. 20–27.)

Sir Michael Howard, an eminent military historian and strategic thinker, defined three conditions that underwrite any military innovation, particularly in peacetime—technical feasibility, operational requirement and financial capability. (Howard, "Military Science in an Age of Peace," pp. 3–9.)

Dr. Richard Swain, former director of the United States Army Combat Studies Institute at Fort Leavenworth, lists five things a military force needs to keep up with changing military developments in times of peace: 1) a correct strategic rationale; 2) a concept of military operations; 3) investment in research and development and procurement proportional to the likelihood of immediate employment; 4) an open-minded proponent for the whole; and 5) a convincing spokesman capable of explaining military requirements to government decisionmakers and, ultimately, the public. (Richard Swain, "Adapting to Change in Times of Peace," *Military Review* 74 [July 1994], pp. 50–58.)

Harold Winton, a former Army officer and one of the founders of the United States Air Force School for Advanced Airpower Studies at Maxwell Air Force Base, Alabama, offered six requirements for changing military institutions: 1) a close and dynamic relationship between the purposes of military institutions and the forms those institutions take; 2) the need for senior leaders to articulate continuously the vision for the future; 3) the intellectual mastery of the nature of war and development of doctrine on how future wars should be waged; 4) the validation of doctrine through field testing to check it and form the basis for changing organizations, weapons, equipment and training methods; 5) high-level support and consensus to overcome ingrained habits and branch or service parochialism; 6) the need for reformers to remain accepted by the body and not become alienated or marginalized by the mainstream of the institution. (Harold R. Winton, *To Change An Army: General Sir John Burnett-Stuart and British Armored Doctrine, 1927–1938* [Lawrence, Kans.: University of Kansas Press, 1988], p. 239.)

Dr. I. B. Holley, in *Ideas and Weapons*, his study of the relationship between technological advancements, military doctrine and weapons development, contends that military organizations fail to discover and apply the best weapons and techniques

in war because they fail to: 1) adopt, actively and positively, the thesis that superior arms favor victory; 2) recognize the importance of establishing a doctrine regarding the use of weapons; and 3) devise effective techniques for recognizing and evaluating potential weapons in the advances of science and technology. (I. B. Holley, *Ideas and Weapons I*, [Camden, Conn.: Archon Books, 1971], p. 10.) In developing doctrine, Holley offers a three-phase process of “assembling objective information, formulating doctrinal generalities, and disseminating the doctrine to the field.” (I. B. Holley, “The Doctrinal Process: Some Suggested Steps,” *Military Review* 59 [April 1979], pp. 2–13, quoted in Winton, *To Change an Army*, p. 5.)

Brigadier General Huba Wass de Czege, founder of the U.S. Army School of Advanced Military Studies at Fort Leavenworth, suggests that “successful military reform comes from developing a harmony among the three elements of soldiers, ideas, and weapons.” (Huba Wass de Czege, “Preparing for War: Defining the Problem” [Fort Leavenworth, Kans.: 1984] quoted in Winton, *To Change an Army*, p. 6).

54. Posen, *The Sources of Military Doctrine*, p. 47; Peter Paret, “Innovation and Reform in Warfare,” *The Harmon Memorial Lectures in Military History, Number 8*, (Colorado Springs, Colo.: United States Air Force Academy, 1986), p. 8.
55. Hajo Holborn, “The Prusso-German School: Moltke and the Rise of the General Staff,” in *Makers of Modern Strategy: From Machiavelli to the Nuclear Age*, Peter Paret, ed. (Princeton, N.J.: Princeton University Press, 1986), pp. 281–295.
56. Andrew F. Krepinevich Jr., *The Army and Vietnam* (Baltimore, Md.: Johns Hopkins University Press, 1986), p. 260.
57. David G. Chandler, *The Campaigns of Napoleon* (New York: Macmillan Publishing Co., 1966), pp. 332–378.
58. *Ibid.*, p. 9; Friedrich von Decken, *Betrachtungen über das Verhältniss des Kriegsstandes zu dem Zwecke der Staaten*, in Peter Paret, “Innovation and Reform in Warfare,” p. 7.
59. Paret, “Innovation and Reform in Warfare,” p. 8.
60. Meese, “The Process of Organizational Change,” pp. 203–204; for a complete history of the Marine Corps’ efforts to sustain its institutional existence, see Allan R. Millett, *Semper Fidelis: The History of the United States Marine Corps*, rev. ed. (New York: The Free Press, 1991).
61. Allan R. Millett, *In Many a Strife: General Gerald C. Thomas and the U.S. Marine Corps 1917–1956* (Annapolis, Md.: Naval Institute Press, 1993), p. xix.
62. Starry, “To Change an Army,” p. 23.
63. *Ibid.*
64. *Ibid.*
65. Sullivan and Harper, *Hope is Not a Method*, p. 53 (*italics added*).
66. Von Decken, *Betrachtungen über das Verhältniss des Kriegsstandes zu dem Zwecke der Staaten*, pp. 6–7.
67. Howard, “Military Science in an Age of Peace,” p. 8 (*italics added*).