ABSTRACT

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Two objectives motive this study: relating key aspects of an intrinsically important military innovation period of interest to students of U.S. defense transformation and proposing an innovation framework to facilitate additional military innovation studies. The innovation period spans 1973 through 1986. A military innovation framework is proposed to help students of military change assess contextual and organizational factors influencing the ripeness of an innovation milieu.

MILITARY INNOVATION AND THE AMERICAN REVOLUTION IN MILITARY AFFAIRS

by

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CONTENTS

1. Military Innovation and Defense Transformation

> To Alice's question, "Would you tell me, please, which way I ought to go from here?" the Cheshire cat responded, "That depends a good deal on where you want to get to."
>
> Lewis Carroll, *Alice in Wonderland*

When students of American defense policy asked at the end of the Cold War, 'Where should U.S. armed forces go from here?' the response, generally, was building on 'revolutionary' capabilities attributed to U.S. forces during the 1991 Gulf War. Since then, U.S. strategic planning and military thought have been inundated with arguments that U.S. armed forces exhibit a significant, discontinuous increase in military effectiveness, "the process by which armed forces convert resources into fighting power."[1] Talk of an emergent American-led military technical revolution (MTR) first gained prominence in the late 1980s. MTRs involved the "simultaneous change in military organization and doctrine as a result of technological advances."[2] The term was short-lived, deemed too focused on technology over operational and organizational factors. Defense planners subsequently embraced the term revolution in military affairs (RMA) in the 1990s.[3]

Long-range precision strike, stealth technology, air-ground operations, Global Positioning System applications, night vision capabilities to 'own the night,' the advent of a knowledge enabled professional force, and other factors were labeled revolutionary in the early 1990s partly because their operational debut coincided with unexpected changes in the global military balance. At the millennium, the U.S. defense policy lexicon shifted again. Analysts and policy makers invoked the term 'transformation' as an umbrella term for multifaceted initiatives building on the ongoing American-led

RMA. RMA-associated concepts like network centric warfare, battlespace dominance, shock and awe, and rapid decisive operations continue to dominate U.S. military thought.

A wellspring of RMA studies and prolific media references to 'revolutionary' warfighting capabilities emerged following the 1991 Gulf War. By the end of the decade, they cohered into what this study terms an American *RMA thesis*. This thesis argues that a revolutionary shift in U.S. military power had occurred based on the synergy of advanced intelligence, surveillance, and reconnaissance (ISR) capabilities, automated target identification systems, information-enabled weapons, superior education and training, and joint warfighting capabilities.

A generation of security studies scholars and military theorists had lived through the turbulent post-Vietnam period under the intellectual yoke of the illogic of nuclear deterrence. Military theory, as chapter 3 argues, struggled to fill the gap between deterrence theory and insurgency. The paradox inherent in theories of nuclear strategy and deterrence grew more problematic for international relations theorists attempting to expand their own explanatory frameworks beyond power politics models. To paraphrase Jacques Barzun's observation about the sixteenth century Reformation, emancipation is an immediate appeal of all revolutionary moments.[4]

This is one of the reasons, arguably, for what this study terms a lexical turn in American military though and defense discourse at the end of the Cold War. That is, a fundamental shift in the terms and images of military thought and defense planning away from Cold War, nuclear-centric discourse to one dominated by a lexicon of information theory, rapid dominance, and jointness – all oriented on advanced conventional forces.

Defense readiness and intelligence reform became a key issue during the 2000 presidential elections. Questions about how innovation could be identified and fostered resurfaced in 2001 when incoming president George W. Bush asked the 'where do you want to get to' question again. No clear answer emerged. As the U.S. continues its Global War on Terrorism (GWOT), U.S. defense transformation strategy aims to change "the nature of military competition," further exploit and sustain U.S. military advantages, and "facilitate a culture of change and innovation in order to maintain competitive advantage in the information age."[5]

Ideas and concepts associated with RMAs continued to define the intellectual core of transformation thinking. Government transformation initiatives, meanwhile, reflect a policy agenda to accelerate programs, reinforce policies, adapt operational concepts, and refine visions of future capabilities. They reflect a desire to further evolve thinking about RMAs into transformation processes conducive to the emergence, maturation, and adoption of additional military innovations to sustain America's military superiority.

Underscoring this study is the view that, after a decade of arguments and rhetoric, too little analysis exists on the innovations *anteceding* current U.S. military capabilities. It seems disingenuous and epistemologically unsound for students of U.S. defense policy and military thought to proceed headlong into assessments of the current defense reform period without some degree of perspective – historically and intellectually – on the origins and evolution of the nexus of capabilities and technologies giving rise to the American RMA.

Notwithstanding excellent studies of RMAs as historical phenomena, in the 1990s little thought was given to fully understanding and documenting the technological, operational, and organizational innovations observers identified as RMA-like. Throughout the 1990s, furthermore, RMA rhetoric outpaced actual changes in organizations, operational concepts, and the integration of information technology across the military services.

Technologies and concepts associated with a new American way of warfare anteceded RMA terms and images. For RMA thought-leader Admiral Bill Owens (retired), former Vice Chairman of the Joint Chiefs of Staff Owens, the capabilities labeled RMA-like in the early 1990s derived from operational approaches and systems "engineered and acquired in the late 1970s through the late 1980s" that "made the allied victory inevitable and our historically small loss of life probable."[6] Nonnuclear strategic capabilities, for example, suggested an altogether different ends-means relationship to defend American interests. During this period, Institute for Defense Analyses researchers Richard Van Atta and Michael Lippitz posit, "the ability to exercise military control [shifted] from forces with the best or the most individual weapon systems toward forces with better information and greater ability to plan, coordinate, and accurately attack."[7]

This statement, and its unspoken centering of information technology at the center of changes in military effectiveness, is admittedly pedestrian after a decade of information-centric RMA discourse. It would have been quite revolutionary from the perspective of the 1970s, but not because military thinkers suddenly stumbled onto the need for information on the battlefield. This has always been the case.

What was new was how commanders and weapons developers thought about information systems and decision technologies that demonstrated an unparalleled capacity for situational awareness. Information technology led to operations being lethal over greater distances with fewer forces. A new language of warfare reflected the prevailing social-economic disruptions associated with the information/knowledge revolution. Despite the potential for building on these developments to truly enable the potential of the technologies labeled RMA-like, Owens concludes that the "Pentagon was not interested in embracing" the full promise of the RMA. In 1991, he laments, "instead of a revolution we had a summer of Desert Storm victory parades, and our domestic agenda focused on economic issues rather than national defense."[8]

Defense modernization stalled during the 1990s; defense spending decreased and the pace of operations increased. As a new era of defense transformation thinking begins, students of U.S. defense transformation will benefit from insights into how and why RMA arguments arose in the early 1990s and from an exploration of how the RMA thesis effects U.S. military thought and defense policy. Thinking about transformation strategies and processes will also benefit from additional insights into military innovation behavior. Finally, current thinking about defense transformation will benefit from investigations of the origins of current military capabilities and how they evolved into a new American way of warfare *after* the conditions impelling their creation, political-military confrontation with the Soviet Union, dissolved.

Two objectives are pursued in the following chapters. The first is documenting key elements of the origins of the American RMA from late 1970s through the mid-1980s. Accordingly, this study distills important historical, conceptual, and doctrinal factors central to the evolution of U.S. defense policy and military thought during the last three decades. A synthetic approach summarizes key themes and events, providing context and perspective. In doing so, the study explores the widespread perception that advanced U.S.

warfighting capabilities became suddenly available in the early 1990s, a perception that skewed defense policy discourse at a time when a more balanced understanding of historical factors was sorely needed.

The second objective is expanding military innovation literature for students of the political and military sciences. Although research objectives guiding military innovation works vary – descriptive, prescriptive, or a mix of both, findings and conclusions are increasingly surfaced in policy discourse, including public policy journals, official reports, and dialogue among policy makers themselves. Insights into innovation phenomena aid understanding of the origins and core elements of recent U.S. advances in areas such as battlefield surveillance and reconnaissance, long-range precision strike, stealth technology, and end-to-end information and knowledge capabilities.

Within policy communities, military innovation studies offer additional insights into ways to think about major military changes involving new, novel, and breakthrough changes by unpacking complex innovation processes into discrete and analyzable historical narratives. In doing so, they locate decision makers in past innovation milieus that may differ widely in scope and scale – but not necessarily in kind – from contemporary ones.

I contend that a military innovation framework is the most appropriate conceptual approach for building an understanding of the origins of the American RMA and then using this understanding to inform current transformation decisions. The wide and varied field of defense policy studies will benefit from scholarly frameworks that refract the lessons of previous cases of significant military change through lenses attuned to today's strategic and operational challenges. Innovation studies are well positioned to draw on the theoretical, historical, and policy dimensions of previous works on discontinuous changes in military effectiveness; they also provide ample room for focusing on continuities across periods of change – an important area of study often overlooked in RMA-focused works.

The innovation framework presented in chapter 2 and discussed in chapter 6 provides one conceptual template for further consideration of the management of innovation diffusion and adoption activities, a subject that students of U.S. national security should pursue more systematically with the intent of informing policy discussions. Additional work in this area is needed if the arguments and assumptions central to the 1990s RMA debate and associated military effectiveness studies are to be rendered more useful to policy making.

The remainder of this introductory chapter sets the stage for a study of military innovation and the origins of the American RMA. The section immediately below reviews the rise of the RMA thesis in U.S. defense planning discourse. Next, the emergence of transformation language in post-Cold War defense planning discourse conveys a sense of the evolution from a defense modernization strategy based loosely on RMA theory to one aiming to institutionalize innovation and achieve specific transformation objectives. Another section outlines the innovation period reviewed in later chapters and argues its utility to students of defense transformation.

On the RMA Thesis and the Evolving Discourse of Military Change

What constitutes an RMA? The U.S. Office of Net Assessment, an organization within the Office of the Secretary of Defense, defines one as "a major change in the nature of warfare brought about by the innovative application of new technologies which, combined with dramatic changes in military doctrine and operational concepts, fundamentally alter the character and conduct of military operations.”[9] Prominent figures in the evolution of U.S. RMA thinking in the early 1990s included Andrew Marshall, Director of Net Assessment, and his then military assistant, Andrew Krepinevich, who has since become a leading defense consultant and military analyst. For Krepinevich, an RMA “occurs when the application of new technologies into a significant number of military systems combines with innovative operational concepts and organizational adaptation in a way that fundamentally alters the character and conduct of conflict. It does so by producing a dramatic increase — often an order of magnitude or greater — in the combat potential and military effectiveness of armed forces.”[10]

Paul Van Riper and F. G. Hoffman suggest a more succinct definition, positing that that RMAs occur “when a significant discontinuous increase in military capability is created by the innovative interaction of new technologies, operational concepts, and organizational structures."[11] James Fitz-Simonds and Jan van Tol add that “the essence of an RMA” is “not the rapidity of the change in military effectiveness relative to opponents” but “the magnitude of the change compared with preexisting military capabilities.”[12]

RAND Corporation defense analyst Richard O. Hundley takes another approach. He observes two characteristics common to RMAs that may occur simultaneously: 1) a new capability “renders obsolete or irrelevant one or more core competencies of a dominant player”; 2) a new operational reality “creates one or more core competencies” involving “some new dimension of warfare.”[13]

Talk about revolutionary advances in U.S. military power appeared in 1991. That year, Marshall assigned Krepinevich the task of assessing the pace and scope of changes to warfare. Strategic management questions motivated his study, completed in 1992, which also examined Soviet observations about changes in warfare. Areas of emphasis included assessing the overall discourse of change, much of it emanating from Soviet military theorists, discerning what really was new and different in terms of available capabilities, and locating shifts in military effectiveness in historical context. Krepinevich also suggested what such shifts implied for the future.

Throughout the early 1990s, the Office of Net Assessment sponsored studies and facilitated discussions to develop an intellectual framework suitable for policy-relevant thinking about changes in military affairs. The intent was informing post-Cold War defense modernization activities with knowledge about military revolutions and the emerging technologies most likely to sustain a U.S. military advantage.

Political scientist James Der Derian noted that the American RMA thesis was "only an idea in the wind" in 1993 when Andrew Marshall circulated an eight-page memo entitled "Some Thoughts on Military Revolutions."[14] By 1994, at least five Pentagon task forces were exploring RMAs.[15] Strategic analysts Steven Metz and James Kievit noted that a "heady vision" associated with the evolving RMA thesis "aroused tremendous excitement among American defense planners" by 1995 and that, for many, the RMA's promise of "increased effectiveness at reduced cost" was "an obsession."[16] A year later, military historian Dennis Showalter observed that the term RMA had "replaced TQM [Total Quality Management] as the acronym of choice in the U.S. Armed Forces."[17]

At the turn of the century, military historians Williamson Murray and MacGregor Knox introduced their survey, *The Dynamics of Military Revolution, 1300-2050*, with the observation that the RMA thesis constituted "the heart of debates within the Pentagon over future strategy."[18] Aspects of the RMA thesis appeared in the Secretary of Defense's *Annual Report to the President and Congress*, in a series of new joint warfighting publications, and in Service modernization roadmaps. Public statements by senior military and civilian leaders embraced the central tenets of the RMA thesis. Increased awareness to RMA theory and language stemmed from studies and conferences organized around case studies on, theoretical debates over, and historical arguments about significant military change. Studies sponsored by the Office of Net Assessment informed RMA discussions in the 1990s and shaped the cognitive landscape. By mid-decade references to the RMA were ubiquitous.

National security scholar Stephen Biddle argues that the RMA thesis evolved "from exposition to consideration for implementation as a U.S. government policy" so quickly that it "outpaced the ability of scholarship to examine its underlying premises and evidence."[19] Much of RMAizing of defense policy devolved into empty rhetoric.

With the defense budget in decline and force reductions a political priority, few senior leaders wanted to risk identifying programs as inappropriate investments for the new security situation. Doing so would leave their programs vulnerable for cuts; it also risked alienating congressional representatives with districts affected by cuts in terms of lost revenue. As chapter 6 argues, it was also difficult to argue that additional change was needed in light of apparent U.S. military prowess. RMA debates, in the end, failed to crystallize into a policy-focused modernization debate in the 1990s or spark significant changes in Service core capabilities.

In many areas, however, a healthy dose of reality underwrote and carried the essential ideas of the RMA thesis forward. The potential did exist for additional, significant changes to the core missions of military organizations. Chapter 6 discusses why the 1990s witnessed a relatively small magnitude of change in terms of what seems to have transpired during the 1980s and what is being proposed in the 2000s. This study interlaces a review of tangible developments in military affairs with discussion of the ideas, operational concepts, and theories of success associated with advanced conventional warfighting capabilities.

As the RMA thesis ascended in national security discourse, historical analogies were invoked first to explain the concept in general terms and then to place the American experience in a direct historical comparison. Because Andrew Marshall hypothesized that the immediate post-Cold War period was analogous to the interwar period between World War I and II, many of the Office of Net Assessment's studies on military change focused on the events and processes leading to interwar shifts in military effectiveness. Mechanized forces, submarine warfare, air defenses, carrier aviation, and other mission areas were scrutinized.

Fiftieth anniversary reflections on the epochal events of World War II, including blockbuster movies and best selling histories, rendered interwar military innovations and their World War II operational manifestations familiar touchstones for late 1990 thinking about military change.

Interwar military effectiveness studies surfaced historical patterns and the representative examples of innovation at a time when little was known about RMA phenomena. What is interesting in retrospect, and indeed a motivation for this study, is the lack of analysis on the period that gave rise to capabilities deemed RMA-like*despite* so many deliberate, detailed analyses of decades-long trends and development processes during the interwar period.

Barry Watts and Murray ascribe the "motivation" underlying interwar studies to a "*hypothesis* that" the U.S. was "in the early stages of a period in which advances in precision weaponry, sensing and surveillance, computational and information-processing capabilities, and related systems will trigger substantial changes" in military capabilities "as profound and far reaching as the combined-systems 'revolutions' of the interwar period." [20]

Chief among interwar references used to frame the American experience was the German combined-arms armored capabilities popularly known as blitzkrieg or "lightening war." For Williamson Murray, the German's 1940 "breakthrough on the Meuse" in northern France "and its explosive exploitation . . . was so crushing, so convincing, that it has served as the shining exemplar of *the* revolution in military affairs of the mid-twentieth century."[21]

Parallels emerged in the way the German and American RMAs were defined, the former lending images and concepts to the latter. Both involved relative advances in command and control of distributed forces. Blitzkrieg was described as a combined-systems RMA consisting of radio communications, tanks, tactical air cover, doctrine, and operational practices; the American RMA became known as a "system-of-systems" revolution defined primarily by advanced surveillance, information warfare, stealth, long-range precision strike, and joint warfighting doctrine.

Former Secretary of Defense William Perry (1994 through 1997), an early proponent of a system-of-systems approach and father of key RMA-related capabilities, describes the underlying philosophy of systems-of-systems thinking as “links in the chain of effectiveness.” If “any one of these had been removed, the overall effectiveness of the chain would have been significantly diminished.”[22] Crucial to keeping these links, as later chapters argue, was the co-evolution of doctrine and technology.

The U.S. experience differed from the German interwar in one important respect. It included the emergence of what Israeli military historian Shimon Naveh terms an ‘operational cognition’ (discussed below) in the last decades of the Cold War. In the planning domain, this involved thinking of mission packages in which all the required aspects of an operational capability were developed and fielded together, with sub-elements integrated into an enterprise. Discursive and organizational parallels to this operational cognition included a range of images and activities associated with different forms or archetypes of integration. Enterprises, networks, network-centric operational concepts, common operating pictures, joint organizations and doctrine, and other terms were evoked to describe idealized behaviors and conditions all concerned with synergistic, emergent capabilities of the Services acting in concert.

Exposure to RMA discourse and references to discontinuous shifts in military effectiveness across historical periods, often compared to American performance in the 1991 Gulf War, sensitized the defense planning establishment to theories about, and cases of, military change. Historical studies of how, when, and why some military organizations successfully increase their military effectiveness underscored a lexical shift from the terms MTR to RMA to transformation. Military effectiveness and innovation works disaggregated specific, mostly interwar shifts to examine the multifaceted reasons for success or failure.

Until the late 1990s and early 2000s, however, it appears that the majority of these efforts remained distant from policy decisions in terms of conjoining theories of change with specific modernization initiatives. One reason for this, perhaps, was the lack of an empowered, official voice for transformation. An important government conduit for applying military effectiveness studies to defense policy decisions, the Office of Net Assessment, was marginalized for much of the 1990s. No single office was charged with championing innovation; warfighting labs and joint experimentation activities were under funded and largely existed on the margins of decision-making.

A turning point in came in the national debate over defense preparedness occurred in 1997 when the National Defense Panel called for a new defense strategy to transform the military. It argued for initiatives to fully leverage information technology and develop additional space-based capabilities to accelerate modernization. Another event was the intelligence community's failure to predict nuclear weapons testing by India and Pakistan, which highlighted difficulties identifying and monitoring foreign military developments. Could the U.S. sustain its military advantage and prevent technological surprise?

The context of national security strategy shifted in the early 2000s when multifaceted 'change' arguments again dominated defense-planning discussions among scholars and policy makers. Senior members of the George W. Bush administration refocused attention on transformation visions, revisited alternate force structure initiatives, and rekindled discussion of national security strategy. Transformation was characterized as either enabling or leveraging an RMA

The Office of Net Assessment returned to the forefront of historical studies and analysis of transformation options. Joint experimentation and exercise activities received senior leadership support, additional funding, and achieved greater prominence in Service force structure discussions. Lessons from operations in Afghanistan, Iraq, exercises, and more realistic joint experiments informed thinking about the future of warfare. Key aspects of the 1990s RMA thesis were reexamined and refined in light of operational experience.

Historical Threads in the Evolution of the New American Way of Warfare

An opportunity exists for scholarly studies to increase knowledge of military innovation and effectiveness and to inform policy discussions of defense transformation. A suitable place to start is to revisit arguments made about the appearance of and historical underpinnings for the American RMA, what observers have called the new American war of warfare. This section briefly introduces four historical threads woven through the following chapters: the need to rethink the interwar period as the RMA exemplar informing U.S. defense studies; the evolution of systems engineering; the information revolution; and the writings of Soviet military theorists.

As discussed above, interwar analogies helped facilitate greater appreciation for historical aspects of military change but failed to focus attention on how the American RMA differed from previous cases. Initial discussion of these differences introduces arguments made in later chapters. Sketching their historical underpinnings accentuates differences between the interwar period and the developments discussed in chapters 4 and 5. The interwar period was the one most frequently identified with the post-Cold War American RMA while the one discussed in chapters 4 and 5 appears to be the more applicable period for informing transformation.

Military innovation studies tend to partition theories of military change into peacetime and wartime categories. A preponderance of the interwar studies aiming to inform defense policy in the 1990s viewed the interwar period from the perspective of a peacetime context for innovation. At the end of the Cold War, the natural strategic condition or historical parallel seemed to warrant peacetime analogies.

With the U.S. simultaneously prosecuting a global war on terrorism and pursuing defense transformation, however, the historical periods informing innovation activities cannot be confined to tidy peacetime or wartime analogies. Theories of change that speak to only peacetime contexts cannot be easily adapted to the current situation in which U.S. defense planners are attempting to transform military forces while simultaneously engaged in high-intensity, global military activities. The Cold War period studied in later chapters falls between classic definitions of peace and war in terms of military spending, defense research and development, and doctrinal change.

A thread running through the initial rise and continued evolution of American military power was the above-mentioned emergence of an operational cognition in American military thought. For Naveh, it is the first true systems approach to military planning in the West because it includes a cognitive orientation, a schema, conditioned to think about military operations in a systems-theoretic fashion. Strategic objectives, campaign plans, and tactics are linked.[23] Arguably, this remains the case in military operations against other militaries. Yet to be determined is the applicability of the operational cognition associated with the American RMA with the travails of insurgency warfare in Iraq and a global campaign against terrorism.

Naveh raises an important difference between the German interwar army and the U.S. military in the period giving rise to the American RMA. Where German military leaders failed to develop an operational cognition during the interwar period, American commanders did in the 1970s and 1980s.

The Germans certainly achieved tactical excellence. Operational excellence, including theater-level planning and an ability to coordinate operational maneuver, was lacking. Barry Watts and Williamson Murray concluded that Germany were able to demonstrate revolutionary capabilities because they "evolved sound concepts for mobile, combined-arm warfare and had trained their army to execute those concepts."[24]

But at the operational and strategic level, Naveh faults Germany for "deep operational ignorance" in the conduct of World War II and, during major campaigns, adhering to a "strategic framework" that "completely disregarded the existence of depth, space, fighting resources and operational trends."[25] Above the tactical level, "Blitzkrieg not only lacked operational coherence but . . . [in] its actual formation dictated relinquishing a systemic approach to military conduct."[26] The German Army lost its ability to think operationally in the late 1930s largely because Hitler severely weakened the German staff school and crushed the effectiveness of a core group of military thinkers that appeared unsympathetic to Nazi ideology. The training of military officers thereafter "centered on the levels of the brigade and the division and only rarely touched on problems related to the operating of corps."[27]

During the 1980s, as part of a larger reawakening of American military thought, the operational level of war became a key focus of study and an important consideration in defense planning. A larger integration theme co-evolved with the emerging information technology sector, leading to network centric warfare and other concepts.
Indeed, integration emerges as an important part of the rise of the American RMA.
An American operational cognition, later chapter argue, is in fact of part of a larger approach to solving complicated problems that involves integration in both technological and organizational domains.

This is part of the story of the thirty-year transformation in U.S. defense planning overlooked in many RMA studies, one that involves the maturation of systems engineering and integration skills. Modern system engineering capabilities evolved from the work of Brigadier General Bernard Schriever in the 1950s. He "introduced a systems approach to long-range planning that involved the analysis of potential military threats to the United States and a design for Air Force responses using advanced technology.[28]
Another key figure was Simon Ramo, who "made an original contribution to the development of systems engineering by creating an organization dedicated to scheduling and coordinating the activities of a large number of contractors engaged in research and development and in testing the components and subsystems that are eventually assembled into a coherent system."[29]

Developed in the 1950s and 1960s, systems engineering and integration practices were created to manage large, Cold War projects like the SAGE (Semi-automatic Ground

Environment) air defense project, the Atlas intercontinental ballistic missile, and the Polaris submarine launched missile. The Atlas Project of the 1950s was indeed a watershed, leading to a new "mode of management" that "changed the complexion of both the Cold War and the aerospace industry."[30] Where the Soviet Union failed to perfect skills needed to develop, field, and integrate complex weapons systems, "America avoided the same fate because it was more efficient . . .in combining complex technologies into weapon systems and integrating advanced weapons systems into its fielded forces."[31]

Experience creating, evolving, and adapting systems engineering and integration capabilities as a discipline facilitated the emergence of processes to help leaders identify where new technology was needed. It also positioned the U.S. to mature the information revolution within military organizations as new information-enabled capabilities emerged during the 1980s. The operational cognition mentioned above co-evolved with perceptions for, and expectations about, information technology applied to battlefield problems.

Underscoring all of the technologies and doctrinal facets of the American RMA are systems, organizational behavior, and operational concepts brought together through information technology. Owens posits in *Lifting the Fog of War* that, "the computer revolution, if correctly applied, presents us with a unique opportunity to transform the U.S. military."[32] For him, the computer revolution "*is* the American Revolution in Military Affairs," one that will yield perceived increases in effectiveness only if the Defense Department succeeds in "creating a *synergy* in new weapons, sensors, and communications" through the successful integration of "technological applications with an information-age military organization."[33]

The dawn of the current computing age occurred in 1943 when ten "Colossus" machines were built by the British to facilitate the breaking of German Enigma code. Three years later the Electronic Numerical Integrator and Calculator (ENIAC) was activated in Pennsylvania. An unrelated event occurred about the same time. As the 1947 National Security Act was being considered, scientists at Bell Laboratories discovered the transistor effect: a small piece of wire with germanium contacts could be fashioned to produce an amplifying effect.[34] After the 1959 creation of silicon wafer transistors (integrated circuits) prices for microelectronics "brains" dropping thirty percent a year while their sophistication doubled at the same rate.[35]

In the late 1970s, digital systems replaced antiquated and clumsy electromechanical ones. Such systems are faster, cheaper, more efficient, and able to carry more information. They also carry different *kinds* of information: telecommunications and data processing could move over the same system. This encouraged developments in the formative period of the American RMA.

Another trend evolved after IBM's 1969 decision to market hardware and software separately. The development of the graphic user interface in the late 1970s and the subsequent development of personal computers with user-friendly cognitive and physical interfaces (e.g., visualization tools, the mouse, touch screens) changed the course of technology history, military science, and society. Military operations followed, as did the focus of military innovations in weapons, training, doctrine, business processes, and other aspects of organizational behavior. An explosion in personal computing and network software created a billion dollar industry in the 1980s.

A benchmark in the computer revolution occurred in 1985 when the National Science Foundation required universities requesting funding to provide Internet access to all qualified users and mandated application of standard Internet protocols. By the end of the decade, vastly expanded usage brought further innovations in digital communications, including routing and delivery capabilities.

Add satellite communication to the fray – and then consider that all of these areas of technology came to rely on semiconductors and microchips – and the maturation of the American RMA begins to take form. These were the basic technological components, or building blocks, for the information revolution that underwrote the information-centric components of the American RMA. Doctrinal and organizational developments were closely intertwined with technological ones.

The revolutions fed on one another. Better hardware meant more sophisticated software; new software created demand for faster processors; faster processes meant faster external devices and telecomputing; faster systems demanded quicker links between them – and on and on. All of these, in light of the merging of the "revolutions" mentioned above, characterize the basic technological infrastructure of the late twentieth century's computer information revolution. Spatial and temporal distance no longer determined communication parameters, a critical factor for a military contemplating long-range precision strike and dynamic re-targeting of nuclear missiles.

The 1970s witnessed important advances in the development and integration of complex information systems and the adaptation of digital information technology for military purposes. The 1980s brought experiments and exercises demonstrating the utility of leveraging information technology to offset Soviet superiority in Europe. From this period emerged key operational, technological, and organizational capabilities later identified as an RMA. Key U.S. military innovations involved recognition that information technology could be leveraged to attenuate specific strategic and operational military challenges. For these and other reasons discussed below, this period warrants additional consideration when using examples of twentieth century military change to inform defense transformation.

Central to this part of the larger computer information revolution was a decrease in the cost of storing information. According to one estimate of the military innovation period studied here, "The cost of storing a single digital unit of data in a memory chip fell from one-tenth of a cent in 1976 to one-thousandth of a cent in 1986, and it will keep dropping by about 35 percent per annum."[36] It is the decline in the cost of computing power over this pivotal decade, along with the integration of low-cost computational technology into all aspects of American society, that helped create the world's first truly information-based culture and made many elements of the RMA possible. RMA discussions borrowed terminology and ideas from the world of information technology.

In the rush to adopt RMA language and imagery, however, many seemingly glossed over the ironic origins of the RMA terms and arguments. Initial thinking on RMAs evolved within Soviet military thought over several decades to describe multifaceted developments associated with a *nuclear* RMA. Former Under Secretary of Defense for Strategy and Threat Reduction Ted Warner, for example, notes that U.S. views of the RMA were "heavily based on Russian or Soviet conceptions."[37] As discussed in chapter

4, discussions of troop dispersion, command and control requirements, and compressed decision making timelines within the nuclear RMA migrated to a conventional variant that remained linked to nuclear warfare in Soviet military theory.

Owens is among those attributing early recognition of the potential for information technology to underwrite an RMA to Soviet observers. Soviet “technocrats,” he posits, first recognized “that computers, space surveillance, and long-range missiles were merging into a new level of military technology, significant enough to shift the balance of power in Europe in favor of the United States and NATO” (North Atlantic Treaty Organization).[38] Soviet analysts, in fact, argued in the late 1970s and early 1980s that American conventional forces were developing precision strike capabilities able to achieve battle effects similar to tactical nuclear weapons (e.g., impede armor formation movement; disruption of command and control), thereby creating a conventional deterrent. Marshal Nikolai V. Orgarkov, for example, claimed in 1984 that U.S. conventional forces would soon “make it possible to sharply increase (by at least an order of magnitude) the destructive potential of conventional weapons, bringing them closer, so to speak, to weapons of mass destruction in terms of effectiveness.”[39] Advances in the effectiveness of conventional long-range precision strike systems provided both the point of departure from and link to the larger body of nuclear RMA thought.

Soviet perceptions of American conventional developments in the late 1970s and early 1980s had an amplifying effect on subsequent U.S. defense modernization decisions. Marshall relates that, upon learning of Soviet concerns about “reconnaissance-strike” initiatives in the late 1970s and early 1980s, U.S. defense planners “concluded that it would be useful to intensify those concerns by further investment” in conventional precision strike.[40] "Warsaw Pact defense ministers," Christian Nunlist learned from Soviet archives, "saw developments in conventional armaments in the early 1980s as even more ominous than the strategic change" wrought from nuclear weapons developments because they came with the "revitalization" and "redesigning" of U.S. and NATO conventional doctrine.[41]

Among the most important reconnaissance-strike programs was the then classified Assault Breaker concept demonstration geared to "rip the heart out of" the Soviet Army's armored and mechanized strengths."[42] "To the Soviets," Norman Friedman aptly states, realizing the capabilities suggested by the concept demonstration would be "a disaster" because of their ability to blunt Soviet armor.[43] Assault Breaker was, arguably, part of a larger vision for using information technology in what today's defense analysts call a "system-of-systems"; it was the original plan for linking systems with other systems using information technology.

Studies sponsored by the Office of Net Assessment figured prominently in the initial surge of RMA language and concepts. In general, reports on the origins of the RMA in the 1990s were motivated by a broader question. "Looking back over the military history of the twentieth century, what were the fundamental technological, conceptual, operational, and organizational factors that, during times of peace, gave rise to fundamental changes in how military organizations would fight future wars?"[44] This question also retains currency in the early 2000s.

Although important insights into military change emerged, many innovation studies aiming to answer this question excluded an important period giving rise to fundamental changes in military effectiveness. More detailed assessments of U.S. military innovations in the 1970s and 1980s, including cases where marginalized programs evolved into critical capabilities, might have focused defense modernization discourse on continuities and discontinuities in the strategic environment, force structure, and separate Service modernization plans.

Arguably, additional studies should have built on Krepinevich's 1991 study, the above-mentioned Office of Net Assessment post-Cold War examination of RMA arguments. This study returns to a central theme of that seminal report. Informed by Soviet assessments of American innovations, drawing on broad understanding of military history, and guided by theories of military change, the study attempted to answer several strategic management questions at the center of defense modernization debates today: "How to identify appropriate innovations? and "How to foster innovation?"[45] Identifying and fostering innovations were not a focus of the majority of the 1990s RMA works; innovation dynamics received too little attention in official defense planning discussions.

Study Overview

In his*What is History?* E. H. Carr posited that, "Nothing in history is inevitable except in the formal sense that, for it to have happened otherwise, the antecedent causes would have had to be different."[46] True enough. It was certainly not inevitable that late 1970s and early 1980s defense initiatives would underwrite the American RMA thesis in the 1990s as the Cold War ended peacefully, perhaps anti-climatically.

What antecedent events and processes set the course toward the RMA? What factors facilitated the material and conceptual turn from the dominant narrative of nuclear strategy? What processes, trends, and developments provided the conceptual and material basis for the resident military capabilities on which the lexical turn in defense discourse hinged? What events and processes catalyzed the shift from the nuclear narrative of defense discourse?

A mix of antecedent causes converged serendipitously. A number of evolutionary threads converged. Much continuity in military thought and operational practice remained, but the dominant narrative of nuclear thought was irreversibly changed. Contingent factors affecting the *language* of military change included the Warsaw Pact's demise, a pervasive disposition toward "revolutionary change" discourse across the government, the widespread influence of technology-driven socio-economic changes on perceptions of the future, and a desire to shed references to nuclear weapons or doctrine in U.S. military thought. Deliberate planning and, from hindsight, seemingly prescient forethought about the capabilities of emerging technology merged with historical contingency to create a situation conducive to the ascension of the RMA thesis.

Contingency is an unsatisfactory explanation for those seeking insights into the evolution of discourse and the emergence of disruptive military capabilities. More important to understanding the capabilities inherent in the RMA thesis are technological, organizational, and operational innovations that cohered into a new American way of war.

For much of the post-Cold War period a preponderance of defense planners and military theorists framed strategic management questions, as well as the general "where you want get to" question posed at the top of this chapter, with visions related to the 1990s RMA thesis. Reoccurring themes were superior ISR, a seamless air-land-sea-space command and control structure, long-range precision strike weapons able to destroy mobile targets, improved stealth, and information warfare.

Addressing historical, technical, and defense policy issues related to the American RMA in *Lifting the Fog of War*, Owens opined that, “if one has to affix a date to the beginning of the present [RMA] it is 1977, when three key Pentagon officials – Harold Brown, Andrew Marshall, and William Perry – began to think in concert about the application of technology to military affairs.”[47] They did so, arguably, because they were acutely aware of the Soviet threat in Europe and generally informed of research and development activities to meet it.

Of course, a specific date for the gestation and birth of the current American RMA do not exist. It is impossible to disassociate the invention of the computer, the impact of nuclear weapons, early satellite navigation systems, the advent of radar, or other antecedent factors from the chain of events leading to the emergence of ‘revolutionary’ military capabilities. That said, and historical contingency aside, it is possible to delimit the period in which decisions were made to fund specific programs and develop certain capabilities that, in time, gave rise to forces exhibiting a discontinuous increase in military effectiveness. Key decisions, inflection points, cognitive and doctrinal turnabouts, technological developments, and innovation activities cohered to create capabilities that altered calculations of strategic effectiveness and how military organizations measured their readiness.

1977 nonetheless emerges as a pivotal year. The Defense Advanced Research Project Agency aligned its budget to address conventional theater challenges. Lockheed flew a technology demonstration airplane leading to a F-117 stealth bomber. Signals for what became a space-based Global Positioning System (GPS) were proven adequate for ground navigation and maneuver. The Air Force's Airborne Warning and Control System (AWACS) and other battlefield remote sensing systems entered operational service and redefined the notion of tactical reconnaissance by enabling theater surveillance. A new space-borne reconnaissance capability for remote sensing entered operational use, eventually linking national (strategic) remote sensing and warning tools directly to military operations. President Jimmy Carter's national security adviser Zbigniew Brzezinski proposed a security strategy for the Persian Gulf region, including a rapid deployment force; and Carter directed Harold Brown to create Delta Force, the first strategic unit trained and equipped to combat terrorism.

Another 1977 event warrants mention. William Perry became the Director of Defense Research and Engineering and assisted Secretary of Defense Harold Brown's articulation of a new research and development strategy, known as the "an offset strategy."[48] Perry himself argued that the post-Cold War advances in U.S. military effectiveness descended from this strategy, named for technologies (e.g., sensors, precision-guided weapons, and stealth technologies) that "would give qualitative advantages to American forces to offset the quantitative advantage the Soviet forces enjoyed."[49] Capabilities and technologies associated with the offset strategy later "achieved the status of a 'revolution in military affairs."[50]

This study reviews the events leading to innovations – technological, doctrinal, and operational – aiming to reduce the threat of Soviet military power in Europe and Soviet military influence in strategically important peripheral regions. It then examines how discussions of these capabilities evolved after the fall of the Soviet Union and the 1991 Gulf War.

Chapter 2 surveys military innovation theory and proposes a framework for studying innovation processes. This is not an attempt to develop and prove a new theory explaining all cases of military innovation across all periods of military affairs. As chapter 2 introduces and later chapters revisit, a single causal theory accounting for or explaining all cases of successful or failed military innovation is unobtainable because of the complex and contingent nature of innovation in general. The type of theoretical rigor desired to explain or predict all reoccurring events or behavior – or to prescribe specific policies – is unobtainable. That said, there are general patterns and expectations about behavior, drawn from historical cases and studies of innovation practices, which define parameters of options that are likely to promote successful innovations.

Chapter 3 reviews Cold War American military thought and defense planning. It concludes that a dominant narrative of nuclear strategy in defense policy discourse, military thought, and doctrine evolved within American national security policy, one that constrained thinking about conventional warfighting capabilities (termed 'general purpose' forces in contemporary writings). Reviewing Cold War nuclear strategy, particularly deterrence strategy and nuclear targeting developments instills appreciation for later changes in American military doctrine and defense planning. These changes, traceable to developments in the 1970s and early 1980s, are best understood from the perspective of what was *overturned* in military thought and doctrine by the centering of the RMA thesis.

In this study, the antecedents to the American RMA are divided into two periods: chapter 4 addressed the formative phase (1973 through 1980) and chapter 5 the maturation phase (1981 to 1986). The period discussed in these two chapters witnessed the first movements away from nuclear-centric military theory; the emergence of conventional deterrence theory and its policy adjuncts; the ascension of joint warfighting; a training and doctrine revolution; and the ascent of information technology on the battlefield. Each of these developments relates to the offset strategy, as does the creation of rapid reaction forces. Specific technological innovations included long-range precision strike capabilities drawing on GPS, theater reconnaissance assets, and information-enabled, integrated weapons platforms. GPS alone created an innovation stream that revolutionized numerous aspects of operations, including maneuver, logistics, and precision targeting from unmanned aerial vehicles (UAVs).

Referring to chapters 4 and 5 as the formative and maturation phases of the RMA does not imply that precision strike, stealth, knowledge capabilities, and other developments subsumed within the RMA *fully* matured by the late 1980s. The dates bounding these chapters do, however, provide useful historical benchmarks. They also parallel the formative and maturation years of the computer information revolution, the post-Vietnam evolution of new degrees of cooperation between air and ground forces, and the evolution of key space-based capabilities like GPS.

The formative period spans roughly from American disengagement in Vietnam to reversals in the Carter administration’s defense and foreign policy planning after the 1979 Soviet invasion of Afghanistan. In addition to including the range of 1977 developments mentioned above, the formative period included changes in the context within which national security decisions were made.

Inflation reached fourteen percent. Gas rationing was imposed as long lines appeared at filling stations. Millions cancelled their vacations. In 1979, with American hostages still in Iran, Carter kept the national Christmas tree dark – a symbolic move that defined the national mood. Shifting strategic realities and pressing operational challenges created a milieu ripe for multidimensional innovations. The Carter Doctrine extended U.S. military power to defend the Persian Gulf from Soviet expansion; the failed April 1980 Iran hostage rescue mission had a ripple effect on contingency planning and readiness; and a presidential directive brought the largest U.S. arms build-up in three decades. Important innovations originating during this period included stealth technology and the Assault Breaker program.

Meanwhile, the commercialization and diffusion of computing capabilities and associated information technology began to influence defense planning and military capabilities. Computers themselves were only part of an important shift in technology underlying military effectiveness. A more subtle change was the rise of what Steven Johnson termed an "interface culture" after Apple's revolutionary incorporation of a graphic user interface in its desktop operating system.[51] Thereafter, interfaces evolved into a revolutionary way to think about and exploit operator-machine linkages, which became as important as the hardware and software to efficiency. The military implications of these and other developments for aggregating, correlating, visualizing, and leveraging information for decision making and action taking are central to the story of the American RMA.

The seeds of the maturation period of the American RMA began with the late 1970s reversal in defense spending, budded in the early 1980s, and ended around 1986 with the signing of the Goldwater-Nichols Act, the Army's publication of a revised AirLand Battle doctrine, and Soviet Premier Mikhail Gorbachev's consolidation of power. U.S. defense spending nearly tripled during this period. As the 1980s closed, the narrative of nuclear strategy no longer dominated defense discourse and the key elements of the information-enabled precision reconnaissance-strike system were under development or already in service. A vision for the future of warfare, therefore, existed before the Cold War ended and the RMA thesis ascended in U.S. defense planning.

Building on preliminary discussions in chapter 4, chapter 5 reviews U.S. Army doctrine, the rediscovery of operational art, and ground support missions assigned to the U.S. Air Force. Focus is on developments related to defending NATO from a Soviet attack and retaining deterrence stability in Europe. Key operational concepts, core technologies, and general agreement on the vision for future conventional warfighting forces solidified during the early 1980s. In some cases, first generation systems that demonstrated potential in the late 1970s helped shape thinking about the application of new technology and the need for new operational concepts. Technology, concepts, organizational changes, and other developments conjoined in the 1980s, setting the stage for the more robust capabilities in use today.

Developments associated with the evolution of AirLand Battle doctrine in Europe and the advent of light forces for rapid deployments to the Persian Gulf provide a better conceptual and historical "fit" for a study of innovations anteceding the American RMA. Owens, a career naval office, argues the advent of "new technology and a shift toward different operational concepts" in the 1970s "was most prominent in the U.S. Army"; the Army "began to develop a much greater capacity to see and track events at greater distances and attack with longer-range, precision weapons."[52] For sure, the Marine Corps and Navy undertook innovations during this period as well, and the Navy was responsible for important developments in guidance systems and targeting. Navy work on network centric warfare was almost adopted wholesale into American military thought in the early 2000s. As much as possible, Navy and Marine Corps innovations are incorporated. Still, they figured less prominently in the origins of the American RMA than Army, Air Force, and Department-wide innovations.

Chapter 6 reviews the post-Cold War defense policy discourse, including a critical review of the so-called RMA debate. It examines the effects of the end of the Cold War on American military thought, and reviews post-Cold War defense modernization. It also sketches the role of the information revolution in the evolution of the American RMA and on current defense transformation visions. Chapter 7 concludes the study, revisiting the military innovation framework discussed in chapter 2 from the perspective of historical information presented in chapters 4 and 5.

Chapter Conclusion

This is only one of many studies needed to expand our understanding of the events, innovations, and cultural shifts giving rise to the American RMA. Students of U.S. defense transformation thirsting for information placing current programs and operational requirements in historical context should drink deeply from the period spanning 1973 through 1986. These are, arguably, the years witnessing the formative stage of the

American RMA and its maturation. The years since have been in some ways anticlimactic in terms of concepts, doctrine, and technology if one considers the magnitude of change present in earlier decades.

Newfound interest in defense transformation, and a renewed quest for innovations to catalyze transformation, suggests that military innovation studies are posed to provide historical cases, theories, and other insights into the hows and whys of innovation-transformation processes. Indeed, transformation discussions can benefit from insights and lessons learned from the study of military innovation periods precisely because their commonalties promote comparative research and analysis into the underlying processes and variables targeted by transformation initiatives.

Criticizing RMA theory does not mean the RMA thesis is a fiction, that RMA-like changes in warfare are wholly illusory, or that no benefit comes from continuing to evoke RMA language and arguments in defense transformation discussions. RMA visions and rhetoric about information superiority, decision superiority, full-spectrum dominance, and rapid decisive operations altered the discourse of defense planning and did shift how Services discussed their priorities.

RMA studies, arguably, only inform defense transformation when they convey an understanding of military innovation processes in a fashion conducive to thinking about the business of transformation. Innovation is the underlying organizational behavior giving rise to RMAs transformations, or other academic framework purporting to explain “big change” in the history of warfare. So if the objective is to do more than merely explain, to attempt deliberate about change, then studies on innovation strategy, processes, and associated management approaches are needed.

Arguably, underlying the turn to defense transformation activities within Defense Department is a quest for policy utility in the discourse of change and more decision relevant theories of how changes in military effectiveness transpire. That is, lexical resources more suited to discussions of the process of reform and the specific areas of "revolutionary" change required.

A final comment about the idea of "rapid change" is important. Students of military innovation cannot take the image of 'rapid change' in defense planning too literally as significant change requires decades. It typically takes some fifteen years to develop and field new systems. GPS, for example, evolved over several decades before being integrated into systems and operations. Cruise missiles were also in the arsenal for decades before strategic and operational needs, together with new navigation capabilities, impelled their widespread use. Accelerating the process of innovation is difficult. Jacques Gansler, a scholar of defense acquisition processes as well as a policy practitioner, argues that "cultural change (with fierce resistance)" rather than technology challenges are responsible for long lead times required for transformation.[53]

It is important, in this context, that the revolution implied in the RMA thesis concerned the relative change in effectiveness from on period to the next rather than a sense of sudden, rapid change. The emerging language of transformation, on the other hand, implies a sense of where one is going, how fast, and to what end.

Chapter 1 Notes

[1] Allan Millet, Williamson Murray, and Kenneth Watman, "The Effectiveness of Military Organizations" in Allan R. Millet and Williamson Murray, *Military Effectiveness, Volume I: The First World War* (Boston: Unwin Hyman, 1988), p. 2.

[2]Abhi Shelat, "An Empty Revolution: MTR Expectations Fall Short," Harvard International Review (Summer 1994), p. 52.

[3] See, for example, then Deputy Director of Defense Research and Engineering Frank Kendell, "Exploiting the Military Technical Revolution: A Concept for Joint Warfare" in *Strategic Review* (Spring 1992), pp. 23-30. Among the large literature on RMAs are Williamson Murray, "Thinking About Revolutions in Military Affairs," *Joint Force Quarterly* (Summer 1997), Robert Tomes, "Revolution in Military Affairs—A History," *Military Review* (September/October 2000), pp. 98-101; Lawrence Freedman, *The Revolution in Military Affairs*, Adelphi Paper 318 (IISS 1998); and Richard O. Hundley, *Past Revolutions, Future Transformations: What Can the History of Revolutions in Military Affairs Tell Us About Transforming the U.S. Military?* (Washington, DC: RAND, 1999). Later chapters provide a more extensive discussion on RMAs.

[4] Jacques Barzun, *From Dawn to Decadence: 500 Years of Western Cultural Life* (New York: Harper Collins, 2000), p. 20.

[5] *Military Transformation: A Strategic Approach*, (Washington, DC: Director, Force Transformation, Office of the Secretary of Defense, Fall 2003), p. 8.

[6] Owens, *Lifting the Fog of War,* p. 89.

[7] Richard Van Atta and Michael J. Lippitz, *Transformation and Transition: DARPA's Role in Fostering and Emerging Revolution in Military Affairs, Part I: Overall Assessment* (Alexandria, VA: Institute for Defense Analyses, April 2003), pp. 5-6. Original in italics.

[8] Ibid., p. 85

[9]Quoted in Szafranski, p. 116.

[10]Krepinevich, p. 30.

[11] Paul K. Van Riper and F.G. Hoffman (1998) "Pursuing the Real Revolution in Military Affairs: Exploiting Knowledge-Based Warfare," National Security Studies Quarterly vol. IV, no. 3 (Summer 1998), p. 2

[12]Fitzsimonds and van Tol, p. 25.

[13] Hundley, *Past Revolutions, Future Transformations*(Santa Monica, CA: RAND, 1999), p. 9.

[14] James Der Derian, *Virtuous War: Mapping the Military-Industrial-Media-Entertainment Network* (Boulder, CO: Westview Press, 2001), p. 28; Andrew Marshall, Director of Net Assessment (Office of the Secretary of Defense), *Memorandum for the Record*, “Some Thoughts on Military Revolutions – Second Version,” August 23, 1993.

[15] Der Derian, pp. 28-29.

[16] Steven Metz and James Kievit, *Strategy and the Revolution in Military Affairs: From Theory to Policy* (Carlisle Barracks, PA: U.S. Army War College, 1995)., 1.

[17] Attributed to Dennis Showalter’s paper presentation, “The Wars of Moltke, an RMA” presented at the Revolution in Military Affairs Conference, Marine Corps Combat Development Command, Quantico, VA, April 1996. Quoted in Williamson Murray, “Introduction,” in Williamson Murray (ed.), *The Emerging Strategic Environment* (Westport: Praeger, 1999), p. xxvii.

[18] Williamson Murray and MacGregor Knox, “Thinking About Revolutions in Warfare” in MacGregor Knox and Williamson Murray (eds.) *The Dynamics of Military Revolution, 1300-2050* (New York: Cambridge University Press, 2001), p. 1

[19] Stephen Biddle, *The RMA and the Evidence: Assessing Theories of Future Warfare*, Institute for Defense Analyses, manuscript dated August 8, 1996.

[20] Watts and Murray, Military Innovation in Peacetime” in Williamson Murray and Allan R. Millet (ed.), *Military Innovation in the Interwar Period* (New York: Cambridge University Press, 1996), p. 405.

[21] Williamson Murray, “May 1940: Contingency and Fragility of the German RMA,” MacGregor Knox and Williamson Murray (eds.), *The Dynamics of Military Revolution, 1300-2050* (New York: Cambridge University Press, 2001), p. 155.

[22] William J. Perry, “Military Action: When to Use and How to Ensure its Effectiveness” in James E. Nolan (ed.), *Global Engagement: Cooperation and Security in the 21st Century* (Washington, DC: Brookings Institution Press, 1994), p. 240. Also cited in William A. Ownes, “Creating a U.S. Military Revolution” in Theo Farrell and Terry Terriff (eds.), *The Sources of Military Change* (Boulder, CO: Lynne Reinner Publishers, 2002), p. 219.

[23] Shimon Naveh, *In Pursuit of Military Excellence: The Evolution of Operational Theory* (London: Frank Cass, 1997).

[24] Barry Watts and Williamson Murray, "Military Innovation in Peacetime" in Williamson Murray and Allan R. Millet (ed.), *Military Innovation in the Interwar Period* (New York: Cambridge University Press, 1996), p. 373.

[25] Shimon Naveh, *In Pursuit of Military Excellence: The Evolution of Operational Theory* (London: Frank Cass, 1997), p 126.

[26] Ibid., p. 105.

[27] Ibid., p. 128.

[28] Thomas P. Hughes *Rescuing Prometheus: Four Monumental Projects that Changed the Modern World* (New York: Vintage Books, 1998), p. 96. I'm indebted to Richard Van Atta for reminded me of the role Schriever played in the evolution of systems engineering as an American discipline.

[29] Hughes, p. 119.

[30] Thomas P. Hughes *Rescuing Prometheus: Four Monumental Projects that Changed the Modern World* (New York: Vintage Books, 1998), p.4. Hughes provides a detailed history of SAGE and Atlas.

[31] Michael Hobday, Andrea Prencipe, and Andrew Davies, "Introduction" in Andrea Prencipe, Andrew Davies, Michael Hobday (eds.), *The Business of Systems Integration* (New York: Oxford University Press, 2003), p. 16

[32] Owens, *Lifting the Fog of War* (New York: Farrar, Straus, Giroux, 2000), p. 15.

[33] Ibid.

[34] Tom Forester, *High-Tech Society: The Story of the Information Technology Revolution* (Cambrdige, MA: MIT Press, 1987), p. 19.

[35] Ibid., p. 27.

[36] Ibid., p. 2.

[37] Warner quoted in the transcript of the 1999 Fletcher Conference, panel 5, "Redefining Defense: Preparing U.S. Forces for the Future" (November 3, 1999), p. 11.

[38] Owens, *Lifting the Fog of War*, p. 83.

[39] Marshall quoted in Watts and Murray, "Military Innovation in Peacetime," p. 377.

[40] Marshall in Krepinevich (2002), p. i.

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[41] Christian Nunlist, *Cold War Generals: The Warsaw Pact Committee of Defense Ministers, 1969-90*, Parallel History Project on NATO and the Warsaw Pact, May 2001. p. 14-15.

[42] Colin S. Gray, *Strategy for Chaos: Revolutions in Military Affairs and the Evidence of History* (London: Frank Cass, 2002), p. 247.

[43] Friedman cited in Gray, *Strategy for Chaos*, p. 248.

[44] In "Military Innovation in Peacetime," Watts and Murray attribute these questions to Andrew Marshall.

[45] Andrew Marshall, "Forward" to Andrew F. Krepinevich, Jr., *The Military-Technical Revolution: A Preliminary Assessment* (Washington, DC: Center for Strategic and Budgetary Assessments, 2002), pp. i-ii. The original Net Assessment was issued in July of 1992. The 2002 publication includes new forwards by Andrew Marshall and Andrew Krepinevich.

[46]*What is History?* (New York: Vintage Books, 1961), p. 125-6.

[47] Bill Owens, *Lifting the Fog of War* (New York: Farrar, Straus, and Giroux, 2000), p. 81.

[48] Richard H. Van Atta et al, *Transformation and Transition: DARPA's Role in Fostering an Emerging Revolution in Military Affairs, Volume 1 – Overall Assessment*, Alexandria, VA: Institute for Defense Analyses, April 2003), p. 10

[49] Perry discussing his tenure as Undersecretary of Defense in Ashton B. Carter and William J. Perry, *Preventive Defense: A New Security Strategy for America* (Washington, DC: Brookings Institute Press, 1999), p. 180.

[50] Ibid.

[51] Steven Johnson, *Interface Culture: How New Technology Transforms the Way We Create & Communicate* (New York: Basic Books, 1997), pp. 45-55.

[52] William A. Owens, "Creating a U.S. Military Revolution" in Theo Farrell and Terry Terriff (eds.), *The Sources of Military Change: Culture, Politics, Technology* (Boulder: Lynnee Rienner, 2002), p. 207

[53] Thanks to Jacques Ganlser for recommending these comments about 'rapid change' in correspondence with the author (Personal correspondence with author, 10 February 2004).

2. On Military Innovation

Several scholars have explored why, how, and to what end nations make major innovations in the way they organize, equip, and employ military forces.[1] Historians and political scientists analyze military innovations to describe why and how they take root, to theorize about their manifestation in the form of operational capabilities or altered security relations, and to assess how civil, military, or other factors found within innovation processes affect outcomes. Some aim to develop or bolster new or existing theoretical frameworks to explain the conditions accounting for successful innovations; a few do so specifically to suggest how these conditions might be replicated. Others study details of specific innovation cases aiming to enhance military effectiveness. Military historians exploring and documenting unique innovation cases seek to understand how states either succeed or fail to transform their military forces and, consequently, to defeat their opponents or to suffer defeat themselves.[2]

Historians and military innovation scholars Barry Watts and Williamson Murray view the "underlying purpose" for innovation studies as "helping decision makers to think creatively about changes in the nature of war that may occur in coming decades," not merely examining "historical episodes for their own sakes."[3] Furthermore, and despite their own significant contributions to RMA scholarship, they contend that "without some attention to antecedents and subsequent effectiveness" it is "impossible to draw political lessons and implications" from history to inform current defense reform discussions.[4] Understanding the ebbs and flows of previous innovations, Murray argues elsewhere, illuminates "how military institutions innovate" in generalized terms, which for contemporary policy makers suggests how innovation and transformation initiatives might alter "performance on the battlefields of the twenty-first century."[5]

Military innovation studies are fundamentally and epistemologically about understanding and describing qualitative improvements in *military* effectiveness that yield a comparative advantage over other militaries, creating opportunities for increasing a nation's overall *strategic* effectiveness. For Colin S. Gray, strategic effectiveness involves the "the net (i.e. with the adversary dimension factored in) effectiveness of grand strategic performance, which is to say of behavior relevant to the threat or actual use of force."[6] Chapter 1 cited Allan Millet, Williamson Murray, and Kenneth Watman's definition of military effectiveness as the processes "by which armed forces convert resources into fighting power."[7]

Social scientists often define the relationship between military and strategic effectiveness in terms of correlations between a militarily decisive increase in one nation's military capabilities, exhibited by a significant relative shift in dominance over others, and the corresponding change in a regional or international 'power' balance due to that nation's ability to influence the behavior of others. Identifying and assessing the magnitude of historically important shifts in military capabilities is the general domain of military scientists studying RMAs. This relationship involves numerous factors, including chance. Interdisciplinary military innovation studies are less concerned with the magnitude of an historical shift in grand strategic importance than the underlying processes involving the mobilization of resources to achieve dominance.

Although numerous factors contribute, specific military innovations associated with significant advances in effectiveness often trace their origins to necessity wrought from the strategic, operational, or tactical challenges facing military organizations. These challenges can be immediate, in the form of an existing battlefield problem, or perceived. As military historian Allan Millet observes, the "essence of justifiable innovation" stems from "strategic calculation and the analysis of perceived threat."[8] Williamson Murray similarly concludes that, although not an absolute in every case, "one precondition for significant military innovation" seems to be "a concrete problem which the military institutions involved have vital interests in solving."[9] His observations are born out in chapters 4 and 5, which discuss strategic and operational challenges facing U.S. forces in Central Europe.

Although different degrees of innovation exist, what frequently matters to those interested in engendering a discontinuous increase in strategic effectiveness are significant military innovations that diverge from standard practices or prevailing ways of warfare. They often involve some mix of untried, disruptive technological, operational, and organizational change.

Major military innovations, or major periods of innovation in military affairs, are about large-scale, historically notable change over time. Differentiating between lesser innovations and historically noteworthy ones is difficult given the widely disparate contextual factors subsuming innovation activities across time, cultures, and socio-technical domains. A single theoretical bent is unlikely to capture the richness of the underlying behavior. Analytically, it remains useful to differentiate historically momentous examples of military innovation from the more routine march of military science. Even major military innovations are not necessarily harbingers of military revolution or revolutions in military affairs, although neither seems possible without one or more innovations. Perhaps it is more appropriate to argue that major innovations are necessary but not sufficient for the emergence of an RMA. Leaving this issue for later chapters, here it suffices to propose that historically novel or noteworthy modernization paths that pursue discontinuous innovations are more likely to shift military theory, operational art, a specific combat arm, doctrine, or other factor – alone or in combination – to alter the course of military history. Such changes shift the correlation of forces and the fortunes of armies due to the successful application of innovations on the battlefield.

Like warfare, military innovation is a social activity hinging, in this case, upon pockets of cooperative behavior (often in the face of stern opposition) aiming to alter organizational missions and activities in response to some strategic or operational need. This frequently occurs to correct a real or perceived, existential or anticipated, specific or general, performance gap that has strategic implications. During periods of "great historical challenges" or "at times of crisis," military historian and philosopher Azar Gat opines, new ideas emerge expressing "human effort to come to grips with new developments and integrate them within meaningful intellectual frameworks."[10]

Within an organization, innovators may perceive themselves as zealots on a mission, viewing their work as saving the organization by redefining identities and mapping an organization's core values to emerging or future operational realities. Success, from a leadership perspective, depends on some mix of disciples, champions, and organizational discipline. Innovations, then, usually require some type of external or high-level sponsorship to achieve successful implementation and diffusion. Innovations also tend to disrupt organizations by causing a change in business processes or a change in how the organization measures strategic effectiveness. Examples include German S*tormtrooper* tactics, the development of amphibious landing capabilities in the U.S. Navy and Marine Corps, the Air Force's turn to long-range strategic bombing after the Munich Pact, and Israel's development of an offensive doctrine.

Chapter Overview

This study is primarily about the cognitive, material, and organizational antecedents to the intellectual framework – with associated material capabilities– that evolved in the late 1970s and 1980s to capture multi-faceted changes in warfare and prescribe a modernization path for U.S. forces.

In order to understand these changes, the study mines military innovation theory (which addresses the diffusion and adoption of innovations) to construct a framework useful for thinking about the context for and processes associated with significant increases in military effectiveness. This does not mean that studies in military innovation or military effectiveness are the only sources of insight into significant advances in combat power available to analysts. To paraphrase Eugene Gholz, however, they are "a crucial independent variable in good theories of victory."[11]

Activities that contribute to significant changes in a nation's strategic effectiveness are admittedly contingent, constructed by conjoining social, political, organizational, technological, and other factors within a security environment characterized by strategic or operational challenges to military organizations. Such environments are uncertain and complex. So-called emergent properties or unexpected outcomes associated with major innovations that significantly alter the course of military history are infrequently discerned beforehand. Predicting whether a major innovation will indeed provide a qualitative advantage in warfare is difficult at best. Antipodal to military innovation studies, therefore, are those works investigating unexpected military failures and operational blunders.

Military innovations are of growing interest to scholars concerned with war studies, power transitions, and a myriad of other international security issues involving qualitative shifts in force correlations between or among competitors. Such shifts draw interdisciplinary interest because they relate to other aspects of global politics and security. They also illuminate how specific organizational and political processes affect later security arrangements and war outcomes. Likewise, because they provide fertile ground for theory building and hypothesis testing, innovation cases are employed to polish theoretical lenses attuned to issues as diverse as threat perception, offensive-defensive theory, deterrence theory, arms control, and technology diffusion.

Theo Ferrell and Terry Terriff argue that studies of major military change concern three essential types of organizational behavior: innovation, adaptation, and emulation.[12] Change through innovation derives from "new military technologies, tactics, strategies, and structures"; adaptation involves "adjusting existing military means and methods"; emulation concerns the imitation of others.[13] Each type warrants investigation. Each offers insights into defense policy and force structure decisions.

Our primary concern here is significant military innovation pursuant to the sustaining or increasing of strategic effectiveness, which involves a range of challenges quite different from those encountered in adaptations and emulations. As discussed below, this study employs a military innovation framework sensitive to incremental innovations, pursued through both divergent and convergent activities, intended to foster discontinuous increases in organizational effectiveness. Of primary interest are proactive, anticipatory innovation processes, although it seems important to note that most successful military innovations are in some way reactive in that they are attuned to a real (or perceived) strategic or operational challenge.

Early innovation literature discussed disruptive change from the perspective of technology, a concept articulated by Joseph Schumpeter in his 1942 *Capitalism,* *Socialism and Democracy*. More recently, discussions of disruptive change have adopted more comprehensive, sophisticated concepts addressing all aspects of organizational life.

This chapter addresses several questions. What is innovation? What types of studies inform the military innovation sub-field within political science? Are current theories and cases on U.S. military innovation positioned to inform ongoing transformation discussions? If not, what revisions or innovation cases are required?

The intent is sketching, with broad strokes, the outlines of innovation as a phenomenon distinct academically, epistemologically, and organizationally from other behavior. Additional sections address the issue of technology innovations and review business and management innovation studies. This sets the stage for a section outlining a four-fold categorization of military innovation works informing this study. A chapter conclusion touches on measurement issues before proposing an alternative framework for approaching military innovation studies.

Coming to Terms with Military Innovation

This section paints with admittedly broad strokes the parameters of what the study views as military innovation phenomena. Long ago *vox populi* observed that necessity is ‘the mother of invention’; for those unwilling to accept invention’s maternity, necessity is at least invention’s midwife. Invention – of a thing or an idea – is antecedent to innovation, which is the outcome of applied invention or inventions mixed with opportunity and will to attempt change.

Innovation is not invention, although the invention of a thing, idea, or concept often antecedes the articulation and diffusion of an innovative application of technology or new approach to warfare. The key to successful innovation lies in the health and welfare of the diffusion and adoption process. In this study, innovation subsumes diffusion and adoption: there can be no successful innovation if the advantage proffered by the proposed new capability never enters service. Indeed, military innovation studies are partly about the efficacy of processes stewarding new capabilities with the potential to increase effectiveness. The anteceding discovery-invention process is often a solitary one, focused on the development of something new. The innovation, diffusion, adoption process is focused on maximizing the outcome of ideas, technology, or processes in terms of performance, either in an organization, on behavior, or within a market.

Perhaps necessity is the grandmother of innovation, with necessity here being a strategic challenge or opportunity (or operational one having strategic implications) involving military effectiveness. Retired Vice Admiral Arthur Cebrowski, Director of the U.S. Office of Force Transformation in the Office of the Secretary of Defense, would certainly agree that the urgency and necessity underscoring the imperative for accelerated transformation heightens the need for invention (e.g., research and development) and innovation (e.g., experimentation, prototypes, advanced concept technology demonstrations). Necessity figures in chapters 4 and 5 in terms of strategic and operational challenges related to the converging of a Soviet nuclear and conventional threat in the late 1970s.

It is more difficult to effect change when no clear, existential strategic threat exists, arguably a problem military reformers farced in the early and mid-1990s. Of course, even when necessity does exist, nations often pursue the wrong innovations or cannot capitalize on a key capability when conflict does occur. The study conclusion revisits the problem of understanding strategic necessity.

Innovations are applied within and through organizations to achieve significantly better or qualitatively different *military* outcomes. They involve some mix of opportunity and necessity; interests and values; calculated determination and sheer luck. Ultimately a teleological enterprise, successfully diffusing a major innovation involves disruption, displacement, and divergent thinking; innovators, by definition, rub against the accepted order of things and are exemplars of entrepreneurial activism.

Military innovations of interest to this study manifest themselves in some mix of technological, operational, doctrinal, or other changes that significantly increase military effectiveness. They change the parameters by which one measures how resources are converted into fighting power. Often they alter the definition of fighting power by altering the core competency of a military organization. Significant innovations are discontinuous primarily in *affect*, although some degree of antecedent discontinuous or disruptive behavior usually occurs before an innovation takes root and matures within an organization. Above all, innovations change organizational outcomes in terms of how resources are mustered to accomplish objectives and missions. Moreover, they change intra-organizational dynamics, sometimes bringing conflict between organizations, an important element of innovation behavior returned to in later chapters.

Innovation definitions vary. Organizational theorists consider innovation to be simply "the creation and implementation of a new idea" so "long as the idea is perceived as new and entails novel change for the actors involved."[14] Political scientist and student of military doctrine Barry Posen defines innovation as "large change" originating from organizational failure, external pressures, or an organization's expansionist policy.[15] James Q. Wilson views innovations as new programs or technologies that "involve the performance of new tasks or a significant alteration in the way in which existing tasks are performed."[16] For Wilson, "[r]eal innovations are those that alter core tasks," a conclusion that resonates in the realm of military innovation where Service roles and missions are indeed organized around key military tasks.[17] At the basic level, these tasks are divided into aerospace, land, sea, and littoral warfare domains.

Stephen Peter Rosen defines a "major innovation" in similar terms. They involve "a change that forces one of the primary combat arms of a service to change its concepts of operation and its relation to other combat arms, and to abandon or downgrade traditional missions." Overall, he concludes, significant military innovations "involve changes in critical tasks, the tasks around which warplans revolve."[18]

In the burgeoning business management literature on innovation, strategic and operational necessity relates to organizational performance, with innovation often driven by current or emerging performance gaps, market changes, or shifts in customer expectations.[19] Legendary management theorist Peter Drucker simply defines innovation as "'change that creates a new dimension of performance.'"[20] In his classic *The Comparative Advantage of Nations*, Michael E. Porter sees innovation as an outcome of "unusual effort" to embolden "new or improved ways of competing" designed to overcome "pressure, necessity, or even adversity." For Porter, furthermore, "fear of loss often proves more powerful than the hope of gain," an insight applicable to the innovation period studies in later chapters.[21]

Drawing on Wilson, Rosen, and others, defining aspects of military innovation for this study include an understanding of an organization's core tasks, the relationship between tasks and war plans, changes in the strategic (or operational) environment, war plan viability given such changes, and how efficiently organizations accommodate adjustments in missions or tasks required by the new capability.

Contextualizing Innovation

In the early 2000s, senior U.S. officials professed renewed new sense of urgency for defense transformation, arguing that the global war on terrorism and other challenges demanded accelerated change. Context, as well as interdependent aspects of both structure and agency (or the behavior of specific actors), is a reoccurring issue in military innovation studies that warrants additional attention. For Williamson Murray and MacGregor Knox, "revolutions in military affairs always occur within the context of politics and strategy – and that context is everything."[22]

For political scientists, the strategic *and* socio-political environments together define the strategic and operational context. In this larger context, organizations and leaders define and pursue objectives, missions, and tasks. Although the theories and findings of business management scholars do not always lend themselves to military innovation studies, a point discussed below, their increasing focus on contextual factors within which significant change occur, including case studies, illuminates the critical role of environmental factors in success or failure. Such factors range from perceptions, leadership support, the degree of urgency underlying pursuit of change, and qualities of the organization's culture.

"Strategic innovation," which is really the domain of military innovations pursuant to transformational changes, is, as Richard Betts concludes, dependant "on the social and political milieu."[23] Drawing on Betts, this study evokes the term *innovation milieu* to describe the nexus of challenges and opportunities within which military innovations occur. Here, the innovation milieu framework subsumes interaction effects of both structure and agency, the primary elements of innovation systems, processes, and actors that exist in specific moments within specific organizational settings. A French term, a milieu is a point or coordinate in space and time that includes both the middle and its surroundings. Conceptually it has no beginning or end, more a nexus of connections, relationships, and potential influence pathways. In the world of innovation, it is a useful image to capture how organizations and systems interact with their environments – in both contextual and ideational terms – such that over time certain relationships and influence paths evolve profoundly, sometimes revolutionary, change.

Retired Admiral William Owens posits that new technology and concepts originating in the 1970s, many of which became central to the American RMA, appeared after "new generations of nuclear and conventional weapons required novel approaches by the Army and Air Force to maintain the credibility of deterrence in Europe."[24] "It was in this milieu," he continues, "that technologies and operational concepts arose that would be central to the" American RMA.[25] Such military innovations as radar, the Norden bomb sight, amphibious assault technology and doctrine, the German blitzkrieg, nuclear weapons, and stealth technology emerged from specific strategic and operational milieus characterized by necessity and focused ingenuity.

In these cases and others, the innovation milieu took root in a context of strategic and operational challenges that pushed military or defense organizations toward new ideas and ways of accomplishing military tasks. In this sense, the innovation milieu construct follows Secretary Emeritus of the Smithsonian Institution Robert McC. Adams' observation that "innovations are better understood less as independent events that unleashed new sequences of change in their own right than as periodically emergent outcomes of wider, interactive systems."[26] Such interactive systems are the domain of military innovation studies.[27]

Williamson Murray adopts a parallel approach, urging readers to "remember that the strategic arena, as well as political and military assessments of the strategic framework, is [sic] an essential prerequisite to successful innovation."[28] Concerning processes, Murray further opines that, those "broad innovations either undertaken or neglected by military institutions often depend on the political guidance and strategic framework within which those institutions operate.[29]

Generally, the contextual elements of an innovation milieu can be identified as specific areas of analysis or investigation, as suggested in Figure 2-1.

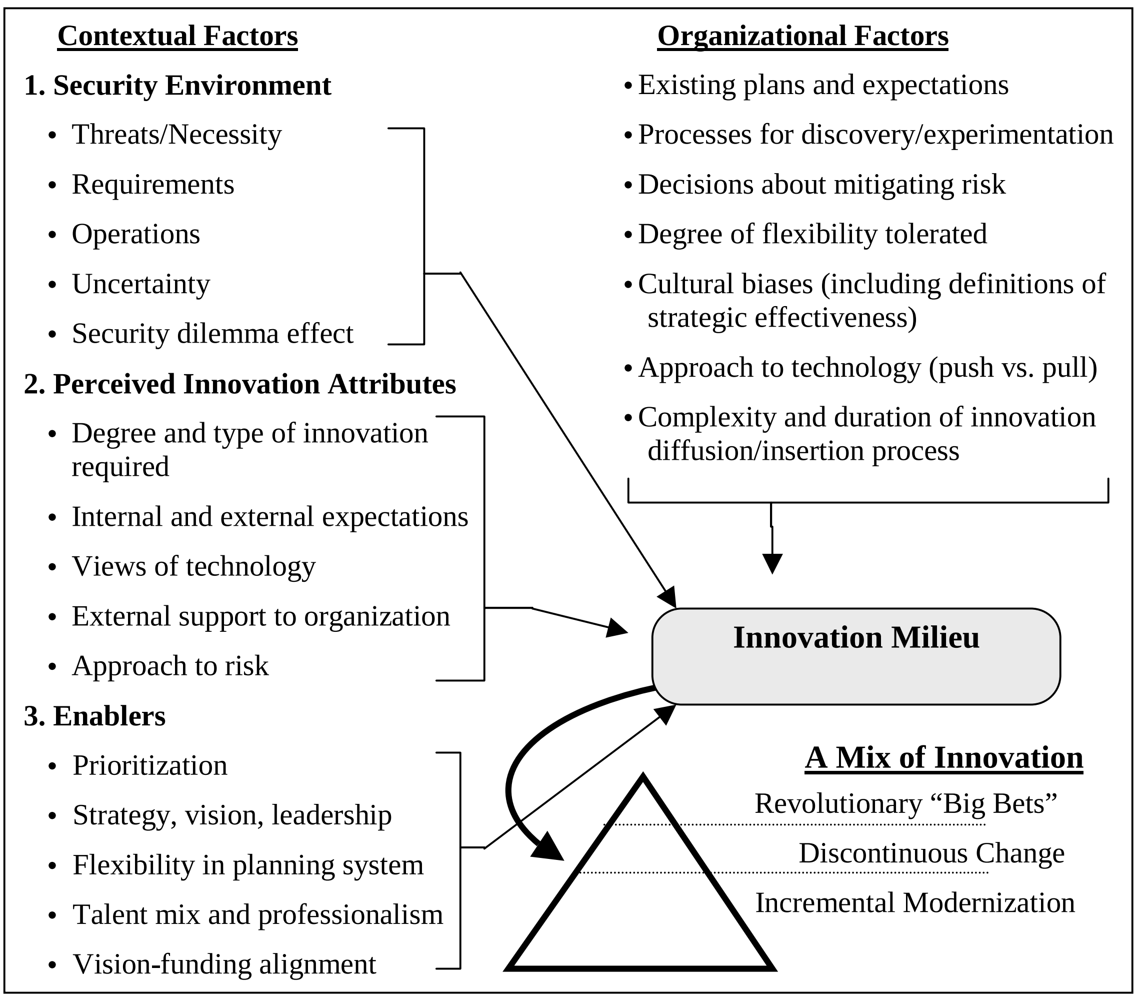

Figure 2-1: Framework for Conceptualizing Innovation

Chapter 6 revisits this framework, using it to unpack major aspects of the history of the American RMA to suggest how students of defense transformation may benefit from a reinvigoration of military innovation studies.

Contextual factors, to reinforce the point, are vital for the maturation and success of innovation, which "occur in organizational contexts that both enable and motivate innovation."[30] Conversely, of course, context can act as a barrier, preventing the coming together of an innovation milieu ripe for the type and degree of innovation behavior of interest to students of major military innovation.[31]

Murray discusses another important aspect of context. "Military innovations that have the greatest influence are those that change the context within which wars take place."[32] This suggests two sides to the analytic problem of contextualizing military innovations: understanding the contextual antecedents and conditions that shape an innovation milieu ripe for significant changes in military effectiveness and then understanding how military innovations themselves alter or otherwise influence military affairs. For policy makers pursuing transformative changes in their military services, it is often the details of the former that are of greatest import; for students of military history it is frequently the effect of military innovations that draws the greatest interest. Here, attention is given to both.

Economist Nathan Rosenberg adds that that innovation "involves extremely complex relations among sets of key variables," including "inventions, innovations, diffusion paths, and investment activity," and further concludes that "innovation and diffusion rates" are "powerfully shaped by expectation patterns."[33] Innovations, moreover, depend "upon an entire supporting infrastructure."[34] In other words, context counts, perception matters, and technology is not the final arbiter of technology innovation. His analysis also emphasizes the role of systems and social networks in innovation, both of which concern organizational expectations about missions and performance. Rosenberg differentiates between innovations and *major* innovations, the latter providing "a framework for a large number of subsequent innovations, each of which is dependent upon, or complementary to, the original one." They "constitute new building blocks which provide a basis for subsequent technologies."[35]

Students of military innovation explore four levels or areas of context. The first concerns the strategic environment in which an organization is nested, including its larger political setting, what this study refers to as strategic dynamics. The second are those factors intrinsic to how innovation in perceived in light of the security environment. This includes how the organization is socially and materially constructed as a functional unit serving some larger societal purpose (e.g., national defense). The third level of context involves what this study terms enablers, which included resource alignment. Finally, innovation is contextualized within the organization itself as a discrete entity.

These levels of context are explored in chapters 4, 5, and 6. Although some argue for the primacy of variables common only to one or two of these levels, this study finds that all are important, as are interactions among levels – a point returned to in the conclusion. The process of translating strategic imperatives into required organizational capabilities (or outcomes) requires some understanding of the new measures of effectiveness required. Innovation scholars seeking to understand such processes cannot adequately assess innovation strategies, processes, or changes in effectiveness without first understanding the underlying rationale to pursue significant change.

Military Innovation Studies: A Sketch of Resources

What resources from traditional political and military science schools of thought inform military innovation studies? This section suggests four categories of works from history and political science that tend to be more accessible and familiar to students of defense analysis, military science, and international security. They inform this study of innovation. The first and second are primary and secondary works on innovation cases and periods, many from outside the formal discipline of political science; the preponderance of these are historical studies, essays, and memoirs. The second two include political science and international relations works addressing doctrinal innovations and other multi-faceted approaches to military innovation.

Collapsing a rich and diverse spectrum of works into categories is undoubtedly problematic; some will surely object to the categories themselves. One benefit of considering the range of available sources is providing a more *inclusive* survey of works than found in current studies, most of which attempt no dissection of the universe of existing resources. Additionally, the categorization of sources informing this study is structured to differentiate, generally, the types of studies available. It also identifies those this study most resembles. That said, the categorization is not presented as *the* standard for others nor does it claim to be comprehensive. Instead, it represents a general guide to understanding sources, with an admitted bias toward U.S. defense studies.

This first category of studies helps sketch the topography and contextual nuances of military cultures, institutions, and other characteristics of military organizations learned through direct experience or association. As the broadest, it includes memoirs, autobiographies, and select analytical essays on the U.S. defense establishment. In additional to conceptual and historical analysis, included here are essays and writings by military reform participants and policy makers that discuss, describe, or otherwise provide insight into decisions undertaken before and during periods of innovation or organizational change. Among these are Carl Builder's *The Masks of War: American Military Styles in Strategy*, a classic work on American military culture and Service identities. Builder informs military innovation studies by helping students of military organizations understand decisions concerning roles and missions, the procurement of new weapons systems and combat platforms, and the effect of organizational culture influences on innovation choices. Others include two biographies of John Boyd (one by Grant Hammond, the other by Robert Coram) that discuss the culture of defense reform in the 1970s, James Burton's memoir on defense reform, and Kenneth Adelman and Norman Augustine's analysis of technological and geopolitical influences on U.S. defense policy.[36] These works provide insights into the culture of change inside defense organizations.

The second category explores military innovation and modernization process, focusing on specific cases or technologies. To distinguish these from the third and fourth categories, works in the first and second categories generally do not engage in theory building. This does not mean they demure from offering theoretical insights or observations to inform contemporary innovation processes. Their focus tends toward unpacking the complexity and nuances of innovation cases by rendering aspects of innovation processes and outcomes more accessible. They do so, generally, as fairly straightforward narratives concerned with conveying insights along historical dimensions rather than through theories, frameworks, and policy-focused analysis.

Representative of these works are Robert Buderi's history of radar, aptly entitled *The Invention that Changed the World* and Harvey Sapolsky's *The Polaris System*

Development: Bureaucratic and Programmatic Success in Government.[37] Other variants focus on historical processes that yield conclusions about the phenomena of military innovation for specific historical cases, often embedded within a particular context. Nicholas A. Lambert's *Sir John Fisher's Naval Revolution*, which documents innovations in British naval defense in the period before World War I, carefully dissects the interaction among strategic and technological changes, organizational reforms, political pressures, and the role of leaders (e.g., Winston Churchill) in bringing doctrinal and other innovations to fruition.

Another multifaceted account is Frank Winter's history of rocket technology in the nineteenth century, *The First Golden Age of Rocketry*, which documents how innovations by William Congrave and William Hale affected military technology, whaling, torpedoes, and other areas. A classic study in this category is Elting E. Morrison's chapter on innovations in naval gunfire at sea in *Men, Machines and Modern Times*, which demonstrates that organizational identity and personality factors are sometimes more important to innovations than technological and doctrinal changes alone. Bruce Gudmundsson's *Stormtrooper Tactics: Innovation in the German Army, 1914-1918*, documents the German innovations in infantry tactics during World War I that spurred the transformation of German military thought and doctrine. Gudmundsson attributes German innovation to the decentralized nature of German military organizations, a proclivity for self-education within German culture, an early start toward change compared to other nations, and innovations in operational art. William Odom, in *After the Trenches: The Transformation of U.S. Army Doctrine, 1918-1939*, concludes that successful modernization requires "procurement of enough equipment for experimentation"; an adept foreign intelligence organization; and, "an organization dedicated to monitoring and accommodating change."[38]

Also included here are studies of specific systems not focused on innovation processes or innovative technologies per se. Richard Betts' edited volume *Cruise Missiles: Technologies, Strategy, Politics* is representative of similar works that touch on aspects of innovation in larger studies of weapons or technologies.[39] Allan R. Millet and Williamson Murray's three-volume series on military effectiveness are additional examples.[40] Among the noteworthy aspects of the edited volumes is their collective treatment of strategic measures of effectiveness. Although significant military innovation is not necessary to achieve superior military effectiveness, and although military effectiveness often increases when organizations perfect established procedures or technologies (not innovative ones), effectiveness studies remain important sources of insight into military change.

MacGregor Knox and Williamson Murray's edited volume *The Dynamics of Military Revolution, 1300-2050* contains a number of important chapters for current students of military innovation.[41] In addition to offering a comprehensive historical framework that nicely distinguishes large, epochal changes in warfare (e.g., creation of modern nation state, French revolution, industrial revolution) with specific RMAs (e.g., steamships, combined arms tactics, submarine warfare, radar, nuclear-armed missiles, stealth, precision strike), the volume yields important insights into specific innovation periods.

Notable is Jonathan A. Bailey's "The First World War and the Birth of Modern Warfare," which outlines the advent of modern warfare from the perspective of a new, three-dimensional approach. It involved the emergence of "artillery indirect fire as the foundation of planning at the tactical, operational, and strategic levels of war" during

World War I and subsequent "style" of warfare from which "the following ideal-type characteristics" evolved:

- It covers extended theaters and is three-dimensional.
- Time is of critical importance, in the sense of tempo – relative rate of activity – and simultaneity.
- Intelligence is the key to targeting and maneuver.
- Available hardware can engage high-value targets accurately throughout the enemy's space, either separate from or synchronized with ground contact.
- Commanders can calibrate the application of firepower to achieve specific types of effect.
- Command, control, communications (C3) systems and styles of command that fuse the characteristics above can break the enemy's cohesion and will with catastrophic consequences.[42]

World War I experiences with indirect fire led to profound changes in how planners and commanders conceptualized the battlefield, including an appreciation for simultaneous operations extending into the enemy's rear.

The three dimensional style of warfare influenced the birth of aerial reconnaissance, which matured coordination between air and ground units, advances in precision targeting through surveys, new mapping and registration capabilities to provide unwarned barrages, and new photographic techniques (i.e., overcoming distorted images, deriving coordinates from imagery). It also pushed near-real time command and control to adjust fire, led to interception of enemy command and control communications, and a new appreciation for the relationship between fire and maneuver. Overall, warfare in the third dimension co-evolved with, and significantly reinforced the need for, C3 capabilities. During this process, as training, planning, and actual operations extended into three physical dimensions while time (the fourth dimension) was increasingly compressed, the lexicon of military thought became increasingly linked to technology underwriting C3 innovations.

The third category informing this study includes works addressing the sources of doctrinal innovation. Frequent foci of these studies are the external influences on military doctrine during the period between World Wars I and II and, more generally, on internal processes causing or impeding the development of successful, innovative military doctrines. Of chief concern are influences on the emergence of particular doctrines, specifically what factors lead to offensive or defensive doctrines. Although these studies are organized around military doctrine, they tend to address all of the elements of military organizations and national strategy. They also tend to study the relationship between doctrine and performance in a specific armed conflict. Notable examples are Jack Synder's *The Ideology of the Offensive: Military Decision Making and the Disasters of 1914*, Barry R. Posen's *The Sources of Military Doctrine: France, Britain, and Germany Between the World Wars*, and Elizabeth Kier's *Imagining War: French and British Military Doctrine Between the Wars*.[43]

Relative to the first two categories, military doctrine studies are viewed as core works in the military innovation sub-field. They self-consciously and deliberately explore, document, and assess military processes and outcomes in order to dissect doctrinal innovations that affect military effectiveness. Such studies usually engage in theory building and theory-testing, seeking to develop explanatory models about influences on military doctrine. They address the role of civilians in doctrinal innovation and the affect of organizational dynamics within military decision making processes concerning the development of doctrine.

Both Synder and Posen found that civilian intervention in the formation of military doctrine has a positive effect when it accurately aligns military doctrine with grand strategy or other foreign policy objectives. Their agreement stems, in part, from their belief that civilian intervention to induce military change proceeds only from accurate knowledge about military affairs, or from a more developed understanding of the security environment. They also agree that organizational factors, including resources, prestige, and institutional autonomy, lead military organizations to pursue offensive doctrines.

Posen treats military doctrine as a "subcomponent of grand strategy that deals explicitly with military means" that concerns two questions: "*What* means shall be employed? and *How* shall they be employed?"[44] Using balance of power theory and organizational theory to analyze military doctrine, Posen ascribed a preponderance of influence for doctrinal innovation to civilian intervention, with civilian influence sometimes requiring military "mavericks" to be effective. Drawing primarily from the case of the British Royal Air Force's (RAF) decision to pursue air defense capabilities in the 1930s, he argues that British civilians were responsible for innovations in RAF air defense systems that later staved off and won the Battle of Britain during World War II.[45]

Kier disagrees with explanatory frameworks ascribing causality for doctrinal innovations to external, structural factors alone. Arguing that structural factors used by Posen, Synder, and others are empirically indeterminate, and therefore inconclusive for theory-building, Kier turns instead to domestic politics and organizational culture for the source of doctrinal innovation. She further takes issue with organizational approaches assuming that roles and missions already performed by military organizations determine their decisions about war fighting concepts and doctrine in the future. "Deducing organizational interests from functional needs," she argues, "is too general and too imprecise."[46] Accordingly, she develops her own explanatory framework that locates answers to questions about doctrinal innovations "in domestic political battles, not foreign threats."[47] Kier maintains that civilian intervention responds to domestic, not international, politics.

In the case of the origins of the American RMA, both internal and external factors are important. Although Kier is right in arguing for the inclusion of domestic politics, she understates the degree to which domestic political battles are conditioned and shaped by changes in strategic context. Overall, in military innovation studies – including doctrinal innovation – the idea of an innovation milieu seems a more helpful construct for discussing internal and external influences on military innovation because it does not attempt to compartmentalize or partition motivations or other influences contributing to innovation behavior. Later chapters explore the question of civilian intervention and revisit doctrinal innovation, addressing whether doctrinal or other ideational variant of innovation is really a distinct sub-field of military innovation studies or merely another route to synthesizing complex organizational behavior.

A final category of works informing military innovation studies include those attuned to the diverse factors increasing or decreasing the effectiveness of military organizations within specific strategic environments. What differentiates them are their methods, scope, and case selection, which are generally more sensitive to the indeterminacy and contingency of military innovation phenomena than the other categories. This fourth category focuses quite self-consciously on military innovation as a form of social behavior – successful or unsuccessful –so that lessons, insights, or patterns might inform more contemporary policy decisions. At times sacrificing the richness of historical narrative and the objectivity of deeper case studies, these studies attempt to organize processes and behavior within specific frameworks to tease out variables and other artifacts for discussion.

Recent examples include Millet and Murray's volume on military innovation in the interwar period and Theo Farrall and Terry Terriff's before mentioned *The Sources of Military Change: Culture, Politics, Technology*.[48] Among the earliest examples, Edward L. Katzenbach's essay "The Horse Cavalry in the Twentieth Century: A Study in Policy Response," originally published in 1958, remains an interesting study of the politics of military change.[49] Michael Armacost's *The Politics of Weapons Innovation: The Thor-Jupiter Controversy* stands as a landmark study in the role of interservice politics and service lobbying for weapons systems, documenting how both uniformed and civilian interest groups respond to international and institutional changes when arguing for weapons innovations.[50]

In this category is also the chief work on military innovation within political science, the work on which this study aims to build: Stephen Peter Rosen's *Wining the Next War: Innovation and the Modern Military*.[51] Rosen's seminal work remains the most comprehensive attempt to assess a diverse range of innovation cases (American and British) to inform post-Cold War defense modernization and transformation discussions. Building on the underlying academic question, "When and why do military organizations make major innovations in the way they fight," Rosen investigates "how the United States can and should prepare for the military problems it faces"[52] and aims to inform "Americans concerned with the possible need for military innovation."[53] Rosen analyzes twenty-one cases of successful military innovation using a three-fold typology of American and British innovation cases spanning the years 1905 through 1967.

His three types of innovation include peacetime, wartime, and technological innovation:

> Peacetime military innovation may be explainable in terms of how military communities evaluate the future character of war, and how they effect change in the senior officer corps. Wartime innovation is related to the development of new measures of strategic effectiveness, effective intelligence collection, and an organization able to implement the innovation within the relatively short time of the war's duration. Technological innovation is strongly characterized by the need to develop strategies for managing uncertainty.[54]

Problems occur when applying the categories to more contemporary innovation cases. Binning military innovation into these three categories leads one into intellectual cul-de-sacs when contemplating what his cases might mean for innovation activities writ large. Generalizing from his case studies to others is therefore more difficult than necessary. In an era where information technology is both ubiquitous and a primary factor in advancing military effectiveness, and after a decade of unprecedented operational tempo, Rosen's suggestion that each of his innovation types derive from "distinct sets of intellectual and practical problems" risks transferring false boundaries and unhelpful analytic distinctions to today's innovation scholars and defense analysts.

Some of the innovations discussed in chapters 4 and 5, moreover, are likely to fall into Rosen's definition of technological innovation but seem to support arguments from the other innovation categories. It warrants restating an important analytic caution. The importance of technology, especially information technology, to peacetime and wartime innovations during the last several decades warrants against making this a distinct category. "Peacetime and wartime organizational innovation," as Rosen defines them, involves "social innovation, with changing the way men and women in organizations behave. Technological innovation is concerned with building machines."[55] This distinction seems to trivialize the social dynamics involved in technological innovation or, at the very least, conflates invention and discovery with the application of new technology to operational problems and diffusion through an organization. The latter are profoundly social.

Excellent case studies notwithstanding, his framework for analysis complicates extrapolation of findings about leadership, organizational dynamics, role of knowledge about threats, and other insightful conclusions to similar situations. For him, the emergence of new measures of military effectiveness follows from "process of rethinking how operations lead to victory and devising new ways to measure how military capabilities relate to strategic effectiveness."[56] But his discussions of military effectiveness are primarily limited to wartime innovation. Cold war developments discussed in later chapters, not to mention 2000s defense transformation initiatives while fighting a war on terrorism, do not fit neatly into Rosen's peacetime and wartime categories.

Rosen's treatment of intelligence is also problematic for defense transformation scholars in the 2000s, for which intelligence is a key concern. Rosen concludes that "intelligence about the behavior and capabilities of the enemy has been only loosely connected to American military innovation."[57] This is certainly not true for the period studied here, nor is it the case for planners making decisions about future force structure needs.

Despite organizational and theoretical problems, however, *Wining the Next War* retains currency as a cornerstone of the evolving military innovation sub-field, ostensibly because in offers a foundation amenable to revision and adaptation ten years after its 1991 publication.

On Innovation for Profit

Chapter 1 briefly discussed similarities between the evolution of 1990s defense planning discourse and 'change management' frameworks in business management studies. In both, a pro-revolution *zeitgeist* gave way to more circumspect discussions of processes and the exigencies of organizational transformation.[58]

John D. Wolpert of IBM's Extreme Blue, an innovation incubation activity, summarizes corporate views of innovation derived from Industrial Research Institute surveys. In the "late 1980s," Wolpert relates, "most executives reported little interest in innovation" and, "in the early 1990s, innovation didn't rate among the top five corporate priorities." This changed by the end of 1990s, when innovation emerged "at the top of the list."[59] The business and management studies flagship journal, the *Harvard Business Review*, recently documented that innovation emerged as a top management priority only at the end of the 1990s after nearly a decade as a tertiary—at best – item on the business management agenda.[60] Thomas Kuczmarski, Arthur Middlebrooks, and Jeffrey Swaddling found in *Innovating the Corporation* that "quality" emerged as the core corporate concern in the 1980s in response to "the threat of foreign competitors offering higher quality products"; "reengineering" captured boardrooms in the early 1990s; and in the early 2000s, organizations "are beginning to publicly declare innovation as a top priority."[61]

Another shift in management theory is also being mirrored in defense modernization discussions. Early 1990s attention on reengineering within businesses and market segments has been replaced by a focus on integration and collaboration across them. Exemplifying the change in thinking is James Champy's shift from writing on reengineering the early 1990s to "X-Engineering" in the early 2000s. "Whereas reengineering showed managers how to organize work around processes inside a company," Champy argues, "X-engineering argues that the company must now extend its processes outside" to achieve "vast improvements in operations across organizations."[62]

The shift from revolutionary, "hard right turn" management strategies to ones attuned to innovation theories and processes is arguably part of a larger drive to understand and successfully lead change in large, complex organizations operating in uncertain times. Innovation for profit theories, case studies, frameworks, and management tools are widely read and followed in the business world.

U.S. defense transformation evolved in the 2000s as a strategic management concern for an administration that entered office with a pledge to reform the military and throughout its first term assured the nation that the war on terrorism would not forestall meaningful change. Official 'strategic plans' outlined transformation objectives. Social scientists aiming to inform defense transformation cannot expect defense planners, or for that matter the larger cohort of defense transformation interlocutors, to adapt academic frameworks to their policy needs.

Political scientists interested in informing this important policy arena, for example, should not expect to achieve policy relevance unless findings are communicated in ways policy makers can readily understand. Military innovation scholars should pursue theoretical frameworks that yield conclusions decision makers can place in context with today's problems. RMA scholars succeeded in socializing their work within the defense policy community because, in the early 1990s, this community was highly receptive to, and indeed thirsted for, frameworks able to place seemingly revolutionary changes in military effectiveness in some historical perspective. Meanwhile, planners welcomed new concepts and theories into military thought as nuclear-centric thinking about defense planning lost its relevance.

Ten years later, arguably, these same planners no longer required insights into the historical dimensions of military change. Nor were they wanting for theories, concepts, or new ways of thinking about warfare. Instead, transformation planners require insights into the strategic management of military innovations pursuant to additional leaps in military effectiveness. This suggests an avenue for social scientists to further draw upon management and business school research. The earlier presentation of four military innovation categories informing this study did not include this research because it is not a traditional source for military innovation scholars.

There may be good reason for not including management theory on innovation into military innovation studies. By the late 1990s, the use of the term innovation was so widespread in business literature and management theories that Paul C. Light concluded it was "one of the most overused, underdefined [sic] terms in organizational life. No one seems to be sure just what the word means."[63] Strongly associated with innovation in the business world are novelty, newness, uniqueness, significant change, performance leaps, new market niches, new product creation, and the sense of more efficient resource utilization or increased value for customers.

John Kao, economist and founder of the Idea Factory, argues that the turn toward the language of innovation stems from the "imperatives of the new economy," including "speed, pushing new forms of winner-take-all competitive dynamics, introducing new business models that involve the creation of standards," and "the accelerated transformation of technology."[64] As does Light, Kao laments that innovation "is so important that the word itself is groaning under the weight of expectations placed on it. Yet as a systemic practice, it remains obscure."[65]

One sees the same befuddlement in discussions of defense transformation, a domain where more serious and systematic approaches to innovation are needed. But the field is rich in case studies and planning strategies offering frameworks for other scholars to utilize.

Clayton M. Christensen's *The Innovator's Dilemma* is one example of how the innovation for profit literature can inform military innovation studies. The dilemma central to his work is the historical fact that "logical, competent decisions of management that are critical to the success of their companies are also the reasons why they lose their position of leadership" in the market.[66] "Disruptive technologies," he argues, "bring to market a very different value proposition than had been available previously. Generally, disruptive technologies underperform established products in mainstream markets."[67] The point, also applicable to early stages of military innovation, is that major innovations that truly depart from established practices or capabilities should not be assessed against currently available capabilities because, "by definition," the disruptive technology (or other type of change) must measure different attributes of performance than those relevant to in established" contexts of strategic effectiveness.[68]

Not all arguments and concepts from the innovation for profit literature fit with organizational dynamics and cultural attributes of military services. As Light, Peter Drucker, and others point out, important differences exist in their application in the private versus public sectors. Drucker, for example, highlights differences in degrees of change characterized as innovative or noteworthy. "In any institution other than the federal government," he argues, "the changes being trumpeted as reinventions would not even be announced, except perhaps on the bulletin board in the hallway."[69] Here, the comparison is primarily based on organizational processes and other internal changes rather than on wholesale shifts in mission, customer bases, and markets. Arguably, one reason for the diverse, and sometimes contradictory, range of definitions in the business management domain is the sheer diversity of analytic interests involved. There exists a broader range of organizational, technological, and philosophical issues discussed and a wider range of motivations for innovation, spanning a variety of measurements and conceptions for what constitutes significant increases in "value" for the firm. Moreover, many studies on innovation for profit are wedded to existing management philosophies or business schools.

Unlike the business management domain, defense planning and military thought remain saturated with RMA and transformation discussions. Although a danger exists that innovation will also be overused and rendered meaningless as a term and perhaps process, military innovation studies can benefit from some of the language and ideas of those seeking innovation for profit. The diversity of leadership philosophies, change management frameworks, and corporate cultures supports, perhaps, *too* many innovation constructs. For those leading change, on the other hand, because successfully *implementing* a strategic plan is as important as the plan itself, leaders often benefit from a wide range of analytic tools and processes to bolster organizational change.

All of this begs the question of how to leverage insights for military innovation students. One area where business management studies are relevant concerns the innovation milieu itself, what Kao discusses as "the importance of physical environments that support innovation, that make innovation processes concrete, that support and generate persistence around knowledge creation processes."[70] Within the construct of an innovation milieu, moreover, business innovation case studies provide ample data on the importance of strategy and processes, aligning future needs and performance gaps with new technology, doctrine, and unit tasks. Select lessons from business management case study literature are returned to in later chapters in discussions of processes and leadership.

Although this study does not comprehensively document or exploit the innovation for profit literature it remains an important sector of innovation knowledge that needs to be periodically scanned for insights into aspects of innovation common across types of organizations. One important area concerns organizational dynamics associated with diffusion and insertion processes. Here, the focus is on leading and executing innovation processes, whether they involve aligning organizations to succeed at new tasks or missions, closing critical performance gaps by implementing doctrine or other ideational change in processes or operations, or merging organizational cultures to overcome biases and barriers impeding innovation diffusion.

Learning from the Military Revolution in Early Modern Europe

Students of military innovation can tap another source for insights into the historical dimensions of changes in warfare. The historiography of military revolutions originated in 1956 when Clifford Roberts published *The Military Revolution, 1560-1660*, which initiated an ongoing debate among historians.[71] Roberts' general field of study was early modern Sweden and his focus was Gustavus Adolphus, a focus in part derived from his biographical work on the eighteenth century Swedish king. Examining the transformation of European warfare during the period 1560-1660, Roberts suggested four major changes to warfare in Early Modern Europe. First, there was a shift in tactics from the classic square of the Spanish *tercio* to linear formations. Thereafter, tactics based on lines of forces dominated Western warfare until well into the Industrial Revolution. Second, traditional weapons, including the lance and pike, were displaced by new weapons, including arrows and then firearms. Third, the size of armies supported by political entities increased dramatically. Finally, the overall impact of warfare and war on society grew.[72] The general argument made by Roberts was that this period witnessed a revolution in tactics, which was based on the increased size of well-drilled armies (that fought in linear formations) and which significantly increased war's impact on society.

Twenty years after Roberts published his work on the military revolution in Early Modern Europe, Geoffrey Parker expanded its foci with *The Military Revolution: Military Innovation and the Rise of the West, 1500-1800*.[73] Parker critically assessed Roberts' thesis, finding it plausible yet incomplete, and his work became the intellectual center of an expanding debate among historians. He concluded that Roberts' thesis was insensitive to changes in naval and siege warfare, overlooked military education, and ignored the codification of certain laws of war. Parker's military revolution had a wider scope, one explored through the question, "Just how did the West, initially so small and so deficient in most natural resources, become able to compensate for what it lacked through superior military and naval power?" Much of his answer to this question revolved around the theme of action-reaction in the relationship between the offensive and defensive aspects of warfare, a relationship modulated by the introduction and rise of cannon and their effect on fortification technology. Essentially, the military revolution was linked to the development and proliferation of bastion-style fortification technology, otherwise known as the *trace italienne*.

Brian M. Downing further expanded the military revolution debate among historians with *The Military Revolution and Political Change: Origins of Democracy and Autocracy in Early Modern Europe*.[74] For Downing, "[t]he 'military revolution' or 'military modernization' refers to the process whereby small, decentralized, self-equipped feudal hosts were replaced by increasingly large, centrally financed and supplied armies that equipped themselves with ever more sophisticated and expensive weaponry. The expense of the military revolution led to financial and constitutional strain, as parsimonious and parochial estates refused to approve the requisite taxes."[75] Downing's military revolution is political, rather than military, in its consequences and definition, and he argued more forcefully for thinking of weapons and armaments as only a small part of a military revolution. For him, a military revolution involved more than a single combat arm or technology issue, an argument he made by exploring the complex politico-military changes transpiring in the 16th and 17th centuries. His version of the military revolution focused on the social and political conditions wrought by war changed some constitutionalist societies in European to "military-bureaucratic absolutist" states while others developed into liberal democracies. Generally, states that did not have to deal with high domestic pressures to mobilize and support war avoided the need to develop highly centralized, absolutist governments.

Clifford Rogers is another influential voice in the historical debate on military revolutions. He argues that a "focus on the centuries after 1500 obscures the importance of the period in which the most dramatic, most truly revolutionary changes in European military affairs took place: the period, roughly, of the Hundred Years' War (1337-1453)."[76] During the Hundred Years' War, he contends, European war was revolutionized twice, first by an infantry revolution (which matured in the middle of the

14th century) and second by an artillery one (which occurred in the first third of the 15th century). Clifford states that his two revolutions were followed in later centuries by two other military revolutions in Early Modern Europe. A fortification technology revolution, which was the centerpiece of Parker's military revolution was followed by a revolution in administration, which was a focus of Roberts' military revolution.

Rogers' conclusion informed thinking about the American RMA. After stating the obvious — that the "concept of 'revolution' in history is a flexible one" — he restated his observation that not one but a *series* of military revolutions occurred between 1300 and 1800. All four of the above mentioned revolutions were "synergistically combined to create the Western military superiority of the eighteenth century."[77] The identification of four military revolutions in close historical proximity led Rogers to ponder whether the period was actually one of long evolution rather than four distinct revolutions. Suspecting that the overall theory of military revolutions might be impeding our understanding of natural order of things, he borrowed the concept of "punctuated equilibrium evolution" from biology.

Punctuated equilibrium, he argued, might be applicable to the history and theory of warfare. Under such an approach, evolution is characterized by short periods of rapid alteration followed by long periods of "near stasis" in which only slow, incremental changes occur. Indeed, it appears that the processes of innovation and transformation, which antecede RMAs, adhere more to the model of punctuated equilibrium than to the idealized revolutionary construct implied in much RMA literature.

Noteworthy in the historical debate over the true boundaries and features of the military revolution in early modern Europe is the lack of quibbling over definitions and the general aloofness from the question, "What's in a name?" Each of these military historians, only a few of which are discussed above, produced a well-researched, painstakingly argued, and historically accurate argument that bounds a particular research question within a certain analytical context. The methodology employed by each follows a traditional historical method, although Downing's is more a comparative political history.

Studies of themilitary revolution in early modern Europe do not offer insights into organizational behavior or political processes directly transferable to today's transformation discussions. These works inform students of the American RMA and provide insights into the utility of academic debate over the unfolding of history. Each of the above works clearly articulate the image or definition of the military revolution under consideration, with caveats about the merits and demerits of the analysis. Each also displays deep interest in social, political, organizational, economic, and other "non-technological" aspects of warfare. Finally, these works demonstrate sensitivity to the nature of fundamental change from one period of history to the next.

A more noteworthy aspect of these studies concerns Rogers' reflection on the approach to military revolutions. Parenthetically, it appears that he and other historians were intellectually *compelled* to engage in the historical military revolution debate established within the discipline by luminaries such as Roberts and Parker. Indeed, Rogers steps back from his argument to consider the greater issues of what he is studying and attempts to give an alternate perspective for the theory of military revolutions, a perspective drawn from biology's theory of punctuated equilibrium. In doing so he all but admits that he *has* to call his focus of analysis a "military revolution" to be accepted within the discipline even though his study does not align with others. He is forced to fit his argument within the discourse on military revolutions despite the fact that, presumably, he finds the approach lacking because it treats military revolutions as discrete, temporally if not causally.

This is a syndrome students of U.S. defense transformation need to avoid, one that appears to have infected post-Cold War defense policy discussions. By turning to a military innovation framework, which is amenable to unlimited adaptation to facilitate explorations of innovation variables, students of U.S. defense transformation can avoid the intellectual *cul de sac* Rogers decried.

Chapter Conclusion

Defense modernization planning in the early 2000s seemingly returned full circle to the 1990s when Andrew Krepinevich assessed perceived changes in warfare and contributed to the intellectual foundation for the RMA thesis. Meanwhile, defense discourse continued to evolve from RMA frameworks to transformation management strategies. Innovation, and its importance as a means to sustain U.S. superiority, emerged as a more important area of study for students of defense policy and military thought.

Important differences distinguish most RMA works from military innovation studies. With some exceptions, the 1990s RMA debate focused on grand changes in warfare, on technologies likely to dominate twenty-first century conflicts, and on whether or not emerging capabilities deserved the label 'revolutionary.' Conversely, military innovation studies tend to start with grand challenges to strategy (or smaller ones to tactics) and then relate how organizations overcame them in ways that significantly changed a military force's ability to fight and win in combat.

Military innovation studies, consisting largely of historical case studies organized around specific theoretical frameworks, provide policy makers and analysts with insights into past innovation processes and outcomes. Students of military innovations describe and analyze the conditions common to successful innovation processes to suggest how others might replicate them. Although certainly not sufficient, such innovation processes and outcomes are necessary antecedents to successful military transformations.

Military innovation is not merely concerned with technological change. Innovation activities must be informed by an understanding of strategic history, how such changes come about and why. This also clarifies one's current strategic context and direction, if the contextual parameters and operational constructs embedded in the innovation studies are appropriate for the strategic landscape. RMA studies, therefore, can be used to inform innovation studies.

Williamson Murray is right that the very "concept" of an RMA "is a useful way to think about the possibilities" of military change.[78] Grand tours through military history and specific cases are both excellent sources of insight, examples, and even analogies. Mining of the interwar period for cases such as German innovation anteceding the famed blitzkrieg, the rise of submarine warfare, the advent of carrier-based aviation, and a narrow range of other was the mainstay of RMA scholarship. These studies helped inform post-Cold War strategic studies and military thought by placing the idea of military change in perspective.

One contribution of the military effectiveness literature emerging from studies of interwar RMAs is greater appreciation for visions of the future, their relationship to military capabilities, and the importance of testing them empirically in full view of military leaders. During this process, appreciation for changes in the strategic landscape and an understanding of future warfare requirements, key features of the strategic context, are also important. Along with vision, deep knowledge of the origins for existing and proposed technology, doctrine, and operational practices helps decision makers and planners grapple with transformation decisions.

Historical awareness is, for sure, crucial to navigating arguments for and against military change. Murray points out that “no example in history” exists “where military organizations have successfully jumped into the future without a compass from the past to suggest how they might best incorporate technology into a larger framework.”[79] Just as business leaders carefully select cases and theories applicable to their needs, so too should defense transformation scholars focus on applicable historical cases.

After a decade of discussions about adapting the U.S. military to a new strategic environment, the question remains whether students of defense policy are being presented with a diverse enough range of cases to think creatively about today’s defense planning challenges.

Recognizing that numerous definitions and typologies of innovation are possible, I’m persuaded that, for military innovations aiming toward discontinuous changes in military effectiveness (e.g., transformation), a relatively straightforward innovation framework can be employed to guide military innovation scholars. Understanding the types of change suggested by an innovation is a key factor when using the innovation framework as an aid to thinking. This process is analytically accomplished by first posing some basic questions about the intent and essence of potential change.

- First, does the acceptance and diffusion of the innovation require incremental or discontinuous shifts in the organization?

- Second, do the required policy, organizational, technological, or other types of changes required lead to the sustaining of current policies or technologies (adapting or extending them) or their disruption?[80]

- Finally, from an organizational culture and leadership perspective, does change promote a convergence of the old and new or a divergence?

In some cases, convergence involves merely the integration of something old and new; in others it involves an innovative integration or fusion of existing capabilities or technologies. Integration, for example, is central to the story of the Assault Breaker program, which included a joint information fusion element, and to the evolution of the AirLand Battle doctrine, which sought to integrate air and ground capabilities. But the aggregate capabilities represented by the offset strategy represented a divergence from previous capabilities. These arguments are revisited in later chapters.

The study conclusion returns the figure 2-2 (below), which depicts a notional organizational "space" relating different types of change behavior; it also includes a proposed "zone" for innovation studies that specifically aim to inform national security transformation discussions. It is an operational view of the innovation milieu from figure 2-1, one that attempts to deconstruct how a case-specific assessment of military innovation might move from analysis of contextual and organizational factors to a mix of innovation activities. Conceptually, this is one representation of what a reformer or advocate for an innovation might need to consider when leading change.

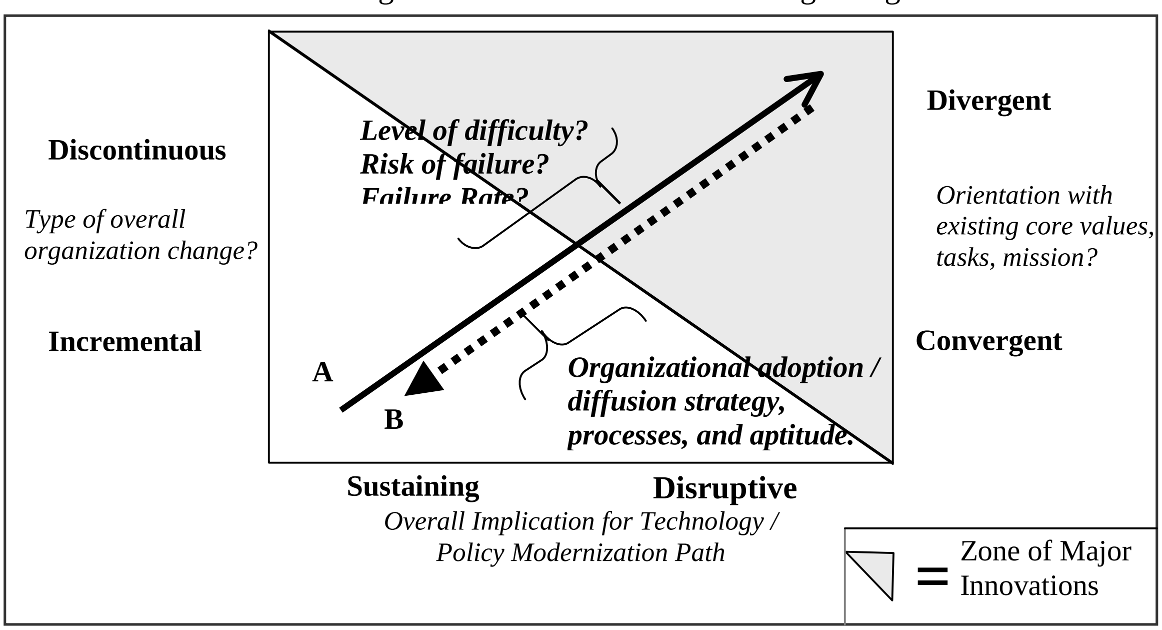

Figure 2-2: An Operational View of the Innovation Milieu

Lesser-order changes are not a chief concern of this study. Nor are they a prominent focus of military innovation studies, a distinction important for delimiting cases, periods, and examples. Adaptation, for example, is a fundamentally different phenomenon from organizational and technological perspectives. This does not mean that adaptation is not important, an argument returned to below in a discussion of interaction effects within organizations and what business and organizational studies discuss as "institutionalizing innovation."

Adaptations, as defined here, concern a better fit between an entity and its environment without effecting core tasks or organizational identity. They are, nonetheless, important components within what students of innovation for profit describe as 'innovation streams. Of course, both adaptations and significant innovations affect organizational thinking and operations through contagion effects. The difference, arguably, is that innovation roils an organization by changing its constitutive nature in some fashion or form.

It is for this reason that major innovations are associated with disruptive or discontinuous outcomes. Reformers seeking profound leaps in efficiency rarely seek adaptations or mere incremental change. Although adaptations may also stem from necessity or opportunity, they tend toward convergent thinking, incremental change, and sustaining technology or policies that do not lead to alterations in core tasks or missions.

Before leaving this chapter, a brief discussion of measurement issues in innovation studies is warranted. Measurement in the realm of military innovation is neither elegant nor refined, and comparative studies of different innovation cases do not easily succumb to methodological rigor or the aesthetics of metrics-based marketing research. Impacts on the environment are decidedly non-linear, knowable only by virtue of the promise of, and potential for, ameliorating the challenges and problems inherent in the strategic or operational necessity driving the impetus to innovate. As one organizational theorist concluded, there cannot be "one best way to innovate because the innovation process is inherently probabilistic and because there are myriad forms and kinds of innovations."[81] Others argue, "observed processes cannot be reduced to a simple sequence of stages or phases as most process models in the literature [of innovation] suggest."[82]

Of course, generalizations about innovation processes have been proposed, primarily through the auspices of organizations and research centers focusing on innovation phenomena in the marketplace, government, and business endeavors. An example is Everett Rogers' study of some 3100 organizational innovation studies – or the diffusion of technology innovations, which remains among the most systematic works on innovation across nations. Rogers also documented the rise of innovation studies, tracing the field to early 1900s analyses of French, British, and German innovation diffusion processes. North American anthropologists entered the field in the 1920s; American sociologists and political scientists began addressing innovation issues in the 1960s.[83] His work on the diffusion of innovations, revisited in the study conclusion, provides important insights into specific aspects of innovation and organizational life.

Innovation students are cautioned that no theory of innovation applies across all organizations, issues, or disciplines. Finding "little progress" toward "developing theories of innovation," James Q. Wilson found that "innovations differ so greatly in character that trying to find one theory to explain them all is like trying to find one medical theory to explain all diseases."[84] "In this regard," he continues, "the study of innovation in government agencies is not very different from its study in business firms," where it is almost impossible to predict with any degree of certainty from where or from whom innovations arise.[85] In their study of military effectiveness, which address the processes and outcomes of military innovations, Allan Millet, Williamson Murray, and Kenneth Watman similarly conclude that the "basic characteristics of military effectiveness cannot be measures with precision. Instead, any examination must rely on more concrete indicators of effectiveness at the political, strategic, operational, and tactical levels."[86]

True enough. The challenge is avoiding overly simplistic generalizations and extrapolations, a problem that befell RMA scholars in the 1990s. In sum, a single innovation theory explaining all cases remains unobtainable. As a body of work, innovation studies generally reinforce the approach taken here: the need to understand and focus on the innovation milieu within which each innovation case is nested. Moreover, they reinforce the need for an organizing theoretical framework that leaves sufficient room for incorporating disparate theoretical resources attuned to different elements of innovation existing across innovation cases and periods.[87]

Chapter 2 Notes

[1] See Mathew Evangelista, *Innovation and the Arms Race: How the United States and the Soviet Union Develop New Military Technologies* (Ithaca: Cornell University Press, 1988). The primary work in the field, and the one of most concern to this study, is Stephen Peter Rosen's *Winning the Next War: Innovation and the Modern Military* (Ithaca: Cornell University Press, 1991).

[2] See David E. Johnson, *Fast Tanks and Heavy Bombers: Innovation in the U.S. Army, 1917-1945* (Itaca: Cornell University Press, 1998); Timothy Moy, *War Machines: Transforming Technologies in the U.S. Military, 1920-1940* (College Station: Texas A & M University Press, 2001).

[3] Barry Watts and Williamson Murray, "Military Innovation in Peacetime" in Williamson Murray and Allan R. Millett (eds.), *Military Innovation in the Interwar Period* (New York: Cambridge University Press, 1996), p. 371.

[4] Ibid.

[5] Williamson Murray, "Innovation Past and Future" in Murray and Millett (eds.), *Military Innovation in the Interwar Period*, p. 300.

[6] Colin S. Gray, *Strategy For Chaos: Revolutions in Military Affairs and the Evidence of History* (London: Frank Cass, 2002), p. 6.

[7] Allan Millet, Williamson Murray, and Kenneth Watman, "The Effectiveness of Military Organizations" in Allan R. Millet and Williamson Murray, *Military Effectiveness, Volume I: The First World War* (Boston: Unwin Hyman, 1988), p. 2.

[8] Allan R. Millet, "Patterns of Military Innovation in the Interwar Period" in Williamson Murray and Allan R. Millett (eds.), *Military Innovation in the Interwar Period* (New York: Cambridge University Press, 1996), p. 335.

[9] Murray, "Innovation: Past and Future" in Murray and Millet, p. 312.

[10] Azar Gat, *The Development of Military Thought: The Fourteenth Century* (New York: Oxford University Press, 1991), p. 247.

[11] Eugene Gholz, "Military Efficiency, Military Effectiveness, and Military Formats," paper presented at the 2003 annual meeting of the American Political Science Association, Philadelphia, PA, p. 2.

[12] Farrell and Terriff, "The Sources of Military Change" in Theo Farrell and Terry Terriff (eds.), *The Sources of Military Change: Culture, Politics, Technology* (Boulder: Lynnee Rienner, 2002), p. 6.

[13] Ibid.

[14] Nigel Nicholson (ed.), *The Blackwell Encyclopedic Dictionary of Organizational Behavior* (Cambridge, MA: Blackwell Business, 1995), pp. 233, 234.

[15] Barry R. Posen, *The Sources of Military Doctrine: France, Britain, and Germany Between the World Wars* (New York: Cornell University Press, 1984), p. 47.

[16] James Q. Wilson, *Bureaucracy: What Government Agencies Do and Why They Do It* (New York: Basic Books, Inc., 1989), p. 222.

[17] Ibid., p. 225.

[18] Stephen Peter Rosen, "New Ways of War: Understanding Military Innovation," *International Security* (Summer 1988), p. 134.

[19] See Michael L. Tushman and Charles A. O'Reilly III, *Wining Through Innovation: A practice Guide to Leading Organizational Change and Renewal* (Cambridge, MA: Harvard Business School Press, 2002) and Frances Hesselbein and Rob Johnston (eds.), *On Creativity, Innovation, and Renewel* (San Francisco, CA: Jossey-Bass, 2002).

[20] Drucker quoted in Frances Hesselbein, Marshall Goldsmith, and Iain Somerville in "Introduction" to their edited *Leading for Innovation: And Organizing for Results* (San Francisco: Jossey-Bass, 2002), p. 1

[21]*The Comparative Advantage of Nations*, Michael E. Porter Porter (New York: The Free Press, 1990), p. 49.

[22] Murray and Knox, "The Future Behind Us" in MacGregor Knox and Williamson Murray (eds.), *The Dynamics of Military Revolution, 1300-2050* (New York: Cambridge University Pres, 2001), p. 180.

[23] Richard K. Betts, "Conventional Strategy: New Critics, Old Choices" in *International Security* (Vol. 7, No. 4), p. 149.

[24] William A. Owens, "The Once and Future Revolution in Military Affairs," *Joint Forces Quarterly* (Summer 2002), p. 56.

[25] Ibid..

[26] Robert McC. Adams, *Paths of Fire: An Anthropologist's Inquiry into Western Technology* (Princeton, New Jersey: Princeton University Press, 1996), p. 5.

[27] For similar comments on interactive innovation systems, albeit described with different terms, see Allan R. Millet, Williamson Murray, and Kenneth H. Watman (eds.), "The Effectiveness of Military Organizations," in *Military Effectiveness, Volume I: The First World War* (Boston: Unwin Hyman, 1988), p. 3; Williamson Murray, "Innovation Past and Future" in Williamson Murray and Allan R. Millett (eds.), *Military Innovation in the Interwar Period* (New York: Cambridge University Press, 1996), p. 302; Allan R. Millet,

"Patterns of Military Innovation in the Interwar Period" in Murray and Millett, p. 367; and Barry Watts and Williamson Murray, "Military Innovation in Peacetime" in Murray Millett, p. 381.

[28] Williamson Murray, "Innovation Past and Future," p. 305.

[29] Ibid.

[30] Nicholson, p. 234.

[31] For an extended discussion of contextual factors in international relations theory, and a useful theoretical framework drawing on contextual and structural factors, see Gary Goertz *Contexts of International Politics* (New York: Cambridge University Press, 1994).

[32] Williamson Murray, "Innovation Past and Future, p. 305

[33] Nathan Rosenberg, *Exploring the Black Box: Technology, Economics, and History* (Cambridge: Cambridge University Press, 1994), pp. 68; 69; 70.

[34] Ibid.

[35] Ibid., p. 115.

[36] Grant Hammond, *The Mind of War: John Boyd and American Security* (Washington, DC: Smithsonian Institution Press, 2001); James C. Burton, *The Pentagon Wars: Reformers Challenge the Old Guard* (Annapolis, Maryland: Naval Institute Press, 1993); Kenneth L. Adelman and Norman R. Augustine, *The Defense Revolution: Intelligent Downsizing of America's Military* Lanham, Maryland: Institute for Contemporary Studies, 1990).

[37] Robert Buderi, *The Invention That Changed the World: How A Small Group of Radar Pioneers Won the Second World War and Launched a Technological Revolution* (New York: Simon and Schuster, 1996); Harvey M. Sapolsky, *The Polaris System Development: Bureaucratic and Programmatic Success in Government* (Cambridge, MA: Harvard University Press, 1972).

[38]Odom, (College Station, TX: Texas A & M University Press, 1999), 244-45.

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[40] Allan R. Millet Williamson Murray, *Military Effectiveness*, 3 vols, (Allen and Unwinn, 1988).

[41] MacGregor Knox and Williamson Murray's edited volume *The Dynamics of Military Revolution, 1300-2050* (New York: Cambridge University Press, 2001).

[42] Chapter 8 in Knox and Murray *The Dynamics of Military Revolution, 1300-2050*.

[43] Snyder, *The Ideology of the Offensive: Military Decision Making and the Disasters of 1914*, (Ithaca, NY: Cornell University Press, 1984); Posen, (Ithaca: Cornell University Press, 1984); Kier, (Princeton, New Jersey: Princeton University Press, 1997).

[44] Posen, p. 13.

[45] Ibid., pp. 141-178.

[46] Kier, p. 20.

[47] Ibid., p. 23.

[48] Williamson Murray and Allan R. Millett (eds.), *Military Innovation in the Interwar Period* (Cambridge: Cambridge University Press, 1996). See especially Millett "Patterns of Military Innovation in the Interwar Period," pp. 329-368. Farrell, Theo and Terry Terriff (eds.), *The Sources of Military Change: Culture, Politics, Technology* (Boulder, CO. Lynn Rienner Publisher, 2002).

[49] Katzenbach in Endicott, John E. and Stafford, Roy W (eds.). *American Defense Policy*, fourth edition, (Baltimore: Johns Hopkins University Press, 1977), pp. 360-373.

[50] Armacost, Michael H., *The Politics of Weapons Innovation: The Thor-Jupiter Controversy* (New York: Columbia University Press, 1969).

[51] Stephen Peter Rosen, *Winning the Next War: Innovation and the Modern Military* (Ithaca: Cornell University Press, 1991).

[52] Ibid., p. 1.

[53] Ibid., p. 251.

[54] Ibid., p. 52.

[55] Ibid., pp. 39-40.

[56] Ibid., p. 110.

[57] Ibid., p. 253.

[58] The business world began the 1990s focused on revolutionary change, a focus that waned at the end of the decade as management theories and business process re-engineering studies suggested that revolutionary approaches tended to fail. Overall, as the decade progressed, the "hard right turn" philosophy waned in favor of transformations and innovations, along with management strategies to nurture pockets of innovation and diffuse transformation through an organization's culture and processes.

For a summary of this, see "The HBR List: Breakthrough Ideas for Today's Business Agenda," *Harvard Business Review* (April 2001), p. 125.

[59] John D. Wolpert, "Breaking out of the Innovation Box," *Harvard Business Review* (August 2002), p. 77.

[60] Ibid..

[61] Thomas Kuczmarski, Arthur Middlebrooks, and Jeffrey Swaddling, *Innovating the Corporation: Creating Value for Customers and Shareholders* (Chicago: NTC Nusiness Books, 2001), pp. 20-21.

[62] James Champy, *X-Engineering the Corporation: Reinventing Your Business in the Digital Age* New York: Warner Books, 2001), pp. 2-3.

[63] Paul C. Light, *Sustaining Innovation: Creating Nonprofit and Government Organizations the Innovate Naturally* (San Francisco: Jossey-Bass Publishers, 1998), p. xiv.

[64] Kao, "Reinventing Innovation" in Hesselbein, Goldsmith, and Somerville, p. 275.

[65] Ibid., p. 275.

[66] Clayton M. Christensen, *The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail* (Boston: Harvard Business School Press, 1997), p. xiii.

[67] Ibid, p. xv.

[68] Ibid., p. 41.

[69] Peter F. Drucker, "Really reinventing Government" in the *Atlantic Monthly*(February 1995), p. 50.

[70] Kao, p. 284.

[71]Michael Roberts, *The Military Revolution, 1560-1660*, (Belfast: Queen's University Press, 1956). The most comprehensive review of the literature is Clifford Rogers (ed.), *The Military Revolution Debate* (Boulder: Westview Press, 1995).

[72]Summarized by Alex Roland in "Technology and War: The Historiographical Revolution of the 1980s," *Technology and Culture* (vol. 34 no. 1), p. 123.

[73]Geoffrey Parker, *The Military Revolution: Military Innovation and the Rise of the West, 1500-1800.* (New York: Cambridge University Press, 1988).

[74]Brian M. Downing, *The Military Revolution and Political Change: Origins of Democracy and Autocracy in Early Modern Europe*, (Princeton: Princeton University Press, 1992).

[75]Ibid., p. 10.

[76]*The Journal of Military History* (vol. 57 no. 2), p. 242.

[77]Ibid., p. 276

[78] Williamson Murray, “Introduction,” in Williamson Murray (ed.), *The Emerging Strategic Environment* (Westport: Praeger, 1999), p. xxxiv

[79] Ibid.

[80] On sustaining versus disruptive change, see Clayton M. Christensen, *The Innovator’s Dilemma: When New Technologies Cause Great Firms to Fail* (Boston: Harvard Business School Press, 1997).

[81] Nicholson, p. 236.

[82] Ibid., p. 236.

[83] Everett M. Rogers, *Diffusion of Innovation* (New York: Free Press, 1983).

[84] James Q. Wilson, *Bureaucracy: What Government* Agencies *Do and Why They Do It* (New York: Basic Books, 1989) p. 227.

[85] Ibid.

[86] Allan R. Millet, Williamson Murray, and Kenneth H. Watman, “The Effectiveness of Military Organizations” in Allan R. Millet and Williamson Murray (eds.), *Military Effectiveness, Volume I: The First World War* (Boston: Unwin Hyman, 1988), p.3.

[87] See Lawrence B. Mohr, *Explaining Organizational Behavior: The Limits and Possibilities of Theory and Research* (San Francisco: Jossey-Bass, 1982).

3. Toward the Narrative of U.S. Nuclear Strategy

For much of the Cold War, Colin S. Gray concludes, "the central thread in the history" of U.S. military thought and defense strategy stemmed from "the problem of extending nuclear deterrence over distant allies in the face of increasingly robust Soviet nuclear capabilities."[1] Deterrence theory took shape in the Truman and Eisenhower years (1945-1960) and coalesced in the late 1960s when civilian strategic theorists and their deterrence models became entrenched within U.S. defense discourse and planning. During this time, conventional force modernization suffered. The narrative of U.S. grand strategy was largely the narrative of U.S. nuclear strategy.

U.S. grand strategy, of course, always addressed conventional military power. Conventional warfighting theory struggled for resources of the margins. During the late 1970s, however, the role of conventional forces in achieving national security policy ascended due to changes in the domestic and international political contexts and technological developments. By the 1980s, a conventional renaissance inhered that brought conventional issues from the margins to center stage. Thirty years after the nuclear revolution in military affairs (RMA) shattered perceptions of military force, a new period of military transformation emerged. This chapter provides conceptual and historical background to characterize this shift.

Why the historical data presented in this chapter? First, it is important for current students of defense policy to understand, or at least get some sense of, the evolution of American strategic thought from the end of World War II. Second, it was during this period that defense planners would first develop their approaches to dealing with nuclear deterrence as a national strategy, which conditioned approaches to conventional deterrence in the late 1970s and early 1980s. Additionally, differences between the U.S. and the Soviet Union at the end of World War II led to asymmetric balancing strategies – the U.S. had atomic weapons while the Soviets had territory (proximity) to Western Allies and massive ground forces. These asymmetries created successive balancing periods that reached a tenuous equilibrium in the 1970s after the Soviets achieved nuclear parity. Subsequently, attention turned toward Soviet ground forces, leading to a new period of balancing that focused on advanced conventional operations. Another reason for starting with the following sketch of early Cold War defense planning is to place the evolution of force structure decisions in perspective.

The origins of post-World War II U.S. military planning were, in hindsight, inauspicious from a military perspective.[2] For historian David Alan Rosenberg, the "foundations of postwar nuclear strategy established in the Truman years were characterized by ambiguity."[3] In his *We Now Know: Rethinking Cold War History*, John Lewis Gaddis broadens the argument, concluding that President Harry S. Truman "and his advisers were as uncertain about what they could actually *do* with nuclear weapons when they left office in 1953 as they had been in 1949."[4] Henry Kissinger, doyen of American national security analysts and archetypal foreign policy adviser, adds a third perspective: "The gap between military and national power was complete." [5] In part, he contends, this was "because we added the atomic bomb to our arsenal without integrating its implications into our thinking."[6]

What was the overall effect? Military historian Russell F. Weigley aptly characterizes the essence of the long-term impact on U.S. security strategy. In his classic, *The American Way of War: A History of United States Military Strategy and Policy,* he labels the entire postwar period as "American Strategy in Perplexity."[7] Building on this theme, later chapters argue that part of the antecedent conditions to the emergence of an American RMA was a resurrection of strategic thought in terms of moving away from what this chapter calls the dominant narrative of nuclear strategy.

Chapter Overview

Because the impetus for military innovation often derives from exigencies in the security environment, much of the background information presented below establishes relationships among these events, arsenal decisions, and the primary doctrinal threads within U.S. defense discourse.[8] A synthetic approach is taken, summarizing key themes or events, providing context and perspective framing later discussions.

One important theme in post-World War II strategy was the increasing role of technology. As the chapter conclusion argues, one negative outcome on the reliance on nuclear weapons and delivery vehicles was a strategic outlook dominated by nuclear targeting and deterrence theory, a development that centered deterrence theory in American military thought and defense planning to the detriment of convention military thought. As what this study calls the narrative of nuclear strategy was de-emphasized in the 1980s a conventional renaissance occurred, one that occurred within a larger context of a systems approach to defense planning and military operations. This approach, which included the emergence of operational art as a key aspect of U.S. war planning and theater-level operations, derived much of its intellectual rigor from systems planning and integration approaches that co-evolved with large-scale Cold War defense projects. Most of these involved information technology in one form or another, including command and control, early warning, intelligence, and targeting data. The systems approach to war planning and operational art that emerged at the end of the Cold War evolved with applied information technology as a cornerstone, materially and intellectually, of an American theory of maneuver warfare. Again, although people remained central, grand strategy after the Cold War was also closely wedded to technology.

Interestingly, as chapter 6 argues, a thread linking the post-War II and post-Cold War periods in terms of the evolution of a central facet of American military thought and defense planning was first articulated by Army scientist and Director of the Office of Scientific Research Development Vannevar Bush in a 1945 *Atlantic Monthly* article. [9] His “As We May Think” imagined information tools strikingly similar to the personal computer, including the ability to automatically link content, and what many consider the first expression of the idea that became hypertext. Doug Engelbart read the article awaiting his return to the U.S. following World War II. Twenty-three years after Bush published his article, Engelbart, who attributes some of his ideas to Bush, demonstrated an information management capability at a conference in San Francisco that helped spark a revolution. In addition to inventing the mouse as an interface for a user to manipulate information, Engelbart actually invented direct manipulation of data within the confines of the computer. He invented the computer-human interface construct that forms the core of the current digital information revolution. In large part, he based his insights on Bush’s visionary concept for a data-rich infostructure where associations and links empowered individuals.[10]

Underneath all of the Cold War politics, nuclear strategy, and other background information discussed in this chapter is the simmering story of how this information revolution occurred, a story that is very much intertwined with U.S. defense planning, research and development, and strategic command and control. It is very much concerned with the technological underpinnings of grand strategy.

This chapter outlines the narrative of U.S. Cold War national security strategy anteceding the 1970s emergence of intellectual, doctrinal, and programmatic innovations that later converged into the American RMA thesis. Information technology, including the ability to identify, target, and deliver weapons, was part of this process. In part, this study argues, one factor rendering the RMA thesis so attractive to defense policy interlocutors was the very promise of demystifying national security strategic and national military strategy by returning conventional military readiness to center stage. In other words, the conventional renaissance reconnected military thought to its historical roots, detaching it from the abstract and senseless canon of nuclear strategy.

The chapter culminates with the solidification of American strategic thought in the late 1960s that, once entrenched, crystallized along several theoretical threads that influenced force structure decisions and doctrine. Several developments or processes beginning in the historical period discussed below are best introduced in later chapters discussing their impact on the emergence of advanced conventional capabilities. They include: the digital computer revolution; geo-positioning and navigation technologies; and, the creation of the Advanced Research Project Agency (ARPA), later renamed the Defense Advanced Research Project Agency (DARPA).

The Collapse of the Grand Alliance and the Postwar Security Environment

Of paramount concern in the immediate post-World War II period was the unraveling of the Grand Alliance between the United States, Great Britain, and Russia (the Union of Soviet Socialist Republics, USSR). A singular common interest during the war, defeating the Axis powers, engendered broad political and military alignment among the Big Three until Japan’s August 1945 surrender removed the impetus for further cooperation. Complicity for decreased cooperation has been assigned to each of the Big Three.[11] For U.S. observers, Soviet Foreign Minister Vyacheslav Molotov's actions at the September 1945 London Conference of Foreign Ministers foreshadowed the Grand Alliance's demise. A conference to collaborate on postwar settlement issues was notable for common antipathies more than common interests. In London, Molotov demanded that Soviet troops be allowed to occupy Japan and successfully pressured the U.S. and Great Britain to accept Soviet versions of peace settlements in Europe. Soon thereafter, Russia unsuccessfully pressured Turkey to grant passages to Soviet warships navigating the straits of the Bosporus and the Dardanelles and began pressuring Iran to grant oil concessions.

Joseph Stalin's new five-year economic program further dashed optimism in Washington concerning postwar relations with the Soviets.[12] Announced on 9 February 1946, Stalin described its intent as preparing the Soviet Union for the impending (and anticipated) conflict with the capitalist world. His declaration corresponded with initiatives to expand the Soviet sphere of influence by coercion, including sponsoring communist activities abroad.

The strategic context was indeed changing. Defining events in the history of the Cold War unfolded apace. As they did, American military thought crystallized, laying the foundations for Cold War strategy and doctrine. It is important for students of U.S. defense policy to grasp the unfolding of these events and their effect on defense planning.

On February 22, 1946 George Kennan sent his 8,000 word "Long Telegram" to the State Department from his posting as the senior diplomat at the U.S. embassy in Moscow. The cable, a landmark in the documentary history of the Cold War, provided forceful insight into Soviet motives, social and economic circumstances, and the historical factors bearing on policy making within the Kremlin.[13] Kennan argued against the inevitability of conflict with the Soviet Union, predicting that Soviet leaders would seek to expand its influence wherever possible but would moderate their policies in the face of firm opposition. Widely circulated in Washington, the cable summarized and gave cogency to emerging views of Soviet animus, providing detailed analysis and a sense of structural coherence to what many perceived as dangerously erratic Soviet behavior. Kennan also suggested a policy course. He argued that America and its Allies would become frustrated *if* they expected Soviet behavior to conform with emerging Western visions of behavior grounded in reason and moderation. To counter the Soviet's power politics, Kennan prescribed patient and firm containment consisting of political and economic measures to offset or blunt expansionist behavior.[14] Within a year, containment would be redefined in more military terms and thenceforward provide the organizing principle of Cold War American policy toward the Soviet Union.[15]

Six days after Kennan's cable was received in Washington, on 28 February 1946, U.S. Secretary of State James Byrnes gave public voice to critics of Soviet behavior, arguing, "we cannot allow aggression to be accomplished by coercion, or pressure, or subterfuges, such as political infiltration."[16] On his mind, perhaps, was the upcoming 2 March deadline for Soviet troops to be withdrawn from Iran; indeed, Moscow announced its intent to keep its troops in place. Facing strong pressure from the United States and Great Britain, and believing that a joint Soviet-Iranian oil agreement was forthcoming (Iran later abrogated the deal), Stalin agreed to a withdrawal by mid-May. That he conceded in the face of such pressure only confirmed Kennan's arguments for a patient and firm approach to Soviet expansionism. Another notable speech occurred on 5 March at a Fulton, Missouri commencement ceremony. With Truman sitting on the dais behind him, Winston Churchill lamented, "From Stettin in the Baltic to Trieste in the Adriatic, an Iron Curtain has descended across the [European] continent."[17] Churchill denounced the Soviet Union, essentially called for a formal end to the Grand Alliance, and suggested a new Anglo-American concert of power to prevent the emergence of another Hitler – in Stalin – and the onslaught of another world war.[18]

What about the Soviet military, the "on the ground" manifestation of the Iron Curtain? In the immediate aftermath of World War II, Stalin mandated that Soviet ground forces reconstitute and modernize concurrently with post-World War II demobilization. Some eight million men left active service by 1948, providing ample stockpiles of weapons and equipment for the three million remaining in uniform. Nearly eighty percent of these served in ground forces. Stalin also channeled a preponderance of available industrial resources toward defense preparedness, including research and development. A variety of armored vehicles followed, including the T-54 and T-55 main battle tanks. Battlefield missile systems were fielded in 1947. Entire sectors of industry were focused on advanced electronics and other military support systems. In 1946, ground, air, and naval forces merged into a unified Ministry of the Armed Forces, a similar but arguably more effective reorganization than the U.S. National Security Act of 1947. Overall, Soviet ground forces posed a strategic threat to NATO and the U.S. by sustaining Soviet occupation of Eastern Europe and threatening areas such as the Middle East.

On "Carrying a Twig": The Travail of Postwar Defense Planning

Contrasting U.S. defense preparedness at the end of 1945 with emerging security concerns overseas, addressing the possibility of conflict with the Soviet Union, and cognizant of the relative strength of Soviet conventional forces, Byrnes turned a phrase attributed to former president Theodore Roosevelt. Where Roosevelt posited, "'Uncle Sam should speak softly and carry a big stick,'" Brynes lamented that reduced defense spending and demobilization left him to "speak loudly and carry a twig."[19] "Some of the people who yelled the loudest for me to adopt a firm attitude toward Russia," Brynes later observed, "yelled even louder for the rapid demobilization of the Army."[20] There was truth in his rhetoric. Stephen Ambrose captured the fundamental problem. "The Truman administration's military and foreign policies were now rushing forward but in exactly the opposite directions, so that the gap between them increased daily."[21] This trend continued well into the 1970s when, in a twist of policy, the Carter administration increased defense spending and set in motion a multifaceted conventional weapon development program.

In the post-World War II period, national security planners grappled with vexing domestic issues as they reinvented the nation's role in global politics. Not the least of these were transitioning the economy off wartime price controls, managing post-World War II demobilization, and retaining military preparedness as defense spending declined.

The pace and scope of some re-conversion policies drew domestic opposition from labor unions in Spring 1946. Some one third of all nonagricultural workers in the United States belonged to unions. Their collective bargaining power was politically decisive; their concerns had to be addressed. Unions sought more favorable wages as the government relaxed wage and price controls, leading to disagreements over the pace and scope of re-conversion policies and, eventually, to strikes. Strikes were countered by increased government involvement, which in turn drew further political opposition.

Demobilization proceeded concurrently with government plans to re-convert the economy from wartime price controls, regulations, and labor policies to peacetime conditions. Continued military engagement abroad was unpopular at home, as were proposals to maintain high levels of defense spending. Overseas, servicemen rioted against demobilization delays, leading to their expedited return home and into civilian life. Personnel strength declined by some ten and a half million between 30 June 1945 and 30 June 1947, as depicted in Table 3-1[22]

	30 June 1945	*30 June 1946*	*30 June 1947*
Army (less Army Air Corps)	5,984,114	1,434,175	683,837
Army Air Force	2,282,259	455,515	305,827
Navy	3,377,840	951,930	477,384
Marine Corps	476,709	155,592	92,222
	12,120,922	2,997,212	1,559,270

Table 3-1: Armed Forces Strength

The situation worsened when inflation reached ten percent. Truman's approval rating declined from eighty percent to nearly thirty. Fiscal and political conservatives from across the political spectrum criticized Truman's domestic policies, leading to a Republican victory in the November 1946 Congressional elections. Republicans, running against FDR's legacy as much as against Truman, won both the House (winning 245 seats to the Democrat's 188) and Senate (51 to 45). Military considerations notwithstanding, and despite Republican politicking that the Administration should be tougher in negotiations with the Soviets, the domesticpolitical environment left little room for increased defense spending.

Throughout the Cold War, defense planning was complicated by inter-service rivalries over funding, roles, missions, and by further changes in the structure of national security decision making, important aspects of the period well documented in other studies.[23] Then as now, force structure and military doctrine decisions reflect higher-order national security policy making, a process involving internal (e.g., political, organizational, and psychological) and external (e.g., Alliance relations, threats) factors.

Uncertainty, confusion, or ambiguity at the national policy level is often amplified at the level of force planning and doctrine within the military services. This aptly describes the situation at the dawn of the atomic age as protean changes in U.S. national security decision making gave rise to a new planning system, formally enacted by the National Security Act of 1947. The Act gave rise to the so-called National MilitaryEstablishment (NME) consisting of a new Department of Defense that incorporated the Army, Navy, Marine Corps, and a new Air Force. The Act also created the Central Intelligence Agency (CIA) and a federal research and development program, both of which matured during the Cold War to become important elements of U.S. military innovation activities. After a number of adaptations, the Goldwater-Nichols Department of Defense Reorganization Act of 1986 legislated fixes to counter inter-service competition and planning deficiencies, a topic revisited in chapter 5.

In the foreign policy arena, the 1946 Congressional elections did coincide with – or wrought, depending on one's perspective – changes in Truman's policies toward the Soviet Union. A period of bipartisan foreign policy emerged, either because Congressional supporters agreed with Truman's tougher stance toward the Soviet Union or because Truman adopted such a stance to avoid continued clashes with Congressional Republicans over U.S. foreign policy.

Recognizing the growing imbalance between emerging defense requirements internationally and preparedness to meet them, and increasingly conscious of the domestic political situation, Truman requested an assessment of the U.S. military situation relative to Soviet activities. The task fell to Clark Clifford, Special Counsel to the President, who assigned the task to his assistant George Elsey. Input for the final report came from across the government.[24] Upon receiving it September, the President immediately impounded the remaining copies, summoning Clifford to the White House to surrender them.[25] The report was too pessimistic and politically sensitive at a time when the Truman administration faced domestic opposition.[26] Overall, he remained cautiously optimistic that U.S.-Soviet relations might improve, although recent work suggests that by this time Truman had already decided that a "get tough" attitude was the only viable approach toward Moscow.

A month later, recognizing that logistics planning could not proceed without strategic plans and an understanding of requirements (e.g., munitions needs), the JCS began developing a joint strategic concept and plans to guide mobilization. With hindsight, military planning appears to have proceeded within a context that constrained the emergence of a coordinated and integrated approach to defense policy making. Such constraints took the form of intellectual as well as organizational barriers. In the case of the former, coordination and learning stagnated from the extreme secrecy surrounding the state of the atomic arsenal, which compartmented knowledge of the effects of atomic bombing at the very moment when such knowledge – limited as it was – should have been shared. Organizationally, Services continued to disagree over roles and missions, a persisting problem that realized important, though only partial, resolution in the mid-1970s before becoming subsumed within the larger issue of joint warfighting in the 1980s.[27] Other barriers to integrated defense planning included Truman's tendency to view atomic bombs as terror weapons, prohibitions against official atomic planning, and technological issues limiting the rate of bomb production (what would be known as the "scarcity problem").

The Evolving Context for Strategic Thought, the Bomb, and the Baruch Plan

Overshadowing these and other barriers to more integrated planning in the early atomic era were troublesome questions about the future of international atomic energy and weapons, an issue attenuating national security decision making throughout 1946 and early 1947. Noteworthy in this formative period was the U.S. transfer of custody of atomic energy and atomic weapons to the newly created U.S. Atomic Energy Commission. Done in 1946, this temporarily ended the War Department's stewardship of America's fledgling atomic arsenal. Counterintuitive to most students of the period who associate nuclear weapons only with the Department of Defense (which replaced the War Department in 1947), the move reflected larger objectives of forestalling the further nuleariztion of international relations. Strategically, atomic energy was subsumed within a national security strategy of promoting peaceful atomic energy use worldwide, with an objective of moderating and controlling atomic energy to forestall its further militarization.

Early attempts to control atomic energy engendered what later statesmen fashioned into a strategic imperative: limiting or otherwise controlling the spread of nuclear weapons. A theme revisited in later chapters concerns the subsequent emergence of a strategic nuclear arms limitations regime to stabilize deterrence and, in the late 1970s and 1980s, further stabilization initiatives regarding general purpose forces and regional confidence building measures.

Ambiguity surrounding the utility and use of atomic weapons in the late 1940s derived from the uncertain international security climate, lack of intelligence about Soviet military capabilities and intentions, and the relatively immature state of atomic weapons and associated delivery means. As late as the early 1950s, even as uncertainty about the security environment evolved to an acknowledged U.S.-Soviet rivalry, ambiguity concerning defense planning persisted, in part because the atomic arsenal was growing without comprehensive planning for their use or integration into general purpose forces. Uncertainty also existed about when atomic weapons might be employed, what effect they might have on diplomacy and efforts to prevent a wider conflict, and their very battlefield utility compared to other capabilities.

As stated earlier, Truman maintained that atomic bombs where a weapon of terror to be used only as a last resort throughout 1946 and 1947. During a 21 July 1948 oval office discussion, at the height of the Berlin Blockade (discussed below), Truman reiterated his views on the military utility of atomic bombs, a view that gelled shortly after their August 1945 use on the Japanese towns of Hiroshima and Nagasaki. With the Berlin Airlift ongoing, Truman declared that atomic bombs were decidedly not “a military weapon.” Perhaps reflecting nostalgia for a bygone era when war was more limited in scope, and because they were “used to wipe out women and children and unarmed people,” Truman affirmed that atomic bombs were “not for military uses,” to be treated “differently from rifles and cannon and ordinary things like that.”[28] Furthermore, he did not think the American public would approve of using atomic weapons in any situation other than an all-out war.

Already stated was the lack of information sharing about the bomb. A closely guarded secret, Truman himself remained unaware of the exact size of the arsenal until early April 1947.[29] Only pieces of two weapons were available in 1945, a number reaching thirteen in July 1947 and fifty a year later. At the time, the arsenal was ill-prepared for use in a crisis. Only a small number of bombs existed, a limiting factor in the calculus of their military utility in the opening months of any war over Berlin. Moreover, they were stored disassembled – readying them took some forty men nearly two days.[30] Trained assembly personnel – the scientists responsible for creating the bomb and most knowledgeable about their use, had dispersed following the war along with their uniformed compatriots. Instituting a training program was therefore difficult simply because the military did not have access to bomb components, not to mention limited institutional knowledge to facilitate training. *Planning* for their use was also difficult. That the arsenal was in such a state at all reflects, perhaps, the tradition of demobilization following wars and the belief on behalf of the scientists that produced the bombs that their job ended with the war. Military planners, furthermore, were uncertain what effect the bombs would have on Soviet war making potential, political will, and war termination. "Until well into 1947, Lawrence Freedman observed, these and other "limitations of the bomb governed U.S. strategy."[31] Delivery options, or the lack thereof, remained an issue. Only a few dozen B-29 bombers were modified to carry the bombs, and they remained vulnerable to enemy defenses. In sum, military options for the atomic bomb were limited politically, operationally, and cognitively.

Truman's approach to atomic weapons custody, or who controlled them within the United States government, were linked to plans for international control of atomic energy and the prevention of an atomic arms race with the increasingly uncooperative Soviet Union. American visions of limiting atomic warfare to peaceful uses through global agreements and control mechanisms culminated a month following the Iran crisis and Churchill's "Iron Curtail" speech.

In June 1946, the Baruch Plan was presented at the United Nations and promptly rejected by Moscow. Indeed, Soviet negotiators quickly proposed an alternative. Named for Bernard M. Baruch, the American special representative to the United Nations Atomic Energy Commission, the U.S. plan outlined a system for inspection measures and international controls to impede covert development of atomic weapons. After suitable international inspection measures were in place, the United States would surrender atomic weapons to an International Atomic Development Authority, share technical knowledge about atomic energy, and forestall further atomic bomb development. Conversely, Moscow wanted the U.S. to share its knowledge about the bomb, surrender its weapons, and, rather than an international inspection regime, preferred a self-policing agreement.

The Baruch Plan arrived stillborn. Neither the Soviet Union nor the United States seemed prepared to cease work on atomic weapons without guarantees that another power would not secretly develop them. In July, the U.S. proceeded with its second test of an atomic bomb on the Bikini Atoll, reinforcing Soviet doubts about America's stated vision of peaceful uses for atomic energy and international control of atomic weapons. A month later Soviet Foreign Minister Andrei Gromyko all but buried further discussions of international control of atomic energy (or weapons) by stating that the Baruch Plan's inspection provisions were incompatible with state sovereignty.

The Truman Doctrine and Shifts in Strategic Planning

Political sovereignty and issues related to it, including the status of colonial possessions, the solidification of "spheres of influence," and the formalization of American containment doctrine, shaped the evolving security environment. In this case, an antecedent cause involved the *natural* environment. The 1946 harvest in Europe was uniformly terrible, the 1946-1947 winter the most severe in a generation, and, in Great Britain, a series of blizzards in late January 1947 froze the winter wheat crop. America's staunchest ally was already struggling economically. Electricity rationing limited some households to a few hours of availability per day. Unemployment reached six million, double the rate at the height of the 1930s depression. Burdened by domestic economic ills, London reduced commitments abroad. On 21 February 1947, Britain notified the U.S. State Department that their economic and military aid to Greece and Turkey would end within six months. India's independence would come within a year and the British mandate in Palestine would be transferred to the United Nations.

The CIA concluded that the "poverty and underprivileged position of the population" of these and other colonial areas, along with "the existence of leftist elements within them," rendered "them peculiarly susceptible to Soviet penetration."[32] Truman, anticipating the vacuum Britain's withdrawals created in terms of opportunities for Soviet expansionism, approached Congress for funding to prevent the potential loss of Greece to communist insurgents and the expansion of Soviet influence into Turkey. Press accounts dubbed his 12 March 1947 speech to Congress requesting aid the "Truman Doctrine." Addressing a Harvard commencement a month later, Secretary of State George Marshall, who replaced Byrnes, unveiled the European Recovery Plan, thenceforward known as the Marshall Plan. It aimed to underwrite Europe's economic recovery and postwar reconstruction to prevent the conditions analysts considered inducements to communist ideology and enticements for Soviet political subversion (e.g., hunger, poverty, unemployment). The Marshall Plan was initially unpopular among those preferring a focus on domestic economic issues and accelerated postwar re-conversion – it would require over ten percent of the federal budget to implement. Still, there was widespread support for the new global economic strategy and for the expansion of U.S. involvement abroad as Americans recognized the interdependencies linking foreign and domestic economic conditions. Debates about further involvement in European recovery continued until the 1948 Soviet-orchestrated 'coup in Czechoslovakia provided prima-facie evidence that the Marshall Plan was needed to stave off additional losses in Europe.

Subsequently, the issue of defense preparedness was subordinated to aid for economic reconstruction in Europe while defense planning continued to be constrained by Truman's objectives for international control of atomic weapons. Although defense planners sought increased defense spending, they generally acquiesced on the issue of prioritizing aid for European reconstruction higher than U.S. defense spending. As Melvyn P. Leffler documents in *A Preponderance of Power: National Security, the Truman Administration, and the Cold War,* while few believed Moscow would engage in military aggression, many believed economic problems threatened "the long-termed balance of power" in Europe.[33] Influencing this perception was a March 1948 estimate by a Joint Ad Hoc Committee of representatives from the Central Intelligence Agency and the intelligence arms of the Department of State, Army, Navy, and Air Force. It concluded "that the USSR will not resort to direct military action during 1948."[34] Moscow would, intelligence analysts posited, seek greater influence in Europe and other strategically important regions, by exploiting and, if warranted, fomenting, political-economic crises. “Rearmament,” therefore, “remained subordinate to reconstruction because defense analysts did not expect Soviet aggression.”[35]

Such sensitivity to the importance of international economic conditions in national security discussions was a relatively new phenomenon, at least in terms of cross-cutting agreement among diplomats, defense officials, and others that U.S. economic aid was both necessary and appropriate. Indeed, the pursuit of national economic security through overseas commitments, aid, and alliances evolved as a core theme in Cold War security discussions. Similarly, two further themes evolved during this period: the emergence of an American approach to global intelligence collection and analysis; and widespread support for peacetime defense research and development at historically unprecedented levels. Both are discussed in later chapters; each served as the basis for important military innovations.

Crisis, Opportunity, and Strategic Change

During summer 1947, U.S. military planners grappling with the conceptual and operational exigencies of atomic-era warfare operations set about developing the first targeting plan for the limited atomic arsenal.[36] Initial operational plans for the atomic arsenal reflected World War II experience with strategic bombing. Dubbed ‘city busting’ attacks by some, the objective was attacking and destroying an enemy’s industrial base – frequently associated with population centers – to undercut industrial support to opposing armies with the aim of rendering them militarily ineffective. Soviet industrial centers, therefore, encompassed the targeting base for the future atomic arsenal and B-36 bombers, just then coming into service, became the delivery vehicles for atomic warfighting. Under Truman, air power, which for all intensive purposes meant the newly created Department of the Air Force, ascended to the pinnacle of strategic planning because it was the sole means for delivering atomic weapons. At the time air power was an undeveloped and poorly integrated element of military power. Nonetheless, because of the atomic-centric nature of national security strategy in the late 1940s and early 1950s, its political importance was already supreme.

Planning for atomic warfare was constrained by the barriers mentioned above and by the scarcity of atomic weapons. There were simply too few weapons (and bombers) to destroy all the targets required to truly cripple Soviet war making capabilities. And not all available weapons were likely to hit their mark because of the vulnerability of bombers and difficulties locating targets. "Because of limited capability and inadequate intelligence," Rosenberg concluded, "bomber crews could only hope to penetrate to their targets under cover of darkness and bad weather" to "locate precise aim points" – a task made more difficult over "often snow-covered targets."[37] Strategists, moreover, considered it likely that limited atomic attacks that left the industrial capability intact without utterly crippling an adversary's social-economic infrastructure would only embolden an adversary's will to persevere.[38]

Political developments would soon change the context for military planning. The focal point for the next crisis involved what later generations of Cold Warriors called the "inter-German fault line," the inner-German border. Later chapters revisit the challenges of this border, including the development of U.S. and NATO doctrine to address the operational exigencies of defending West German territory using a forward defense (a defense that aimed to stop an assault at the most forward line of defense possible rather than using tactical or theater depth to absorb and attach and then counter it). Postwar agreements partitioned Germany into four occupation zones, one for each of the Big

Three and a fourth for France. In June 1948, the Soviet Union barred the United States, France, and Britain from access to Berlin, a so-called "open-city" within the Soviet-controlled occupation zone. Eleven months later, in May 1949, the blockade ended. The United States, avoiding direct confrontation on the ground – which might lead to war – staged an airlift to prevent starvation and signal continued political commitment to Berlin's open city status. At the height of the Berlin Airlift, which ran continuously for 324 days, American aircrews delivered 13,000 tons of supplies a day. Berlin remained an important issue throughout the Cold War.

The Berlin Blockade changed attitudes in Washington, leading to new levels and types of military planning, particularly atomic war planning, although defense spending remained stable. It also reinforced the utility of air power. Although no atomic bombs were deployed, Truman's decision to deploy atomic-capable bombers in Britain during the crisis was interpreted as a successful show of strength and resolve. Finally, the crisis over Berlin added further impetus to arguments calling for an alliance structure formally linking Western Europe to the United States. Each of these – crisis-driven military planning, the strategic utility of air power, and American-Western European security arrangements – became important components of national security throughout the Cold War.

The context for military planning changed on 16 September 1948 when Truman signed a National Security Council policy statement, NSC-30, on the use of atomic weapons. Originating as an Air Force policy paper drafted in response to planning deficiencies raised during the Berlin Blockade, NSC-30 "recognized that the military 'must be ready to utilize promptly and effectively all appropriate means available, including atomic weapons.'" Atomic weapons employment decisions were reserved for the President alone.[39] NSC-30 sanctioned official planning for atomic weapons use, including more detailed operational planning and targeting scenarios, and remained the sole national document outlining atomic (later nuclear) weapons employment policies until 1959.[40] Two months later another document, NSC-20/4, proscribed general aims of a war with the Soviet Union. "The goal in a general war," David Allen Rosenberg concludes, "would be to reduce or eliminate Soviet or 'bolshevik' control inside and outside the Soviet Union."[41]

Although NSC-30 and NSC-20/4 represented a change in policy by sanctioning atomic war planning and highlighting readiness issues they did little to clarify important policy and operational questions about how, when, where, and why "the bomb" might be used. These issues would be left unresolved until the Eisenhower administration. The primary influence of these memoranda during the Truman administration was to accelerate atomic production, a decision that coincided with Truman's forgoing of international atomic energy control and his decision to approve more efficient bomb production technologies. For military planners, this promised to remove the scarcity issue in targeting and facilitated revised operational planning. It also established a stream of innovations in weapons development that would lead to tactical nuclear weapons entering the arsenal in the mid-1950s.

The Berlin Blockade raised concerns about military preparedness in both the United States and Western Europe. Underscoring such concerns were questions about the U.S. commitment to defend Western Europe should the Soviets attack. Given the relatively poor state of conventional preparedness, the crucial issue became the deterrence value of America's atomic arsenal. If East-West relations deteriorated into outright war, conventional wisdom held that Western Europe would be overrun unless America's atomic arsenal was formally linked to its defense. Discussed in 1947 and declared in 1948, this emerging political-military strategy committed the U.S. to using the atomic bomb to defend Western Europe against Soviet aggression. Defined some years later as "extended deterrence," this was the first U.S. strategic nuclear posture and the foundation for what became a dominant thread in the narrative of American military thought. The extended deterrence pledge was formally institutionalized in April of 1948 with the creation of the North Atlantic Treaty Organization (NATO). A related thread, the security and stability of the periphery, evolved from aid to Greece and Turkey, the Truman doctrine, and preventing Moscow from maintaining a presence in Iran.

Subsequently, military innovation during the Cold War generally derived from three sources: perceived imbalances in global nuclear deterrence, operational challenges arising in peripheral regions that had the potential to escalate into U.S.-Soviet crises, and specific threats to European stability. As later chapters argue, the origins of the American RMA involved necessity wrought from operational challenges in all three sources.

The H-bomb and NSC-68

In June 1949 the Soviet Union tested its first atomic bomb. Communists won China later that December. The CIA concluded that, "Soviet possession of atomic weapons has increased the military and political capabilities of the USSR and the possibility of war" and that "the security of the United States is in increasing jeopardy."[42] The loss of China raised the specter of a Sino-Soviet pact against the West. Theseand other changes in the international security environment spurred a period of innovation in U.S. national security planning, one decidedly nuclear-centric in character and derived from more pessimistic assessments of the likelihood of armed conflict with the Soviet Union.

Changes in targeting strategy ensued. NATO defense planning requirements and the a fall 1949 Joint Chiefs of Staff study had already pointed toward new targeting priorities for the U.S. Strategic Air Command. The study, led by Air Force Lieutenant General H.R. Harmon (known as the Harmon Report), concluded that early use of atomic weapons remained crucial to damaging Soviet war-making capabilities but might also bolster Soviet will to continue fighting. In layman's terms, hitting the Soviets with only a few nukes might solidify the enemy's will. Because there remained too few atomic weapons to destroy all targets, and because the U.S. was now responsible for defending Western Europe, the Strategic Air Command was assigned the new task of *retarding* Soviet forces rather than strategic bombing of war-making capabilities.[43]

President Truman expanded the atomic arsenal, beginning with increased weapons testing and development programs. He formally approved development of the hydrogen bomb. Theoretical work on hydrogen bombs began during the war but many scientists and policy makers saw its operational development as unnecessary once the war ended. The decision to proceed with development was controversial and sparked debate along two axes: the morality of using a hydrogen bomb and its operational utility (Was a bigger bang better?). Several committees proved unable to provide Truman with a decisive answer to the question, Should the U.S. build the H-bomb? The more important question to Truman was whether the Soviet Union could or would be able to build one. An affirmative answer mooted all opposition. Truman formally approved the decision to build a hydrogen bomb in January 1950, although recent studies suggest he had privately made the decision much earlier.[44]

Whereas the explosion of an atomic bomb involved splitting uranium or plutonium atoms, the more powerful hydrogen bomb worked by fusing lighter weight atoms –

hydrogen or tritium.[45] Because hydrogen bombs worked through thermonuclear explosions, this shifted the lexicon of strategic warfare from atomic bombs to nuclear ones. For Marc Trachtenberg, "the new conditions of warfare. . .emerging from the early 1950s" represented a "'nuclear revolution.'"[46] Indeed, the early 1950s marked the origins of nuclear strategy, a field of national security affairs that remained highly theoretical at the same time that it provided the framework for force structure decisions and doctrine. Part of the revolution stemmed from the creation of a fusion device, which made intercontinental ballistic missiles more feasible. Fission devices had relatively small yields, requiring greater accuracy. They were also heavy. Bombers were required to ensure a bomb of significant yield detonated close enough to the intended target to destroy it. Hydrogen weapons, on the other hand, had yields large enough that they could miss most targets by miles. They also packed destructive power in smaller warheads. Missiles were thereafter more feasible.

Increasingly, U.S. arsenal decisions during the Cold War would be driven by perceptions of Soviet military capability. "After 1945," Gray observes, "fear of what the USSR might choose to do with its increasingly formidable military power drove" U.S. defense planning'; it was "not *a* factor helping to define the purposes of U.S. policy, grand strategy, and military strategy. It was *the* factor."[47]

On the same day, Truman approved the H-bomb he directed the Secretaries of State and Defense to reexamine likely objectives in both peace and war and how such objectives related to strategic plans. The response came in February from the State Department's Policy Planning Staff, led by Paul Nitze, in the form of National Security Council memorandum 68 (NSC-68). It served as an ideological and conceptual justification for the H-bomb decision, providing a further pessimistic image of the Soviet

Union, predicted continued deterioration of U.S.-Soviet relations, and urged the adoption of containment as a strategy backed by increased defense spending.

NSC-68 was the first comprehensive national security document of the Cold War directly relating international security conditions with specific defense spending and force structure proposals. Neither Kennan's long telegram nor Clifford's report made the causal arguments rendered in Nitze's memorandum. Among its policy recommendations was a massive U.S. arms buildup. Another noteworthy aspect of NSC-68 was the rejection of a declared no first-use policy concerning atomic weapons. "In our present situation of relative unpreparedness in conventional weapons," NSC-68 posited, the Soviets would view a no-first use policy "as an admission of great weakness" and by America's allies "as a clear indication that we intended to abandon them.'"[48] From then on, the logic of U.S. nuclear deterrence rested on projecting a credible threat of "going nuke" in response to any Soviet thrust into Western Europe.

As later chapters show, when the credibility of nuclear employment options became questionable, conventional weapons innovations were pursued to raise the threshold at which going nuclear was the only viable option to defend U.S. Allies in Europe.

At the time of its drafting, however, it appeared unlikely that NSC-68's principal recommendations would be implemented because political conditions barred increased defense spending. NSC 68's prospects for implementation seemed to change when North Korea crossed the thirty-eighth parallel into South Korea in June 1950. Certainly, proponents of increased defense spending argued, the deplorable state of readiness left the Army and other Services critically ill prepared for war.

The 8th Army in Japan, for example, was undermanned and resource poor when it mobilized in response to the North Korean invasion. At that time, nine of ten existing divisions were under-strength (the exception being the 82nd Airborne Division). Regular infantry divisions retained their World War II structure of three infantry regiments and one artillery regiment; each infantry regiment had three infantry battalions. Because each division lacked one infantry regiment, with the remaining two regiments lacking a rifle company apiece, each infantry division was short over a dozen rifle companies. Additionally, artillery battalions lacked one artillery battery, leaving divisions without a battalion of tubes. Training was also seriously below standards, a problem that continued into the late 1970s when a training revolution occurred. A general ammunition shortage existed across the Army for all types of weapons. Ammunition conservation was imposed during the opening battles of the Korean War, a conflict that saw U.S. conventional warfighting capabilities only marginally improve.

Many assumed the communist North was being directed, or at least aided, by Moscow, an assumption that galvanized newfound support for defense spending. Fears of Soviet expansionism in Asia were already widespread, in part based on a 1949 report, NSC-48-1. It concluded that the Soviet Union sought to dominate all of Asia, fueling fears of a "domino effect" whereby other regimes in the region would fall to communism. For many, the Korean War confirmed NSC-68's argument for a tougher stance toward Moscow and increased defense spending to offset Soviet forces. Thereafter, the notion of containment would be viewed through a lens attuned to military power more than the economic and political aspects Kennan initially proposed.

Nuclear targeting received greater attention in the aftermath of Korea conflict than innovations to improve the readiness of conventional force. At the beginning of the war, in August 1950, fearing Soviet interference and the threat of a Soviet atomic attack, first priority for nuclear targeting was assigned to Soviet atomic weapons capabilities. This included delivery vehicles, which at the time meant airbases. The top three priorities for nuclear forces, thereafter, were "blunting" Soviet atomic capabilities, "retarding" Soviet forces in any attack on Allies, and "disrupting or destroying" Soviet war making capabilities (e.g., fuel, power, and atomic industries).[49]

Although boots on the ground held the back the tide of communist forces, the war affirmed the role of *nuclear* weapons and the viability of a nuclear-centric national security policy. Eisenhower, who assumed office in 1953, believed that their threatened use impelled North Korean to sign an armistice ending hostilities in July 1953. Strategic thought, thereafter, developed in an entirely new direction, leading to the first genuinely American strain of military thought. "Until the unpleasant and confusing experience in Korea," Gray posits, "American society and its military experts had little experience dealing with conflicts that required high-order strategic skills."[50] Arguably, the international politics of nuclear warfare and the emerging paradigm of nuclear deterrence gave great impetus for the development of such skills.

Soviet military science during this period stagnated under Stalin's political and ideological restrictions.[51] Military thought suffered the intellectual tyranny of Stalin's proscribed "permanently operating factors," which supplanted other defense planning activities and reduced official military thought to a series of simplistic formulas. Permanently operating factors were in retrospect simple concepts meant to circumscribe thinking about warfare. Less refined than doctrine, they included attention to armaments, the role of social factors (ideology) in warfare, the need for rear area security, and some strategic factors (i.e., an Eastern Europe presence). While simplicity aided in achieving broad understanding about leadership vision, in this case the rigidity of the Soviet system restricted debate and discussion about the permanently operating factors and their relationship to Soviet modernization. Debate about the effects of nuclear weapons was also curtailed. Publicly, nuclear weapons were denied any revolutionary impact on the outcome of future wars. Why the facade? Strategically, downplaying the importance of nuclear weapons to marginalize or gloss over the coercive characteristics of massive retaliation remained the only viable option until the Soviets possessed their own nuclear weapons and delivery capabilities.

The New Look and Massive Retaliation

Eisenhower, who was Supreme Allied Commander of NATO forces from 1950-1952, understood as well as anyone the emerging role nuclear weapons might play in European stability. While commanding NATO, he encouraged the development of plans for using nuclear weapons to defeat numerically superior Soviet forces. As president, he faced political pressure to curb rising defense spending and to reverse the economic militarization process that came with the Korean War. He also understood the political downside of increasing military spending without a clear popular mandate for doing so. Realizing that neither the resources nor the will existed for continued rises in defense outlays, and drawing on his experience in NATO, Eisenhower proposed a "New Look" defense policy to align fiscal realities with security challenges. It aimed to balance the budget, reduce defense spending, cut manpower, and improve the nuclear arsenal. Admiral Arthur W. Radford, Chairman of the Joint Chiefs of Staff, characterized the policy as "providing a sturdy military posture which can be maintained over an extended period of uneasy peace, rather than peaking forces at greater costs for a particular period of tension."[52]

The New Look had three basic thrusts. First, it sought to shift the burden of conventional defense spending to allies and security partners around the world. A series of alliances and security treaties implicitly linked the U.S. nuclear deterrent to the defense of other areas and regions (including Europe). The Southeast Asia Treaty Organization (SEATO) was formed with South Korea and Nationalist China (Taiwan), the Baghdad Pact was established (later becoming the Central Treaty Organization, CENTO), and the Administration signed agreements with some 150 nations. U.S. military planners could, theoretically, incorporate indigenous forces into regional defense schemes, reducing the burden on American forces. Accordingly, the U.S. could keep defense spending down – the second thrust. The goal of reducing defense spending had the effect of reinforcing the Administration's focus on nuclear weapons: nuclear weapons were less expensive than maintaining conventional forces. Spending on strategic nuclear forces rose steadily while the overall growth of defense spending declined. Of course, this strategy left scant room for the U.S. to honor its treaty commitments to deter the possibility of Communist aggression with means *other* than nuclear weapons. Soviet observers, it was hoped, would view the relative weakness of U.S. conventional forces as a sign that, if pressed, Washington would indeed employ nuclear weapons to defend itself as well as its allies. The third thrust involved the idea of preventive war. American policy makers would not declare a "no first use" posture concerning nuclear weapons because this would delimit preventive war options.

Evolving views of nuclear weapons and their utility underscored the New Look's strategic dimensions. The Truman administration's weapons initiatives were integrated into the armed forces by 1953 and emerging options to use new weapons became central to national security planning soon thereafter. Technological developments provided a wider range of yields and further expanded targeting options from large “city busters” to tactical weapons designed to disrupt conventional ground attacks. Such technological advances offered different courses of military means to achieve strategic (or political) ends, a dynamic that became an important and persisting adjunct to overall national security policy decisions. Weapons innovations wrought smaller, more reliable bombs with increased yields – as well as tactical weapons with smaller yields – that could be used across a range of military and strategic targets, including conventional forces preparing for or mounting an attack.

Concerning military planning, Eisenhower likened nuclear weapons employment decisions to conventional ones. “Where these things are used on strictly military targets and for strictly military purposes,” he opined, “I see no reason why they shouldn’t be used exactly as you would use a bullet or anything else.”[53] The New Look’s top secret planning document, NSC 162/2: “Basic National Security Policy” was signed in late October 1953. It maintained that, if conflict occurred with either Russia or China, U.S. nuclear weapons would “be as available for use as other munitions.”[54] This view of nuclear weapons stimulated the first true U.S. nuclear strategy declaration – massive retaliation – to be fully coordinated with force structure decisions, which favored air power and nuclear deterrence over conventional defense capabilities. U.S. forces adopted a massive retaliation planning assumption in 1953 and the Administration publicly declared the policy in 1954.

The implication for would-be aggressors was simple. Massive retaliation left open the possibility that the U.S. might meet any aggression or threats to its interests with a devastating nuclear attack. Capitalizing on the inherent ambiguity in a policy implying massive nuclear retaliation, the policy left Moscow to determine whether any aggressive move on its part would be met with a nuclear response. Underlying the policy was singular objective. That is, preserving the right to choose when and how to retaliate, thereby retaining initiative within a large rhythm of strategic interaction.

In 1955, the American nuclear arsenal was further diversified when President Eisenhower approved the development of the Thor and Atlas missiles. Thor was America's first intermediate-range ballistic missile (IRBM). Atlas, the first U.S. intercontinental ballistic missile (ICBM), became operational in 1959. The second ICBM, the Minuteman, was approved for development a year later and supplanted the bomber as the centerpiece of the nation's nuclear arsenal in the 1960s. The coming of nuclear armed missiles changed the underlying premises of massive retaliation by creating a situation later labeled "mutually assured destruction" MAD. By 1960, the U.S. nuclear arsenal would grow to some 18,000 weapons, with some ninety percent of them under military control – an outcome of Eisenhower's treatment of nuclear weapons as any other item in the military stockpile.[55]

Eisenhower's New Look proscribed the integration of conventional and nuclear planning under the umbrella of nuclear deterrence – that is, within the doctrinal construct of massive retaliation. But as Henry Kissinger's previously cited observation attests, the integration of nuclear weapons into defense planning occurred without fully appraising their implications or limitations. Although the decision to integrate nuclear weapons into the arsenal to "be used exactly like a bullet or anything else" may have bolstered the credibility of massive retaliation, it seems to have crippled the overall development of military thought. Under the New Look, as chapter 4 explores in greater depth, the "future prospects for the army were grim: fewer roles and missions would be entrusted to it, and its strength would be reduced to the point of impotence."[56] In other words, while nuclear forces underwent a period of innovation in terms of weapons and delivery vehicles, the evolution of U.S. conventional ground forces stagnated.

With scant resources for new weapons development, little attention was paid to modernizing the U.S. Army in the early 1950s. World War II stockpiles remained the primary source of equipment and supply. The Air Force increased in personnel, procured additional bomber and fighter aircraft wings, and received an increasingly larger percentage of the total defense budget. The Army, on the other hand, suffered a decline in manpower, divisions, and funding. The Navy suffered as well, but emerged from the period with new aircraft carriers, bombers capable of carrying nuclear weapons, and a ballistic submarine initiative. Organizationally, the Strategic Air Command (SAC) was the largest beneficiary of new funding.

Scrambling to assure itself a role in the nation's growing nuclear arsenal, Army priorities in the early 1950s were maintaining occupation forces and performing civil defense duties – hardly tasks promoting the maturation of military thought and warfighting doctrine. Miniaturization and other technological developments provided for smaller, lower-yield tactical nuclear weapons that spurred the Army to pursue nuclear artillery and landmines. In time, because they brought the Army into the strategic defense domain, tactical nukes became more important than was justified by their operational utility. Army leadership, struggling to reinvent the organization, fundamentally restructured its divisions in 1956 (the Pentomic Division) and again in 1961 (the Reorganized Objectives Army Division, or ROAD). Such reorganizations masked persisting challenges in doctrine and other areas.

Meanwhile, reoccurring defense patterns were reinforced in the 1960s. Conventional strategy suffered in the shadows of strategic nuclear theory; conventional training was virtually non-existent; the morale of general purposes forces plummeted. Notably deficient were refinements in operations planning with the Air Force, serious consideration of prolonged conventional battles in a nuclear environment, and coherent approaches to maintaining operational control over dispersed forces. All of these trends continued into the 1970s when, in the shadow of Vietnam, the Army struggled to redefine itself, reclaim its identity, and revitalize its role in U.S. national security.

On the other side of Iron Curtain, although Stalin retained a firm grip on conceptual and ideological aspects of the armed forces until his 1953 death from a heart attack, the armed forces did undertake reforms based on detailed studies of the Great Patriotic War (World War II). Soviet theorists and planners gleaned the value of mechanized units and combined arms integration from the crucial battles along the Eastern Front, themes that subsequently underscored force structure planning. Rifle corps evolved into more robust combined arms organizations capable of projecting seven or more times the firepower of their World War II predecessors. Mechanization was aggressively pursued, although self-propelled artillery capabilities were not developed until much later. As maneuver forces gained organic firepower they realized greater mobility that, in turn, enabled their commanders more operational autonomy to exploit enemy weaknesses.

Discussion of U.S. Army conventional force developments during this period is deferred until chapter four, which reviews ground forces doctrine beginning with the 1954 version of the Army Field Manual (FM) 100-5, *Operations*, the official statement of Army warfighting doctrine. Important here is the fact that, "[b]y the beginning of the 1957-58 academic year at the Command and General Staff College," the Army's premier planning school for its brightest officers, "the previous emphasis on the conventional battlefield had been completely reversed in favor of the atomic battlefield."[57] So, while

Soviet planners were modernizing their equipment and tactics, despite the fact that Soviet military thought was also nuclear-centric, a growing disparity in U.S. and Soviet conventional capabilities existed. This disparity would be addressed more aggressively in the late 1970s within the context of deterrence stability.

Also in 1958, the Department of Defense Reorganization Act established the Advanced Research Projects Agency (ARPA) to oversee the consolidation of defense research and associated engineering activities, including the myriad activities with the military services. Twenty years later, ARPA became DARPA and refocused on conventional warfare.

Further Evolution of Deterrence Strategy

Lawrence Freedman argues that the underlying strategic foundation of the New Look was a signal to Soviet leadership that the "West would not reply in kind to an Eastern invasion but raise the stakes of war" with nuclear weapons. "Thereafter," he continues in his classic *The Evolution of Nuclear Strategy*, "Western strategy would depend on convincing the Soviet leaders that it had the nerve to do this. This problem would become progressively more difficult as the Soviet capabilities to fight at the new level increased."[58] Indeed, it became more difficult still after Soviet capabilities increased in both the nuclear and conventional domains. As Soviet capabilities in both areas increased through the late 1960s and 1970s, Soviet leaders seemingly had two trumps to the West's sole nuclear threat, their own nukes and the Red Army.[59] This situation, as chapter 5 discusses, eventually spurred U.S. defense planners to respond with a large conventional modernization program in the late 1970s and early 1980s, a program wholly concerned with stabilizing deterrence stability in central Europe.

Military forces deter in several ways. Their very existence presents obstacles to an aggressor, in political or military terms (or both), increasing the uncertainty inherent in cost-benefit projections figuring in decisions to attack. This was, of course, the notion underscoring the presence of U.S. forces in Berlin. Another way forces contribute to deterrence is the implied threat of retaliation in kind or through escalation, the deterrent contribution assigned to nuclear weapons. The key is holding at risk something an adversary so values that its possible destruction makes any attack too costly to pursue. The classic example is threatening to retaliate against an adversary's population centers to deter an attack. Military forces specifically arrayed in a defensive posture deter by raising the possibility that an attack might fail or, at the very least, raise the cost of succeeding. Because the defense might succeed, the attacker must commit, and therefore risk, more forces in the opening attack. This is what U.S. and NATO military planners sought though advanced conventional forces to offset Soviet numerical, and in some areas qualitative, advantages in Europe, the subject of chapters 4 and 5.

Like the U.S. deterrent underscoring it, NATO's collective deterrent against a Soviet attack in Europe rested, or so it seemed, on NATO's ability to communicate a *credible* deterrent threat, one that conveyed the Allies commitment to use nuclear weapons. The continuing need to cultivate stability in Europe impelled a new logic of nuclear deterrence. For historian Frank Ninkovich, "an abiding obsession with credibility" would become central to U.S. foreign policy during the Cold War.[60] Increasingly, for the time being at least, credibility was associated with strategic and tactical nuclear weapons, not conventional capabilities.

The operational details of the deterrence scenario important to later chapters involve the threat of Soviet conventional forces attacking into NATO territory. If things went badly for NATO during the opening moments of the war, which seemed likely given Soviet numerical advantages, NATO's only recourse (other than conceding territory and perhaps the ensuing war) was to go nuclear. The threat of this response, presumably, would be sufficient to deter such an attack from occurring. Going nuclear first with large yield weapons, however, might not deter the Soviet Union from electing to initiate their own full-scale escalation to destroy as many U.S. nuclear weapons as possible (and to prevent theirs from being destroyed before launched or airborne). If the only option was an opening move with such weapons, moreover, no subsequent deterrent existed to dissuade Soviet retaliation in kind once they possessed nuclear forces as well, which meant both would be obliterated. Therefore, if the Soviets expected the U.S. to employ massive retaliation for *any* attack, there seemed little incentive for Moscow to begin with only a limited strike against NATO. It would surely mean a larger retaliation that might destroy Soviet nuclear capabilities, suggesting that they should be employed to the fullest extent possible in the initial attack. Deterring further nuclear escalation by the Soviet Union *after* NATO had already gone nuclear emerged as a complicating issue, one that had no easy resolution.

Another facet of deterrence stability concerned the reasonable threshold for going nuclear in the first place. Here the above logic seemed to falter. Small acts of aggression, which may or may not foreshadow a larger attack, seemed less amenable to deterrence by the threat of an all-out nuclear strike (e.g., the North Korean attack). This required deterrence options commensurate with the requirement to defeat both minor and massive ground attacks. Nonetheless, to respond to both, the U.S. sought to make massive retaliation doctrine more credible in 1953 by stationing tactical nuclear weapons with U.S. forces in Europe. A year later, in December 1954, tactical weapons were integrated into NATO's war planning, with NATO's conventional forces serving as a "tripwire defense" to trigger their use. Tactical weapons, which included nuclear artillery (cannons), missiles, and landmines, became the centerpiece of NATO's defense plans against *any* potential Soviet conventional attack. Raising the threshold for their use remained an issue throughout the Cold War, eventually leading to discussions about conventional force modernization and advanced strike capabilities.

The foundation of the Cold War deterrence regime remained the underlying logic of massive retaliation, which depended in part on the belief that the U.S. retaliatory capability was invulnerable to attack. As the Soviet arsenal grew in size, proportionally less was known about it. This raised uncertainty about the utility of threatening to attack Soviet population centers or industrial targets because Moscow now possessed their own retaliatory capability. Soviet bombers in the 1950s could only strike at the U.S. if they flew one-way suicide missions, but by the early 1960s the threat of Soviet missile attacks rendered deterrence relationships more complex. No longer did it make sense to threaten a massive retaliation because any U.S. attack would surely bring a Soviet strike on the continental United States.

Memories of Pearl Harbor and Korea combined with the development of missiles able to strike anywhere in the globe within thirty minutes to fuel fears of surprise attacks. Preparing for a surprise attack became a central facet of American defense planning. Several programs emerged to increase U.S. intelligence collection behind the Iron Curtain and illuminate Soviet capabilities as well as intentions. Understanding Soviet military developments and assessing their impact on deterrence became an overriding national security priority, rivaled only by the issue of protecting U.S. retaliatory forces from being destroyed in a so-called "bolt-from-the-blue" attack.[61] Of particular concern in the early 1950s was assessing the state of operational Soviet missiles. A 1954 intelligence estimate reported “a large and active research and development program” but, without “firm current intelligence” on what the USSR was developing or had deployed, concluded that the surprise attack threat could not be assessed.[62]

The 1957 Sputnik space mission demonstrated the advanced state of Soviet rockets, delivered a blow to American pride, and reinforced fears of Soviet ICBMs being used to deter U.S. retaliation against the Soviet Union attacking Western Europe. Soviet rocketry advances further raised the issue of a “missile gap,” an issue John F. Kennedy later exploited in his successful 1960 presidential campaign against Eisenhower’s Vice President, Richard Nixon.

The coming of Soviet missiles had led the Eisenhower administration to adapt its deterrence posture from massive retaliation to what became known as “graduated deterrence.” As then Secretary of State John Foster Dulles wrote in an October 1957 issue *Foreign Affairs,* this recognized a turn toward “less reliance upon deterrence of vast retaliatory power.”[63] In other words, limited war without immediate escalation. In fact, Eisenhower himself came to question the logic of a massive retaliation doctrine as early as 1955, concluding that it provided “‘no defense against the losses we incur through the enemy’s political and military nibbling. So long as he abstains from doing anything that he believes would provide the free world to an open declaration of major war, he need not fear’” the deterrent power of America’s nuclear arsenal.[64]

At the end of the Eisenhower administration, in August 1960, then Secretary of Defense Thomas Gates directed the formation of a full time staff to perform two primary tasks: maintain data on all targets warranting attack in a U.S. nuclear strike (the National Strategic Target List, NSTL) and to prepare target assignments for all U.S. nuclear forces (the Single Integrated Operational Plan, SIOP). He charged the new Joint Strategic Targeting Planning Staff with finishing both by December. The complete list included over 2,000 targets in the Soviet Union and China, ranging from ICBM bases to command and control centers to at least 131 urban centers. Targeting, planners subsequently argued, "should involve a series of 'sequential options,' consisting of such targets sets as 'central strategic systems, theater threats, and countervalue targets' [economic and industrial targets, including cities]."[65] The groundwork was thus set for a change in targeting.

Programs such as the U-2 reconnaissance plane and space-borne intelligence collection from Corona spy satellites became central to defense planning and to the building of targeting capabilities, leading to American preeminence in technical intelligence gathering.

Toward a More Flexible Response

Early 1960s revisions in U.S. nuclear strategy were in part derived from the before mentioned development of intercontinental ballistic missiles able to reach the United States. Although there was no bomber gap, and intelligence concluded that no missile gap existed, many feared that U.S. vulnerability to Soviet missiles meant that a declared strategy of immediate nuclear retaliation would only assure a nuclear exchange if conflict emerged. Missiles changed the parameters of strategic warning, truncating decision-making time for responding to an attack. Missiles also required different types of strategic planning and targeting in preparation for an attack. Technological advances evolved to locate potential targets in a global reference system and to ensure missiles and bombers reached intended targets.

Kennedy was among the critics of Eisenhower's massive retaliation policy in the 1950s. He was not alone. Others included Deputy Chief of Staff of the Army Lieutenant General James M. Gavin and Chief of Staff of the Army General Maxwell D. Taylor. Both retired in the last years of the Eisenhower administration and wrote critical books that greatly influenced a national debate on defense policy. Gavin's *War and Peace in the Space Age* argued for greater Army efforts in the fields of missiles, the development of air mobility, and the pursuit of tactical nuclear weapons.[66] Taylor's book, *The Uncertain Trumpet*, was more influential – he introduced the term "flexible response" into the defense lexicon. The underlying concepts originated in Britain during the 1950s within the larger framework of "graduated deterrence." Taylor was recalled to active duty by Kennedy as a special military advisor and then as Chairman of the Joint Chiefs of Staff.

Rejection of the Eisenhower administration's massive retaliation policy meant a rejection of its nuclear targeting plans. When the Kennedy administration came to office the current SIOP (SIOP-62) was a single-threaded plan: as soon as nuclear war was initiated with the Soviet Union launch all U.S. strategic weapons at pre-designated targets. No weapons were to be withheld. Expected Soviet (and Chinese) casualty estimates approached half a billion.[67] The fatalism of the plan, its inherent rejection of other escalatory options, and the revelation that "whatever happened, some portion of the admittedly inferior Soviet long-range force would survive to strike America," led the administration to reject SIOP-62 and build on the work Gates initiated.[68]

The Cuban Missile Crisis, the Berlin crisis, Third World proxy wars, and an overall deterioration in U.S.-Soviet relations reinforced the search for a new nuclear strategy, one that would "match the potential range of challenge with a correspondingly broad range of options."[69] The Berlin Crisis, in particular, led to a reconsideration of conventional readiness. Kennedy thought that the weaknesses of U.S. and NATO conventional forces limited his options for dealing with the Soviets, forcing him to rely on somewhat incredulous threats to use nuclear weapons. So, one element of the new strategy was greater appreciation of, and ability to response to, non-nuclear conflicts, which among other developments spurred increased funding for special operational (unconventional) forces. Kennedy subsequently doubled the ships in the Navy, increased tactical Air Force squadrons, and created five new Army divisions. Many of these new units would see their first action in Vietnam. The first U.S. combat forces departed for what would become America's longest war in May 1965. As later chapters discuss, Vietnam derailed plans for conventional modernization.

Another factor encouraged change. Massive retaliation was conceived at a time when the U.S. enjoyed a monopoly in nuclear weapon delivery systems; by the early 1960s the Soviet Union had amassed a huge arsenal, including some ICBMs. The nature of the deterrence game shifted in 1963, which Mark Trachtenberg terms "a watershed year" in part because the Soviet Union achieved rough parity in nuclear weapons, helping change the Cold War into "a different type of conflict" altogether.[70] Now, for example, there was a greater possibility of *intrawar* deterrence, meaning that some targets should not be attacked in the initial stages of war, allowing the other side to reconsider continued escalation.

When Defense Secretary Robert S. McNamara formally declared a "flexible response" strategy in February 1962, the underlying focus was on nuclear strategy, primarily on refining the nuclear dimensions of national deterrence strategy.[71] It also announced to the world a reduced reliance on nuclear weapons and to national security planners a requirement for greater *internal* flexibility in the U.S. military. As a planning factor, as stated above, this did lead to increased spending on conventional forces (the army grew by six division, the navy doubled its number of ships, the air force gained seven new fighter squadrons). And as a warfighting strategy, it emphasized the use of conventional forces to fight other conventional forces while retaining the capability to use nuclear weapons in any scenario that warranted it – including first use (warfighting capabilities were diversified and improved, including the development of special operations forces). Force structure became more diverse. In reality, however, flexible response did little to diversify nuclear-centric national security strategy and subordinate military doctrine. Even tactical airpower doctrine remained focused on nuclear missions. For example, training manuals for the F-100 tactical fighter-bomber instructed pilots that "nuclear training will in every instance take precedence over non-nuclear" training and pilot qualification.[72]

Among the Kennedy Administration's earliest and most significant changes to strategic planning was a reexamination of the Soviet threat to NATO, leading to adaptations in U.S., and then NATO, strategic postures. Some of these changes can be attributed to Kennedy's personal views about nuclear weapons, others to differences in defense philosophy, still others to notions of how the U.S. should conduct its international affairs. Concerning Soviet military capabilities, the administration "found that roughly half of the Soviet divisions deployed in the Soviet Union itself were, in effect, low-readiness reserves with only 10 percent of the total manpower assigned to them in peacetime [and that] the fighting power of a U.S. Army division was about three times that of a Soviet division."[73]

This seemed to challenge a premise of massive retaliation. That is, that Soviet conventional forces were so superior in numbers that the only way to prevail in a future European war was to go nuclear at the first sign of attack. It now appeared that NATO conventional forces might effectively counter initial Soviet echelons in time for full mobilization, effectively delaying the escalation to full-scale nuclear war. Underlying questions about the rationale for increasing conventional force spending, including their ability to deter numerically superior Soviet conventional forces, persisted throughout the Cold War.

The real focus of flexible response, nuclear warfighting strategy, involved a more flexible SIOP, one that would allow "controlled response and negotiating pauses in the event of thermonuclear war."[74] Flexibility before and *within* nuclear warfighting scenarios meant more elongated escalation processes before all-out nuclear war. This meant more options and entry points for nuclear weapons in overall deterrence policy. This is a key concept: flexible retaliation preserves deterrence at all levels and types of conflicts, an important characteristic for national security planners facing uncertainty. For planners in 1960 it added a range of conventional deterrence options to what was then a relatively short list of the pre-nuclear ones. Flexible response might also promote the development of "rules" (or expected behavior) concerning nuclear use. Declaring that nuclear weapons will be used in any situation, however, correlates to using them in all situations – a poor rule to utilize in diverse, rapidly changing, and uncertain situations. At the time national security planners welcomed "rules" or at least common understanding of how deterrence threats could be better adjusted during a crisis. The Cuban Missile crisis, for example, had taught a lesson: negotiating pauses could be critical to the diffusion of tensions.

Flexible response was adopted by NATO in 1967 and remained the overarching NATO nuclear strategy for the period concerning this study. As later chapters will discuss, when military planners turned to conventional weapons innovations in the 1970s and 1980s to reclaim the deterrence stability achieved during the earlier periods, they proceeded along the same basic arguments outlined in flexible response doctrine. In fact, many of the innovations anteceding the American RMA were partly conceived to bolster the conventional options inherent in a flexible response strategy.

Motivating the creation of flexible response strategy was a quest to move away from the limiting, and morally uncomfortable, reliance on massive retaliation as the linchpin of deterrence. This required not only more flexible nuclear targeting and employment options to control the conceptual ladder of escalation, but also robust conventional capabilities. Because NATO did not increase its conventional capabilities commensurate with the Soviet threat, the flexible response strategy left few real options other than using nuclear weapons unless the U.S. committed additional resources. That is, men and material to bolster the Alliance's nonnuclear posture. Nixon's realistic deterrence strategy placed the majority of the burden for deterring conventional aggression on Allies. Declining U.S. defense spending seemed to leave few options other than theater nuclear capabilities. A Soviet no-first use declaration placed additional pressure on NATO to develop conventional capabilities to blunt Soviet aggression. *Not* increasing conventional capabilities, leaders discovered, meant the continuing Soviet buildup would increase reliance on early nuclear use at a time when political pressure against the very existence of tactical nuclear weapons was building.

Political scientist Samuel Huntington distilled the evolving deterrence relationships among nuclear and conventional forces into graphical form. Adapted in Figure 3-1 below, the evolution of planning realities bounding NATO's "four possible means of deterring Soviet aggression" are depicted as "defense with conventional or nuclear forces and retaliation by conventional or nuclear forces."[75]

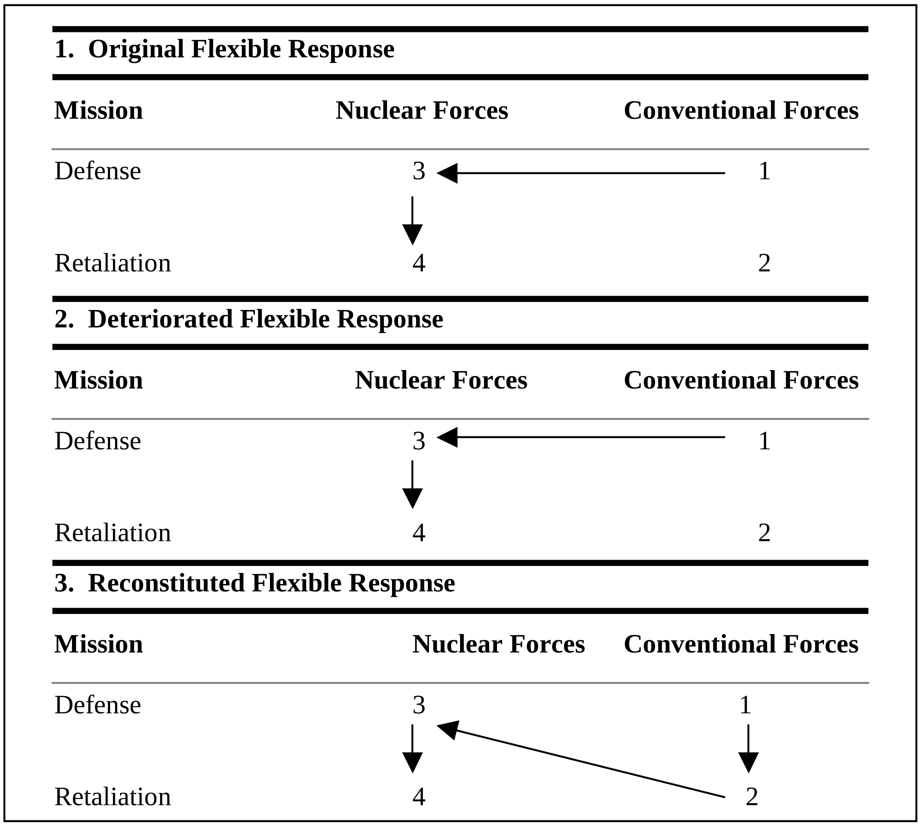

Figure 3-1: Huntington's Flexible Response Planning

Defense planners realized early in the 1970s that the execution of flexible response strategy was itself being limited. In the face of a Soviet conventional attack, the only realistic option was politically unpalatable: a limited direct defense with clearly threadbare conventional forces (1), a calculated escalation to a nuclear defense to prevent loss of NATO territory (3), and if Moscow chose to retaliate in kind, a more general and destructive nuclear retaliation (4). In the late 1970s and early 1980s, the aim was to strengthen NATO's conventional defense and develop conventional retaliatory capabilities to hold at risk Soviet targets without having to employ nuclear weapons.

Soviet reactions to the new doctrine, specifically to its attempt to control escalation from conventional defense to increasingly more severe nuclear strikes, reinforced the action-reaction relationship between NATO and Warsaw Pact doctrine and force structure. As defense analyst Steven Canby concluded in a 1973 report for the Defense Advanced Research Projects Agency, flexible response "tends to invite an enemy strategy of lightening invasion, against which NATO is least prepared to defend, and subsequent negotiation in order to fragment an alliance under stress."[76] Indeed, this is how Soviet strategy evolved, a development addressed in the next two chapters.

A lightening armored strike into NATO territory, even for a limited gain from which to improve negotiations, increased concern among NATO defense intellectuals that Soviet forces would strike before nuclear weapons could be employed. Some analysts predicted it would take as long as a week to finalize a decision to use tactical nuclear weapons to defend NATO, adding the need for conventional options. Conventional retaliation options, made credible by more capable and ready forces, would allow NATO field commanders to simultaneously defend NATO's front lines and attack advancing Soviet forces.

Proponents of conventional modernization contended NATO decision processes for conventional defense and retaliation were nowhere near as cumbersome or prolonged as were those for battlefield nuclear weapons. Additionally, ambiguities in the NATO document adopting flexible response, MC 14/3, reinforced intra-Alliance disagreements on the aims of flexible response. European interpretations generally favored readiness to prosecute only a limited conventional defense that quickly escalated to nuclear use. In this view, conventional forces were meant to deter conventional attacks for limited gains and delay all-out attacks long enough for nuclear weapons release decisions to be made.

The European view derived from a belief that greater emphasis on conventional capabilities would be perceived as diminishing confidence in NATO's willingness to use nukes. U.S. planners preferred a more robust conventional phase.

Final Thoughts on Targeting

Although other nuclear warfighting strategies followed flexible response, none replaced it as the general theme underlying U.S. strategic posture. Renaming and reshaping strategic doctrine was seen as a way of placing the imprimatur of new administrations on defense strategy. A decade after McNamara's speech announcing the need for flexible response, another defense secretary, Melvin R. Laird, outlined a new strategic doctrine of "realistic deterrence," essentially a variant of flexible response.[77]

Speaking on the island of Guam in 1969, Nixon outlined the elements of realistic deterrence, which drew heavily on policies conceived during Nixon's tenure as Eisenhower's vice president. It reinforced American treaty commitments. Allies and important nations would be defended. In key regions the U.S. would intervene to block direct attacks by a nuclear power (meaning primarily the Soviets). Where the Soviets did not directly intervene, military and economic assistance – but not troops – would be provided. Nations threatened by nonnuclear powers would have to provide their own manpower.[78] For the viability of the ideal of flexible response, this last element was a major policy shift.

Limited nuclear options, countervailing strategies, and the so-called Schlesinger Doctrine – all proposed during the 1970s – were in part based on more flexible targeting theory developed in early 1960s but never codified in planning documents. The mismatch between flexible response strategy and planning guidance for controlling escalation during a conflict received presidential attention in the late 1960s and early 1970s. Indeed, incoming Nixon administration Secretary of Defense Clark Clifford laid out two priorities to correct "the lack of complete plans and data processing centers for selective responses": (1) providing pre-planned options for the National Command Authority (NCA) for additional selected responses against military and industrial targets (for example, strategic strikes for support of NATO); and (2) providing the procedures, data processing equipment, and computer programs for planning new, selective responses on a timely basis during the crises."[79]

From one perspective, the basic elements of the SIOP changed very little during the Cold War, merely becoming more complex as types of targets and their priority evolved (industry, cities, military). Scenarios were added, but once they existed they tended to be complemented with new ones, not replaced.

From another perspective, changes in the late 1960s and early 1970s represented a significant adaptation in targets selected and their prioritization. This argument is bolstered by 1970s targeting doctrine changes to provide retargeting capabilities, including attacking Soviet conventional forces during a conflict. SIOP-5, implemented in 1976, included planning guidance and targeting directives representing a clear evolution from assured destruction, spasm-planning in which thousands of targets were attacked.

Changes in targeting doctrine derived both from strategic and technological developments, the latter including vastly improved missile accuracy. More accurate missiles combined with warheads designed to penetrate and destroy "hardened" bunkers and missile silos re-opened debates about the destabilizing effect of first-strike weapons. They seemingly encouraged early launching of weapons to prevent their destruction. Politically, the development of targeting scenarios to support "controlled escalation" from conventional to theater nuclear war to global war prevented criticism that U.S. nuclear strategy was "decoupled" from NATO. Command and control initiatives to develop such capabilities included "Command Data Buffers," begun in 1973 with an objective of achieving full operational capability in 1978. It "allowed prompt remote-control retargeting of missiles (presumably to switch back and forth between limited and massive options)."[80] Other developments in the 1970s pursuant to an invigorated flexible response capability included improving reconnaissance, surveillance, and warning systems.

New national technical means – classified satellites – were developed, including accurate targeting maps and navigation charts produced by a new Defense Mapping Agency (DMA). Among the reasons for creating DMA was the need to create a single, standard geodetic control system for navigation and targeting – one able to make use of global positioning satellites under development. Among the drivers for new geodetic controls was the idea of putting ICBMs on trains to preserve a U.S. second strike capability. This required "a capability that used inertial technology to carry ICBMs to launch positions with an inertial platform that would be updated on the move from geodetic positions along the railroad tracks."[81] Other uses for geospatial data included simulation, modeling, and training. Flight training, for example, became an important part of the military's foray into computers and digital databases.

New data processing and exploitation capabilities were required to handle the imagery, signals, and other intelligence data provided by new systems. Research and development efforts were launched to provide automated systems in preparation for new satellites that would yield massive electronic intercepts and mapping data over areas for which no maps or targeting references existed. An entire, critically important subculture within national security decision making evolved around classified strategic reconnaissance capabilities, considered by many the essential tool to understand the state of Soviet force readiness. Strategic reconnaissance, in conjunction with other intelligence sources, provided insights into Soviet military capabilities. In the late 1970s and early 1980s, as later chapters argue, strategic reconnaissance capabilities were deemed insufficient to monitor Soviet force posture in the European theater. Especially after the 1981 Polish crisis, discussed in chapter 5, theater surveillance became a strategic necessity.

Because flexible response assumed, even *required*, the political and military leaders would be able to communicate during crises and after the initial nuclear exchanges, command and control became a necessity for achieving national strategic. Strategic and operational success required new means and methods for communication of situation updates and monitory the status of remaining forces as well as preparing for and launching additional strikes. Furthermore, because the underlying assumption of flexible response was that escalation could be prevented as negotiations occurred and intra-war deterrence relationships gelled, both military and civilian leadership considered communications capabilities the highest priority for research and development. Strategic and operational necessity drove the application of "packet switching," breaking communications into small pieces and later reassembled, and later capabilities laying the foundation for the Internet.

Refinements in thinking about escalation in the face of Soviet conventional superiority spawned arguments for "escalation dominance" planning – an extreme variation on the concept of flexible response. Central to the logic of escalation control was a re-articulation of the logic underlying the massive retaliation doctrine. As progressively more destructive and wide-ranging nuclear strikes were exchanged, at some point the devastation reached a state where both belligerents were destroyed. The concept was dubbed "mutual assured destruction" (MAD). Both flexible response, which facilitated planning for conventional and nuclear escalation, and MAD persisted.

The last evolution in nuclear targeting warranting mention here was Carter's July 1980 Presidential Directive (PD) 59. Desmond Ball summarizes its five notable attributes: greater attention was devoted to military targets; the role of targeting in deterrence was reinforced in terms of making transparent the consequences of escalation; approaches to targeting were diversified to include Major Attack Option, Selected Attack Options, Limited Nuclear Options, and Regional Nuclear Options; more flexible targeting options were prescribed, including the ability to adapt targeting during a conflict (which required more advanced, dynamic retargeting capabilities); and, command, control, and communications had to be improved to assure that more flexible approaches to targeting could be executed.[82] Important here, PD-59 "emphasized that the preplanned target packages in the SIOP should be supplemented by the ability to find new targets and destroy them during the course of a nuclear exchange."[83] New targeting guidance also emphasized the destruction of military targets that previously not assigned high priority for initial strikes. Dubbed "counterforce" targeting, new guidance established requirements to attack both fixed and mobile targets.

Among other requirements, this added a new military operations dimension to arguments promoting near-real time reconnaissance and surveillance systems able to provide flexible targeting information on Soviet forces. These capabilities were later refined to support strategic nonnuclear strikes.

In terms of command and control, the primary acquisition recommendation from the 1978 Nuclear Targeting Policy Review (NTPR) was improving command, control, communications, and intelligence capabilities. Subsequent research and development stressed flexibility, retargeting, and other advances within the notion that stepwise escalation and targeting scenarios would be feasible. At the same time, as chapter 4 argues, many of the advances sought within the larger concept of flexible nuclear strategy were later applicable to conventional operations.

Chapter Conclusion

Three themes emerged from the period explored in this chapter. The first directly follows from the centering of nuclear strategy, nuclear doctrine, and nuclear targeting policy (terms that were virtually synonymous) within U.S. defense discourse. This meant, among other things, that the *business* of preparing for nuclear war was highly privileged within the military services. Because national security strategy rested primarily on nuclear deterrence, Services placed high priority on their respective nuclear-related missions in doctrine, leadership selection, and the cultivation of corporate identities. Of course, other capabilities, including special operations forces, air superiority, and air defenses were not completely ignored during this period. Many important innovations ensued, including helicopters, the mechanization of the U.S. Army, nuclear-power aircraft carriers, and submarine launched ballistic missiles. Still, nuclear doctrine and warfare, which included conventional operations on a nuclear battlefield, were the most prominent features of military thought and achieved a canonical status in advanced professional military education.

Because of this, and compared to the focus on nuclear weapons, little attention was given to the overall art of conventional warfare within the U.S. Inattention was reflected in the relatively few significant conventional warfighting innovations pursued. "By worrying about strategic weapons," former CIA Director William Colby argued in 1977, "we will indeed be fighting the wrong war" by failing to address conventional, economic, and political components required "to meet the threat."[84]

The expansion of U.S. nuclear capabilities during the Kennedy and Johnson administrations far exceeded the above mentioned conventional modernization initiatives. Airmobile operations using helicopters in Southeast Asia and computer-aided fire support technology are among the exceptions. Compared to Soviet developments in the late 1960s and early 1970s, U.S. conventional modernization appears decidedly lackluster. Of course, developments in nuclear strategy and targeting certainly involved innovations that would later be applied to conventional warfighting. Among the examples of inattention to conventional warfare was Air Force's reluctance to pursue innovative air dropped munitions. A 1970 RAND study concluded, "the conscious decision made in 1947 and again in 1961 to rely on Army and Navy ordnance developers and industry and to forego in-house capability may have stifled new ordnance developments."[85]

A second theme concerns the legacy of nuclear strategy on overall military thought. From one perspective, the emergence of nuclear strategy and policy-making based on deterrence calculations extended and expanded U.S. strategic thought, giving it a more global perspective. Perhaps it also squared defense policy decisions with economic, social, and political factors, helping nurture an intellectual approach to understanding causal relationship within strategic processes. Actual progress in the realm of strategy, however, was illusory from the warfighter's point of view, especially considering the political objective of deterrence – never having to use the weapons on which the strategy rested. "Whereas traditional strategy had been associated with war, much of nuclear strategy operated only in peace and, indeed, was specifically designed to preserve it."[86] The only successful strategy for nuclear war remains *not* engaging in one.

Few made this point as elegantly or persuasively as did Bernard Brodie in the 1946 volume *The Absolute Weapon: Atomic Power and World Order*.[87] Just months after Hiroshima, Brodie argued, "Thus far the chief purpose of our military establishment has been to win wars. From now on its chief purpose must be to avert them. It can have almost no other useful purpose."[88] In time, nuclear weapons were increasingly seen as useful deterrents solely against other nuclear powers (and in some cases against opponents armed with biological weapons).

Others reinforced the essence of Brodie's early thoughts on the military dimensions of nuclear arsenals, including those articulated in an October 1955 *Harper's* article entitled, "Strategy Hits a Dead End." Lawrence Freedman bemoans the very idea of nuclear "strategy" in the traditional connotation of the term, concluding in his seminal work on nuclear strategy, "C'est magnifique, mais ce n'est pas stratégie." Writing at the end of the Cold War, Freedman found that "the position we have reached is one where stability depends on something that is more the antithesis of strategy than its apotheosis – on threats that will get out of hand, that we might act irrationally, that possibly through inadvertence we could set in motion a process that in its development and conclusion would be beyond human control and comprehension."[89]

For Martin van Creveld, the continuity of military thought seemed in danger. For him, the evolution of military strategy was in fact "splintered" by nuclear weapons into "nuclear strategy, conventional strategy, grand strategy, theater strategy, economic strategy, and other types too numerous to mention."[90] Van Creveld further laments that the term "strategy" was itself rendered virtually meaningless, ostensibly because its original connotation concerning relationships between ends and means in national policy became obscured. The very term "strategy," he continues, "became one of the buzzwords of the age, meaning the methodical use of resources to achieve any goal, from selling consumer goods to winning a woman. In the process, it lost most of its connections with the conduct of large-scale war."[91]

Among the effects on strategic planning was a dilution of military planning expertise at the highest levels. "In Washington," Derek Leebaert opines, "civilian NSC staffers debating force deployments had no idea how many troops constituted a battalion."[92] In his 1965 classic *Military Concepts and Philosophy*, Rear Admiral (retired) Henry Eccles observed that "the lack of an accepted body of military theory and principle leaves a void in the basic philosophy that should guide people in distinguishing between cause and effect, between the trivial and the important, between the central and the peripheral."[93] This further contributed to a lack of operational thought, what Shimon Naveh called an operational cognition, in U.S. conventional warfighting theory for much of the Cold War.

In the early 1980s, to correct this situation or perhaps work around it, U.S. military theorists and planners began substituting the phrase "the operational art of war" for the term "strategy" in writings on campaign and theater-level military planning. The term was subsequently "adopted as the core subject at most military institutes of higher learning."[94] Operational art, in American parlance, focused on the orchestration of combined arms *conventional* forces, although operations were still envisioned to occur on a nuclear battlefield. During the latter years of the Cold War, operational art received increasing attention. The traditional language of nuclear strategy remained supreme.

Still, military planners seemingly recognized a need for lexical innovation (e.g., doctrine, concepts, training) as conventional force developments – like those discussed in the following chapters – set the stage for a thirty-year transformation in American military thought. As the Cold War ended, moreover, important aspects of operational art ascended to the forefront of defense discourse as the United States forged a new national military strategy.

A final theme emerging from the above discussion of the narrative of nuclear strategy involved the sustained quest for deterrence stability, which led to greater complexity in terms of technology, operational planning, and the political exigencies of dissuading nuclear-backed aggression. A greater scope, breadth, and depth of issues were folded into the larger umbrella concept of strategic nuclear deterrence as the fundamental tenets of flexible response guided American military thought and defense spending in the 1970s and 1980s. This, in turn, reinforced the tightening of complex systems, a process that further evolved systems engineering and systems integration as key skills in defense planning and operations.

And these skills were fundamentally about managing information about organizations, their internal elements, their connections internally and with the environment, and with how multiple parts of a system or organization come together and interact with other systems and the environment. Underneath these skills was a largely unsung, yet mounting appreciation for what Vannevar Bush imagined as a data-rich information tool that facilitated the development of associations and links. By the end of the nuclear strategy dominated period of U.S. grand strategy, in which military effectiveness was defined in largely abstract deterrence frameworks, the information revolution was slowly gaining prominence as a social-cultural force. The age of electromechanical machines was ending, underwritten in part by the information technology fashioned to make nuclear targeting more precise and nuclear strikes more efficient, to make intelligence about enemy capabilities and intentions more insightful and timely, and to assure secure, dependable communications with globally dispersed nuclear forces in the even of a Soviet attack. As the business of nuclear deterrence became more complex, and as conventional warfighting in Europe became a more pressing strategic issue, information technology applied to nuclear warfighting was attuned to nonnuclear capabilities.

Chapter 3 Notes

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[1] Colin S. Gray, “Strategy in the Nuclear Age: The United States, 1945-1991” in Williamson Murray, MacGregor Knox, and Alvin Bernstein (eds.), *The Making of Strategy: Rulers, States, and War* (New York: Cambridge University Press, 1994), p. 603.

[2] An excellent source remains Thomas H. Etzold and John Lewis Gaddis, *Containment: Documents on American Policy and Strategy, 1945-1950*, eds., (New York: Columbia University Press, 1978).

[3] Rosenberg, “U.S. Nuclear War Planning, 1945-1960” in Desmond Ball and Jeffrey Richelson (eds.), *Strategic Nuclear Targeting* (Ithaca: Cornell University Press, 1986), p. 38.

[4] Gaddis, *We Now Know: Rethinking Cold War History* (New York: Oxford University Press, 1997), p. 100. Emphasis in original.

[5] Henry A. Kissinger, *Nuclear Weapons and Foreign Policy* (New York: Harper and Brothers, 1957), p. 13.

[6] Ibid., p. 12.

[7] Weigley (New York: Macmillan Publishing Co., Inc., 1973), part five.

[8] For accounts of this period, see: Ronald E. Powaski, *The Cold War: The United States and the Soviet Union, 1917-1991* (New York: Oxford University Press, 1998); Daniel Yergin, *Shattered Peace: The Origins of the Cold War and the National Security State* (Boston: Houghton Mifflin Company , 1978); Marc Trachtenberg, *History and Strategy* (Princeton, NY: Princeton University Press, 1991; Richard Crockatt, *The Fifty Years War: The United States and the Soviet Union in World Politics, 1941-1991* (New York: Routledge, 1995); and Melvyn P. Leffler, *A Preponderance of Power: National Security, the Truman Administration, and the Cold War* (Stanford, CA: Stanford University Press, 1992).

[9] Vannevar Bush, “As We May Think,” *Atlantic Monthly* (Vol. 176 No. 1), pp. 101-108. Cites from www.theatlantic.com/unbound/flashbks/computer/bushf.htm, *Atlantic Monthly’s* online archives.

[10] For more on Bush and Engelbart, see Steven Johnson, *Interface Culture: How New Technology Transforms the Way We Create & Communicate* (New York: Basic Books, 1997), chapters 1 and 4.

[11] For extended analysis of the collapse of the Grand Alliance see James L. Gormly, *The Collapse of the Grand Alliance, 1945-1948* (Baton Rouge, LA: Louisiana State University Press, 1987). The concern in this study is the U.S. view of the collapse.

[12] See Arnold A. Offner, *Another Such Victory: President Truman and the Cold War, 1945-1953* (Stanford, CA: Stanford University Press, 2002), pp. 128-129 for a review of American interpretations of Stalin's speech.

[13] Kennan's telegram is reprinted, with commentaries, with similar documents from British and Soviet analysts in Kenneth M. Jensen (ed.), *Origins of the Cold War: The Novikov, Kennan, and Roberts 'Long Telegrams' of 1946* (Washington, DC: U.S. Institute of Peace, 2000).

[14] Kennan discusses the period in George Kennan, *Memoirs, 1925-1950* (New York: Pantheon Books, 1967), chap. 11. The so-called "Long Telegram" is reprinted and discussed in Thomas H. Etzold and John Lewis Gaddis (eds.), *Containment: Documents on American Policy and Strategy, 1945-1950* (New York: Columbia University Press, 1978), pp. 49-64. For information on Kennan, his telegram, and its impact on policy, see: John Lewis Gaddis, *The United States and the Origins of the Cold War, 1941-1947* (New York: Columbia University Press, 1972) and David Mayers, *George Kennan and the Dilemmas of U.S. Foreign Policy* (New York: Oxford University Press, 1988), chapters five and six.

[15] Analysis of Kennan's telegram and its impact is provided by John Lewis Gaddis, *Strategies of Containment: A Critical Appraisal of Postwar American National Security Policy* (New York: Oxford University Press, 1982), especially chapters one and two.

[16] Byrnes cited in *Vital Speeches of the Day* 12 (March 15, 1946), pp. 326-329.

[17] David Cannadine, *The Speeches of Winston Churchill*, "The Soviet Danger: The 'Iron Curtain' (New York: Penguin Books, 1989), p. 303. Also in *Vital Speeches of the Day* 12 (March 15, 1946), pp. 329-332.

[18] Walker provides background on the event leading up to Churchill's speech and American and British reactions to it, pp. 34-45.

[19] James F. Byrnes, *Speaking Frankly* New York: Harper and Brothers Publishers, 1947), p. 256.

[20] Ibid.

[21] Ambrose, "The Armed Services and American Strategy, 1945-1953" in Kenneth J. Hagan and William R. Roberts (eds.), *Against All Enemies, Interpretations of American Military History From Colonial Times to the Present* (Westport, CN: Greenwood Press, 1986), p. 308.

[22] Armed Forces strength information, derived from Army and Navy annual reports, is adapted from a table in James F. Schnabel, *History of the Joint Chiefs of Staff, The Joint Chiefs of Staff and National Policy, Volume I: 1945-1947* (Washington, DC: Office of the Chairman of the Joint Chiefs of Staff, 1996), p. 109 and 225 fn. 56.

[23] Noteworthy attempts to review the Cold War or important political-military developments during it include: Ronald E. Powaski, *The Cold War: The United States and the Soviet Union, 1917-1991* (New York: Oxford University Press, 1998); Lawrence Freedman, *The Evolution of Nuclear Strategy*, second edition (New York: St. Martin's Press, 1989); John Newhouse, *War and Peace in the Nuclear Age* (New York: Alfred A. Knopf, 1989); Martin Walker, *The Cold War: A History* (New York: Henry Holt and Company, 1993); Richard Crockatt, *The Fifty Years War: The United States and the Soviet Union in World Politics, 1941-1991* (New York: Routledge, 1995); and David Reynolds, *One World Divisible: A Global History Since 1945* (New York: W.W. Norton and Company, 2000). Informative accounts of early U.S. defense planning include: Thomas D. Boettcher, *First Class: The Making of the Modern U.S. Military, 1945-1953* (Boston: Little, Brown, and Company, 1992); Amy B. Zegart, *Flawed By Design, The Evolution of the CIA, JCS, and NSC* (Stanford, CA: Stanford University Press, 1991); Warner R. Schilling, Paul Y. Hammon, and Glenn H. Snyder, *Strategy, Politics, and Defense Budgets* (New York: Columbia University Press, 1962); and, Maurice A. Mallin, *Tanks, Fighters, and Ships: U.S. Conventional Force Planning Since WWII* (New York: Brassey's Inc., 1990). See also the seven volume *History of the Joint Chiefs of Staff* (Washington, DC: Office of Joint History, Office of the Chairman of the Joint Chiefs of Staff). Further studies are cited below.

[24] A text of the report is reprinted in *Memoirs: Sixty Years on the Firing Line* (New York: Funk and Wagnalls, 1968), Appendix A.

[25] Clark Clifford, *Counsel to the President: A Memoir* (New York: Anchor Books, 1991), pp. 123-129.

[26] Ibid, p. 48-50.

[27] David Alan Rosenberg, "The Origins of Overkill: Nuclear Weapons and American Strategy, 1945-1960" *International Security* (Vol. 7 No 4.), p. 11.

[28] Truman quoted in David E. Lilienthal, *The Journals of David E. Lilienthal. 1945-1950*, volume 2, *The Atomic Energy Years* (New York: Harper and Row, 1964), p. 391. For an account of the discussion and additional information on Truman's views of atomic energy, see David McCullough, *Truman* (New York: Simon and Schuster, 1992), chapter 13.

[29] James F. Schnabel, *History of the Joint Chiefs of Staff, The Joint Chiefs of Staff and National Policy, Volume I: 1945-1947* (Washington, DC: Office of the Chairman of the Joint Chiefs of Staff, 1996), p. 135.

[30] Rosenberg. p. 38.

[31] Freedman, *The Evolution of Nuclear Strategy*, 2nd ed. (New York: St. Martin's Press, 1989), p. 50.

[32] Office of Reports and Estimates, ORE 25-48, "The Break-Up of the Colonial Empires and its Implications for US Security" (3 September 1948) in Michael Warner (ed), *The CIA Under Harry Truman* (Washington, DC: Center for the Study of Intelligence, Central Intelligence Agency, 1994), pp. 223-4.

[33] Leffler, p. 163.

[34] Joint Ad Hoc Committee, "Possibility of Direct Soviet Military Action During 1948," (Central Intelligence Agency: Office of Reports and Estimates, 30 March 1948), p. 1.

[35] Leffler, p. 149.

[36] For a history of the origins of atomic targeting and nuclear doctrine, see David Alan Rosenberg, "The Origins of Overkill: Nuclear Weapons and American Strategy, 1945-1960" *International Security* (Vol. 7 No 4.), pp. 3-71Rosenberg, p. 12.

[37] Rosenberg, p. 15.

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[39] Rosenberg, p. 13.

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4. The Formative Period: Evolving Strategic Realities and Operational Challenges

We now turn from an overview of the narrative of nuclear strategy to a review of the antecedents to the American RMA. The story begins with one of the key themes of chapter 3: the lack of focus on conventional force modernization. This chapter also begins to develop an argument that the American RMA reflected a turn away from the dominant narrative of nuclear strategy in defense policy and military thought. Changes in American military doctrine and defense planning in the 1970s and early 1980s, discussed in this chapter and the next, are more clearly understood from the perspective of the background information related in chapter 3. They are more noticeable from the perspective of *overturned* threads of military thought and doctrine.

For much of the 1970s American units in Europe were anything but combat effective. Scant force modernization occurred during the decade of involvement in Southeast Asia. American equipment staged in Europe to defend NATO was poorly maintained. Allies openly questioned the U.S. commitment to a conventional defense. Contributing to European perceptions was the April 1970 introduction of the Mansfield Resolution in the Senate and subsequent, similar resolutions. Although not adopted, the Mansfield Resolution called for a unilateral deployment of U.S. troops from Europe to Vietnam – without consultation with Allies.

Deterrence credibility problems mounted. Would NATO use theater nuclear weapons on Soviet troops already pushing into Allied territory? Would conventional forces be modernized in accordance with the flexible response doctrine? Post-Vietnam U.S. foreign policy behavior did not resolve Allied concerns.

During the Nixon and Ford administrations, events pointed to U.S. retrenchment or at least reluctance to involve U.S. military forces in regional conflict. When Saigon fell in 1975, Ford was unable to secure military and economic aid for the struggling South Vietnamese. Later that year, Congress passed the Clark amendment limiting military and economic aid to pro-Western forces fighting Soviet-backed communists in Angola.

Jimmy Carter assumed the presidency in 1977 with the intent of resurrecting détente to restore stability in Europe, re-focusing American foreign policy on humanitarian concerns, and downplaying the influence of nuclear weapons in world affairs. His reluctance to engage abroad militarily reflected personal beliefs as well as the national mood. Promoting human rights resonated with a post-Watergate public wanting ethics and morality re-centered in national policy making. Rejecting Machiavellian virtues ascribed to statesmen (which prescribed to princes a different moral code than citizens followed), Carter seemingly believed that foreign policy should follow the same principles and codes of conduct expected at home.

Notable achievements included the Camp David accord, normalized relations with China, an un-ratified Strategic Arms Limitations (SALT) II treaty, and a general increase in awareness of human rights issues. On balance, Carter foreign policy foundered on the critical issue of improving relations with the Soviets. In fact, his repeated attacks against the Soviet human rights record and pursuit of a Washington-Beijing axis of cooperation increased Moscow's recalcitrance.[1]

Carter's foreign policy was also criticized for being overly cautious. Facing Soviet conventional aggression and given the relative weakness of flexible response, analysts feared that NATO was vulnerable to "salami tactics" whereby Soviet conventional forces would be used to achieve limited gains in Europe, the Persian Gulf, and in the third world. His September 1977 decision to release control of the Panama Canal to by the end of the century drew sharp criticism from conservatives.

At the end of the decade, funding increased for nuclear and conventional weapons modernization. Intelligence and information systems became more important. After successive approaches to moderating the threat of nuclear holocaust, in the late 1970s, as a post-Vietnam Defense Department struggled to rebuild its image with the American people and its credibility with Congress, conventional innovation returned as a strategic imperative. Conventional readiness was elevated to a strategic concern, setting the stage for significant military innovations. The history of conventional military forces, which had already taken sharp turns in the twentieth century with the introduction of air power, mechanized armor, and wireless command, control, and communications, took an altogether different turn. A legacy of late 1970s was a reinvigorated research and development program to leverage the power of the emerging microchip-driven information revolution to resolve strategic and operational challenges.

Perhaps more importantly for later discussions, the road toward the ‘knowledge warrior’ of the 2000s began in the late 1970s. Retired Air Force Lieutenant General James Clapper was the Chief of Air Force Intelligence during the Gulf War, director of the Defense Intelligence Agency (DIA) in the early 1990s and, after several years in industry, returned to government in 2001 as the civilian director of the National Imagery and Mapping Agency (NIMA). NIMA was renamed the National Geospatial-Intelligence Agency (NGA) in November 2003. For his significant restructuring and modernization initiatives at DIA and NGA, he is widely viewed a “change agent” in the intelligence community.

Like many peers who rose to senior leadership positions as Cold War security challenges were replaced by new ones, Clapper's career spans the thirty-year transformation in U.S. military capabilities.

Commissioned in 1963, Clapper served two tours in Southeast Asia during the Vietnam conflict. First as a watch officer and air defense analyst assigned to the 2nd Air Division (later 7th Air Force) at the Tan Son Nhut Air Base in South Vietnam from 1965-1966 and then as the commander of a Thailand-based signals intelligence unit from 1970-1971.[2] Considering early 1970s intelligence support to military operations, Clapper remembers intelligence analysis being important to mission planning but primarily viewed as a support activity. Because of this, Clapper recalled his tours in Southeast Asia as years of "frustration." Intelligence was not recognized as a "main player" in the fight. Bombing accuracies were "awful," targeting accuracies "inconsistent," and exploitation times to feed commanders information from the battlefield "dismal."[3] He recalls that what today would be termed operational intelligence was basically "history" by the time it was exploited and disseminated, useless to pilots on missions over enemy territory.

For example, a signals intelligence site in Da Nang would intercept and translate North Vietnamese communications about U.S. aircraft and then pass that information via high frequency Morse code to watch stations. This information was plotted as accurately as possible on a board using grease pencils. After analyzing the plots, reports would go out over a sixty-word per minute Teletype machines to combat units. Frustration derived from the slowness of the process relative to the potential utility of the information to pilots if communicated immediately. Noteworthy here is the fact that signals intelligence was considered by many to be the most effective of the intelligence disciplines in

Vietnam, consistently yielding greater insight into enemy activities than human intelligence or imagery intelligence. Imagery intelligence – then termed photo-reconnaissance, also failed to live up to its potential in the triple-canopy jungle. Even with infrared sensors to detect Vietcong activity at night, film could not be processed and analyzed quickly enough to effect current operations.

In today's parlance, the information was not "actionable." Many of the innovations undertaken in the 1970s aimed to correct this problem, laying the foundation for a key enabler of 1990s RMA-related visions of future warfighting capabilities (e.g., information superiority, dominant battlespace awareness, decision superiority, persistent surveillance, strategic preemption). Much of the story of the emergence of the American RMA is tied to the problem of gaining and being able to act on intelligence. Strategic and operational warning drove Cold War intelligence activities and, in the 1980s, information technology was increasingly applied solve specific operational challenges.

Chapter Overview

The history of American defense policy during the Cold War is often told by chronologically outlining the waxing and waning of defining ideas or concepts: atoms for peace, open skies, massive retaliation, flexible response, détente, entente, various "doctrines" (e.g., Nixon, Carter, Reagan) and so on. Frequently, the characterizing idea or concept represents a complex strategy or policy that retains historic significance because of its influence on subordinate defense planning and force structure decisions. One motivation for this study of the origins of the American RMA is the very *lack* of scholarly attention given to the organizing ideas and concepts influencing the formation and maturation of the RMA in the late 1970s and early 1980s. In a period replete with acronyms and nicknames, the relatively straightforward “offset strategy” concept discussed below and in chapter 5 has gone relatively unnoticed.

Planning requirements in the 1970s impelled what defense analyst and national security scholar Kenneth Allard arguably understated as the “dawning of the modern era in command and control.”[4] The formative period of the RMA was also an important period in the twentieth century’s computer information revolution, which engendered (or made more feasible) a wide and varied array of operational and organizational innovations. Given the significance and pervasiveness of shifts in military thought and defense planning, one might more accurately associate the 1970s as the dawning of all aspects of modern command, control, communication, computers, intelligence, surveillance, and reconnaissance (C4ISR), including space-based systems.

Many of these developments were undertaken with the aim of integrating the battlefield to tighten the relationship between conventional defense and nuclear deterrence. The Army developed new doctrine, training regimes, and technology enabling it to seize and maintain the initiative in a highly dynamic and intense battlefield environment; the Army also adapted to new strategic and operational realities demanding that it pursue the ability to fight outnumbered and win without employing nuclear weapons. Among the most important developments during this period was the emergence of near-real time intelligence systems.

The sections below briefly review historical and conceptual material. Immediately below, the evolution of the term “RMA” in Soviet military theory is documented. When it was applied to U.S. forces, the term, which had special meaning in Soviet military thought, was meant to evoke elements of a decades-long discourse on multifaceted changes in strategy and warfare. Concepts and arguments from Soviet military literature continued to influence U.S. defense discourse after the 1991 Gulf War. Reviewing the evolution of the Soviet nuclear RMA provides an important backdrop for understanding military developments in the last decade of the Cold War. In fact, Soviet observers actually provided the initial historical argument in the 1980s that U.S. forces were exhibiting revolutionary capabilities.

The remainder of the chapter focuses on developments largely reacting to the Soviet threat and operational challenges in Europe. Successive sections sketch the post-Vietnam strategic landscape of the mid-1970s, the October 1973 War, the evolution of air power, technology development, Army doctrinal changes, and domestic developments leading to a reversal in defense spending. Such changes crystallized within a larger conceptual framework geared toward "extending" the battlefield, a framework that reflected widespread anticipation of new "deep strike" capabilities.

The Soviet Nuclear RMA: On the Strategic and Operational Threat

Soviet military planners adapted doctrine and force structure to counter U.S. and NATO flexible response strategy in the mid- and late 1960s, adaptations that created new strategic and operational challenges for the U.S. An Office of Technology Assessment study concludes that after Soviet Premier Nikita Khrushchev's 1964 ouster and the 1967 adoption of flexible response by NATO, "the Soviets began to consider the possibility of a war remaining conventional."[5] Many believed that NATO's adoption of flexible response by NATO was an admission that nuclear deterrence had lost its credibility. As statesmen learned when and where nuclear weapons truly influenced the course of conflict resolution and diplomacy, the implied threat of nuclear escalation seemed less applicable.

What Soviet military theorists labeled a decades-long nuclear RMA provides an interesting backdrop to consider the strategic context in which U.S. military planners sought post-Vietnam revitalization.

Soviet military analyst Joseph Douglass concludes that the nuclear revolution thesis was "an accepted precept" among Soviet military theorists by the early 1960s[6]; another analyst concluded that revolutionary changes derived from "fundamental, qualitative changes in the means of armed conflict, of methods of combat actions, in the organization of troops," and in military "training and education."[7] Within the construct of the unfolding nuclear RMA, Soviet planners reconsidered the importance of the initial period of war, eventually codifying a complex, formulaic system of doctrinal templates designed to expedite battlefield decisions.

Initial thinking on the nuclear RMA was described in the so-called "Special Collection" of documents passed to the West by British-directed spy Oleg Penkovsky.[8] Compiled in 1958, a year before the creation of the Soviet Strategic Rocket Forces, it discussed "the impact of nuclear-tipped rockets on military science."[9] Khrushchev concluded in 1960 "that nuclear weapons made huge infantry and tank armies redundant" and, along with other changes, mandated that ground forces be "slashed."[10] Emphasizing rocket forces briefly delayed both ground force modernization and the further refinement of military thought. Khrushchev went as far as abolishing the "chief of the ground forces" position in September 1964, a month before his ouster.

After several years of inattention to conventional forces, Soviet theorists and planners returned to the core themes of mechanization, maneuver, deep battle, and combined arms attacks in the mid-1960s almost as if the Khrushchev period hadn't occurred. The Soviet nuclear arsenal matured thanks to years of strategic rocket forces largess while conventional warfare was again recognized as a crucial adjunct to the ongoing nuclear RMA.

In his *Race to the Swift: Thoughts of Twenty-First Century Warfare*, perhaps the best single volume capturing changes in military thought at end of the Cold War, Richard Simpkin outlines four phases of Soviet military thought associated with the revolutionary impact of nuclear weapons, phases really capturing the evolution of Soviet "deep operations" theory into the nuclear era.[11]

During the first phase of the nuclear RMA – which extended to roughly 1967 – planners assumed any conflict would lead to nuclear escalation. No consensus emerged on the operational role for ground forces on the nuclear battlefield. Many assumed that nuclear weapons would obliterate enemy forces, obviating the need for large armies. Others considered conventional forces useful only for "mopping up" after nuclear exchanges. Still others emphasized enormous tank formations rolling through areas after their "preparation" with nuclear and chemical attacks. Kimberly Martin Zisk concludes that, although debate continued on the impact of nuclear weapons on operations after Stalin's 1953 death, Moscow tended "to view nuclear weapons as support forces for the ground troops, not independent strike forces that obviated the need for armies."[12]

Robert A. Doughty captures the early stages of phase one: "the Soviets shifted from a primary focus on continental land warfare to a focus on global nuclear warfare. Military leaders believed that the revolution in military affairs compelled complete revisions in strategy, tactics, and force structure. Red Army commanders modified their thinking about the conduct of ground operations in the nuclear age and emphasized dispersion, mobility, high operating tempos, and multiple attacks on broad axes."[13]

Noteworthy was the degree to which Soviet planners adopted a vision of future conflict that integrated nuclear and conventional operations on the same battlefield. The nuclear RMA construct conditioned commanders to accept the integration of non-nuclear forces, operationally and doctrinally, into military affairs, leading to the "rapid development and mass introduction of nuclear weapons, missiles, and radio electronic means among the troops as well as the significant improvement of other types of armament and combat equipment."[14] Doctrinal and operational integration of "new weapons in all categories of the armed forces" impelled "radical changes in the methods of conducting warfare" and a "review of the established principles of the art of war."[15]

While U.S. planners held similar views, Soviet planning seemed more sensitive to conventional operations. Only in the late 1970s would the U.S. focus greater attention and resources on an "integrated" battlefield.

The second phase of the Soviet nuclear RMA began in 1967, the same year that NATO adopted flexible response; it was also the year that Soviet ground forces were returned to a status of falling under a separate command. Michael McCGwire sees the 1967-1968 period as "a watershed in Soviet defense policy."[16] The essential change was a switch from believing any world war would lead to nuclear "strikes against the homelands of the two superpowers" to believing "that a world war might be waged with conventional weapons" without nuclear escalation.[17]

One benchmark in Soviet military history remains Operation Dnieper, a 1967 training exercise named for the river across which massed armored forces rehearsed river-bridging missions. In his*The Soviet High Command, 1967 -1989*, Dale Herspring contrasts Dnieper with the 1965 "October Storm" and the 1966 "Vlatva" exercises. "Whereas both previous exercises had included a conventional phase, each had quickly escalated to the use of nuclear weapons. This time, the exercise was entirely conventional."[18]

Distinguishing the new phase, then, was a focus on conventional planning – even a "grudging admission" among rocket force proponents "that conventional weapons might be used" without the nuclear preparation occurring first.[19] What factors contributed to this shift? In their study of Soviet conventional warfare, Douglass and Hoeber suggest four: reactions to "U.S./NATO strategy shifts, recognition of the need to conduct non-nuclear operations at the unit and subunit level, recognition of the need to be able to fight non-nuclear wars, and recognition of potential problems involved in starting an operation with a mass nuclear strike."[20] This reaffirmed central tenets in Soviet strategic culture, that "ground forces are what, in the end, are used to implement the Soviet offensive strategy."[21]

According to a 28 April 1972 CIA intelligence memorandum entitled "Soviet Defense Policy, 1962-72," during phase two of the nuclear RMA "the Soviet view of war in Europe had undergone a significant change" reflecting a belief "that the initial period of a war with NATO could be fought without the use of nuclear weapons."[22] The CIA also concluded that "Soviet acceptance of a possible non-nuclear phase of hostilities [led] to some changes in force structure."[23]

A motorized rifle division was added to each tank army. Among the new weapons systems introduced were "five new tactical air defense systems, five artillery systems, three new tracked combat vehicles, and improved tactical engineering and logistics systems."[24] BMP1 armored infantry fighting vehicles, the first mass-produced modern armored vehicle since World War II, would speed infantry forces into battle alongside new T-72 main battle tanks. BMP1 armament included Sagger anti-tank missiles and a new anti-tank gun. Anti- tank weapons became ubiquitous. “Division artillery,” analysts discovered, “increased by about 50 percent” – and they were self-propelled. Mechanized forces became much more capable in terms of bringing fire support to bear on a fluid battlefield.[25]

Soviet military planners also concluded from “‘detailed analysis of possible ways to resolve problems of modern offensive operations” that ground forces must pursue the “fullest possible use of the airspace.”[26] Airborne (air-deliverable) versions of the BMP and other armored vehicles were fielded. The ZSU-23 air defense system, with its four 23mm cannons, was the most sophisticated in the world. Russian divisions advanced within a “bubble” of protective air defense systems, including ZSU-23s for low altitudes and a suite of surface to air missiles (SAMs) for higher ones. This required interlocking air defense radar, warning, and fire control.

It was during this period Zisk argues, when U.S. defense planners were focused on Vietnam, “that the Soviet General Staff began to implement its infamous ‘conventional option.’ Fully developed by the late 1970s, it held that Soviet conventional weapons would be used to destroy NATO theater nuclear weapons before they could be used, and thus secure victory. . .without the use of nuclear weapons.”[27] Because the poor state of NATO conventional forces would require escalation to nuclear weapons, “it might indeed make sense for the Soviets to try to make them as useless as possible as soon as possible, and to try to accomplish as much as possible before they came into play.”[28] Additional political and military problems for U.S. planners followed. To borrow from Stephen Ambrose, the “Soviets now had two trumps, the bomb and the Red Army, to NATO’s” reliance on nuclear defenses.[29]

During the second and third phases of the nuclear RMA, Soviet military theorists invigorated their study of the historical elements of Soviet operational art and discussed the idea of a conventional "theater-strategic offensive." Incidentally, Soviet analysts evoked this same term to characterize U.S. forces in the Gulf War a decade later. For U.S. and NATO analysts, the theater-strategic offensive and other developments seemed "propelled by the hope that Soviet conventional forces could in fact control NATO's wartime decision-making" by delimiting nuclear defense and retaliation options.[30]

Soviet thinking about flexible response was as much about a strategy aiming for mutual restraint concerning the use of force as it was about signaling a deterrence strategy based on progressively more "punishing" military options ending with all-out nuclear war. NATO was not the only target of Soviet deterrence policies. Soviet planners were also concerned with China, an important consideration after a new military theater of operations was created in response to rising Chinese military strength in the 1970s and to Sino-Soviet border clashes. Articulating a preference for nonnuclear war also reflected Moscow's reaction to China's testing of nuclear weapons and U.S. diplomatic efforts to court Beijing.

The third phase involved the further adaptation of Soviet deep operations theory and a more capable offensive capability. As President Carter would tell the 1977 North Atlantic Summit Meeting in London, his first year in office and roughly the period marking the transition to the third phase of the Soviet nuclear RMA,

> The threat of facing the Alliance has grown steadily in recent years. The Soviet Union has achieved essential strategic nuclear equivalence. Its theater nuclear forces have been strengthened. The Warsaw Pact's conventional forces in Europe emphasize an offensive posture. These forces are much stronger than needed for any defense purposes. Since 1965, new ground and air weapons have been introduced in most categories: self-propelled artillery, movable tactical missiles, mobile air

> defense guns, armored personnel carriers, tactical aircraft, and tanks. The Pact's build-up continues undiminished.[31]

That year more than 120,000 Soviet troops deployed into Eastern Europe during a one-week exercise as part of a normal troop rotation, increasing fears that an unwarned attack might occur.

Among the important strategic developments during this period was the public revelation by Defense Secretary Harold Brown on the twentieth anniversary of Sputnik that Soviets had "an operational capability that could be used against some satellites" – the era of space warfare had begun.[32] Soviet conventional capabilities threatened to undermine the existing deterrence regime on which European stability rested; it also provided additional impetus for U.S. military innovation.

The fourth and final phase of the Soviet nuclear RMA matured in the 1980s. An Operations Maneuver Group (OMG) increased the conventional threat to NATO in the early 1980s. This phase also witnessed the evolution of vertical envelopment as an adjunct to deep operations theory: the introduction of hellebore assault brigades that further expanded the battlefield. The fourth phase is discussed in chapter 5.

Framing the Post-Vietnam Strategic Context

Vietnam was, of course, the crystallizing event of the period for U.S. national security, perhaps of the entire post-World War II era. Weighing heavily on the America's collective consciousness, itwas a conflict George McGovern characterized as America's "second civil war," one he rightly predicted would be fought "for the rest of our lives."[33] President Lyndon Johnson famously decried it as "that bitch of a war." It was a tumultuous experience for an Army that had struggled to define its place in the nuclear world without losing touch with core aspects of its organizational identity.

The January 1973 Paris Peace Settlement ended President Richard M. Nixon's first week in office and the U.S. military presence in Vietnam. The agreement was among a number of coterminous events that closed one chapter in the history of U.S. defense planning and opened another.

Other noteworthy events contributing to the evolving strategic context were: the rise of international terrorism associated with radicalism in the Middle East after the 1972 Munich Olympics; Nixon's 1972 visit to China; OPEC's oil embargo; the 1972 signing of the Strategic Arms Limitations Talks (SALT) treaty recognizing strategic parity between the U.S. and USSR; the 1972 signing of the Anti-Ballistic Missile (ABM) treaty [the United States withdrew from it in 2002 – another aspect of the thirty-year transformation]; Moscow's 1972 agreement to participate in the Mutual and Balanced Force Reduction (MBFR) talks and Washington's agreement to join the Conference on Security and Cooperation in Europe (CSCE); increasing American concern with communist parties gaining power in Western Europe, including in NATO members Spain, Portugal, and Italy; and the 1974 announcement of a New International Economic Order in conjunction with the ascent of a non-aligned movement in the United Nations – both reacting to North-South economic disparity.

Additionally, Henry Kissinger dubbed 1973 as "the year of Europe," a signal that the Nixon administration was refocusing on the primary axis of East-West tension. At the Moscow summit a year earlier the United States and Russia agreed on the essential pillar of détente: that neither side would strive for a unilateral nuclear advantage over the other.

Ambiguity and divergent expectations about the meaning of détente limited its longevity. U.S. observers understood détente to involve both the curtailment of the arms race *and* constraints on Soviet expansionism. In a classic Hegelian interpretation evoking the paradoxical nature of dialectical materialism, Moscow viewed détente as including opposing elements of peaceful *and* competitive co-existence. For Moscow, détente created opportunities for gaining advantages over the West in some areas while recognizing that nuclear parity limited opportunities for advantage in strategic nuclear arsenals. Soviet expert R. Craig Nation concludes that, after Willy Brandt, leader of West Germany's center-left governing coalition, initiated his *Ostpolitik* or "political opening to the East" policy, "Moscow's hope was to use détente as a complement to *Ostpolitik* in order to reinforce its hegemonic status" in Eastern Europe.[34] Secretary of Defense James Schlesinger lamented détente's fundamental flaw in 1976: "If détente means everything," including opportunities for Moscow to legitimize its control of Pact nations, "it means virtually nothing."[35]

While Nixon sought peace with honor in Vietnam, and as the second phase in the Soviet nuclear RMA unfolded, the stark reality of Soviet conventional capabilities troubled U.S. defense planners. Zisk aptly summarizes their underlying concern: "if conventional weapons destroyed NATO's theater nuclear forces, they could remove a step in the NATO escalation ladder, and thereby prevent nuclear use entirely."[36]

Nuclear strategy drove conventional warfighting innovations on both sides of the Iron Curtain. For some, the likelihood of a nonnuclear attack was inversely related to the perceived credibility of the overall U.S. extended deterrent. As the credibility of nuclear deterrence suffered, some argued that the potential for an opportunistic Soviet conventional attack, even if for limited gains, increased. Additionally, the argument for assured nuclear escalation waned as the political viability of anything sounding like "massive retaliation" decreased. For these and other reasons, conventional readiness issues ascended in importance as the U.S. extricated itself from Vietnam.

The 1976 Defense Science Board Summer Study of potential technological solutions to the conventional threat in Europe documents evolving thoughts on conventional modernization. "It concluded that some of the technologies, or achievable modifications of them, could be integrated into a feasible fighting system that could effectively counter the second echelon of a Warsaw Pact attack."[37]

Vietnam exacted the greatest toll on the Army in terms of delaying modernization efforts. The Air Force and Navy "developed, or were in the process of developing, new aircraft, new air-to-air missile weaponry in the air defense arena, and with dramatic new technologies were beginning to extend their reach into space."[38] As General Haig observed, the relative lack of attention given to forces in Europe "tended to breed a garrison mentality" that had a negative influence on readiness, one that was "especially marked among our ground echelons" which, "unlike their air and naval brethren" did not "routinely function in an environment of high operational intensity."[39]

The outlook for Army modernization changed following Soviet Premier Leonid Brezhnev's Tula speech. Delivered days before Carter assumed office, it signaled a change in Soviet declared nuclear policy. Its essence was a no first use declaration combined with a plea that NATO proclaim a similar policy. If NATO did so, the credibility of the Alliance's nuclear deterrent would be weakened. Moscow's strategic objective, here and in other foreign policy overtures, was to create or intensify as many axes of disagreement within NATO as possible. First use was already a contentious issue during the mid-1970s as political opposition, including peace movements, mounted.

NATO planners quickly criticized the sincerity of the Tula line when the Soviet's modernized their theater nuclear arsenal significantly with the introduction of the SS-20 mobile intermediate range ballistic missile (IRBM) missile. The SS-20, deployed in 1977, was much superior to the missiles it replaced in virtually every measure of IRBM capability: reliability, survivability, range, accuracy, and the time required to fire, move positions, and reload. It was the first Soviet IRBM armed with multiple warheads (multiple warheads per rocket). The SS-20's mobility wrought changes in U.S. counterforce targeting capabilities by adding the requirement to be able to find and destroy Soviet mobile missiles, which meant retargeting bombers and missiles in flight. Further modernization plans suggested that more new missiles would be introduced in the 1970s.[40]

This spurred NATO to plan for the deployment of U.S. Tomahawk ground-launched cruise missiles (GLCMs) and Pershing 2 intermediate range ballistic missiles. Cruise missiles and Pershing were both so-called long-range tactical nuclear forces (LRTNF) because they had ranges between 3,000 and 5,500 miles. Some, like West Germany's Helmut Schmidt, viewed the new U.S. systems as crucial for NATO deterrence because their deployment signaled continued U.S. commitment to a nuclear defense of NATO. In the mid-1970s, in the aftermath of Vietnam, many feared that the American nuclear deterrent would be "decoupled" from Europe, leaving Western Europe susceptible to Soviet nuclear blackmail or destine to be annihilated by theater nuclear exchanges that left the American and Soviet heartlands free of direct nuclear strikes. Such views were reinforced during the second round of Strategic Arms Limitations Talks (SALT II).

The initial plan placed 96 cruise missiles in Germany, 160 in Britain, 112 in Italy, 48 in Netherlands, and another 48 in Belgium. West Germany would also host 108

Pershings, the highly accurate, high-speed missiles with a 1,000 mile range that could reach targets in seven or eight minutes from launch.

East-West relations continued to decline, muddying the arms control negotiations that embodied the fading spirit of détente. Political pressure to find alternatives to nuclear deterrence intensified. Mass political demonstrations erupted against the deployments across Western Europe. Nikolai Ogarkov was appointed chief of the Soviet General Staff, bringing changes in Soviet doctrine and force structure that shifted the balance of power in Central Europe. As Jacob Kipp concludes, developments in Europe, leadership changes inside the Kremlin, Soviet activities in the third world, and a growing Soviet global naval presence fostered "a political climate conducive to efforts to raise the theater-nuclear threshold through the improvement of conventional forces."[41] Raising the threshold remained a prominent theme in U.S. national security planning throughout the late 1970s and early 1980s.

Conventional force modernization activities subsequently received newfound support. Shortly after Carter assumed office, NATO members agreed to a new long-term defense program (LTDP). Formally adopted in May 1978, the LTDP evolved into a fifteen-year modernization plan addressing ten mission areas. Only one concerned nuclear forces (Pershing II and cruise missiles). Others included air defense; anti-submarine warfare; anti-armored capabilities; advanced air-delivered munitions; command, control, and communications advances; improved reserve readiness and mobilization; and electronic warfare. Allies also agreed to increase annual defense spending and to the joint development of airborne early-warning aircraft. Pursuit of advanced conventional capabilities was reinforced in the 1978 NATO Summit communiqué, which highlighted the risk of a Soviet attack with minimal warning and related need for rapid reinforcement after hostilities commenced.

Force Modernization Ills and Expectations for Strategic Effectiveness

All of this changed the pace and scope of the Army's post-Vietnam revitalization. In a recent history of the U.S. Army's armor branch, former General Don Starry summarizes the planning environment during the 1970s. "It was an era characterized by the expanded threat in Europe, a growing threat of conflict in the Third World (especially the Middle East), increasing worldwide economic interdependence, greater difficulty articulating political goals for the planners who designed military activities to achieve them, and intrusive and abrasive media probing into all aspects of military operations."[42]

Strategic and operational challenges impelling reforms were similar in concept to those prompting debate over flexible response in the 1960s; in the late 1970s they became more intractable. Planning challenges became more diffuse; strategic objectives in European and peripheral regions became more tightly coupled; technology reduced the warning time to react to crises abroad.

Other issues included long-standing equipment shortfalls; poor training programs; a paucity of doctrinal adaptation to battlefield challenges; critical recruitment and retention problems; and disputed responsibilities for air mobility and the development of tactical missiles. Such problems existed before troops began flowing into Vietnam. As America withdrew from Southeast Asia, "funds available for Army general-purpose procurement" in 1973 " were about two-thirds of the last pre-Vietnam year in terms of equivalent purchasing power."[43]

Army Chief of Staff General Creighton W. Abrams focused Army planning on Europe, including efforts to integrate new weapons systems to meet the Soviet Red Army. Another decision prevented the Army from deploying to fight a major campaign without the Army Reserve and National Guard. Dubbed the "Golden Handshake" within the Pentagon, the "Total Force" concept allowed Abrams to increase the number of Army divisions from thirteen to sixteen without requiring new recruits. By transferring support functions into the Reserve and Guard Abrams shifted active duty manpower into new combat divisions. The Total Force concept would eventually force all of the Services to rethink the role of reservists in military activities. Army reserve requirements remain particularly high, witnessed by the number of soldiers called to active duty in the 2000s to simultaneously fight a global war against terrorism and remove Saddam Hussein from power in Iraq.

Among the problems facing post-Vietnam Army leadership was what to do with soldiers inducted under Lyndon Johnson's Project 100,000. Part of the Great Society program, it brought some 300,000 underprivileged and unemployed recruits into the military by lowering minimum standards for intelligence and physical health. Many were illiterate. Post-Vietnam studies revealed Project 100,000 inductees were killed in action at nearly twice the rate of other combat soldiers. By 1973 many had progressed into the non-commissioned officer ranks, entrusted with leading and training the backbone of the Army, its soldiers. Army leaders had further cause for concern. To bolster recruitment, defense officials mandated that a quarter of the Army's recruits be high-school dropouts. Personnel challenges included rampant drug use, the ending of the draft (which placed additional burden on recruiters), and racial tensions that frequently spurned bloodletting in the barracks. Compounding recruitment woes, retention suffered across the Army as re-enlistment rates declined.

Overshadowing the problems besetting Army leaders included what might be diagnosed as organizational schizophrenia, especially concerning the future of warfighting doctrine. Was it an army preparing for low intensity conflicts or for nuclear battlefields and armored warfare in Europe? The answer would be the latter, a decision that left low intensity conflict training somewhat in limbo until the early 1980s when, in the wake of the failed attempt to rescue Americans held hostage in Iran, resources and leadership attention were devoted to building a special operations capability to prosecute regional conflicts and fight terrorism. In the aftermath of Vietnam, funding for low intensity conflict, an inaptly named level of warfare given the intensity of fighting involved, was politically untenable.

Former Director of the Defense Intelligence Agency (DIA), retired Army Lieutenant General Pat Hughes was a platoon leader with the 9th Infantry Division in the Mekong Delta (1969) and advisor to a provisional reconnaissance unit in the Phoenix Program (1971-1972). Vietnam, he contends, forced a generation of military leaders to contemplate the utter “finality” of combat.

This warrants elaboration. Military thought during much of the early Cold War was wrapped in a highly abstract cloak of nuclear targeting. Calculations of blast effects, radiation, and overpressure were the work of civilian technicians adding scientific detail to the work of other civilian theorists – the political scientists and economists shaping deterrence theory. A defense discourse centered on abstract nuclear warfare issues left tacticians and planners ill prepared for unconventional war in Vietnam. Militarily, politically, operationally, it was unlike the two world wars of liberation or the inaptly named Korean "police action." Especially at the tactical level, where the battlefield climate of chaos and destruction imparted a vivid, deeply personal appreciation for the non-linearity of even meticulously planned operations, respect for the finality of war led post-Vietnam Army officers to profess that they would never allow another Vietnam to occur.

Quite simply, as Hughes recalls, they had to go to war to win – a conviction that students of today's American military forces are likely to have a tough time understanding. Indeed, it is difficult to relate the historic importance of a generation of military leaders concerned that they might *not* go into battle with the political backing and resources to win. In other words, it is difficult to convey how this shaped the Army's post-war planning or how it influenced the behavior and views of officers like Hughes later charged with strategic planning, technology development, and doctrine writing.[44] Similar thinking motivated Collin Powell to pen what became known as the "Powell Doctrine" in the early 1990s.

Attitudes about preparing for war changed more quickly than did the mix of resources available to do so. "In the anti-military orgy spawned by Vietnam," Henry Kissinger recalls, "to have challenged the overwhelming Congressional sentiment for 'domestic priorities' was almost an exercise in futility, pouring salt on the open wounds of the Vietnam debate."[45] The immediate post-Vietnam political situation worsened longstanding readiness issues, resulting in another inauspicious post-war situation for Army planners. The Vietnam War had cost upwards of three-and-a-half billion dollars, sapping funds from modernization and other readiness areas. High rates of inflation throughout the 1970s made matters worse because the buying power of defense dollars declined. Weapons systems were also more complex and more costly, leading to what defense economists termed cost growth. As weapons grew more complex, their per unit cost increased.

Resolving conventional readiness and modernization issues was made more difficult by the Nixon's administration's approach to defense planning, which in turn was muddied by post-Watergate political problems. John Lewis Gaddis summarizes Nixon's approach to defense planning as "consisting of (1) the appeasement of Congress, with a view to defusing as much as possible growing anti-military sentiment there, and (2) negotiations with the Russians aimed at restricting as much as possible their own military buildup, without constraining in any significant way comparable measures the United States might choose to take once the furor over Vietnam had died down."[46]

Secretary of Defense Melvin Laird spearheaded Congressional appeasement. A former Congressman reportedly skilled in "bureaucratic gamesmanship," Laird's chief mission was "forcing the American military to adapt to a harsher post-Vietnam environment without significant loss of either morale or capabilities."[47] Noteworthy here, given the press of conventional issues and declining defense spending, was that he sought "several new strategic weapons systems – the B-1 bomber, the Trident submarine, the cruise missile – but only at the price of a substantial reduction in conventional forces."[48] Not until the end of the decade would conventional issues receive Congressional support. For the time being, as Kissinger relates, the plan was, quite simply, to focus on preserving the "sinews" of American strength, in this case the pillars of nuclear deterrence.[49]

Subsequently, nuclear weapons modernization was funded while overall military spending *decreased* "at an annual rate of 4.5 percent between 1970s and 1975"; this severely limited "the capacity of the United States to project conventional military power."[50] Even at mid-decade, "long after trends in Soviet military spending had become too obvious to ignore," the defense budget was cut an additional seven billion dollars" as strategic nuclear programs received additional funding.[51]

Because of resource issues, Laird's prioritization of future weapons systems, and the general political climate, the post-Vietnam Army remained hard-pressed to meet new expectations for a more robust conventional deterrent. For Haig, such expectations reflected NATO's search for "a balanced military posture in which the deterrent value of each component – conventional, theater nuclear, and strategic nuclear – is magnified by its relation to the other two."[52] If the conventional deterrent continued to decline, the theater and strategic nuclear deterrence would be weakened. Senator Sam Nunn was among those supporting increased defense spending. Addressing the "cockpit of Soviet-American confrontation" in Central Europe, he argued in 1976 that, "after twenty-seven years of collective investment on an unparalleled scale, it is still questionable whether the United States and its European allies could muster the sufficient military might in time to defeat a determined conventional Warsaw Pact invasion of Western Europe."[53]

By the end of the decade, as discussed below, U.S. grand strategy evolved in ways that emphasized conventional measures of strategic effectiveness. In other words, conventional warfare in Europe was re-centered in U.S. grand strategy. Secretary of Defense Donald Rumsfeld's Fiscal Year 1978 Posture Statement to Congress argued that, "'the burden of deterrence has once again fallen on the conventional forces.'"[54] Quite simply, the Army was expected to respond to new strategic realities and operational missions – and soon thereafter began receiving additional resources to do so.

Evolution in Air Power

Reflecting broad strategic realities, as the Army's fundamental mission of deterring Soviet attack was reinforced, the Air Force focused more attention on tactical missions. As chapter 3 related, the U.S. post-World War II defense planning environment was characterized by demobilization, occupation duties, fixation with the atomic bomb, economic re-conversion to peacetime production, general issues associated with the 1947 creation of a Department of Defense, and specific issues concerning the creation of a Department of the Air Force. In this environment, ground force modernization stagnated. Air power, the sole means of delivering atomic weapons, emerged as a strategic priority for defense spending and, with the creation of an independent air service, the Air Force's disproportionate share of resources and access to the executive branch and Congressional leadership aggravated Service infighting.

The evolution of U.S. air power theory and doctrine is a study in organizational theory. More appropriately, it is a study in organizational culture. Among the cultural factors addressed in this study is the newfound support for close air support and nonnuclear ground attack missions.

As stated above, the strategic nuclear mission drove Air Force technology, doctrine, and operational readiness for much of the early Cold War. This reflected priorities during decades in which defense discourse was dominated by a nuclear-centric narrative of military thought. Reflecting national security strategy, Air Force doctrine in the 1950s focused on nuclear strike despite the importance of theater conventional missions during the Korean War. Operational necessity for reliable long-range strategic nuclear strike and pursuit of safer, more advanced commercial airliners underwrote a number of developments during the 1950s. Fuselages became more aerodynamic, propulsion and new materials technologies helped push them to supersonic speeds. Thermonuclear (hydrogen) weapons provided them with unparalleled destructive power, renewing arguments airpower theorists had made since the 1920s that airpower could be singularly decisive in war. In part because conventional airpower was not decisive in Korea, and despite the importance of close air support missions, conventional missions were neglected. New long-range bombers armed with thermonuclear weapons trumped fighters in the pursuit of Giulio Douhet's and Billy Mitchell's visions for decisive airpower. Reinforcing theory was the practical matter of resources.

The emerging nuclear stalemate in the strategic domain, combined with technological and operational developments, would lead to a reemphasis on tactical air power in the 1970s. This is one of the evolutionary processes contributing to the emergence of a context ripe for further innovation in the 1980s. Widespread debates over the relative merits of ICBMs and strategic bombers also revisited questions about the Army and Navy's strategic missions, which complicated the Air Force's internal decision making concerning the right mix of strategic bombers and close air support aircraft.

Among the benchmarks sowing the seeds for Air Force collaboration in executing AirLand Battle doctrine remains the 1971 publication of revised Air Force Manual 1-1, *United States Air Force Basic Doctrine*.[55] It posited that nonnuclear conflicts, including regional wars involving Soviet clients, required "sufficient general purpose forces capable of rapid deployment and sustained operations."[56] Going beyond earlier flexible response discussions, 1-1 stated that *all* elements of the Air Force "are responsible for conducting and supporting special operations."[57]

The Air Force was shifting from its insular focus on strategic nuclear missions, a shift driven by changes in the strategic environment and in the expectations placed on the organization concerning regional conflicts. Although long-range strategic bombing and nuclear strategy continued to dominate the Air Force's heart and soul, important leadership and planning changes occurred. Missiles, including innovative theater systems engineered for greater accuracy, more agile re-targeting, and lower yields became more important to strategic planners. Associated innovations occurred in the domains of command and control, intelligence, interoperability, satellite positioning and navigation, stealth capabilities to defeat enemy air defenses, and electronic warfare support.

The Navstar Global Positioning System (GPS), a key technology in the American RMA , was conceived in 1973, building on previous navigation systems such as the long range navigation (NORAN) and Transit systems. Transit, used by Navy Polaris submarines in the 1960s, was made available to the public in 1967 and its satellites given the name "Navsat." Navstar's first phase, from 1973-1979, involved the procurement of satellites and exploration of user interfaces. Ground navigation equipment was tested in 1977 using airborne signals. In 1978, an Altas rocket carried the first GPS Block-I satellite into space. Three subsequent 1978 launches delivered the world's first three-dimensional global positioning capability. Four additional satellites were launched from 1979 through 1985, completing phase two of the GPS program. Prototype GPS receivers began using live satellite data in 1982. Although used extensively thereafter, the defense department did not announce the initial operational capability of GPS until December 1993. Navstar GPS reached full operational capability in 1995 with twenty-four Block-II satellites on orbit. Noteworthy here is the fact that advocacy for GPS came from the Office of the Secretary of Defense and senior civilian leaders, not the military services.[58]

Envisioned roles for precision strike, the need for electronic countermeasures and warfare capabilities, air mobility, and airlift issues all contributed to changes in Air Force planning. "Within the air force," military aviation historian Richard Gross reports, the Strategic Air Command's (SAC) "share of the budget and force structure declined significantly while its tactical forces gained in relative importance."[59] Air power had to deter conflict at all levels of warfare. This was a difficult proposition given the state of tactical air forces. The Tactical Air Command (TAC) suffered from readiness problems in the early 1970s. "On any given day," James Kitfield reports, "half of the planes in TAC's $25 billion inventory were not combat ready because of some malfunction, and 220 aircraft were outright 'hanger queens,' unable to fly for at least three weeks for lack of spare parts or maintenance."[60] Ben Lambeth identifies "aircrew proficiency, equipment performance, and concepts of operations" as additional of concern addressed in the 1970s.[61]

New training approaches striving for ever-greater realism, munitions improvements, and other developments transformed American Air Power by the late 1980s – a transformation that was in large part centered on the conventional threat in Europe. Of note was the Air Force's adoption of successful, realistic training techniques previously incorporated into the Navy's successful "Top Gun" program, the U.S. Navy Postgraduate Course in Fighter Weapons established in 1968. In 1978, the Air Force inaugurated its own realistic training program, highlighted by the "Red Flag" exercises held at Nellis Air Force Base.

By the early 1980s, Gross found that "there were no longer any bomber generals in senior Air Staff positions."[62] Force structure shifts paralleled staffing changes. During the 1970s, the number of medium bombers assigned strategic missions increased from 4 to 60; heavy bombers decreased from 465 to 316. The number of medium bombers assigned to tactical support missions leaped from 26 to 264. If force posture reflects doctrine and planning, it appears that Air Force did indeed undertake a transition in its operational focus during the 1970s, at least concerning the bombers that were the founding rationale for a separate service in the late 1940s. But an important distinction remained between tactical missions and "strategic" ones, the latter being more important in terms of the organization's founding identity. It wasn't until the mid- 1980s that B-52 strategic bomber crews throughout the Department began training in earnest for conventional warfare.[63] By the late 1990s, it would dominate training as well as encourage new pathways for research and development.

A concurrent process was working in the background. According to Institute for Defense Analyses scholar Richard Van Atta, some within the Air Force "quietly focused on an emerging 'grand challenge' in the 1970s , the ability to strike any target, any where in the world, day or night, with precision."[64] Among others, this led to additional research and development in targeting and navigation.

Targeting and navigation advances for global strike were possible because of the investments made in nuclear planning and delivery systems. Among them were global geodetic grids for long-range targeting, navigation and positioning. Because the earth is not perfectly round, accurately delivering a missile across hemispheres required a coordinate system referenced to the planet's center and adjusted to local anomalies. Navigation technologies, including a ring-laser gyroscope, microelectronics and miniaturization, electronic warfare, and attempts to achieve theater situation awareness were also developed. Some of these capabilities were developed to support interdiction of Soviet ground forces with tactical nuclear weapons. Crucial technologies and operational concepts would further evolve to support advanced conventional capabilities.

It was during the 1970s that the seeds of "strategic nonnuclear" campaigns were sown. Ground forces support mission became more important, bringing new airborne surveillance and warning aircraft capable of supporting conventional warfare. The first production version of the E-3 Sentry Air Force Airborne Warning and Control System (AWACS) was delivered in 1975 for testing and evaluation and entered operational service in 1977 with the 552nd Airborne Warning and Control Wing, Tinker Air Force Base, Oklahoma.[65] During Air Force demonstration flights in Europe, E-3 operators discovered that autobahn traffic was being picked up on radar, fueling interest in a ground moving target indicator (GMTI) capability in addition to tracking aircraft. Building on ongoing efforts to develop a long-range synthetic aperture radar for the high-altitude TR-1 surveillance aircraft, an Air Force-Defense Advanced Research Project Agency (DARPA) partnership was formed to modify the TR-1 sensor for a GMTI aircraft. The initiative, the Tactical Air Weapons Direction System (TAWDS) was later renamed PAVE MOVER, evolved into a project to both identify and track mobile ground targets *and* attack the moving targets with missiles. PAVE MOVER would later become a key component of Assault Beaker, discussed in chapter 5.

The long-term benefits of nuclear-focused developments were, of course, not evident to Army planners in the 1950s and 1960s. The stark reality was that the Air Force continued to receive a disproportionate share of defense spending until the early 1960s.

In the aftermath of Vietnam and the 1973 Yom Kippur War, as discussed below, the Air Force revisited the issues of air defense and air superiority, which derived from concerns about both Soviet conventional thrusts to seize or disrupt NATO nuclear command and control systems *and* newfound emphasis on the strategic importance of air support to the conventional defense of NATO's western flank. Achieving greater coordination of the air battle underpinned the development of the AWACS. In time, as officers from different operational backgrounds populated the Air Staff, technologies developed to support nuclear strikes were adapted to support tactical, nonnuclear missions.

No survey of air power developments during the formative period of the American RMA would be complete without mentioning attacks on two bridges, the Paul Doumer and the Thanh Hoa.[66] These were key bridges for the North Vietnamese, although their destruction was really more important for the message Nixon wanted to send to Hanoi: that the U.S. could successfully strike at important command, control, and logistics targets. So, while the bridges were not crucial even in the overall war effort, they are storied events in the history of precision bombing. Among the previous attempts to destroy the bridges was a 1965 attack on the Thanh Hoa where over one hundred sorties dropped some five hundred 750 pound bombs. Repeated attacks failed to destroy the bridges. Ten planes had been lost. In April 1972 twelve F-4 Phantoms, eight carrying two 1000lb each and four flying cover to protect them, disabled the Thanh Hoa. A month later the western span of the bridge was pounded off its supporting beams and rendered unusable. No planes were lost in either attack. The Paul Doumer was rendered unusable in successive attacks the same month.

Why mention the bridges? Two different types of highly accurate, innovative bombs guided by small fins in their tails and propelled by gravity destroyed them. The first was an electro-optically guided high-explosive bomb with a small television camera mounted in its nose that transmitted an image to a weapons officer. After selecting an aim point and locking it into a computer, the bomb guided itself to the target (assuming the guidance system kept its lock) while the plane departed the target area. It was a “fire and forget" weapon. The second was a Paveway laser-guided bomb. Instead of a camera, its nose contained a sensor designed to lock onto a low-powered laser beam "illuminating" the target. Both Paveways involved placing conversion kits on regular bombs, adding guidance packages, fins, and other upgrades.

Noteworthy in the Vietnam bridge attacks was the ratio of attack to supporting aircraft. As George and Meredith Friedman conclude, from the mid-1960s to the early 1970s, the "percentage of attack aircraft had shifted from 91 percent to 37 percent; in fact, the bulk of the aircraft that flew missions in 1972 were intended to protect the attackers."[67] In addition to suggesting the emergence of technology able to achieve a long-time "one bomb, one target" vision for conventional strikes, the 8th Tactical Fighter Wing demonstrated a number of new capabilities in Vietnam: laser-guided precision strike, electro-optically guided precision strike, successful night missions. A new family of weapons entered the arsenal, albeit slowly.

Additional funding for precision munitions development competed against Executive Branch priorities following Vietnam, which emphasized nuclear forces. The Air Force managed to keep a trickle of research and development funding flowing, doing little to convince overseers of their relative effectiveness and importance. Criticism aside, the Air Force did move money from other programs to fund Paveway II. It "had folding wings so that more could be carried by strike aircraft, structural improvements, and improved guidance ability; it eventually went into service with over thirty nations."[68] Paveway II successfully passed through its development and testing phases and its manufacturer, Texas Instruments, was asked to manufacture 7,800 conversion kits in 1976. That same year the Air Force initiated a Paveway III development program to compensate for significant drawbacks. Most importantly, it had to be dropped from medium altitudes, within enemy air defense weapons ranges. Paveway III was indeed an improvement. Designated the GBU-24, it used "on-board autopilot stabilization so that the bomb could 'cruise' toward the target, a scanning seeker to find the spot of laser light illuminating the target" and had "the ability to be dropped outside the target 'basket'" so it could "maneuver itself inside it."[69]

Another important development in the post-Vietnam period was the beginning of the Air Force's transition from air power doctrine to thinking in terms of aerospace doctrine. In addition to its long-standing role in National Reconnaissance Office (NRO) satellite reconnaissance systems, the 1970s witnessed important developments in space power. Digital, global communications and navigation capabilities were pursed by all of the Services, with the Air Force coming to play the largest role in U.S. military space (with the Navy a close second). At mid-decade, the Air Force launched two MIT Lincoln Laboratory experimental satellites (LES-1 and -2). Whereas previous communications satellites had relayed signals between points on the ground, they added a "crosslink" capability enabling both ultra high frequency (UHF) and extremely high frequency (EHF) signals between LES vehicles. Not only did this mean unprecedented communications capability over some three quarters of the earth, but EHF operated at a staggering 38 gigahertz: a much higher transmission rate difficult to jam.[70] Based on a number of advances in satellite communications, in 1979 the Army embarked on multiyear program to procure hundreds of mobile satellite terminals. In the early 1980s, and as GPS and other technologies were deployed, Army-Air Force cooperation to leverage emerging space capabilities led to important command and control advances that further linked air and ground power on the conventional battlefield. By the 2000s, distinct views of ground and air operations would give way to discussions of a single "battlespace."

The October War and Planning for War in Europe

The October 1973 Arab-Israeli War, referred to as the Yom Kippur War because it coincided with this Jewish holiday, fostered multidimensional shifts in U.S. defense planning and military thought. According to Army historian Richard Swain the war "came as a shock to the Army because it pitted three mechanized armies looking much like those facing each other in Europe in a series of battles that suggested a revolution in military affairs had occurred while the Army was preoccupied with Vietnam."[71] Combat attrition was staggering. Arab and Israeli armies lost more armor and artillery than the U.S. Army had deployed in Europe. Planners were stunned by the high rate of munitions expenditures among the belligerents, calling into question the adequacy of basic inventories and strategic reserves. Once NATO forces depleted their reserves, nuclear weapons were the only recourse.

Preoccupied in Southeast Asia, the Army had failed to adopt new technology, adapt doctrine, and modernize training. Studies of the war suggested the stark realities of armored warfare among forces with new precision guided munitions and air defense systems. Analysis of battles along the Golan Heights and across the barren Sinai influenced U.S. defense planning and U.S. Army Doctrine.

Writing in October 1973 – only ten months after the Paris Peace Agreement – analyst M. W. Hoag was among a growing number of defense insiders pondering the question of how new weapons might change the conventional balance in Europe. Hoag and many of his contemporaries focused more of their analytic activities on conventional issues, a trend that exploded in the wake of the October 1973 War and as the 1975 MBFR talks began. Among the questions driving defense analysis, Would new technology and doctrine render traditional concepts of massed armored warfare irrelevant? Perhaps unwittingly, arguments made during this period, many of which were obscured during the Vietnam conflict, would solidify into a conceptual and technological bridgehead from which important innovations would move forward.

Implications for U.S. air power emerged from analyses of Soviet-produced integrated air defense systems employed by the North Vietnamese against U.S. aircraft in Southwest Asia and by Arab forces against Israeli aircraft in the Yom Kippur War. These systems called into question NATO ability to deter Soviet forces or defeat them with existing theater nuclear weapons and available aircraft. At the time, blunting Soviet attacks with tactical nuclear weapons required successful U.S. Air Force penetration into Soviet airspace. Nuclear artillery and rockets, arguably, were not yet fully up to the task of delivering a knockout nuclear punch. Accuracy, command and control, range, and reliability issues remained.

New air defense systems created additional problems for the Army. Tactical air superiority was crucial. For some, the advent of advanced air defense systems questioned the Air Force's commitment to gaining tactical air superiority and providing close air support. A number of U.S. aircraft were dual-use, meaning that the same aircraft and pilots responsible for delivering nuclear strikes were also assigned conventional missions including, in some cases, ground support ones. Because few believed commanders would risk their nuclear strike capability to Soviet air defenses, pragmatic planners questioned whether the Air Force would risk losing their dual use aircraft to provide close air support. If they failed at the nuclear mission when the time came, their decades-long commitment to nuclear strike would be jeopardized, something that the Air Force simply could not allow. In the end, some posited, the Supreme Allied Commander, Europe (SACEUR) would hold back dual-capable aircraft during the opening phases of war.

Among those making this argument was Alian C. Ethoven, a professor, defense industry leader, and senior defense department official in multiple positions throughout the 1960s. In a 1975 *Foreign Affairs* essay, he contended that "SACEUR will not want to risk losing his nuclear attack aircraft in a conventional war" and "will be strongly tempted to hold them out of the conventional battle and make them, in effect, specialized nuclear forces."[72]

Although not all analysts agreed with such arguments, they served to organize debate and discussion about air support to ground forces. Defense analyst Steven Canby stated the underlying concern in 1973. Because "a large share of NATO's air forces are still fully committed to a dated Quick Reaction Alert nuclear role," and because "of the demands of air cover and other missions" supporting nuclear missions, "only a fraction of the remainder are available for ground support."[73] The issue of countering Soviet aircraft evolved. Field Marshall Sir Michael Carver would argue in 1976 that developments in Soviet tactical aviation required NATO "to consider more seriously than we have done since 1942 the anti-aircraft defense, organic and inorganic, on our land forces."[74] The result? As chapter 5 discusses, Army-Air Force cooperation received increased attention.

Another problem highlighted by the 1973 War concerned the PGMs mentioned above. According to James Jay Carafano, data on PGMS "did not suggest that smart weapons proved decisive in combat."[75] Nonetheless, the potential existed to help the Army resolve worsening operational challenges.

Until the early 1970s, the high-velocity main gun on a tank was the only viable battlefield anti-tank weapon. And battle tanks were the coin of the realm in conventional force planning. Perceptions of both defensive and offensive conventional capabilities rested on analysis of manpower and battle tank numbers. Alternatives for defeating tanks were awkward to employ, inaccurate, packed too little punch, had too short a range, or, as in the case of jeep-mounted recoilless rifles, had noticeable back-blasts exposing the crew to enemy fire. Leaving aside the issue of weather and terrain differences between the Sinai Desert and Central Europe, the Yom Kippur War suggested – without empirical data – that inexpensive, man-portable, accurate tank-killers seemingly rendered U.S. armor vulnerable to Soviet infantry forces. If tanks were no longer required to kill tanks, then American armor could be engaged by other Soviet weapons systems while the tanks pushed forward to assault command and control facilities. Even tactical nuclear weapon cantonment and staging bases were at risk.

Tactical problems associated with Soviet PGMs fueled debate over their effect on the correlation of forces in Central Europe. U.S. forces armed with similar weapons systems, including surveillance and targeting sub-systems more suitable to weather and visibility conditions in Europe (not an issue in the Sinai), might blunt Soviet armor more effectively. This appealed to enthusiasts seeking to strengthen the defensive and retaliatory capabilities of U.S. forces without increasing manpower or battle tank deployments. Perhaps they offered alternatives to early use of tactical nuclear weapons – a possibility on the minds of many U.S. and NATO planners. In 1975, the same year the first Sentry was delivered for testing and evaluation, weapons experts testified before Congress on the potential of precision munitions. Suggesting that new technology enabled "substitution of small weapons for larger ones," Henry S. Rowen surmised that "for many missions it may be possible for nonnuclear warheads to be substituted for nuclear ones" with the net effect of enhancing deterrence.[76] Similar arguments were being made among defense analysts with knowledge of precision munitions. Although slower to develop, thinking about the application of such munitions in the context of a conventional ground war led some to postulate that air power could be decisive alone.

The Yom Kippur War also "added new momentum" to existing Army-Air Force initiatives "to adopt a more joint approach to airland combat" and pursue "a set of complementary capabilities that any potential enemy would find difficult to match."[77] Accordingly, in June 1975 a Joint Army/Air Force Studies Group formed at Nellis Air Force Base and, a month later, an Air-Land Forces Application Directorate (ALFA) was created at another base in Langley, VA. Similar activities developed throughout the decade, including a 1979 Joint Second Echelon Interdiction Study that ALFA oversaw. Their legacy included a 1983 Memorandum of Understanding on Joint USA/USAF Efforts for the Enhancement of Joint Employment of the AirLand Battle Doctrine.

Less noted, but perhaps historically more notable, was another technological turn. In addition to touting the potential of PGMs and air defense systems to alter the balance in Europe, 1973 serves as something of a benchmark in electronic warfare. The Yom Kippur War highlighted the value of electronic warfare and influenced the 1976-77 creation of tactically focused Combat Electronic Warfare and Intelligence (CEWI) battalions at Fort Hood, Texas. Defense analyst Ken Allard views CEWI "as a rather daring innovation that originally incorporated sections for ground surveillance (battlefield radars and ground sensors), electronic warfare, operations security, imagery intelligence, and interrogation."[78] The CEWI "all-source production section" was an important development, leading to multi-intelligence fusion capabilities in later decades. Its "sole mission was the integration and production of tactical intelligence."[79] Among the electronic warfare initiatives discussed in chapter 5 was the Precision Location Strike System (PLSS), later renamed the Coherent Emitter Location Testbed (CELT). CELT was the first near-real time, automated system to provide precision location of enemy communications emissions.

Electronic warfare was among the six “basic issues” NATO military planners identified in the early 1970s as critical for the modernization of the Alliance’s conventional posture. Others were aircraft shelters to protect against surprise attack; anti-armor weapons; war reserve stocks to provide logistics depth to bolster a potential defense; mobile air defense to protect ground forces in light of Soviet frontal aviation advances; and advanced air-delivered munitions to improve interdiction.[80]

Following the 1973 War, General Abrams ordered intensive studies of all aspects of the conflict. One conclusion resonated with an army considering conflict with the quantitatively and qualitatively superior Soviet Red Army. The Israelis were able to fight outnumbered and win because they possessed superior tactical doctrine and practiced better training. Vietnam had already highlighted flaws in the Army Training Plan (ATP). Following the World War II model, training approaches focused on the concept of growing the small standing army using waves of conscripts taught on the basic skills required to join a line unit. Training occurred as an initial, small part of a longer mobilization period. Company-level training and, depending on the division and mission, higher-level group training supplemented initial mobilization training. Training was uneven. There were no established standards for company and division training.

Revising Army Doctrine

The Training and Doctrine Command (TRADOC) was created on 1 July 1973. Headquartered at Fort Monroe, Virginia, Abrams assigned TRADOC with responsibility for all individual Army training and all Army schools (West Point excluded) were placed under its supervision. TRADOC assumed responsibility for understanding and developing new approaches to warfare, shape force structure, and evolve doctrine.

The organization directed to revamp post-Vietnam training had barely unfurled its command flags when the Yom Kippur War shocked Army leadership with the implications of anti-tank and air defense technologies for war in Europe.

Lt. Gen. William E. DePuy was tapped to be the first TRADOC commander. DePuy's role in setting the stage for an overhaul of Army training and for establishing new possibilities for doctrinal innovation can be likened to wiping the slate clean for new thinking. If significant or major innovations are associated with the creation of innovation streams, meaning the institutionalization of innovation and disruptive thinking, then the work of TRADOC leadership in the 1970s surely amounts to one within the Army.

Earlier, the Army decided to pursue five weapons systems considered key to its long-term force modernization objectives. The so-called "big five" included a new main battle tank, an armored infantry fighting vehicle able to support the tank on the battlefield, an attack helicopter, an assault helicopter able to carry troops, and an air defense system. DePuy was a key figure in the decision before it became his job at TRADOC to figure out how to organize and train with the "big five."

TRADOC's Special Readiness Study Group, headed by Major General Morris J. Brady, visited the battlefields of the Yom Kippur War and gleaned some one-hundred and sixty-two Army-specific issues for consideration. Three overarching conclusions emerged. "First, the battlefield environment was far more lethal than ever before. Second, fighting demanded a highly trained and integrated combat arms team. Third, tactical training could make the difference between success and failure."[81]

Thinking about the future of war was, as the above discussion suggests, influenced by a number of factors. New technology, studies of the Yom Kippur War, the reality of recruitment challenges, expectations that conventional forces could bolster deterrence, and the need to create a new generation of leaders conditioned to think they could fight and win shaped DePuy's views of Army reform. DePuy's success can be attributed to his envious position of being a leader of other impassioned, visionary leaders, all cast from the same common sense mold and driven by the belief that reform was a strategic imperative.

A generation of notable Army leaders gravitated to the challenge of rebuilding Army doctrine from the ground up. Among them was Brig. Gen Paul Gorman, another TRADOC founding father, who radically changed the foundation of Army training. Standards and skill qualification evaluations were overhauled. Gorman supervised the revision of all Army training literature. Reflecting on the lack of realistic training environments, especially in Europe where political concerns severely limited live-fire exercises and large-scale maneuvers, Gorman fought for what became the National Training Center (NTC) in the desert at Fort Irwin, California. (George Patton had once recommended the same area for armor training.) A dedicated space large enough to exercise with modern weapons at realistic ranges also offered the ability for combined air-ground training. Instrumentation to document training in high-tempo scenarios improved the learning process. Lasers and other technological means were eventually adapted to increase the reality of training for the muddy boots soldiers and, equally important, newly commissioned, not-yet-muddied platoon leaders.

Reflecting back on the Army's turn from the rice paddies of Southeast Asia to the plains of Europe in 1973, General Don Starry (Ret.), who succeeded DePuy as the head of TRADOC, remembers that “the Soviets had been very busy while [the Army] was preoccupied with Vietnam” and had “embraced the notion that they could fight and win at the operational level of war with or without nuclear weapons. Their preferred solution: without.”[82] Even if Soviet forces had in fact adapted their thinking on nuclear weapons, NATO’s doctrine of flexible response and U.S. declaratory policy concerning nuclear weapons use assumed that NATO *would* employ tactical nuclear weapons to stop a Soviet conventional assault. Based on command assignments in Europe, Starry did not believe the decision to use tactical nukes could be made in time to prevent Soviet armored forces from racing across the west German plains into NATO territory. Similar sentiments abounded, giving rise to debate among policy makers and students of security over Soviet capabilities and intentions. Bipartisan concern swirled over the reliability of U.S. and NATO warning systems to uncover any signs of impending attack.

TRADOC spearheaded the creation and evolution of a new capstone warfighting doctrine, field manual (FM) 100-5, *Operations*, published in 1976 and revised in 1982 and 1986 (revisions are discussed in chapter 5).

The promise of new technology informed doctrinal innovation. Innovations in conventional doctrine and strategy, thereafter, would combine surveillance, targeting, and guidance systems at greater levels of sophistication and at greater battlefield depths, a trend that persists today. Additionally, the drive toward precision, accuracy, and increased timeliness emerging from 1970s operational challenges would evolve into the “rapid dominance” and “rapid decisive operations” schools of thought in the early 2000s. Doctrine would serve as an aid to integrate new technology and operational concepts.

Among the new concepts was standoff precision strike enabling Army units to identify, track, target, and destroy moving targets before they were in a direct line of fire.

Army R&D efforts included the helicopter-mounted Stand Off Target Acquisition System (SOTAS), an airborne targeting system similar in concept and operations to the Air Force's E-3. The Lance nuclear missile was adapted to the General Support Rocket System, a non-nuclear long-range precision strike system that evolved into the Multiple Rocket Launcher System (MRLS) successfully used in the 1991 Gulf War. Precision strike required precision munitions. Among the initiatives addressing the Soviet conventional forces threat were the Air Force's wide area anti-armor (WAAM) project and the Army's Terminally Guided Sub-Munition (TGSM) designed for rocket systems and artillery.

One of the core tenets of the 1976 manual, which espoused an Active Defense doctrine, and indeed a precept ingrained in Starry's vision for the Army throughout the decade, was the importance of the initiative in battle over virtually all other factors, including sheer numbers. His thoughts on this issue were shaped by detailed studies of some thousand battles involving numerically uneven forces. Some argued that smaller forces fighting outnumbered (with a 6:1 disadvantage) could be successful by seizing and maintained the initiative throughout the battle, something that required advanced technology and new organizational constructs.[83]

Richard Swain explains the underlying argument. Active Defense was premised on "an imperative to see deep to find the following echelon, move fast to concentrate forces, strike quickly before the enemy could break the defense, and finish the fight before the second echelon closed with the defenders."[84] Strict adherence to the principle of "economy of force" was required along with the ability to absorb an attack, channel it, and then launch superior counter-attacks at key moments against weaknesses. For the countless U.S. military theorists rediscovering Clausewitz in the early 1980s, this reflected the Prussian's concept of a "culminating point." It would take years for the underlying logic to be reflected in a coherent deep battle framework in which targeting capabilities, long-range fires, and electronic warfare restored initiative to Army maneuver units.

The 1976 manual was criticized almost immediately upon publication. Early criticism came from Congressional staffer William Lind in an *Armed Forces Journal* article. His systematic critique of the inner workings of Active Defense was damning. Among the important points Lind raised was the doctrine's glaring lack of attention to wining the "second battle," or defeating echelons of Soviet forces after stopping the first one.[85] Others soon joined Lind, resulting in a wide and varied assault. One historian described it as "the most read and most attacked doctrinal statement in the history of written doctrine in the U.S. Army."[86] Criticism addressed the core concepts, overall process, and virtually all aspects of the doctrinal precepts espoused. A constructive, albeit heated debate ensued. Main lines of dissent included the feasibility of advanced technology as a solution, the proper Army division and corps structure for achieving agility, the efficacy of different defensive postures (e.g., forward defense versus a defense in depth), and the optimal mix of armored and light infantry forces. Interlocutors all had the same objective: fixing shortcomings in American military doctrine.

In pushing for new thinking, Lind worked closely with then Air Force Lieutenant Colonel John R. Boyd. Boyd is most remembered for his Observation-Orientation-Decision-Action (OODA) Loop construct, part of a larger theory of conflict that has indirectly profoundly changed how the U.S. military thinks about warfighting. In his book on Boyd's contributions to fighter tactics, airplane design, and warfare theory, Grant Hammond concluded that Boyd "helped set the stage for a complete revision of

U.S. Army doctrine" and "helped the Marine Corps to embrace maneuver warfare.[87] Hammond sums up the views of others in stating that "Boyd's hundreds of 'Patterns of Conflict' briefings around the Pentagon and throughout the U.S. military had prepared the ground for a different approach to war fighting for the American military."[88]

Boyd and Lind, who many claim knew more about the history of warfare than anyone else in the Pentagon, shaped the intellectual core of what Senator Gary Hart, on whose staff Lind served, termed the military reform movement. The reform movement included several thrusts. In addition to doctrine related to Central Europe, the reform movement would influence the evolution of a maneuver-based Marine Corps warfighting doctrine, designs for the F-16 and A-10 aircraft, how new weapon systems were tested and evaluated, and the defense planning and budgeting process. Several members of the movement achieved national status as their fights against outmoded thinking and bureaucratic ineptness received national media attention. From the late 1970s through roughly 1984, the reform movement elevated defense planning, readiness, and doctrinal issues to a front-page debate. Although it did not receive the same level of attention as later issues such as defense planning and budgeting problems, Active Defense was one of their targets.

Developed out of war games designed to explore alternatives for a defense of NATO that Starry participated in as Commandant of the Command and General Staff School – in collaboration with DePuy, Active Defense was poorly understood even among those assigned to teach it. Unclear articulation of precepts left readers questioning how to implement the doctrine, leading to a 1978 manual on implementation and execution. Starry himself found it difficult to teach Active Defense to his staff when he served as Commander of V Corps in Europe from February 1976 through June 1977.

While commanding V Corps, he encountered an institutional malaise that seemed to discourage commanders from pursuing innovations in training and other factors that might bolster preparations for combat. Few subordinate maneuver commanders were familiar with the terrain they were to defend, a deficiency he sought to overcome by leading intensive staff rides across NATO's Central European front. How could commanders seize and gain the initiative when defending NATO Allies if they didn't know the terrain? How could new leaders be educated to successfully operate at the operational level of warfare, where successfully leading corps-level units required a deeper understanding of the principles of warfare and the art of command? Drawing on his tour in Europe, Starry would lead an effort to address these and other questions when he assumed command of TRADOC.

To their credit, senior leaders welcomed debate, perhaps recognizing FM 100-5's flaws or its status as an interim step; however hesitantly, at the very least it encouraged dialogue on the future of the Army. It stands as a transitional document in the evolution of military thought during the late 1970s, one that spawned "some of the richest for professional dialogue in the U.S. Army's history."[89] In 1979, even as Army Chief of Staff Edward C. "Shy" Meyer directed Starry to revise the manual, Meyer noted that the manual wrought "profound and widespread dialogue across the entire spectrum of basic tactical doctrine" and "caused people to think aloud for a change."[90]

DARPA and the Offset Strategy

An often overlooked but crucial event occurred in 1973 at the start of the formative period of the American RMA : Malcolm S. Currie was appointed the Director of Defense for Research and Engineering (DDR&E) and the Defense Advanced Research Project Agency (DARPA) was directed to address the Soviet conventional threat.

Founded as the Advanced Research Projects Agency (ARPA) in 1958 and renamed in 1972, DARPA's work influenced the course of force modernization and military thought in areas as diverse as precision strike, sensor development, battlefield visualization, and automated targeting. In 1974, for example, DARPA sponsored a workshop "specifically aimed to create 'a renaissance in conventional weapons technology and research.'"[91] It led to new approaches for modeling the penetration of materials like armor by high-velocity weapons, leading to improvements in the M-1 tank main gun.

Institute for Defense Analyses (IDA) researcher Richard Van Atta has led or participated in several studies documenting DARPA's Cold War programs and accomplishments. Many of the successful programs evolved roughly parallel to the necessity-based innovation framework discussed in chapter 2. Of chief concern in the next chapter is Assault Breaker, begun in 1978. Some background information is warranted. Organizations exploring alternate approaches to meeting the Soviet threat turned to emerging technologies and organizational initiatives, including doctrine. When the threat environment placed additional impetus on resolving strategic and operational challenges, what this chapter terms reconstituting flexible response to restore deterrence stability, political support for increased defense spending provided resources to fund research and development. An innovation milieu emerged that was conducive to developing potentially disruptive technologies and systems. Projects under DARPA's purview during the Cold War contributed to technologies, weapons systems, sensors, and knowledge management capabilities underscoring U.S. military prominence in the 2000s.

The Agency also played an important role in the evolution of computing technology, including the Internet.

Currie appointed George Heilmeier to head DARPA in 1974, charging him to energize DARPA to "harness emerging technology capabilities to address the challenge of Soviet military" advances and evolve leap-ahead technologies to offset Soviet superiority in Europe.[92] Among the core technology thrusts Heilmeier established, which shaped DARPA's efforts into the mid-1980s, were follow-on-forces attack with stand-off weapons and associated command and control capabilities; programs to bolster U.S. armor against enemy anti-armor weapons; develop U.S. anti-armor weapons; space-based infrared sensors; and stealth technology.

These thrusts aligned DARPA's future work with the nation's pressing strategic and operational challenges, a shift that reflected the Agency's core mission. DARPA's predecessor, ARPA, was, in fact, established in 1958 after the 1957 Soviet launching of the Sputnik satellite "to ensure that the United States would never be left behind in the area of new technology."[93] Through 1960 the focus remained on the "'Presidential Issues'" of space; Ballistic Missile Defense. . .and nuclear test detection."[94] From 1960 through 1965 missile defense and test detection work continued (accounting for some 70 percent of the budget) alongside new focus areas supporting counter-insurgency warfare (reflecting the importance of the conflict in Vietnam) and on computer processing. The decade 1966-1975 witnessed a relative lull in large-scale research activities specifically attuned to key strategic challenges – perhaps another externality of Vietnam.

As the strategic import of conventional research and development returned, and with the reinvigoration of DARPA under new leadership, the agency turned to "'high risk, high potential payoff' work in the mid- and late-1970s, including computer research.[95]

DARPA projects engendered “a fundamental revolution in integrated circuit design” that “had a major impact on computer technology.” [96] In the early 1980s, the Strategic Computing Initiative reflected the emerging recognition of computing and microelectronics as a primary area of national security.

Areas of particular interest to this study are those involving interdiction of forces behind an enemy’s front lines. DARPA’s rejuvenation and redirection reflected a post-Vietnam wellspring in military technology development. History of technology scholar Alex Roland notes that the “Army concluded from Vietnam that it needed not less technology but more. It was not that smart weapons were bad; rather, they were not smart enough.”[97] A vision for future warfare emerged. In 1969, in the aftermath of the Tet Offensive as American support for the dampened, General William C. Westmoreland envisioned a future battlefield where “enemy forces will be located, tracked and targeted almost instantaneously through the use of data links, computer assisted intelligence evaluation, and automated fire control.”[98] In language nearly indistinguishable from persistent surveillance arguments in the early 2000s, Westmoreland envisioned having “24 hour real or near real time surveillance of all types” and a force “built into and around an integrated areas control systems that exploits the advanced technology of communications, sensors, fire direction, and the required automatic data processing.”[99]

Computers, or digital processing power, were the key to achieving the vision. A year later Congressional hearings on the “electronic battlefield” concluded that “the electronic or automated battlefield represented a whole series of technologies and programs that were combining to form a totally new American way of war.”[100] Senator Barry Goldwater opined that battlefield information systems represented “the greatest step forward in warfare since gunpowder.”[101]

Richard Swain notes that as the Army sought to revise its doctrine, training, and force structure after Vietnam, "the new mantra" would be General DePuy's similar 1974 vision for the future: "What can be seen, can be hit. What can be hit can be killed."[102] For current students of defense planning and military thought there is nothing profound in this. Still, U.S. planners seeking conventional solutions to perceived strategic and operational challenges in Europe during the 1970s viewed increasingly tight, and effective, coupling of sensors with strike systems a watershed in military history.

Testifying on the proposed budget, Currie told Congress that some forty percent of the planned Fiscal Year 1977 research and development funds – more than four billion dollars – would be devoted to tactical issues. Investments, he argued, "reflected a transformation occurring in military technology" that would "change concepts and capabilities in command and control, mobility, armor/anti-armor, night fighting, massed firepower and the precision application of force at a distance."[103]

Van Atta and Michael Lippitz argue that a broadly defined approach for leveraging emerging technology emerged by the end of the 1970s. Directed at the R&D community, the approach was a defense strategy to "offset" Soviet numerical superiority in Europe. Jointly devised by Carter's Secretary of Defense Harold Brown and Director of Defense Research & Engineering William Perry, who replaced Currie, the offset strategy consolidated an existing, theretofore diffuse base of support for technology and organizational innovations. Perry recognized that integrating activities begun by Currie and DARPA director George Heilmeier could increase the operational, and strategic, effectiveness of U.S. conventional forces. In his words, doing so provided "qalitative advantages to American forces to offset the quantitative advantage the Soviet forces enjoyed" and later "achieved the status of a 'revolution in military affairs.'"[104] Notably, Perry retained Heilmeier as the Director of DARPA.

Precision strike capabilities were at the heart of the vision for reconstituting flexible response. In his 1978 testimony to the Senate Committee on Armed Services Perry outlined why precision strike advances offered the "'greatest single potential for force multiplication'" to meet the Soviet threat in Europe:

> Precision-guided weapons, I believe, have the potential for revolutionizing warfare. More importantly, if we effectively exploit the lead we have in this field, we can greatly enhance our ability to deter war without having to compete tank for tank, missile for missile, with the Soviet Union. . . .In sum, the objective of our precision guided weapon systems to give us the following capabilities: to be able to see all high value targets on the battlefield at any time; to be able to make a direct hit on any targets we can see; and to be able to destroy any target we can hit.[105]

Perry's testimony illuminates the essential vision of the "offset strategy," a term that in hindsight appears somewhat pedestrian in its straightforwardness because it had none of the unique symbolism or notoriety of other Cold War terms. Substantively, however, the offset strategy spawned a technology investment portfolio yielding unprecedented returns in both military and non-military applications. Such results largely derived from computer and information technology components.

Although not formalized as a defense department program in the same guise as flexible response or massive retaliation, the offset strategy nonetheless shaped modernization decisions in the late 1970s and became the de facto principle underlying the Reagan defense build-up in the early 1980s.

The offset strategy was an early expression of "systems of systems" thinking. The vision? A "synergistic application of improved technologies – electronic countermeasures, command and control (communications, data links, and networks), stealth, embedded computers (microprocessors), and precision guidance (advanced sensors) – would allow the U.S. to overcome Soviet defenses and destroy Soviet tank legions."[106] The result? Information technology made possible the integration of surveillance and reconnaissance capabilities with weapons systems. Existing systems became more effective. This was the pivot on which flexible response would be reconstituted. It is also an early attempt at what complexity theorists would later discuss in terms of an emergent property.

A coalition for change cohered around the strategically focused offset strategy and built on operational visions espoused by Westmoreland, DePuy, Starry, and others. Leadership was a crucial factor. In addition to believing that existing R&D programs could be merged to more effectively address the strategic challenge of raising the nuclear threshold in Europe, Perry also understood that developments in microchips and computer processing were creating new opportunities at an unprecedented pace. Again, the aim was to enable existing systems and capabilities through integration, multiplying their individual combat power. In the 2000s, similar arguments cohered around the term 'horizontal integration.'

After the offset strategy jelled as an overarching vision for U.S. defense planning in the late 1970s, the initial steps to implement it fell to technologists. DARPA played a pivotal role. Working closely with Service counterparts and drawing on the studies like the 1976 Defense Science Board summer study, the research and development community benefited from insights into crucial operational requirements. Intelligence analysts informed the process from the beginning. Indeed, the Deputy Director of DARPA's Tactical Technology Office, Robert Moore, recalled that the office received "increasing amounts of information on the Soviet tank threats in Europe," including “regular intelligence briefings.”[107] Areas of emphasis included standoff precision strike, stealth aircraft, and real-time command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR). By the mid-1980s, a combination of programs and initiatives – increasingly related in concept, doctrine, or operations – cohered, leading to the “implementation of disruptive capabilities.”[108]

Once technology developers understood the overarching strategic challenge and potential solutions – even those years away from prototyping, they collectively attacked the underlying operational requirement to interdict and disrupt second echelon forces. For example, as early as 1975 Leland Strom, an expert on radar in Moore’s office, proposed “the concept of using an MTI (Moving Target Indicator) radar to track a missile to a ground target (e.g., group of tanks), ‘close the loop’ to guide it to the target and use terminally guided submunitions for the endgame.”[109] This was one of the projects Perry and others recognized as feasible for a larger system of systems to offset Soviet numerical superiority.

Another development warrants attention. Integral to the offset strategy were changes in defense acquisition processes. Brown acted to improve “a highly stereotyped system of acquisition that basically was conceived in reaction to our failures” to improve, relative to the Soviets, the U.S. ability “to translate available – and roughly comparable – technology and productive capability into the most effective military posture.”[110] To achieve this, a formal process for developing and coordinating “mission needs” was developed, with a Mission Element Need Statement required in addition to other requirement documents. Over time, as military forces were increasingly integrated with a joint warfare framework, mission needs evolved into mission capability packages.

On the Present Danger and National Security Planning

Several aspects of the national security decision king context warrant attention before leaving the 1970s. No history of this period can overlook the profound shifts in American culture and attitudes that transpired during the decade. In his acclaimed *How We Got Here: The 1970s*, David Frum discuses changes in the attitude of American citizens toward government that effected the context in which leaders in the executive and legislative branches approach defense policy.[111] Early in the decade Americans seemingly lost faith, or at least what had been a blind trust, in the government. No single event or action caused this, despite the importance some assign to Vietnam or Watergate as playing a determining role. Indeed, as Frum argues, "Americans did not lost their faith in institutions because of the Watergate scandal; Watergate because a scandal *because Americans were losing their faith in institutions.*"[112]

Faith was not restored at the end of the decade; criticism of government activities continued. An interesting reversal occurred in underlying opinions of defense spending, foreign policy, and intelligence activities. Whereas the early 1970s brought frustration over the handling of Vietnam and arguments for reduced defense spending in light of detente, the end of the decade brought criticism of defense policy and intelligence for underestimating the threat. Consider defense spending. At mid-decade "18 percent of Americans said the country was spending "too little' on defense; in 1978 the number jumped to 29 percent; "by 1980, an overwhelming 60 percent worried the country was spending 'too little.'"[113]

What accounts for the change in public opinion? Knowledge of international developments, including increased fears of Soviet aggression, account for part of the change. More importantly, perhaps, was an explosion of domestic debate over Carter foreign policy and defense decisions, a debate aggravated by successive crises, a poor economy, and the sense of national malaise mentioned above.

Most pronounced were criticisms of Carter defense and foreign policy. Arguments that U.S. defense spending was too low to preserve readiness mounted. Bipartisan criticism of defense policy reached critical mass in 1977. Internationally, relations would soon sour with the Soviet Union, Iran succumbed to revolution, American hostages were held in Tehran, Allies would balk at some defense planning decisions that seemed to weaken U.S. credibility in the defense of Europe, and perceptions of stability in the Persian Gulf declined after the Soviets invaded Afghanistan. "The answer," Gaddis found, "in terms both of international events and of what was necessary for him to retain domestic political support, was to subordinate all other foreign-policy considerations to the rebuilding of military power."[114] Important outcomes for this study included a reversal in the defense planning and the "Carter doctrine," a commitment to defend American interests in the Middle East. Both of these policy shifts were reinforced in the 1980s.

On foreign policy, voters had considered Carter's relative inexperience in foreign affairs an asset. Perhaps he would be less likely to entangle the U.S. in protracted conflicts – a concern at mid-decade. Carter did enter office believing his administration could lessen the role military strength played in international affairs and, as Gaddis Smith concludes, "Carter and some of his advisers were readier than any of their predecessors to stare directly at the reality of nuclear weapons" and struggle with "the problems of the nuclear age."[115] Through 1977 and 1978, it seemed the approach might yield progress on several fronts.

But trouble was brewing domestically and internationally. 1979 was a pivotal year. In September a large Soviet military presence (some 3,000 troops) was discovered in Cuba; a revolution in Iran led to the 4 November occupation of the American embassy in Tehran and seizure of fifty-three American hostages; Soviet expansionism in Africa continued; Soviet naval forces were more assertive globally; and in December Moscow sent troops into Afghanistan. Closer to home, the self-proclaimed Marxist Maurice Bishop seized power in Grenada and a revolution occurred in Nicaragua, both setting in motion events that would spur U.S. military action in the 1980s.

In this context, domestic political forces originating earlier in the decade gained momentum, tapping changes in public opinion to mobilize support. The Coalition for a Democratic Majority (CDM), a group formed in 1972 by conservative Washington senator Henry "Scoop" Jackson, lobbied more aggressively for "peace through strength" and a return to aggressive containment of Soviet expansionism. Members included Senators Daniel Patrick Moynihan, Sam Nunn, and Charles Robb and representative Les Aspin. Academics included Seymour Martin Lipset, Eugene Rostow, Roy Godson, Samuel Huntington, and Richard Pipes. CDM members later formed the core of the "Reagan democrats" supporting increased defense spending in the 1980s.

Aligned with CDM in the cause of promoting increased defense spending were a Washington, DC think tank, the American Enterprise Institute, and the Committee on the Present Danger (CPD). The latter, among the most influential public advocacy groups of the Cold War, borrowed its name from a similar group formed in the 1950s to lobby the Truman administration for increased defense spending. Initiated during a 1976 lunch attended by Nitze, the author of NSC-68, a press conference formally announced CPD's existence just two days after Carter's January 1977 inauguration. Among its members was Ronald Reagan, who brought more than thirty CPD associates into his administration.

Intellectually, calls for increased U.S. defense spending and for intelligence reform were tightly coupled to arguments for conventional forces to reinforce deterrence stability in Europe. As détente crumbled, European stability returned as a central point of discussion in domestic politics. Again, perceived inconsistencies in Carter policy fueled criticism.

Apparent contradictions in Carter's foreign policy positions confused both Soviet leaders and more hawkish critics. A pro-disarmament stance combined with pressuring NATO Allies to increase their forces. He canceled the B-1 bomber, but initially pursued an advanced radiation (neutron) bomb – later cancelled, then approved cruise missiles, and accuracy and yield improvements for the Minuteman III missile. The Carter Doctrine and a rapid deployment force seemed out of balance with arguments for nonintervention in the third world. Interest in Moscow's involvement in Middle East peace talks were followed by exclusion from the Camp Davis accord. Of course, Soviet leaders were hardly amenable to achieving the full potential détente, preferring to accept cooperation on select issues relating to Central European stability that reinforced the status quo in Eastern Europe while seeking relative advantage elsewhere. Attention to third world issues opened anew paths for East-West conflict. By the end of the decade, an expansionist foreign policy led to increased Soviet involvement in Angola, Ethiopia, Southeast Asia, Afghanistan, and the Persian Gulf. Soviet military capabilities in Europe steadily increased, leading to renewed discussions of NATO's deterrence credibility and, domestically, a perception problem that undermined Carter's re-election campaign.

Critics also charged Carter with fumbling intelligence reporting on the Soviet threat.

During the formative period of the American RMA, students of national security affairs and military history received historically unprecedented insights into past wartime and combat intelligence successes. For example, most of the public remained ignorant of the role of intelligence during World War II before the 1974 publication of F. W. Winterbotham's *The Ultra Secret.* Ultra was the code name given to intercepted and decrypted communications that had been encoded on an ENIGMA cipher machine, the design for which the British received from Polish operatives before the war. An official ban on referencing Ultra was lifted in 1974, allowing Winterbotham to divulge previously classified information about British cryptography and the breaking of German high command codes. From early in the war, the British had access to a large fraction of the radio communications between Hitler to his senior commanders and from senior leaders to their subordinates. High command communications "reached British intelligence almost at the same time the messages arrives at their intended destination."[116] Fascination with such revelations created a public interest, even appetite, for insights into U.S. intelligence. Meanwhile, public discussions – really criticism – of U.S. intelligence estimates on Soviet military capabilities and the role of the CIA in Vietnam increased awareness of the role of intelligence in foreign policy making.

In the post-Vietnam political climate public criticism of the CIA was widespread, providing a ready-made platform notables and intellectuals found useful to leverage. In the mid-1970s, moreover, congressional hearings on CIA covert operations opened the agency to further scrutiny while lowering its credibility in the eyes of many. Leadership changes did not help – four different CIA directors served from 1973 through 1976, when George H. Bush assumed the reigns and approved what was known as the Team B exercise.

The activity was led by CDM Soviet Scholar Richard Pipes, administered out of CDM offices, and reinforced the formation of the CPD. Few Cold War intelligence activities have received as much attention as this 1976 experiment to produce competitive analysis on the Soviet threat. It consisted of three teams of non-government Soviet experts given access to classified information for the sole purpose of providing an alternate, or competitive, assessment of the same material government analysts used to produce national intelligence estimates, the capstone intelligence assessments produced by the U.S. intelligence community. Teams studied, respectively, Warsaw Pact low-altitude air defenses, the accuracy of Soviet intercontinental ballistic missiles, and Moscow's strategic policies and objectives. Pipes chaired the third team, which received national attention. Press leaks on Team B activities began days after the first meeting.

The origins and unfolding of the Team B experiment reflected the national climate. Apparently, its conceptual origins derived from archetypal Cold War strategist, and University of Chicago Professor Albert Wohlstetter's 1974 criticism of CIA national intelligence estimates. He claimed Soviet capabilities were underestimated. Keegan posited in 1977 "that "the shocking fact about our intelligence community, with its thousands of able, competent, and dedicated people is, that for 25 years, it has consistently underestimated" the threat.[117] After Reagan's election, many of the Team B members, to turn a metaphor, became the A team in the new administration.

Wohlstetter was also an early advocate for advanced conventional forces, arguing in a 1974 issue of the international affairs journal *Orbis* that increased accuracies made it "possible to use non-nuclear munitions in many circumstances where a desperate hope had formerly been pinned on using small nuclear weapons."[118] Noteworthy for this story of the American RMA is the conjoining of criticism of Carter defense and foreign policy, revelations that Soviet force strength had been underestimated, public discussions of U.S. defense reform, and continued political antipathy to sole reliance on nuclear weapons. Among the issues reformers addressed were doctrinal and technological options to offset Soviet forces. Advanced conventional weapons and new doctrine emerged as a likely, and less expensive, alternative.

Pro-defense groups and other domestic influences on the Carter administration surely helped shape the foreign policy and defense planning reversals that defined his last year in office. Military spending was roughly twice the level it was when he assumed office. Yet, Carter's policies were not necessarily wrong as they were inflexible in the face of changing U.S. public opinion. By the end of the decade, certainly as the hostage crisis chaffed the American psyche, and after defense policy debates highlighted threats to U.S. security, public opinion swung back in favor of higher defense spending.

As the above discussion suggests, foreign policy and defense issues dominated the 1980 presidential election. Debate over the severity of the Soviet-U.S. military balance continued after the election. Both the domestic political situation and worse case analysis of the balance of power warranted action. "By this time," one analyst concludes, "Soviet factories were busy spitting out an average of five fighter planes, eight tanks, eight artillery pieces, and at least one ICBM every day."[119] Concurrent with the steady stream of equipment flowing into the western-most Red Army units, equipment continued to flow to the third world where it threatened U.S. allies, security partners, and general stability.

It was not just the numbers raising concerns. Strategic relations seemed less certain, less stable. "If one were to sum up developments in the Soviet army during 1977 and 1978 in one word," noted Soviet scholar Christopher Donnelly concluded, "it would be sophistication."[120] Writing in *Aviation Week and Space Technology*, retired Major General George Keegan, Jr., former chief of Air Force intelligence, asserted that the U.S. "lacks the firepower, lacks the accuracy, and lacks the yields to overcome the enormous advantage in terms of neutralizing our retaliatory punch which the Soviets have engineered for themselves at great cost."[121]

Another element of the domestic political environment concerned the likelihood that a crisis would lead to uncontrolled escalation. With U.S. cruise missiles and Pershing II missiles deployed in Europe, some European leaders compared the strained East-West relationship and reciprocal military buildups to the pre-World War I environment. Misinterpretation could easily spark war, something that added a sense of impending crisis to an already heated domestic policy debate.

A New Context for Defense Planning

Several notable national security documents signed during the last years of the Carter administration warrant mentioning – they reflect changes in the overall context of national security planning.

November 1979 brought the first national-level security planning document on command, control, communications, and intelligence (C3I). It promulgated national objectives for C3I, including a national telecommunications capability to preserve command of nuclear forces, a decision that supported some projects that supported research and development on antecedents to the internet. A new continuity in government operations directive followed a year later. March 1980 brought updated national guidance on mobilization, something that had not been done for nearly twenty years. That July, Carter signed Presidential Directive (PD) 59, shifting U.S. nuclear employment policy to strategic military targets and mandating that the U.S. be able to fight a protracted nuclear war. Adhering to PD 59 required further C3I advances, more flexible targeting, and new nuclear weapons

Carter also reprogrammed defense dollars to improve European readiness. European manpower levels rose from some 300,000 troops in 1975 to 330,000 at the end of the decade. This renewed commitment to U.S. capabilities in Europe was reinforced by the Reagan administration. In addition to increasing defense spending, in 1980 Carter authorized providing Afghani mujahidin with arms (including artillery), boycotted the Moscow Olympics, imposed a grain embargo, and announced the Carter Doctrine (discussed below). It is also important recognize that decisions about defense research and military innovation made during the formative years of the American RMA, during the Carter years, established the momentum and direction needed to make the Reagan years the maturation phase of the RMA.

Intelligence, surveillance, and reconnaissance received increased attention among national security scholars in the 1970s, in part due to public debate about the validity of U.S. intelligence estimates, Congressional committees and investigations into intelligence operations, and after Ultra was revealed. Revelations about Soviet nuclear and conventional capabilities coupled with perceptions of renewed Soviet aggression in the third world to increase attention to the issue of surprise attack. Defense planners called for improved national and theater strategic warning. Concern mounted over Soviet activities in the third world.

Conventional wisdom held that any crisis outside of Europe would quickly escalate, leading to a global conflict. During the 1980s, subsequently, capabilities designed to monitor Soviet forces in Central Europe and detect signs of increased Soviet readiness were focused on regional security issues. Persian Gulf stability was particularly important, leading to force structure changes, new themes in defense planning, and revised doctrine.

Concerns about Soviet power in the Gulf steadily increased after the British withdrew their military presence in the late 1960s and early 1970s. Carter national security adviser Zibigniew Brzezinski coined the term "arc of crisis" in 1977 to describe the area from Africa to Southeast Asia. The region contained some seventy-five percent of the world's known oil reserves and supplied a quarter of U.S. oil imports. Equally important from the perspective of global economic stability, which became a significant U.S. national security issue in the 1970s, Western Europe imported roughly seventy percent of its oil from the Persian Gulf region. Japan was totally dependant. By 1980, U.S. trade with the Pacific basin surpassed Europe, making the stability of Asian economies – heavily dependant on Persian Gulf oil – a security concern.

One of Carter's last significant foreign policy initiatives committed the U.S. to defending the region. The Soviet's 1979 invasion of Afghanistan was not part of a Soviet plan to dominate the Gulf, and the terrain did not realistically support a drive into Iran. Still, for U.S. defense analysts the cognitive image of potential Soviet dominance of the region engendered concern that Afghanistan was a prelude to something more ominous.

The situation in Iran contributed to fears of Persian Gulf instability. Ending a thirty-five year U.S.-Iranian relationship, the 1979 Iranian revolution meant the loss a critical U.S. intelligence facility that monitored, among other things, Soviet missile tests as part of the American effort to monitor and verify SALT. Soon thereafter, the aircraft carrier USS *Dwight D. Eisenhower* would steam for 251 days into, around, and back from the region, the Navy's longest deployment since World War II.

With some 100,000 troops in Afghanistan and the potential for Iran to align with Moscow, keeping the Persian Gulf from out of the Soviet orbit became a priority. The U.S. also began aiding Saddam Hussein who, in leading Iraq into war with Iran, became an important ally in the struggle to prevent further Soviet inroads into the region.

Fears of Soviet expansionism into the Persian Gulf – by direct invasion, being welcomed by a regional client state, or through revolutionary proxies – seemed to leave the U.S. no recourse but developing the capability for timely and decisive military intervention. The Carter Doctrine was in fact an attempt to signal U.S. willingness to intervene; it was containment applied outside of the European theater. Carter directed the Defense Department to form a military force capable of responding to crises outside of Europe and the Korean Peninsula, until then the only other region military planners scrutinized for force modernization requirements. The Rapid Deployment Force (RDF) was established in late 1979, the year that Saddam Hussein seized power, and renamed the Rapid Deployment Joint Task Force (RDJTF) in March 1980.

Subordinated to the U.S. Readiness Command and headquartered in a converted bunker at MacDill Air Base in Tamp, Florida, the RDJTF was chartered to prepare plans, engage in joint training activities, conduct exercises, and ready for deployments in areas were U.S. interests were threatened. Within a year of its creation, the RDJTF would complete some ten training exercises.

Other developments raised the specter of Soviet mischief in the Gulf. Moscow's ties to the People's Democratic Republic of Yemen evoked the threat of plans to coerce Gulf monarchies, including Saudi Arabia and Oman. Concerns were fueled by a wave of coups, murder plots, and border skirmishes between North and South Yemen in 1978 and 1979. South Yemen formally signed a Treaty of Friendship and Cooperation with the

Soviet Union in October 1979. These fears were later reinforced by Soviet overtures to Iraq. Iran also remained a concern. The 1979 Iranian revolution removed one of the two pillars in the U.S. strategy for the region, which had rested on security arrangements with Iran and Saudi Arabia. Although Moscow was as surprised as Washington by the revolution, and although the Ayatollah Khomeini marginalized and then crushed pro-Soviet parties, fears of Soviet regional penetration aggravated the sense of American impotence in the Persian Gulf. Arguments in favor of a military capability to respond to Soviet aggression in the Persian Gulf region continued into the 1980s.

The Carter Doctrine, the name given to the policy of policing the Persian Gulf, signaled a reversal in the principle underlying the Nixon Doctrine of placing the burden of conventional defense on the nation attacked. A number of conceptual, technological, and doctrinal threads in post-Cold War American defense planning co-evolved with U.S. planning for conflict in the Persian Gulf and its bordering states. More importantly, perhaps, the Gulf War provided a sense of emancipation from lingering post-Vietnam doubts and instilled confidence in American visions for a post-Cold War era.

Among other factors, the Carter Doctrine and formation of the RDF increased the need for operational, organizational, and technological solutions to spatial and temporal challenges of global nonnuclear strategic conflict. It remains another key event marking the transition from the formative period of the American RMA to the maturation period. Whereas the Nixon Doctrine reinforced the longevity of containment as a policy, the Carter Doctrine removed uncertainty about American willingness to commit military power. Reacting to the potential forced installation of a Marxist or even pro-Soviet government in the Persian Gulf, the Carter Doctrine signaled U.S. commitment to use military force to contain Soviet expansionism outside of Europe. In this sense, the Carter

Doctrine opposed the 1968 Brezhnev Doctrine. Announced in the aftermath of the Soviet invasion of Czechoslovakia, it signaled Moscow's commitment to using its military power to keep Marxist or pro-Marxist governments in power.

The Carter Doctrine and the RDF added important new dimensions to defense planning activities as the formative period of the American RMA ended. More importantly, increased attention to Persian Gulf security focused defense planning on understanding the requirements for moving military forces into the region and sustaining combat power. Because this required deploying troops from Europe, Allies decided in May 1980 to accept the idea of U.S. forces protecting NATO redeploying to the Middle East. Of note to students of U.S. Middle East policy, this was the first NATO agreement to support what post-Cold War NATO planners term "out of area operations."

Additionally, in 1979, Brzezinski suggested that the RDF would be used preemptively "in those parts of the world where our vital interests might be engaged and were there are no permanently stationed American forces.'"[122] "It is not necessary," Secretary of Defense Harold Brown similarly stated, for us to await the firing of the first shot or the prior arrival of hostile forces."[123] Although it would be more than a decade before the RDF was able to deploy significant combat power "rapidly" to regions other than Europe, the concept of rapid deployments was an early manifestation of what current military thinkers term rapid decisive action, a concept that reinforces the image of preemptive strikes. Important here is the RDF's existence as an extension of U.S. grand strategy into strategicallyimportant regions to counter Soviet influence. The commander of the RDF, for example, warned in 1984 against viewing the unit as an "intervention force," stating at a conference that the RDF's "job is deterrence."[124]

Chapter Conclusion

The years spanning from 1973 through the submission of the fiscal year 1981 defense budget were the formative period of the American RMA. Trends and processes cohered into a national defense strategy closely connected to a technology strategy – both primarily focused on the Soviet threat to NATO and secondarily to the Persian Gulf. International terrorism became a third area of focus. Presidential candidate Ronald Reagan exploited perceived shortcomings of Carter's policies in each of these security arenas.

Strategic, technological, political, economic, and other contextual factors evolved in a way that created an innovation milieu the Reagan administration would mature into capabilities altering the strategic effectiveness of conventional forces. Innovations undertaken to improve nuclear targeting and delivery were adapted to conventional missions and, in time, further evolved into new areas of innovation.

The end of the 1970s marked the transition from post-Vietnam malaise to national resurgence. It was certainly a political turning point in terms of the electoral mood in the United States. Into this environment walked presidential candidate Ronald Reagan, whose mannerisms and rhetoric resonated with a nation that wanted the national Christmas tree to shine again – Carter had kept it dark during the Iranian hostage crisis. Known to history as the "great communicator," Reagan fully exploited new communications technology. A staunch anti-communist who campaigned on a platform promising to restore American power overseas, Reagan's vision included reducing the threat of nuclear war and ending Moscow's occupation of Eastern Europe. A number of policy initiatives emerged to blunt or roll back Soviet power on different dimensions (military, economic, political).

During the 1970s, as the threat from Soviet nuclear and conventional forces increased, attention retuned to flexible response, which remained NATO's declared strategy, and on the credibility of NATO's nuclear deterrent. As the decade unfolded, national security planners pursued alternate paths for stabilizing deterrence. Among them were arms control agreements, regional security cooperation forums, new tactical nuclear systems, surveillance and warning systems, improving war reserves and pre-positioning programs, and developing advanced conventional capabilities. There was also greater realization in Washington that national security was tied to global economic affairs. Thinking about the linkages between economic security and military force, especially the role of presence, matured. Post-Vietnam antipathies to funding modernization also waned. Further elevating the attractiveness of conventional defense and retaliation options was sustained criticism of the logic of relying on nuclear weapons. Finally, developments in technology led many to envision the production of advanced conventional capabilities, whereas only a decade earlier such capabilities were well beyond the realm of the possible.

Undersecretary of Defense for Research and Engineering from 1977-1981 William Perry was a chief architect of the strategy to use emerging technology to offset Soviet military advantages in Europe. Reflecting in the aftermath of the 1991 Gulf War on what was presented here as the formative years of the American RMA, Perry concluded that during "the 1970s U.S. defense officials saw the opportunity to exploit the new developments in microelectronics and computers to great advantage in military applications. The Defense Department conceived, developed, tested, produced and deployed the systems embodying the new technologies" and " "developed the tactics for using the new systems, and conducted extensive training with them, mostly under simulated field conditions."[125]

As East-West relations soured and arms control negotiations stalled, the objective of restoring deterrence stability fixated on conventional deterrence. The formative phase of the American conventional warfighting RMA included a more complex and diversified approach to deterrence theorizing and military operations. Complexity reached new levels in the 1970s when war planning, doctrine, and modernization decisions were increasingly attuned to notions of an integrated battlefield on which any number of conventional and nuclear operations might occur. Historically, the offset strategy embodied the first theater and operational level U.S. innovation program to codify and pursue an information edge by linking systems within end-to-end information and decision-making architecture.

Intelligence support to military operations evolved beyond mere support to strategic nuclear operations. National intelligence systems previously attuned to strategic nuclear issues now addressed conventional force developments. Strategic nuclear targeting support similarly migrated to aid conventional targeting. Planning for theater nuclear strikes was supplemented by the need for theater conventional ones. Strategic warfare was slowly defined in nonnuclear terms while maintaining the emphasis on time dominance and operations over greater distances. Command, control, communications, intelligence, reconnaissance, and surveillance technologies developed for nuclear warfare were adapted to the theater conventional mission. The successful diffusion of technology into organizations became more central to military planning.

Key weapon systems were beginning to be thought of a "system of systems" – a central concept in current military thought – for blunting or outright defeating conventional Warsaw Pact attacks. It is for this reason that retired Admiral Bill Owens and founding proponent of systems of systems thinking locates the origins of the American RMA in the late 1970s. Owens even suggests a year, 1977, when "key Pentagon officials . . . began to think in concert about the application of technology to military affairs."[126] Thinking about modernization changed in a fundamental way. In previous eras technological modernization primarily focused on the capabilities of platforms. Beginning in the mid-1970s, the emphasis began to shift to integrating platforms.

Retired Lieutenant General (LTG) James C. King agrees that the late 1970s was an era of innovation, leading to significant capability increases in the 1980s. King was successively the Director of Intelligence for the European Command and then the Joint Staff, retiring in 2001 after serving for three years as the Director of the National Imagery and Mapping Agency. He participated in the Army's post-Vietnam renewal after serving combat tours in Southeast Asia.

By 1980, he argues, the mindset among commanders had changed. LTG King recalls being the operations officer for an intelligence battalion in the Army's 7th Corps deployed with the 3rd infantry division for a massive Return of Forces to Germany (Reforger) exercise in 1977. Operational necessity encouraged innovation throughout the Army as commanders struggled to offset the Soviet's numerical and perceived qualitative advantages in armor, helicopters, and artillery. King remembers the strategic situation – having to delay Soviet conventional forces for three weeks – as a prime motivator of innovation initiatives.[127] Leaders were highly receptive to technological and organizational innovation. If someone had an idea or technology, the Army would try it.

Integrating new technology into operations slowly emerged as a leadership characteristic. The demonstration of technology in realistic training exercises was pursued aggressively, with senior leaders willing to insert new systems into operational units during exercises to assess their operational utility. Soldiers began to understand the value of integrating new technologies and using information systems to link existing capabilities. Rapid prototyping was encouraged. Technology requirements were gathered and passed to organizations and technology testbeds, who then acted as executive agents for operational units in the development, testing, and fielding of new capabilities.

Systems engineering and integration slowly emerged as an important component of military innovation at the theater level, just as they had at the strategic level with nuclear command and control decades earlier.

An important system of systems legacy of the 1970s evolved from attempts to link modified ground-based radars and several airborne sensors to increase the situation awareness provided by the Joint Tactical Information Distribution System (JTIDS). These and other early joint information integration and fusion projects evolved into the common operating picture (COP) and geospatial awareness capabilities central to defense transformation in the 2000s. Another benchmark supporting the characterization of this period as the formative stage in the American RMA was the 1977 flight of the Lockheed "Skunk Works" stealth technology demonstrator HAVE BLUE, leading to a contract for the F-117 Nighthawk.[128]

Characterizing shifts in defense planning at the end of the decade was a notable change in emphasis on the types of technologies suitable for returning American superiority. Writing on the East-West military balance in a 1978 *Foreign Affairs* article, Richard G. Head argued that the "combination of what may be increasing innovation with the continuity, steady quality growth, and high production rates of new and improved military systems indicates a technological trend in the balance of deployed military capability that is adverse for the United States."[129] What was different? Arguments now called for conventional capabilities. Alain Enthoven captured its essence in terms of the pressing strategic challenge of the time. "Our safety requires that if we really mean to maintain our nuclear guarantee as Europe's last line of defense, we must have strong conventional forces a first line of defense."[130] Senator Nunn echoed his views: "As long as the United States maintained a pronounced nuclear superiority over the Soviet Union at both the strategic and tactical levels, we could effectively deter conventional aggression. That superiority, however, has vanished, and with it the notion that NATO need not muster a credible conventional deterrent."[131]

Chapter 4 Notes

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5. The Maturation Period: New Measures of Strategic Effectiveness

By 1980, the U.S. Army was undergoing revitalization in terms of force modernization, increased professionalism, and organizational focus on the primary strategic threat to U.S. security, Soviet forces in Central Europe. Changes in how the U.S. pursued its grand strategy vis-à-vis the Soviet Union contributed to post-Vietnam renewal for all the Services as the Reagan administration increased defense spending. Although strategic affairs and programs such as the Strategic Missile Defense Initiative (dubbed Star Wars by a skeptical press) continued to dominate defense policy, the early 1980s brought a more diverse discussion of strategic effectiveness that expanded well beyond the highly abstract discussions of nuclear deterrence. After forty years of defense planning treating the notion of "*strategic warfare*" as being "synonymous with *nuclear warfare*," two decades after Kennedy embraced flexible response, one decade after the U.S. left Vietnam, defense analyst Carl Builder noted in 1983 "a perceptible shifting of favor away from nuclear weapons, toward advanced conventional weaponry."[1]

Emerging areas for security policy scholars in the early 1980s included conventional deterrence theories and cases studies that attempted to define conditions in which nonnuclear forces deterred attack. Quantitative force correlation analyses modeled the different mixes of armor, infantry, aviation, and other forces to derive their strategic implications on deterrence relationships, readiness, and other factors. These and other areas of studies were partly motivated by arguments that, over "the next decade or two," emerging conventional warfighting capabilities – "nonnuclear weaponry" – could "and should be used in some of the major military roles" then "served by strategic nuclear forces."[2] In 1984, Marshal Nikolai V. Orgarkov posited that reconnaissance-strike complexes along the lines of Assault Breaker could yield the effectiveness of tactical nuclear weapons.

Foreshadowing one of the largely unspoken but nonetheless fundamental tenets of the post-Cold War RMA thesis, and notwithstanding the fact that nuclear strategy and strategic nuclear systems remained critical to national security strategy, conventional forces emerged from the shadow of nuclear theory to become a central factor in defense policy. This reflected the change in the mobilization of resources to achieve grand strategy, which Barry Posen defines in *The Sources of Military Doctrine* as "a political-military, means-ends chain, a state's theory about how it can best 'cause' security for itself."[3]

A corresponding renaissance in military thought transpired, with military theorists and doctrine writers rediscovering maneuver warfare theory and combined operations. Ground warfare was the focal point of most new thinking about warfare. It, more than other domains of combat, required cooperation among sea, air, land, and space forces. Strategic planning themes like rapid dominance, focused logistics, information superiority, and joint warfare gained prominence. Doctrine was back in the hands of the warfighters. New training regimes and staff planning processes helped prepared commanders for the transition to war. Light forces became more important strategically as planners contemplated the need to fight wars in several theaters simultaneously.

The Army established a High Technology Test Bed (HTTB) in June 1980 to work closely with the 9th Infantry Division, which would lead efforts to design, experiment with, and field new technology as well as attempt to develop new operational concepts. The HTTB developed concepts for light, agile, rapidly deployable units for regional crises. Light infantry divisions were pursued in the early 1980s as planners responded to requirements for flexible forces. Obtaining and sustaining the proper equipment called for in emerging concepts for light, agile forces was not viable given existing force modernization priorities.[4]

Civilian leadership mandated improvements in conventional early warning, increased readiness of European ground and air units, deep strike conventional forces, and more rapidly deployable forces able to check Soviet (or Soviet-backed) aggression outside of Europe. Security challenges that were relatively "new" in the 1980s reinforced the quest to prevent surprise, to develop technological, organizational, and operational offsets to Soviet forces, to respond to instability or conflict in regions without U.S. bases, and to expedite U.S. responses to such crises with appropriate capabilities. In Persian Gulf planning scenarios, projected munitions expenditure rates and the potential effect of precision weapons on the flat desert accentuated the need for timeliness and the ability to strike first at longer ranges with greater accuracy. Securing oil fields and other geo-strategic planning drivers levied a new requirement for light, agile, deployable forces with greater lethality but less mass. The physical and psychological challenges posed by time and distance rallied planners and force developers; the challenge of compressing time and overcoming distance motivated research and development activities as much as the more tangible threat of Soviet armor. Timeliness, deep strike, and precision, therefore, emerged as operational requirements for peripheral areas just as they had in the European theater.

Associated with renewed attention to conventional force readiness was an under-appreciated but powerful cognitive shift: planners expanded their thinking from merely deterring war to actually preparing to fight one.

During the early 1980s, furthermore, Army planners rewrote doctrine to reflect the more assertive and self-confident tone in U.S. grand strategy. Led by the new Training and Doctrine Command, initiative and maneuver became central in Army warfighting doctrine. Increased professionalism and resurgent esprit de corps were evident.

Army leaders also embraced innovation in the late 1970s. Because it seemed unlikely that NATO would make a nuclear release decision quickly, and because Soviet planning aimed to flood NATO's front with breakthrough-oriented armored attacks, Army units on the front line faced quick death or capture given existing weapons, tactics, and doctrine. Preparing to actually fight – and perhaps win – a conventional conflict impelled new thinking about deep strike. Planners reconsidered maneuver and interdiction. Research and development pursuant to the offset strategy encouraged the aligning of new capabilities to conventional missions. Early applications for distributed information technology included sophisticated, collaborative, realistic, and unparalleled training and simulation initiatives. New thinking emerged about the role of conventional forces in theater and strategic-level planning. An explosion in conventional deterrence literature is perhaps the most fundamental artifact of this thinking.

An overhaul of Army training significantly improved battlefield performance. The National Training Center (NTC) at Fort Irwin, California was conceived to provide a level of realism dearly needed to prepare for the defense of Europe. It remains the world's most sophisticated armored warfare battle laboratory for experimenting with new concepts and weapons and for training unit commanders to think creatively. NTC provided a testing ground for the "big five" conceived in the 1970s as the core weapons systems of the revitalized Army. New systems included the M1 Abrams main battle tank, M2 Bradley armored infantry fighting vehicle, AH-64 Apache combat helicopter, UH-60 Blackhawk utility helicopter, and the Patriot air defense missile system.

A traditional focus on weapons platforms, including airframes and missiles, began to give way to software and sophisticated electronics on them. Systems engineering and integration capabilities evolved as key industry skills for winning the position of a "prime" contractor for new weapons systems. Former Undersecretary of Defense for Acquisition, Technology, and Logistics Jacques Gansler recalls that the 1980s brought increased "prime" awards to companies like IBM. Traditional "platform" developers like Boeing won prime contracts for new weapons systems based on their systems integration skills and ability to oversee software development activities.[5] Over time, avionics defined the capability as much as the platform itself, a reality that prolonged the service of airframes as they were refitted with more advanced electronics. For ground systems, what mattered was less the vehicle than the fire control system and organic sensors. Although acquisition program management continued to focus on platforms and specific systems until well into the 1990s, by the early 1980s a key focus of management shifted to the integration of more sophisticated platform sub-components and the integration of the weapons system into the force.

By the mid-1980s, operational capabilities were being viewed as packages or bundles of organizational and technological capabilities to be integrated across time and through space to achieve effects. Complex defense programs like the Polaris missile submarine and AWACS succeeded or failed based on the relationship between requirements generation, concepts of operation, information architectures, and systems integration processes. Evolving thoughts on information as an enabler of success were key. The practice of systems integration and its corollary system engineering, both involved with the coordination and co-evolution of thousands of components and sub-systems into a single enterprise, became a core competency of military innovation.

During the 1980s, LTG King argues, that airborne reconnaissance and surveillance began its decades-long ascent as a primary enabler of operational success. This is an area in which organizational impediments to change delayed the integration of a potentially beneficial capability, unmanned aerial vehicles (UAV). Israeli UAVs were used to great effect in the 1982 Bekka Valley operation in southern Lebanon. Defense Secretary Casper Weinberger, learning about their abilities, directed immediate UAV research. DARPA had been doing UAV research for years, but found Services reluctant to support their integration into operations. UAVs were used in the 1991 Gulf War, but it would take another decade, and successful combat use in Afghanistan and Iraq, before the Services pursued UAVs as an integral part of their strategic transformation plans. Noteworthy for his study is the fact that doing so involved resurrecting operational concepts, technology, and even UAV designs developed in the 1980s.

Other developments in the 1980s set the stage for advances in intelligence support to military operations and the emergence of ISR capabilities trumpeted as “RMA-like” in the early 1990s. Enriching the information available for targeting, moreover, yielded a decrease in target location error and an increase in geolocation accuracies for navigation. Better information for precision strike led to more effective weapons – even after missile components had reached design limits – because of decreased target location error, improved guidance systems, and more precise navigation.

Intelligence evolved from a combat support activity to the primary enabler of operations. Improving intelligence capabilities, of course, was a central focus of technological and operational innovation. A 1974 Army Intelligence Organization and

Stationing Study documented many of the problems plaguing intelligence in the early 1970s. An "indictment of the system that prevailed at the time," the study "found that military intelligence units were not properly organized to support the tactical mission, and, indeed, were in most cases beyond the control of tactical commanders because of their strategic responsibilities."[6] Comparing his Vietnam experience to his tour as Chief of Air Force Intelligence during Desert Storm, Clapper believes the U.S. had progressed "light years" since Vietnam. In fact, he recalls a sense of surprise, even awe, among some operators regarding the sophistication of intelligence support. Quite simply, posits Clapper, automation, digital communications and intelligence exploitation, and computer-aided command and control available in the 1980s created opportunities for doctrinal change and operational innovation that were impossible just a decade earlier.

The maturation period of the American RMA was, arguably, the beginning of a process in which the intelligence discipline evolved from an often-marginalized staff or combat support function to a co-equal source of military effectiveness. National intelligence agencies found themselves supporting military planning and operations in new issue-areas. Soviet conventional readiness and near-real time monitoring of Soviet troop activities ascended on the national strategic intelligence priority list. As the 1980s progressed, the intelligence community increased its exploitation of national intelligence capabilities to provide battlefield situational awareness. Airborne capabilities improved dramatically. A combined enterprise of all weather, day-night sensors became combat multipliers as much as they were strategic warning tools. The U.S. subsequently perfected capabilities to identify, target, and strike fixed targets and forces whose movements (and probable courses of action) could be anticipated. In the case of the latter, strikes were not necessarily targeting the moving forces as much as known, fixed points along their path. Post-Cold War military challenges have increased the fundamental time- and space-dominance problem in terms of hitting small, fleeting targets or learning about and destroying underground facilitates.

Chapter Overview

This chapter discusses the maturation period of the American RMA, which began in 1980 and concluded in 1986. At the end of the maturation period, the Goldwater-Nicholas Act created the conditions of revolution in joint warfighting capabilities and the 1987 Cohen-Nunn Amendment mandated the creation of a U.S. Special Operations Command, an Assistant Secretary of Defense for Special Operations and Low-Intensity Conflict (SOLIC), and laid the foundations for revamping U.S. special forces. This period also marked the beginning of the end of the Soviet Union with Mikhail Gorbachev's 1985 ascension to power.

Goldwater-Nichols reinforced the continuing evolution of air-land-sea-space power integration. Special operational capabilities were especially valued in Reagan's assault against Soviet influence. Military support to counter-drug efforts reinforced this trend. Midway through this period a number of developments or processes had important implications for the evolution of U.S. forces. DARPA launched a strategic computing initiative to pursue, among others, artificial intelligence. Automated information fusion and decision tools were sought to accelerate fire control and other processes. Associated developments explored in this chapter include: further Army doctrinal revisions; operational innovations derived from Army-Air Force cooperation; significant integration of information technology into military affairs; specific DARPA technology demonstrations; and new policies and military capabilities to fight the emerging strategic threat of terrorism.

Decisions to invigorate defense research and development efforts, integrate new technology into the Services, develop new doctrinal and operational constructs, and to pursue inter-Service cooperation agreements opened new possibilities for the effectiveness of U.S. conventional forces.

Strategic Context

Political will, emboldened by popular support for a resurgent American defense capability, combined with strategic necessity to cultivate seeds of technological, operational, and organizational innovations sown during the formative period of the American RMA . Innovators worked closely with intelligence analysts to understand the Soviet threat and attune operational and technological innovations to meet it. Measures of strategic effectiveness shifted for the military services in several historically important areas of warfighting, including special operations and counter-terrorism, logistics and mobility, target acquisition, tracking and weapon guidance, command and control, and joint warfighting. American foreign policy turned from entrenchment to activism. Technology played a significant role, spawning what might be called a globalization of the offset strategy.

Concerns that the worsening U.S.-Soviet relationship increased the threat of war were difficult to assuage. In fact, they were amplified by widespread criticism of the CIA in the aftermath of the Team B exercise and charges of systemic underestimating of Soviet capabilities. Well-publicized accounts of increased Soviet defense spending seemed more poignant psychologically in the aftermath of the failed hostage rescue mission. President Carter's attempts to reassert American influence came too late to restore public confidence in his administration. Defense spending increases and tougher foreign policy stance seemed to legitimate criticism of his earlier policies. The decision to deploy cruise and Pershing II missiles to Europe, for example, reminded voters of his failed approach to the Soviet Union and sparked renewed political debate over nuclear weapons.

Technology, always a matter of strategic import, became more significant in the calculus of power in the late 1970s and early 1980s. Information technology reinforced this trend, as did several military conflicts fought outside of Europe in 1982.

Britain and Argentina clashed over the Falkland Islands (Islas Malvinas for Argentina) in the South Atlantic; Israel invaded Lebanon to evict the Palestinian Liberation Organization; and, Iran and Iraq began an eight-year war. In addition to reinforcing long standing beliefs in the value of training and professionalism, and despite shortcomings of technology, each demonstrated the effectiveness of new weapons systems. Advanced missiles, aircraft, targeting systems, and command and control networks were demonstrated as force multipliers. Concurrently, the speed, accuracy, and lethality of advanced missiles reawakened concerns that surveillance and warning systems were inadequate. Logistics were another area receiving newfound interest.

Chapter 4 related that Harold Brown and William Perry's offset strategy, a national policy reflecting of the importance of sustaining a technological edge, brought a broad "response to the then-perceived threat of an armored assault by the Warsaw Pact forces in central Europe."[7] Advanced weapons combat-tested in regional conflicts reinforced the underlying aims of the offset strategy. This is not to say that new technology was a panacea or that military effectiveness immediately increased across all types of conflict.

Responses to the combined conventional and nuclear threat in Central Europe were multifaceted. Arms control agreements and confidence-building initiatives were pursued, but treaty negotiations suffered as East-West tensions increased and détente waned. Force buildups were not an option given domestic political resistance in Allied nations. Yet, restoring deterrence stability and reducing the potential for war hinged on military readiness. Initiatives addressed in this study launched to offset perceived U.S. military deficiencies included stealth airplanes, advanced precision munitions, doctrinal innovations, cruise missiles, and improved reconnaissance platforms. Strategic nuclear systems were also developed. Modernization of nuclear command and control became a strategic imperative. Cutting decision-making timelines drove the application of new technology, including research into the distributed communications systems preceding the internet. Planners believed that automating warning-to-launch processes would not only shorten decision making processes but also provide additional deterrence value by assuring a retaliation in the face of a surprise Soviet attack.

Academics questioned whether the automated warning and expedited launch processes enacted on both sides of the Iron Curtain were contributing to deterrence or edging toward a doomsday scenario. Automation warning-launch systems were characterized as a potentially more catastrophic, techno-political analog to World War I troop mobilization plans and political ineptitude. Observers questioned whether the combination of algorithm-based early warning systems and rapid launch processes might lead to inadvertent nuclear war.

In June 1983, a malfunctioning Soviet nuclear launch warning system reported an American attack. According to one account, “because the duty officer of the day came from the algorithm department and could sense that the alert was inauthentic” the report "was not relayed to the Politburo."[8] Contributing to Soviet-American tensions was the September 1983 Soviet downing of a Korean Air Lines passenger jet (among the two-hundred and sixty nine dead were sixty-one Americans), and the November 1983 deployment of Pershing II missiles to Europe. Derek Leebaert relates that a classified 1989 U.S. assessment of the 1983 "'war scare' is said to be terrifying."[9]

Among the defining speeches of the era was a March 1983 appearance in Florida where Ronald Reagan condemned Soviet leaders for being a focus of evil. Another came a few weeks later. Convinced that the same scientists that invented nuclear weapons could improvise a defense against them, Reagan announced what later became the Strategic Defense Initiative. Again, the impetus was protecting the United States from an 'evil empire.' As early as 1978, five years before the Florida speech, Reagan warned that Moscow was "an evil influence throughout the world" working in "every one of the far-flung trouble spots" to further "its own imperialistic ambitions" by "stirring a witches' brew."[10]

Reagan administration insider and economist Martin Anderson, described as "one of the few intellectuals in his entourage," distilled Reagan's views into six basic precepts that the President did not systematically articulate in any document but nonetheless pursued as a "'grand strategy'"[11]:

- A belief that a U.S-Soviet nuclear war would have devastating consequences for both sides.
- A commitment to the reduction of nuclear arms instead of a limitation of their increase or a freeze at current levels.
- A moral revulsion to the doctrine of mutually assured destruction (MAD) that had been our national nuclear weapons defense policy for some twenty years.
- A belief that the Soviet Union was 'an implacable foe' and the center of 'an evil empire.'

- A belief ‘that the productive power of the United States economy was vastly superior to the Soviet economy, that if we began a drive to upgrade the power and scope of our military forces, the Soviets would not be able to keep pace.’
- A skepticism about arms control treaties, based on a book that argued that nations keep their treat agreements only when it suits their interests to do so.

Like Carter before him, Reagan sought to impel a Soviet turn toward openness and an improvement in the Soviet human rights record. How Reagan set out to affect such changes in Soviet policy marked a clear break with his predecessor.

This study does not question whether the Reagan administration indeed entered office with a coherent, policy-focused grand strategy. Reagan himself was widely criticized for being ill equipped for complicated foreign policy decisions and few in his inner circle were considered veteran statesman. On many issues, however, he appears to have been remarkably prescient. As additional documents from this period are declassified, particularly those dealing with classified military technology and war planning, additional studies are warranted on this issue. Important to this study were defense policy initiatives related to the Reagan administration’s quest to correct perceived Soviet military advantages.

Critics of the Regan defense buildup argued that Soviet equipment remained less advanced than U.S. systems and maintained that force correlations overestimated Soviet capabilities. Inattention to combat enablers like command philosophy, training, and troop morale diminished the Soviet’s relative combat power. Nevertheless, the Soviet threat seemed more palpable in light of Soviet rhetoric, alarms sounded by U.S. defense intellectuals, the discovery of Soviet troops in Cuba, fears of Soviet backed Cuban subversion throughout the Caribbean, Soviet-backed martial law in Poland along with large ground and naval forces exercises, and increased nuclear alert levels. Perception counts, a truism Reagan understood better than most.

The conventional threat to stability seemed particularly grave in light of the 1981 Polish crisis. Robert Schulenberg directed the U.S. Army indications and warning office at the time. Part of the European Command staff, he was among the limited number of intelligence analysts with access to highly classified intelligence information from all sources. He recalls the winter 1981 crisis as an important catalyst for the modernization of strategic and theater intelligence and information capabilities. Soviet military units practices radio silence, preventing U.S. signals intelligence assets from reporting on troop movements. Because it was winter, days were shorter, limiting daylight needed to obtain electro-optical images of troop movements and locations. Weather further degraded the availability of satellite images – electro-optical satellites cannot penetrate could cover. Because of this, Schulenberg recalls, U.S. commanders had "no idea" where Soviet troops were. Divisions moved. Some movements went undetected for days, even a week.[12]

In the aftermath of the crisis, Schulenberg several groups traveled Europe studying the information needs of those monitoring Soviet troop movements and informing leaders responsible for NATO mobilization decisions. The most important outcome of the crisis from his perspective were decisions to develop theater day/night, all weather, near-real time intelligence collection capabilities to support military leaders. The advent of digital communications technologies enabled new systems to provide information directly to analysts supporting decision makers.

The same year, Soviet military capabilities were demonstrated in a series of military exercises. Naval maneuvers along the Baltic coast included the largest Soviet amphibious landing since World War II. Analysts estimated that Soviet industry had produced nearly two hundred and fifty new intercontinental missiles since 1980. Fighter aircraft production rates doubled in the early 1980s. In 1981, the CIA estimated that Soviet annual military spending was roughly double U.S. spending in real terms. A year later Soviet factories were producing "1,300 new fighters a year, about three to four times the fighter replacement rate of the U.S. Air Force" and an average of "a squadron a week and a wing a month.[13] Defense analyst Ralph Sanders concluded that Soviet industry was turning out "about three times as many tanks and armored vehicles, twice as many tactical combat aircraft and military helicopters" by 1985. [14] For those concerned with Soviet naval developments, which threatened sea-borne reinforcement of NATO and became an important consideration for Persian Gulf contingencies, the Soviets also produced "four times as many attack submarines" and nearly "the same quantity of surface combatants."[15] Increased militarism in Soviet foreign policy seemed more than mere rhetoric in light of Soviet naval activity and additional posting of Soviet military advisors to client states. New, mobile SS-20 missiles further threatened deterrence stability, spurring interest in controlling warhead and missile technology proliferation.

Reagan sought some eight billion dollars in supplemental defense spending to augment the fiscal year 1981 defense budget. Republicans controlled the Senate, a base used to gain wide congressional support for Reagan's defense plan. He subsequently asked for and received an eighteen billion supplemental for fiscal year 1982. Defense spending more than doubled between 1981 and 1986. A large share went to nonnuclear forces, dubbed general purpose by defense analysts. Additional funds were directed to research and development of new weapons systems, procurement, and nuclear force modernization. Other decisions restored the B-1 bomber program, expedited deployment of the MX and Trident missiles, and increased conventional force spending. .

Reagan approved a number of National Security Decision Directives (NSDDs) mobilizing U.S. resources to support the rolling back Soviet influence, undermining its political and economic strength, and aligning U.S. armed forces to engage communism across the globe. By outlining the contours of the defense build-up and providing strategic justification for it, Carter's one-and-a-half war scenario became a transition strategy on which a dramatically more ambitious vision emerged. Reagan Defense Secretary Casper Weinberger proclaimed a new planning scenario, later described as "a worldwide war" requirement requiring "concurrent reinforcement of Europe, deployments to south-west Asia and the Pacific, and support for other areas."[16] The U.S. needed to respond to Soviet aggression in all regions simultaneously.

NSDD-75, an important document in the Cold War's final chapters documents a reversal in the Carter administration's approach. Rather than accommodation or a rekindling of détente, Reagan sought to compel change in Soviet behavior through increased military spending, developing economic tools and sanctions, and questioning the legitimacy of the Soviet presence in Eastern Europe. Another document signed in 1983 formalized policies to raise costs of maintaining a Soviet sphere of influence, seeking to place additional strain on the faltering Soviet economy. In May, NSDD-32 called for "various efforts, including economic measures, to 'neutralize efforts of the USSR to increase its influence."[17] NSDDs "laid out the institutional arrangements and component parts needed to push the Soviet Union to the wall" and "bring the struggle to an end on America's terms."[18]

The U.S. would pursue qualitatively better weapons systems, leverage new technology, create a significantly more robust research and development agenda, and confront the Soviet Union politically and economically wherever Moscow sought to exercise its influence. Strategic Missile Defense (Star Wars) and advanced precision munitions were among the programs pursued. Soviet planners would respond, U.S. analysts predicted, by attempting to catch up technologically or simply increase their own force strength. From the Middle East to South America to the Horn of Africa, the U.S. attempted to roll back Soviet influence, adding to the costs of maintaining an empire. Reagan's ''full court press'" to bankrupt the Soviet economy included "denying [them] critical resources, hard currency earnings from oil and natural gas exports, and access to Western high technology."[19] Soviet defense spending as a share of Gross National Product increased from twelve percent in 1965 to, depending on assessment methodology, between seventeen and twenty-five percent in 1985.[20]

Reagan was not alone in his opposition to Soviet policies. Margaret Thatcher became the Prime Minister of Britain in 1979 – some twenty months before Reagan assumed office in 1981. A key ally in fighting communism, she had already earned the nickname "Iron Lady." One day after Reagan's evil empire speech, the British leased the island of Diego Garcia to the United States. Strategic bombers and warships could be based on the Indian Ocean island, better positioned to respond to a Soviet attack on American interests. Francois Mitterrand became the President of France toward the end of Reagan's first year in office and for a period displayed uncharacteristic French support for NATO. Domestic political dynamics also helped soften Mitterand's leftist leanings. Another conservative, Helmut Kohl, became Chancellor of West Germany in 1983. He approved the basing of Pershing Missiles, which began arriving at U.S. air bases in November 1983.

Western leadership grew more conservative during the maturation period; Soviet leadership evolved in an opposite direction. Yuri Andropov died in February 1982 at the age of eighty-four. His replacement, tuberculosis-stricken Konstantin Chernenko, held power for fourteen months before his 10 March 1985 death. A day later, Mikhail Gorbachev was elected General Secretary of the Communist Party and in July Eduard Shevardnadze succeeded Andrei Gromyko as Foreign Minister. Gorbachev and Shevardnadze's pursuit of "new thinking" in Soviet foreign affairs was noted at the 19-21 November 1985 Geneva Summit, a turning point in U.S.-Soviet relations.

It was the first summit in nearly a decade. Reagan and Gorbachev agreed to accelerate disarmament talks. The U.S. welcomed a Soviet consulate in New York and opened an American consulate in Kiev. Their objective was facilitating cultural exchanges. At the end of the summit Gorbachev uttered a sentence during a ninety minute press conference that, in hindsight, aptly describes the historical importance of his ascension to power: 'The world has become a safer place.'

Gorbachev would publicly address one of the thorniest issues in this relationship a year later: Soviet occupation of Afghanistan. Gorbachev's opening speech to the 27th Party Congress referred to Brezhnev's tenure as "years of stagnation" and called Afghanistan a "bleeding wound." A second Reagan-Gorbachev summit in Reykjavik, Iceland on 10 October 1986 resulted in broad agreement on arms control issues. Former Secretary of State George Shultz and British Prime Minister Margaret Thatcher considered the summit a "turning point" in the Cold War's end; former National Security Advisor Zbigniew Brzezinski concludes that "it was at Reykjavik that the Cold War was won."[21] In December 1987, Gorbachev visited Washington, DC and signed the Intermediate Nuclear Forces agreement. A section below discusses the Gorbachev revolution and its influence on the strategic context in which RMA discourse evolved.

Evolution of the Soviet Ground Threat in Europe

Chapter 4 discussed the evolution of the Soviet nuclear RMA up to the introduction of the Operational Maneuver Group (OMG), which became a source of much contention in the West as military analysts touted its destabilizing "shock" and "surprise" power. LTG King recalls that the OMG threat "drove" technology initiatives and operational innovations in the European Command.[22] Understanding this critical aspect of U.S. threat perception and commensurate affects on defense planning provides insight into the emergence and evolution of the so-called RMA capabilities that won the 1991 Gulf War.

As chapter 4 related, the Soviet approach to ground combat involved multiple layers or echelons of combined arms formations successively pushing forward on the battlefield. Breakthroughs were exploited and reinforced using the momentum of second and third echelons. Speed and direction provided velocity; velocity and mass provided combat power to achieve higher-order missions, including opening a salient to flow forces into the enemy rear. By focusing the effort of second echelons – the "follow on forces" – on breakthrough and exploitation, second echelon commanders concerned themselves with forward movement rather than first echelon losses.

Because second and third echelons were intended to exploit a breakthrough they generally remained in columns, or march formation, as long as possible to maximize flexibility, ease command and control, and reduce travel time maneuvering around enemy forces toward objectives. Dispersion during this phase was difficult because it would complicate command and control and delay the attack. In the late 1970s, the Soviet approach further evolved with the introduction of independent maneuver elements to rapidly penetrate into enemy territory, mixing the lines to lessen the likelihood of a nuclear defense.

The OMG was not merely a reinforcement of the second echelon. Significantly more capable, it reflected a resurrection of the World War II idea of a mobile strike group seeking to create new opportunities for breakthroughs. Such developments in Soviet forces impelled U.S. grand strategy changes concerning conventional readiness. The importance of conventional readiness in deterrence stability calculations, Alliance relations, and overall assessments of U.S. military effectiveness, increased.

Western analysts confirmed the existence and operational purpose of the OMG during the summer 1981 "Zapad" (Zapad-81) training exercise in Poland.[23] Initial discussions of the OMG's operational mission settled on the extension of the so called "conventional option" mentioned in chapter 4: penetration of NATO lines to capture critical targets, disrupt command and control, and prevent the use of nuclear weapons. Presumably, the OMG would encompass an independent maneuver element, perhaps a reinforced division, tasked with breaking through a weak spot in enemy lines to drive deep into enemy territory. Such a drive into the "operational depth" of enemy territory would disrupt command and control, facilitate the OMG's seizure of critical terrain and river crossing sites and, more importantly, prevent the enemy from launching a nuclear attack on the OMG (since this would mean employing nuclear weapons on friendly territory). Having achieved a penetration, the OMG would be followed by large armor formations. NATO forces would be hit with successive waves of massed armored attacks.

Disagreements inhered about the nature of the threat and the likelihood of a Soviet attack. A debate ensued over the historical uniqueness and credibility of the OMG threat to NATO forces. Intent was the source of contention. In the end, what mattered for this study of U.S. military innovation is that U.S. policy makers and Congressional leaders perceived the conventional build-up and Soviet operational innovations as a destabilizing threat that had to be countered.

Analysts did agree that spatial and temporal factors favored the Warsaw Pact – a function of potential combat power generated over a relatively quick period and NATO's lack of operational depth. The OMG was perceived as a new threat to deterrence stability and rekindled fears of a surprise attack. Among the disturbing aspects of the OMG was the implication that the Soviets could wield decisive conventional power to achieve strategic, theater objectives. As air assault and helicopter capabilities emerged in exercises and were demonstrated in Afghanistan, it seemed that Soviet confidence was mounting in the conventional domain.

In this context, the strategic and operational aspects of preventing "surprise" were central to the maturation of the American RMA . From a military perspective, the calculus of surprise derived from the perceived superiority of the Warsaw Pact's mix of conventional and nuclear forces. Space-time asymmetries heavily favored the Warsaw Pact: it had more depth to mount an attack than NATO did to absorb and prepare defenses, enabling it to stage and flow troops forward faster.

The fundamental problem for the defense of NATO, one recognized as early as 1973, was exacerbated. A RAND analysis discerned "a single [U.S.] battalion might find themselves facing 100 to 120 advancing tanks over a 20-minute period" which, given the time required to coordinate defenses, left only two paths for defeating a Soviet attack:

either significantly raised the rounds fired per minute "or the number of minutes available" between echelons.[24]

Among the options selected for ameliorating the challenge for battalions facing a Soviet armored onslaught was pushing the defense "over 50 to 60" kilometers rather than the 5 to 8 prescribed in early 1970s planning documents. Doing so would increase the number of minutes between echelons arriving at the front. At the very least it would diminish their combat effectiveness.

Time compression issues resonated with a generation of defense planners whose formative years included Pearl Harbor and the 1950s surprise attack discussions. A premium was placed on a commander's ability to make decisions rapidly. It is this, arguably, that prompted Simpkin's title, *Race to the Swift.* For SACUER Alexander Haig, "modernizing "conventional forces is our first priority – not because theater or strategic forces are any less important, but because our conventional force deficiencies are the most serious. These deficiencies are exacerbated by trends which, if permitted to continue, portend a diminishing cushion of *warning time*."[25]

On both sides of the Iron Curtain an affinity for automation deepened. Enthusiasm ensued to tightly couple reconnaissance and surveillance capabilities to long-range precision strike systems. Leadership training emphasized pursuit of simultaneous operations throughout the depth and breadth of the battlefield. Greater dynamism in all combat operations reinforced a belief that audacity in operational art was required to quickly win the opening battles of a war in Europe. Evolutionary changes occurred within the combat arms. At a systems level the overall capabilities of conventional forces increased significantly. Dispersion coupled with greater lethality, at great depths and with greater accuracy, placed additional emphasis on intelligence, surveillance, and command and control. The volume and precision of fires increased.

John Lewis Gaddis argues that, beginning in the 1960s and presumably continuing to the 1980s, "underlying all of these complexities, there was the increasing importance of psychology: the perception of power had become as important as power itself."[26] Perception counts – in numbers of missiles and their throw weight, in numbers of tanks, and in doctrine proscribing their use. As technology became more important in the strategic calculus, perception also included the scope and sophistication of research and development (R&D) activities. Indeed, the 1970s ended with R&D becoming a more pressing strategic necessity.

Because Moscow "spent in real terms some $185 billion more on military R&D" between 1975 and 1985, U.S. defense analysts concluded that Soviet forces were "able to deploy one-and-one half or two generations of equipment, while the United States has been able to deploy equipment one generation old."[27] Jacques Gansler cogently stated the argument for U.S. R&D investment: "Because technological superiority is a significant part of our military and economic national strategy – some say it *is* our national strategy in both areas – it is critically important to maintain our leadership position."[28]

The Defense Science Board agreed there was "reason to be concerned,'" concluding "the U.S. lag behind the Soviets" in armored modernization was "'a matter of national urgency'" requiring additional R&D.[29] The next section brings the story of an important concept demonstration into our discussion of the American RMA's preconditions, one that centered R&D activities at the center of visions of future warfare.

The Assault Breaker Concept Demonstration

An important component of the U.S. R&D response to the Soviet threat in Europe was the 1977 decision to re-align Defense Advanced Research Project Agency's (DARPA) activities. Among the goals of doing so was pulling together several ongoing technology projects. A primary objective for realigning investment: avoid surprise; the secondary one: create opportunities for the U.S. to achieve technological surprise should conflict occur. Some forty percent of its R&D budget was invested in tactical warfare domains as part of the offset strategy. The intent was to leverage emerging technology to foster significant change in the "concepts and capabilities in command and control, mobility, armor/anti-armor, night fighting, massed firepower, and the precision application of force at a distance."[30]

Assault Breaker sought to offset Soviet conventional superiority and address a growing "realization that the timely use of tactical nuclear weapons to stop an attack in [Europe] was unrealistic."[31] It also drew upon a central trend in defense research and development: "developments in sensors, delivery systems and conventional munitions . . . had the potential to greatly mitigate or potentially negate the Soviet threat and do so without resort to the use of nuclear weapons."[32]

The program aimed to test a larger concept envisioned in William Perry's testimony, cited in chapter 4, to see all high value targets on the battlefield at any time; to be able to make a direct hit on any targets we can see; and to be able to destroy any target we can hit. "The question to be answered," Richard Van Atta concludes, "was whether the development is sensors, computing, communications, guidance, and munitions allowed for deep precision attack against hard, mobile targets."[33] Among the other elements of the larger system for testing the concept, discussed below, was an attack coordination center able to fuse sensor and other data.

Assault Breaker responded to a specific strategic and operational need, derived from a clearly defined Soviet threat for which existing research and development seemed well placed to resolve. The response was organized around the maturation and integration of several technology projects, a task that brought systems engineering, systems integration, and information technology to the emerging vision for air-ground cooperation against Soviet follow-on echelons. Figure 5-1 lists several mid- to late 1970s technology initiatives that supported the three-fold conventional modernization vision outlined in William Perry's 1977 Congressional testimony.[34]

See all high value targets on the battlefield at any time: Airborne Warning and Control System (AWACS) PAVE MOVER radar Stand-Off Target Acquisition System (SOTAS) Remotely Piloted Vehicle (RPV) and mini-RPV Unattended Ground Sensors
Make a direct hit on any target we can see: Army non-nuclear Lance missile and guidance advances Army Patriot Missile General Support Rocket System Smart bombs
Destroy any target we can hit: Rockeye bomb and bomblets Wide Area Anti-Armor Munitions (WAAM) Terminally Guided Submunitions

Figure 5-1: Precision Strike Projects

Many of the initiatives listed in figure 5-1 were later associated with the Assault Breaker concept demonstration; most matured in the 1980s; all were generally related to the strategic challenge posed by Soviet conventional forces. The project entailed a high degree of risk simply in terms of the systems integration challenges required to achieve a networked architecture of sensors and shooters. Several sub-projects in the demonstration were themselves very challenging, making Assault Breaker an extraordinary effort.

The essence of the Assault Breaker concept first appeared in several studies during the mid-1970s. Among the important intellectual forerunners to Assault Breaker were defense consultant Joe Braddock's classified studies providing detailed analyses of Soviet strategy, doctrine, and force structure. He identified potential weaknesses and suggested how to exploit them.[35] The 1976 Defense Science Board (DSB) Summer Study on conventional capabilities endorsed an earlier Lincoln Laboratory study on an Integrated Target Acquisition and Strike System (ITASS). The DSB was also informed by defense industry proposals, an IDA Weapons System Evaluation Group "'target engagement study,'" and Air Force-DARPA work that "indicated that the real-time targeting and missile guidance updates" required for attacking mobile targets "might be feasible."[36] Widespread support for linking together R&D activities ensued. Assault Breaker moved forward as a program despite concerns that the overall effort entailed a high degree of risk due to its complexity, criticism that the program only integrated – not developed – technology, and reluctance that the Services would resist the level of cooperation required.[37]

Drawing on projects listed above, incoming DARPA Director Robert Fossum formally created the Assault Breaker program in May 1978 after recognizing the potential to provide "a potentially step-level improvement in capabilities to redress the Soviet conventional threat."[38] Testing of key components began in fiscal years 1979 and 1980 with critical tests occurring in the early 1980s. In late 1982, five terminally guided submunitions “made direct hits, one on each tank in a pattern of five stationary tanks.”[39]

Aspects of the concept demonstration evolved slowly over the following two decades, eventually becoming a key part of the defense transformation strategy in the early 2000s. The concept demonstration engendered technological, operational, and organizational innovations that later cohered into a new core competency organized around the idea of long-range, stand-off, precision strike with terminally guided sub-munitions. It also reinforced arguments that a nonnuclear strategic option existed, what Soviet observers viewed as a conventional variant of a theater strategic offensive. It was the progenitor of what Orgarkov termed the reconnaissance-strike complex.

Assault Breaker was not a resounding success in many areas. Some of the ambitious goals remained unrealized until the early 2000s – decades later then optimistic projections. Although the concept itself was proven during the testing phase, and despite the maturity of the technology, the full range of capabilities embodied by Assault Breaker was not embraced by the Services. Several factors impeded full development, including the Services protecting their own programs, a minimal level of joint integration, and the sheer complexity of the required enterprise – which carried additional risk.

The underlying concept matured as an ideal operational capability much quicker than did the sub-systems and cultural change within organizations. For example, information and data fusion capabilities initially considered for integration into the demonstration did not mature in time to be included. DARPA projects did, however, demonstrate what computer information technology added to the offset strategy. Key projects included the Battlefield Exploitation and Target Acquisition (BETA) initiative and the Coherent

Emitter Location Testbed (CELT). Elements of these projects evolved into core elements of the American RMA .

CELT, "the first automatic, near real-time system for precision location of communications emitters," was demonstrated during NATO exercises from 1978 through the 1980s.[40] Antecedents included 1960s initiatives to locate North Vietnamese electronic emissions, the Air Force-DARPA Emitter Location System (ELS) project in the mid 1970s, and a Precision Location Strike System. Responding to increased concerns with Soviet conventional forces, ELS was renamed CELT in 1978 and focused on developing "automatic location and classification" of vast numbers of enemy "emitters expected on the European battlefield, with the accuracy required for targeting by standoff weapons."[41] After successfully demonstrating the ability to locate emitters and generate information for targeting, CELT technology and operational concepts would contribute to subsequent systems, including the Army's Guardrail airborne sensor.

Technologies like those being tested in CELT, others being fielded in AWACS, and the array of other ground and airborne sensors either in service already or under development to identify emitters and enemy targets, raised the question of how disparate information sources would be rendered intelligible for decisions. BETA, created in 1977, responded to concerns about the absence of a "mechanism for correlating and fusing the extensive intelligence information being received from multiple sources."[42] Although there where some fifty studies on the subject, BETA was the first "systemic approach to develop and evaluate what "correlation and fusion would contribute" by demonstrating "a state-of-the-art, computer-based tactical data facility capable of dealing, in near real-time, with the large amounts of information on the modern battlefield."[43] A 1990 technical assessment of the state of data fusion reported that BETA demonstrated the potential for automated exploitation and targeting "while providing a greater appreciation for the problems associated with data fusion."

Among the lessons applied to later systems included "the need for a disciplined systems engineering approach to future developments," a conclusion that reinforced the emphasis on systems engineering and integration in conventional warfare.[44] An associated development involved thinking about a sensor-to-shooter process derived from complimentary capabilities that were best imagined as interfaces and networks rather than individual platforms.

The Joint Tactical Information System (JTIDS) and Joint Tactical Fusion Program (JTFP) are other important systems in the maturation of the American RMA . JTIDS provided a secure capability to move data around on the battlefield. Less vulnerable to enemy jamming, it worked by spreading data transmissions over different frequencies. JTFP merged a secure communications capability with visualization tools able to represent the fusion of data. Together they aimed to increase situation awareness by providing secure, jam-resistant near-real time information updates to commanders.

Assault Breaker is an unusual but important case for students of military innovation to consider. It was among the Cold War's most ambitious systems integration efforts. In the end, it "accomplished unprecedented integration of radar, missile, and submunition technologies to demonstrate a capability to attack multiple tank targets using terminally guided submunitions released from a standoff 'missile bus' controlled by an airborne radar."[45] In doing so, "it represented a pioneering and ambitious effort by DARPA that successfully nested major programs within larger programs, and combined them in a coordinated way to achieve the overall objective."[46]

Another aspect of the Assault Breaker program worth mentioning was its management structure. A joint program office addressed the often diverging interests of the Service sponsors. Because of intersecting interests and assurances that unique organizational requirements would be preserved, Generals Don Starry, commander of the Army's Training and Doctrine Command (TRADOC) and William Creech, head of the Air Force Tactical Air Command, supported conceptual forerunners to the project. Their support was crucial to the program's creation. In part, Army and Air Force support for Assault Breaker was forthcoming because they each maintained the integrity of Service-specific technology programs.[47] As Van Atta, Nunn, and Cook conclude, perhaps "even more important than the testing and developing of specific technologies is the conceptual breakthrough in getting the Services to work together across the barriers of roles and missions to attack the Warsaw Pact tank threat."[48] Important in terms of supporting the viability of long-term innovation processes, projects like Assault Breaker promoted experimental concepts and novel operational solutions to battlefield problems in ways that opened possibilities for organizational and operational change. Discontinuous change in Service capabilities, measured in historical terms – the grist of RMA scholars, would take decades to emerge.

Noteworthy is the fact that the first combat testing of the essential conceptual and technological elements of Assault Breaker occurred in the Persian Gulf, not on the plains of Central Europe. During the Gulf War, for example, some thirty-two ATACMS were used in conjunction with J-STARS. As Paul Nitze remarked about advanced conventional weapons developed for the defense of Europe, the "Gulf War offered a spectacular demonstration of the potential effectiveness of smart weapons used in a strategic role."[49] Technology alone does not render new, smarter weapons so effective that their mere existence evokes discussions of an extant revolution in military affairs. How they are employed, the organizational and operational innovations that enable their effectiveness as part of a warfare being waged by distributed units acting in concert, is the more important dimension of "change" we must consider.

Military Thought and Doctrine

An emerging renaissance in American military theory involved the rediscovery of the campaign. In the early 1980s, Luttwak lamented that "Anglo-Saxon military terminology" addressed "tactics (units, branch, and mixed) and of theater strategy as well as grand strategy, but includes no adequate term for the operational level of warfare" despite long-standing recognition of such a level of warfare in classic military thought.[50] Arguably, this is one outcome of the dominant narrative of nuclear thought on U.S. strategic discourse. As Ben Lambeth contends in his study of the transformation in American airpower from the 1970s through the 1990s, "U.S. defense leaders not only did not speak in these terms but also did not even think in them."[51] Central to the organizational and operational innovations underpinning the evolution of the American RMA was the rediscovery of the campaign, the orchestration of theater military activities and planning for conventional warfare at the operational levels.

The School of Advanced Military Studies (SAMS) opened in 1981 to give Army majors a better understanding of the operational level of war exemplifies this development. SAMS remains fundamentally about operational art, teaching students about large unit operations and campaigns. It is the world's leading school for educating future officers about the complexities involved with achieving what a later discussion will call the 'knowledge burden' of warfare in the information age.

The creation of SAMS coincided with an Army-wide turn toward the study of Clausewitz and Jomini, engendered in part by a U.S. Army War College-sponsored study on the strategic lessons from Vietnam. Colonel Harry Summers' study, *On Strategy: The Vietnam War in Context*, drew heavily on Clausewitz's military theory to frame the political-strategic factors of war and their relationship to the conduct of war.[52] He documented a lack of appreciation for military theory and a blurring of the relationship between military and national strategy, in part a result of decades of over-emphasizing nuclear strategy. Professional military journals were rife with discussions of Clausewitz, the principles of war, and the utility of operational art as a means to rethink planning for and prosecuting campaigns. Debating the principles of warfare and their relevance became a common theme in military science, debates that continue today.

Within the Army, rethinking military theory involved resurrecting maneuver warfare to resolve perceived problems with the applicability of Active Defense doctrine. AirLand Battle, a term coined in 1981, replaced Active Defense as official Army doctrine in August 1982; a revised doctrine came in 1986. The second iteration of AirLand Battle reinforced a new doctrinal emphasis on initiative, maneuver, and joint operations. This, in turn, reflected changes in foreign policy and a new strategic outlook defined by a more assertive American military presence abroad.

During the debate over Active Defense doctrine at the end of the 1970s, then Lieutenant General Don Starry identified two additional problems to those mentioned in chapter 4. The first concerned the insular drafting process used in 1976. Not only did it exclude the preponderance of Army seniors, it did not involve mid-level leaders destine to implement the doctrine in future battles. In July of 1977, Starry left Europe for Fort

Monroe, Virginia, earning his fourth star as the new TRADOC commander. Soon thereafter, he changed the process to make it more receptive to input.

He also distanced himself from the process to minimize criticism that the TRADOC commander's own preferences were influencing the outcome. He assigned drafting responsibility to Major General William R. Richardson, Commandant of the Command and General Staff School and commander of the Combined Arms Center at Fort Leavenworth, Kansas. Richardson guided a handful of doctrine writers, among them then Major Leonard "Don" Holder and Lieutenant Colonels Huba Wass de Czega and Richmond B. Henriques. Wass de Czega played a key role. Son of a Hungarian writer who fled his homeland in 1956, he was a career light infantry officer that remains somewhat of a legend among military thinkers for his romanticism and penetrating mind. According to John Boyd biographer Robert Coram, Wass de Czega talked often to Boyd on the phone and reportedly drew on his theories of warfare in revising Army doctrine.[53]

Starry's second problem was the criticism that the 1976 manual placed too much emphasis on the defensive. During the drafting process, Starry and DePuy had recognized, but had no solution for, the problem of defeating successive echelons of Soviet forces. This meant forward troops would be absorbing Soviet armor with little opportunity to transition from defense to attack. Here, Richardson's team "addressed Starry's concerns about dealing with the second echelon of any Soviet or Soviet-like mechanized attack" and "reinvigorated the basic doctrine, making it more offensive" in nature.[54] That is, the new doctrine emphasized initiative as one of the four tenets of the new doctrine. Others included depth, agility, and synchronization.

Developments in both Europe and the Persian Gulf challenged prevailing notions of firepower-based, attrition warfare. New security requirements to deter conflict outside of

Europe and defend non-NATO security partners renewed criticism of the 1976 field manual, particularly its emphasis on defense. What was different? Two factors stand out. First, the new doctrine pushed ground-air cooperation in new ways. Second, the doctrine began pushing yet another turn toward "speed" within military history. Now, speed involved leveraging information technology to expedite decision making over distributed forces, sustain required levels of lethality, and offset the loss of protection incurred by reducing mass. Further doctrinal changes ensued based on both factors, with time-space compression and expanded, collaborative control over distributed forces reinforcing ground-air cooperation.

Of note to students of RMAs, concepts from German tactical doctrine were incorporated. The new doctrine also included levels of war (tactical, operational, strategic) to recognize the growing complexity of command and control relationships. In doing so, it sought to amplify an advantage derived from differences in strategic culture. Among the most important differences manifested itself, in simple terms, as rigidity in operations (for the Soviets) versus relative flexibility (for the U.S.).

The architects of AirLand Battle were aware of a weakness in Soviet military doctrine and war planning: a penchant to adhere to precisely scripted movement tables, a rigid command and control system that stifled initiative at local levels, and an educational system that failed to nurture a creative approach. Railways and over-the-road heavy equipment movers brought men and equipment to the eastern end of nine mobility corridors running westward into NATO territory. The echelon construct required adherence to detailed plans – down to regimental levels. Commanders rehearsed battle plans to ensure their arrival at designated points at specific times. Planning reflected a ‘scientific’ approach to combat. New U.S. doctrine emphasized flexibility, seizing the initiative, and creating opportunities on the battlefield.

Interestingly, both approaches found theoretical underpinnings in Clausewitz. Whereas the Soviet reading focused on the Prussian’s discussion of offensive-defensive balances, U.S. readings of *On War* emphasized creativity and flexibility. American analysts considered the rigidity inherent in Soviet approaches to military doctrine an exploitable deficiency. A brief detour from the historical narrative highlights an important aspect of ‘rigidity’ to the current generation of military scientists.

Legacy systems forming the baseline of combat forces in the 2000s were considered extremely flexible two decades ago – in terms of their ability to discern Soviet readiness levels, identify and target Soviet echelons, and deliver ordinance to reference points in Central and Eastern Europe. Soviet operational art and tactics were sufficiently well-known to systems designers, who developed capabilities to monitor Soviet cantonment areas, warn of increased readiness levels, identify forces moving eastward toward NATO borders, and deliver munitions to preplanned strike zones – usually point along a mobility corridor. NATO planners had studied the Soviet conventional forces attack problem for decades, evolving capabilities to disrupt, delay, and blunt attacks. U.S. forces in the 2000s must detect, identify, and strike small, fleeting or moving targets, almost *anywhere* on the globe, with great precision, inflicting minimal collateral damage, and within compressed decision-making timelines. And the situation, the enemy, and the overall military mission is often different from that which the participating units train or their equipment was designed for.

Global media coverage of the 1991 Gulf War also exposed the world to a new generation of theater persistent surveillance capabilities and strike weapons, including J-

STARS and more advanced munitions, focused attention on U.S. space capabilities (e.g., communications, reconnaissance, GPS). These and other systems created specifically to attack Soviet echelons at their moment of weakness were on the front pages of major newspapers across the globe. Doctrine and operational practices were also reported. Not only are the operational aspects of missions more complicated, adversaries from Somali warlords to Serbian generals to Osama Bin Laden know more about our capabilities and how to spoof or defeat them outright. Although not a catastrophic problem against ill-equipped and poorly led militaries, the problem remains that forces designed and equipped to fight a comparatively rigid adversary fare less well in more complex, limited-war situations. This argument is revisited in the study conclusion.

The narrative returns to AirLand Battle doctrine, which required closer air and ground cooperation within the European theater. Army and Air Force leaders began collaborating, at times reluctantly, on technology and operational concepts to restore maneuver to ground forces by cooperating on the defeat Soviet second echelons. Army and Air Force leaders worked on policies and operational responsibilities for AirLand Battle implementation from November 1983 through March 1984. Discussions resulted in the Army and Air Force Chiefs of Staff agreeing to the so-called “31 Initiatives” outlining Army-Air Force agreements on roles, missions, and collaboration; one of the areas addressed was cooperation on J-STARS development. The 31 Initiatives built on an earlier 1981 agreement on offensive air support, which transferred limited planning authority over close air support, the tasking of strike aircraft for battlefield interdiction missions, and collection planning for airborne reconnaissance to ground force commanders. Initially applying only to ground force commanders in Europe defending NATO, the 1981 agreement foreshadowed later joint tasking arrangements.

According to one account, AirLand Battle evolved from defense consultant Joe Braddock's ability to identify "a pattern in the operations, exercises and planning of the Soviet Union and Warsaw Pact forces. This called for particularly close coordination between the Air Force and the Army, to prevent the Warsaw Pact from being successful in the forward areas, primarily through firepower and maneuver, while at the same time being able to coordinate attacks on their rear areas that disrupted their capability to reinforce and influence the action in the forward area."[55]

As Starry put it: "interdiction was the key to battlefield success."[56] That is, the importance of interdiction in creating opportunities for forward commanders to maneuver.

By reducing the combat power of Soviet units through interdicting reinforcements, opportunities opened for commanders to transition from the defensive to an offensive position. Important implications at the tactical level followed. Commanders remained focused on the initiative. Planning for combat sustained a sense of creativity. Leaders – and soldiers – knew their fate was not completely controlled by higher commands. Leaders, furthermore, were drilled to seek local situational awareness and at all levels develop options. Indeed, the deliberate planning processes that evolved to guide combat operations preserved a sense of adaptability that Soviet processes precluded. Commanders remained focused on finding transition points, what Clausewitz dubbed a "culminating point," to shift from the defense to an attack.

Noteworthy here is the fact that this retention of initiative and adaptability persisted as the area of a commander's combat influence increased. AirLand Battle settled on a depth of 150 kilometers, largely because this is the depth Army and Air Force leaders agreed upon to both protect Air Force interdiction missions and allow the Army to develop its own indirect fire weapons. In addition to extending the area a corps commander would "influence" through deep attack to 150 kilometers (roughly 72 hours in Soviet doctrine), AirLand Battle also set the commanders area of interest – the area for ISR assets to provide information on – some 300 kilometers out (roughly 96 hours). Extending the area of influence and interest established new requirements for tactical reconnaissance, targeting, and strike planning. Technology developments, including those that eased Clapper's above mentioned sense of frustration, enabled new operational concepts as well as providing new solutions to Army-Air Force responsibility disagreements. Among the key developments in this area was the Assault Breaker technology demonstration and subsequent advances in target acquisition, information fusion, geo-location, and computer-enabled (automated) fire support.

Meanwhile, NATO adopted a strategy of Follow- On-Forces Attack (FOFA), the name given to a concept made public by Supreme Allied Commander, Europe (SACEUR) Bernard Rogers. Rogers began thinking of the concept in 1979, around the same time that Army leaders decided to replace the widely criticized 1976 Active Defense doctrine.

The Rogers plan differed from but complemented AirLand Battle. Both built on a multi-faceted view of integration and sought to achieve battlefield extension by carrying the defense of NATO forward into Warsaw Pact territory. Similar in many respects, FOFA was an Alliance strategy to simultaneously disrupt and attack first and second echelons. Like AirLand Battle, the issue of Soviet battlefield nuclear weapons and the political requirement to reduce escalation to theater nuclear use impelled doctrinal innovation. Rogers, for example, assumed command of NATO forces at a time when the only viable counter to Warsaw pact forces was nuclear weapons. Based on an understanding of emerging technology, including the Assault Breaker demonstration program, he conceived of an ability to detect and respond to a Soviet attack with thousands of deep-strike missiles and rockets. The impetus for FOFA was "reducing to a manageable ratio with conventional weapons the number of enemy forces arriving at" NATO's forward defense lines, its "General Defense Position."[57] Observing the Zapid-81 training exercise and thinking about the second echelon problem, Rogers believed that the OMG, second echelon forces, strategic reserves, and other targets should be targeted simultaneously.

FOFA received widespread support. A 1983 European Security Study group's report entitled *Strengthening Conventional Deterrence in Europe*, known as the ESECS report, recommended a deep attack strategy calling for capabilities to attack some 300 kilometers beyond the forward line of NATO forces. A second report noted that FOFA satisfied Allied requirements for a strong forward defense at the same time it created depth for defense. The 1984 British Atlantic Committee's report, *Diminishing the Nuclear Threat*, also reinforced existing arguments that advanced conventional capabilities, including target acquisition and strike capabilities, offered an effective alternative to nuclear weapons.[58] The ESECS report, moreover, agreed with industry leaders and technology experts that the required conventional capabilities could be fielded in five years. As envisioned in the offset strategy, technology enabled both the defense and the transition to attack.

A key tenet of both AirLand Battle and FOFA was elongating periods between the echelons able to engage the front lines of U.S. forces. If these periods could be increased, NATO forces could regroup, consolidate defenses, and even push forward. Merely creating the windows was not enough. Information from across the front had to be gathered, analyzed, and exploited. In knowledge management terms, information (the "know what") had to be exploited to create knowledge (the "know how") about new opportunities to succeed. This required close cooperation between intelligence and operations staffs.

Figure 5-2 depicts the effect of interdiction on enemy forces from Starry's April 1983 testimony to the House of Representatives Committee on Armed Services along with the perceived "window of opportunity" in which enemy forces would be degraded such that the U.S. could transition to the offensive.[59] Richard M. Swain relates different headquarters' time responsibilities: "The brigade was responsible for all forces within a distance of twelve hours of the forward line of troops, the division out to twenty-four hours, and the corps to seventy-two hours."[60] Instead of defining areas of responsibility in terms of distance, time became a more important planning factor for operations, technology development, and doctrinal approaches.

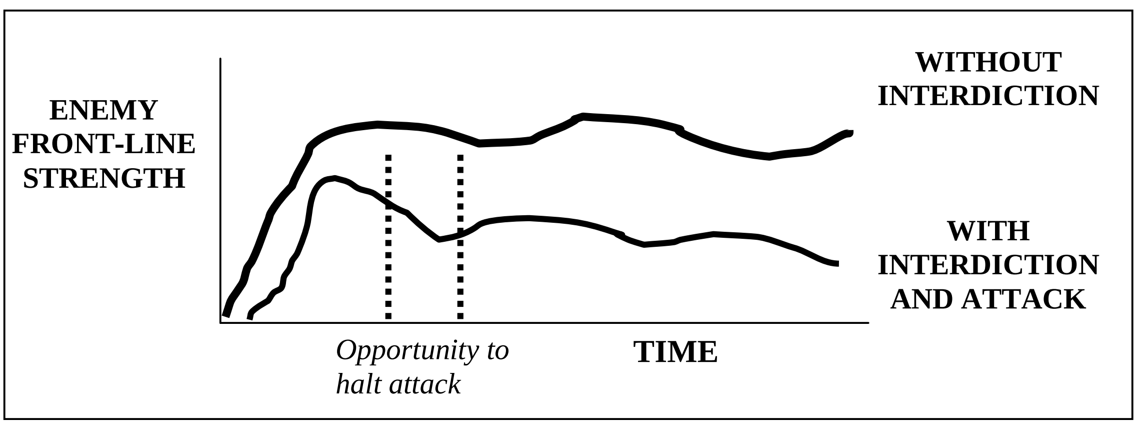

Figure 5-2: Interdiction and Attack

The conceptual and doctrinal implications of focusing on specific time windows are important. Planning had to be more rigorous. Paradoxically for some, but naturally for military planners, flexibility depended on it. Intelligence preparation of the battlefield (IPB) forced commanders and battle staffs to conduct detailed studies of terrain and enemy capabilities in order to prepare mentally and materially to seize opportunities.

This included preparing elevation data and automated location capabilities to rapidly emplace mortars and artillery for indirect fire support. Flexible logistics capabilities were needed. Dynamic air support became more important. Maneuver was reinforced, spawning rediscovery of historical cases suitable for a computer-age maneuver theory. Because Allies and sister services were critical to ground forces, joint and coalition operations became more important as a planning issue.

A premium was placed on simultaneously coordinating the close fight and prosecuting deep strikes. Resolving theater strategic warning and rapid conventional defense-retaliation challenges became a strategic necessity because conventional deterrence and defense were tied to Alliance relations and to East-West deterrence stability. The concept demonstrated in Assault Breaker was one alternative to resolve strategic and operational challenges. It offered the means to coordinate ISR and ground-launched precision strike. Another alternative engendered the transition from mission- and target-specific theater reconnaissance to theater all-weather, day-night continuous surveillance and targeting. Programs like J-STARS, AWACS, BETA, CELT, and JTIDS envisioned an end-to-end, multi-faceted, persistent surveillance capability providing systematic coverage of the battlefield. A third alternative was stealth.

Airpower Developments

The 1976 Defense Science Board Summer Study on conventional capabilities preceding Assault Breaker argued that technology and operational needs inherent in the concept demonstration would fail without unprecedented advances in Army-Air Force cooperation. Others argued that levels of cooperation needed to implement AirLand Battle and FOFA would be impossible without additional technological solutions.

Solutions, that is, that enabled greater air-ground synergy and interoperability. Thereafter, drawing on widespread knowledge of the evolving computer technology revolution, a reciprocal relationship evolved between air-ground technology and joint doctrine. Technological and operational innovation presented serious challenges for organizations with entrenched positions about roles and missions for deep strike.

Air Force planners viewed AirLand Battle suspiciously. For many pilots, the emphasis on deep strike interdiction against Soviet armored forces threatened to turn their aircraft into flying artillery platforms to support ground troops, detracting from their independent strike mission and exposing them to enemy surface to air missiles (SAMs). Moreover, implementation of AirLand Battle would seemingly subordinate airpower to the corps main ground effort, with airpower capabilities treated as a supplement to other corps interdiction capabilities. Many of these capabilities, including long-range missiles with terminally guided sub-munitions and land-based cruise missiles challenged traditional divisions of battlefield responsibility. Army leadership went to great lengths to assuage Air Force critics that AirLand Battle treated ground and air power as co-equal elements of the overall effort. Growing emphasis on Army deep strike missiles and Army attack helicopters, however, led many in the Air Force to remain skeptical.

AirLand Battle innovations included new airborne intelligence capabilities endowing planners and pilots with information needed to be successful against operational-level targets. ISR capabilities, indeed, were an artifact of deeper Army-Air Force clashes over deep strike roles and responsibilities, clashes exacerbated by AirLand Battle doctrine discussions.

In the midst of an ensuing "free-swinging doctrinal debate," Allard writes that Gen. John A Wickman, Jr., chief of staff of the Army, and Gen. Charles A. Gabriel, chief of staff of the Air Force, found themselves united by long-standing personal friendship and remarkable similar viewpoints on the need for closer cooperation between the services they led."[61] A generation of inter-service rivalry colored discussions.

Disagreements did not concern weapons systems or responsibilities as much as the fundamental challenge of extending agreement to cooperate operationally into actual operations – a challenge that continues into the 2000s despite significant progress. Until the 1980s, integrating theater capabilities across Services received little serious attention. Each Service was allocated a mission area. Lacking an overarching framework for joint operations, Army and Air Force leaders viewed their respective battlefield missions as taking priority. When overlapping air operations occurred, airspace was partitioned or divided into corridors of operations for each Service. Synergy at the theater level did not transpire. By the mid-1980s this changed with the evolution of an operational perspective, what Shimon Naveh calls the emergence of an "operational cognition" in which U.S. military planners applied a systems approach to campaign planning and theater military activities within the context of AirLand Battle.[62] The long-term importance of a systems approach to warfare and the emergence of operational cognition is revisited in chapter 6.

Thinking about the implementation of AirLand Battle, the emergence of an operational level of war in military thought, renewed strategic attention to Central Europe, Army tactical aviation developments, concept demonstrations, and experiments were among the factors leading to increased Army-Air Force cooperation. Opposition to cooperation began to fade in the spring of 1981 when Starry and Creech agreed to concepts provided by a Joint Suppression of Enemy Air Defense (J-SEAD) project, leading to the first Army-Air Force agreement on jurisdiction for close air support and interdiction. Subsequent agreements provided arrangements for Air Force control of deep strikes using Army missiles and Army management of the prioritization of air strikes for battlefield interdiction.

In mid-1983, Wickman and Gabriel "quietly put their staffs to work on a cooperative project to rationalize the planning and development of joint combat forces centered around the AirLand Battle model."[63] Jointness – or rather the lack of it – became the overarching defense readiness issue after the invasion of Grenada, discussed below. Communication and other interoperability issues received national media attention, suggesting that Reagan defense initiatives might be building a force unable to fight effectively. As mentioned above, in May 1984 the Army and Air Force announced agreement on thirty-one initiatives, including air defense, suppression of enemy air defenses, and fusion of combat information. Although sometimes a rancorous process, and despite failure to resolve important issues, this period was a turning point in the evolution of joint warfighting. Operational and political exigencies, moreover, eventually brushed aside impediments to increase joint collaboration. Air Force resistance to an Army deep strike role receded as the Air Force assumed new missions, including a lead role in space-based support to military operations – including the GPS, communications, and ground station enablers of deep strike.

Although not perfect, Army-Air Force cooperation also improved during this period as Services revisited conventional war planning. Both sought to dominate adversaries in all types of weather and at night, yielding a decisive American advantage by the end of the decade. They also collaborated on plans to simultaneously defend and attack throughout the depth of the battlefield. The close-in fight would be coordinated with deep attack, creating opportunities to blunt a Soviet attack through interdiction and maneuver.

Ben Lambeth's *The Transformation of American Air Power* provides a comprehensive overview of American air power developments during the years between Vietnam and the 1991 Gulf War. "The convergence of high technology with intensive training and determined strategy," he posits, "bespoke a breakthrough in the strategic effectiveness of American air power after a promising start in World War II and more than three years of misuse in the Rolling Thunder bombing campaign against North Vietnam from 1965 to 1968."[64] Precision strike emerged as a critical competency for a generation of Air Force officers whose indoctrination into the military focused entirely on strategic, relatively indiscriminate, nuclear strikes with little thought to the strategy of wining a European conflict. Pilots trained for a single, career-defining, apocalyptic sortie.

The term "sortie" denotes an operational flight, or combat mission, of a single aircraft on a specific mission. During the maturation period of the American RMA a reversal occurred in the sortie-to-kill ratio traditionally used to measure the effectiveness of airpower. By 1986, for example, based on data from experiments and operation El Dorado Canyon, a single sortie delivering one precision-guided bomb had the effectiveness of eleven single sorties each dropping six dumb bombs. This reversal helped change the perception of airpower within defense planning discourse. Whereas previous eras framed airpower effectiveness in terms of the number of sorties required to destroy a target or accomplish a mission objective, at the end of the maturation period of the American RMA planning considered the number of targets killed per each sortie.

This required timely location information on enemy forces. For an Air Force coming to grips with the complexity and rapidity of operations, this called for richer information context over greater distances in less time. Updated enemy situation data and geo-positioning for weaponeering were two important developments during the 1980s that built on digital, softcopy information sharing and command and control advances in the late-1970s. Specific information technologies contributing to increased military effectiveness for both air and ground forces included: digital imaging from spy satellites, analytic stereo-photogrammetry for targeting and other precision location missions, global positioning system applications, precision terminal guidance through scene-matching correlation, high-bandwidth secure digital battlefield communications, automated information fusion and analysis, hardened (jam resistant) command and control, stealth planes, and cruise missiles.

Organizational developments included more realistic training using digital terrain elevation data, closer integration of intelligence production and analysis with operations staffs, refined decision processes using near-real time dissemination of intelligence and cartography, increased joint warfighting, heightened Congressional involvement in acquisition planning, and processes to consider the costs of information needed to make new weapons work as part of procurement decisions.[65]

An important benchmark in the evolution of battlefield situational awareness and precision strike occurred in late January 1991. On January 29, a column of Iraqi armored forces moved from southeastern Kuwait and occupied Al Khafji, an abandoned coastal town in Saudi Arabia. A second Iraqi armored force was detected the following day, apparently preparing to reinforce Al Khafji and use it as a stalwart to engage Allied forces in ground battles along the Saudi coast. An E-8 Joint Surveillance Target Attack

Radar System (JSTARS) aircraft was diverted from its scud-hunting mission in eastern Iraq to support an air attack on the Iraqi armor. The battle lasted roughly a day and a half, resulting in the destruction of some 600 armored vehicles (tanks, armored personnel carriers, and mobile artillery). As Lambeth concludes, "the combination of real-time surveillance and precision attack capability that was exercised to such telling effect by air power against Iraqi ground forces at Al Khafji and afterward heralded a new relationship between air- and surface-delivered firepower in joint warfare."[66] "The real hero," he posits, "was the E-8 JSTARS."[67]

Brought into the Kuwait theater of operations only two days before the air war began, the E-8 was still in its development stage. Recall that JSTARS traced its roots to 1970s development projects, including the Air Force's Pave Mover radar and the Army's Stand Off Target Acquisition System (SOTAS) brought together into a single program office in 1982.

E-8s were reportedly deployed based on the recommendation of Army Lieutenant General Fred Franks, commander of the VII Corps, who first experienced their operational capabilities during an exercise in Germany. During the exercise (Operation Deep Strike), JSTARS detected and targeted a Canadian unit playing the role of a Soviet armored column, "achieving 51 'tank kills' as a direct result" and impressing Franks so much that "he later raved about the capability to" General Norman Schwarzkopf.[68] Lambeth's affirmation of the E-8's contribution was widely shared by others assessing American air power in Desert Storm: "JSTARS redefined the meaning of using real-time battlespace awareness to make the most of a casebook target-rich environment."[69]

Another "hero" in the Gulf was the Global Positioning System (GPS), which the Air Force assumed responsibility for and evolved as a major boon to long-range precision strike. J-STARS and GPS in an AirLand Battle context engendered a shift in thinking about reconnaissance and surveillance in operational art.

Related to ISR developments were those involving the other side of the “sensor-to-shooter” vision for rapid deep strike. The Air Force reversed decades of inattention to munitions research and development.

Vietnam and the October 1973 war demonstrated the efficiency of precision munitions compared to ‘dumb’ ones. The success of the 8th Tactical Fighter Wing indicated the operational value of laser guided bombs and other innovations. U.S. and NATO planners embraced precision weapons as a means to level the correlation of forces. Still, the U.S. conventional arsenal stagnated. Notwithstanding work on Paveway II and III, cruise missiles (discussed below), and other developments, the Air Force did not devote resources to munitions development until the domestic political situation, renewed concerns about the implications of a Soviet conventional attack, and questions about Air Force commitment to NATO conventional plans compelled new initiatives.

A new Armament Division at Eglin Air Force Base, Florida produced a dozen new non-nuclear ground attack weapons in the 1980s. Miniaturization, microchips, and more efficient sources of electro-mechanical power also improved conventional capabilities. Long-range precision strike advances included successive generations of the Paveway bombs. The GBU-15, an improvement on the electro-optical bomb used in the bridge attacks mentioned in chapter 4, used television guidance to glide bombs from greater distances than available with laser guidance. It entered service in 1984; an infrared guided warhead came in 1987. GBU-15s enabled pilots or weapons officers to lock weapons onto their intended target prior to releasing them or simply guide them to the target. Another development in precision weapons munitions came from the Navy, which wanted more standoff capability. Using a modified Paveway II bomb with a rocket booster, the AGM-123 entered service in 1985. It could be released dozens of miles away, guided via data link, and deliver its 1,000 pound warhead with astounding accuracy. Paveway III entered service in 1986.

Another element of the U.S. airpower revolution warranting mention here is the evolution of cruise missiles, which also evolved to utilize GPS technology. The key role cruise missiles play in the preponderance of post-Cold War U.S. military operations obscures their prolonged and uncertain development.

Air Launched Cruise Missile (ALCM) and Submarine Launched Cruise Missile (SLCM/Tomahawk) development remain case studies into innovation processes and the politics of weapons programs. Cruise missiles had been developed since the 1950s, competing for leadership attention and R&D funding with ballistic missiles. Navy cruise missile programs included the Regulus I and II. Air Force programs included the Matador, Navaho, Snark, Mace, and Hound Dog. Technological and organizational factors favored ballistic missiles. Missiles were not only faster, rendering them less vulnerable to air defenses, they were more accurate and could carry a larger payload. And they were less of a threat to manned bombers, which in the 1950s remained the soul of the Air Force.

Then the strategic context changed. Arms control treaties helped shape the strategic landscape. The May 1972 Strategic Arms Limitations Talk (SALT) I agreement did not limit cruise missiles. The Soviets had them. After Soviet advances in ballistic missiles threatened U.S. nuclear superiority, cruise missiles became an attractive option for maintaining parity. Additionally, Soviet air defense improvements threatened manned bombers. The 1973 Yom Kippur War demonstrated the capabilities of Soviet weapons systems, including air defense innovations threatening an Air Force core competency: manned strategic bombing. Low-flying cruise missiles could attack enemy air defenses. The bombers could then get through. For this reason, some cruise missile developments were classified.

Existing technological developments helped. Turbofan engines evolved in the 1960s out of an Advanced Research Project Agency initiative for a jet-powered backpack. It yielded a low-cost engine used on the first massed-produced cruise missile.[70] Another key development was Terrain Contour Mapping (TERCOM). Patented in 1958, the technology enabling this navigation and guidance capability evolved through successive improvements in accuracy. TERCOM works by loading a digital map into the cruise missile guidance computer along with the intended flight path. An on-board altimeter compares the elevation of the terrain passing underneath with the digital map, computing speed and location. Corrections can be sent to the missile in-route. The guidance system "did not become feasible until advances in large-array microelectronics in the late 1960s permitted the storage of large amounts of data in small spaces with minimal power requirements."[71]

In the end, according to Henry Levine, substantive cruise missile development occurred only in periods of strategic crisis, such as the fear of a Soviet first strike advantage, during which normal weapon development routines were disrupted. This permitted extra-service organizations with interests in promoting cruise missiles and their associated technology to exercise important influence. A new 'action channel' was momentarily created and exploited to achieve a reorientation of ongoing service-sponsored programs."[72]

By the 1990s, after some forty years of development, the Tomahawk emerged as a key component in the U.S. military arsenal. It evolved as a somewhat disruptive capability in terms of challenging long-standing Air Force antipathy to unmanned strike. Unmanned Aerial Vehicles suffered from similar organizational antipathy until the early 2000s, when their utility was proven in Afghanistan and Iraq – leading to Air Force support for armed UAVs.

Another airpower development critical to the story of the American RMA concerns stealth aircraft. Where Assault Breaker involved the integration of a number technologies into a concept demonstration that informed subsequent systems and operational concepts, the development of the F-117 Nighthawk stealth aircraft was a highly compartmented development project resulting in a relatively rapid transition from an operational prototype to production and fielding.

The Nighthawk evolved from programs initiated in the early 1970s to create airplanes able to penetrate enemy airspace undetected and without support aircraft. It also evolved from the vision associated with precision munitions, including the Paveway I and II discussed above. Despite minimal funding for precision munitions following Vietnam the benefits of a one target, one plane, one bomb approach drove the pursuit of efficiency in strategic bombing. The Yom Kippur War, in which Israel lost an inordinate number of strike aircraft to surface to air missiles, and knowledge of sophisticated Soviet air defenses comprised of interleaved, multi-tier missile coverage, created a requirement for air-to-ground strike capable of evading Soviet air defenses. The immaturity of ground-based long-range precision strike capable of neutralizing Soviet air defenses fueled enthusiasm for Stealth. Air Force leadership, moreover, supported the DARPA program responsible for the F-117 only after being assured that it would not compromise funding for the new F-16 strike fighter.[73] This was a case in which the Air Force did not actively pursue an innovative new capabilities – the program was pushed by Dr. Currie, Director of Defense for Research and Engineering (DDR&E).

DARPA-sponsored studies led to two stealth programs defense analysts in the early 2000s discussed as cornerstones of a new American way of war. HAVE BLUE evolved into the Lockheed F-117; TACIT BLUE evolved into the Northrop B-2 stealth bomber. Motivations for both stemmed from U.S. losses incurred during the bombing of Hanoi in which some five percent of the B-52s were lost. Soviet air defenses were reported to extend to some 125,000 feet with overlapping radar coverage. A very difficult penetration operation for tactical aircraft assigned to deliver conventional or tactical nuclear strikes on the ladder of escalation to theater and then global nuclear war. This study focuses on the F-117, the stealth aircraft most commonly associated with the American RMA.

HAVE BLUE "was a quarter-scale proof-of-concept aircraft designed to test out industry concepts of 'very-low-observable' capabilities while meeting a set of defined operational requirements."[74] After successful test flights in 1979, and because of the priority the offset strategy placed on reducing Soviet advantages in Europe, the program was accelerated. "The DARPA stealth program was immediately transitioned to a Service acquisition program with an aggressive initial operating capability (IOC) of only four years – foregoing the normal development and prototyping stage."[75] This was an important departure for acquisition programs. Initial delivery of F-117s occurred in 1982 and fifty-nine were in service by the end of the decade. Operational use came in 1988 during Operation Urgent Fury: the capture of Panama strongman Manuel Noriega. The targeting systems worked as planned, although the press reported that bombs dropped from F-117s missed their targets because they stuck a field near military barracks – not realizing that field was the target. Planners asked for the barracks to be left intact so they could be used later, asking instead that the F-117s shock the troops inside and disorient.

Among the most important reasons for the success of the stealth programs was the creation of a special office in the Pentagon to manage and champion them. Stealth exemplifies the evolution of thinking about operational time-space challenges posed by the Soviet threat in Central Europe *and* the need for civilian intervention to push innovation. It also reflects the underlying strategic and operational necessity underwriting the offset strategy. Its purpose was penetrating into the operational depth of Soviet territory as part of synchronized, simultaneous strategic and theater operations.

Throughout thee above developments, the Air Force evolved a theater and tactical conventional roles for strategic bombers. In the early 1980s, an internal debate ensued about the balance between strategic and tactical capabilities the Air Force needed to prevail in future conflicts. By 1985, the Strategic Air Command's B-52 squadrons were routinely training for conventional combat missions. It was the era of the so-called 'fighter mafia,' a cohort of fighter pilots and conventional force planners who argued for rethinking the core mission areas for Service resources. In this sense, a key part of the conventional renaissance in American military thoughts was the return of a conventional warfare focus within the Air Force. This included a gradual ascension of conventional airpower theory.

Evolving Security Concerns, New Military Missions

European security was not the only area where Reagan reasserted American influence; nor was it the only source of strategic and operational challenges impelling technological, operational, and organizational innovation. By the end of the decade, the conventional capabilities discussed in the ESECS report for the defense of Europe would be discussed in terms of new military missions. Two areas of concern to today's students of U.S. security policy became more important in the early 1980s: Persian Gulf stability and fighting international terrorism.

As Chapter 4 discussed, a succession of events heightened fears of Soviet expansion into the Persian Gulf during the 1970s, culminating in the December 1979 invasion of Afghanistan. Some feared Soviet subversion in Pakistan or the use of Afghanistan to invade Iran. Carter's decision to increase aid to Pakistan following the invasion addressed the former concern, the Carter Doctrine the latter.

The emergence of an American RMA is tied with U.S. involvement in the Persian Gulf in two ways. First, RMA-associated weapons and concepts were battle-tested there in the early 1990s. Second, the evolution of thinking about rapid deployments and rapid dominance were influenced by the need to plan for Gulf contingencies.

Persian Gulf contingency planning complicated the national security planning process, adding new dimensions to the problem of returning deterrence stability to Europe and compounding force readiness issues. Security commitments, training exercises, and forward staging of military equipment indicated a level of U.S. assertiveness not present in the immediate post-Vietnam years.

U.S. foreign policy scholar Cecil Crabb argues that Reagan Secretary of State Alexander Haig's 1981 visit to the Persian Gulf marked an evolution in the strategic intent underpinning the Carter Doctrine. It also marks a transition in U.S. security policy whereby American defense commitments began being extended to the Persian Gulf.

Haig's 1981 visit indicated an acceptance of the "Carter Doctrine as an axiom of American diplomacy in the Middle East" and signaled that "Republican policy-makers accorded the preservation of Middle Eastern security from Soviet hegemony an even higher priority than their Democratic predecessors."[76]

Underpinning Persian Gulf security concerns were links between oil prices and the global economy. "If the industrial democracies are deprived of access to those resources," Harold Brown argued in February 1980, "there would almost certainly be a worldwide economic collapse of the kind that hasn't been seen for almost 50 years, probably worse."[77] During the last years of the Carter administration, CIA analysis predicted that Soviet oil production would experience a sharp downturn in the 1980s. The economic consequences of declining oil production would create enormous political pressure to seek alternate sources through military force, political coercion, or diplomacy – all to the detriment of U.S. interests. Reagan administration officials feared that Soviet oil shortages would lead Moscow to seize oil fields or, more likely, coerce oil-producing states into selling oil for rubles (not convertible in the world market) or exchange oil for Soviet military equipment (leading to increased presence of Soviet military advisers).

In response, Reagan proposed selling Saudi Arabia AWAC airplanes and extended the scope of the Carter doctrine by virtually guaranteeing Saudi security. He also expanded the capabilities of the Rapid Deployment Force (RDF).

New planning challenges emerged for the U.S. military, which had to attune RDJTF forces to different contingencies than required for a Central European conflict. Yet no new military forces were created to support the RDJTF. Mobility forces (sealift and airlift) were particularly lacking. Insufficient combat forces were committed to provide the resources needed to project power into the region. Decades of focus on nuclear contingencies and planning for the reinforcement of NATO with heavy armor units created organizational and conceptual inertia that impeded new thinking about missions to protect oil fields in the Gulf. Politically, furthermore, the post-Vietnam climate made planning for involvement in regional conflicts difficult.

These impediments aside, projecting military power into the Persian Gulf region was no easy task. The region was more than 6,000 air nautical miles and 8,000 sea nautical miles from the U.S. and the U.S. had few military bases from which to stage operations. As in Europe, the U.S. faced time-space asymmetries favoring Soviet forces. Analysts concluded that the Soviets could place some "four airborne divisions, four surface-to-air missile units, and one motorized rifle regiment" within five days and an addition motorized rifle regiment "every 27-to-48 hours thereafter."[78]

Logistics remained a concern for both the European and the RDJTF. During the November 1981 "Bright Star" exercise it took some four days to transport four hundred men across the Atlantic. Their military equipment had to be shipped in a West German freighter because of inadequate sealift. It had to be chartered weeks in advance to ensure availability. That summer defense planners simulated Soviet invasion of Iran to wargame and assess U.S. response capabilities. The results confirmed logistics and mobility shortcomings. Staging the required equipment would take six months. Supporting the projected volume of fire missions complicated logistics planning. Rates of fire during the 1973 Yom Kippur War suggested that planned munitions stocks and reserves might be exhausted before re-supplies arrived. Then and now, modernizing logistics capabilities, including rapid air and sea transport, remain an important undercurrent in defense planning discussions. Subsequent exercises reinforced the need for advanced conventional forces fighting collaboratively with near-real time ISR coverage to identify targets.

Positive results did emerge from Bright Star. For example, U.S. power projection into the region was demonstrated. B-52 bombers flew non-stop from their North Dakota bases to the region, a mission repeated in numerous combat sorties in 1991 and the early 2000s. Military exercises occurred in Oman and the Sudan. One result of Bright Star was an expansion of the POMCUS (pre-positioned overseas material configured to unit sets) program to enable pre-positioning of three additional divisions by 1983 and three more by the end of the decade.

Planning for regional contingencies received renewed impetus when Reagan transformed the RDJTF into the U.S. Central Command on 1 January 1983. Its first commander was then Lieutenant General (LTG) Bob Kingston (part of the trio who helped develop the concept for Delta Force). Central Command's objective was "to disrupt at their outset the attacks of Soviet or Soviet-client forces, and control the battlefield environs for the time required to deploy U.S. reinforcements and resupply from distant points" into the theater.[79] Although new technology and rapid logistics capabilities would help, the only real solution was to keep forces in the region and to prepare airstrips and support facilities for additional forces. Some of those forces would have to be trained to fight "light," leading to new force structure planning requirements.

Apart from retaining the Marine Corps, light forces were not high on the post-Vietnam planners priority list. Even within the Marine Corps, the tendency was toward heavier forces able to engage Warsaw Pact armor. Indeed, until the early 1980s, armored forces dominated thinking about future warfare. Partly this reflected the principle planning challenge: defeating Soviet forces in Central Europe. It also reflected beliefs that light forces were too easily embroiled in regional conflicts. Fears of another Vietnam induced planners to shy from promoting light infantry divisions during the mid-1970s. Security challenges in the 1980s, however, contributed to newfound interest in light forces. Army planners recognized the need to provide organizational and technological responses to increased involvement in low intensity conflict, peacekeeping, and nation building. Chief of Staff General Edward C. "Shy" Meyer was among those arguing for light, mobile, lethal forces capable of reinforcing NATO but flexible enough to deploy quickly into other regions. Greater acceptance of light forces, including both light mechanized forces and special operations forces, occurred in tandem with the awakening to an operational level of warfare. Within a larger systems approach to warfighting in which campaign planning considered multiple operational strategies to disrupt the enemy, awareness developed about the potential for light forces and special operational capabilities to be used creatively to facilitate NATO maneuver.

Terrorism, Special Operations, and New Security Challenges

No history of the thirty-year transformation in U.S. military thought and defense planning can overlook the story of how counter-terrorism and special operations forces evolved from marginalized units lacking political support to exemplars of the new style of American warfighting. This section briefly reviews developments during the maturation period of the American RMA to document additional contextual, material, and intellectual elements anteceding the American RMA. The proclamation of a new American way of warfare in the early 2000s was in part based on the employment of military capabilities in Afghanistan and Iraq that evolved over several decades to fight terrorists and engage in other aspects of what is generally termed unconventional warfare or low intensity conflict. These capabilities evolved as part of the U.S. response to the larger Soviet threat to Europe.

Political violence was a growing source of instability for U.S. security planners in the 1980s. A wave of terrorism in Turkey, for example, led to a military take-over in September 1980 and to increased concern among Turkey's NATO allies that regional instability might undermine the Alliance. More ominous for its long-term implications, the Muslim Brotherhood joined forces with secular groups in Syria and Egypt, creating new models of anti-Western opposition. Global communications technology provided terrorists with access to new media outlets, gaining a larger audience for ideologically motivated violence. Islamic militants opposing the Soviet invasion of Afghanistan were among the users of new communications technology, using it to attract waves of recruits who received their training in Pakistani religious schools and training camps. Thousands of fighters flowed through these schools and camps where the struggle against Soviet invaders provided unity of purpose.

Terrorism was certainly not a completely "new" security concern in the 1980s. What was different? Terrorism in the 1960s and for most the 1970s was fairly localized in its manifestation of indiscriminate violence, only becoming 'transnational' terrorism at the end of the decade. And while terrorist tactics were not necessarily new, the rise of state-sponsored terrorism was. So to was the increased number of indiscriminate attacks to cause mass casualties. Terrorism also became more effective and lethal when states increased their training, equipping, and financial sponsorship. During the 1980s, moreover, terrorist attacks in Europe increased along with the level of violence against civilians.

Terrorism ascended in prominence in U.S. national security policy following the Black September movement's 1972 attack at the Munich Olympics. It was an international concern already, due mainly to high-profile Palestinian hijackings. A September 1970s hijacking, for example, helped spark a civil war in Jordan resulting in the expulsion of Palestinians from Jordan and regional instability. U.S. efforts to coordinate national counterterrorist policy began in 1972 with the creation of a Cabinet Committee to Combat Terrorism.

One historical benchmark in the emergence of a U.S. counter-terrorism force was a 1975 meeting at Fort Bragg's Special Warfare Center that included unconventional warfare experts Robert Kuperman, General Bob Kingston, and Colonel Charles Beckwith. After dinner, they outlined what became the first U.S. dedicated counter-terrorism unit in November 1977 when Carter directed Harold Brown to create Delta Force. The impetus appears to be Carter's desire to establish a U.S. capability similar to West German and Israeli counter-terrorist units, a decision made in the immediate aftermath of a West German counter-terrorist operation in Somalia. Motivating the decision was a general increase in the audacity of terrorist operations. One notable example was the 1975 operation involving a Palestinian group with Libyan sponsorship. It seized sixty hostages from OPEC headquarters in Vienna, releasing them after negotiating passage to Algeria and Libya.

Lebanon marked a turn in U.S. efforts to combat terrorism. Marines deployed to Beirut in September 1982 as peacekeepers with a multinational force to stabilize the central government and end nearly a decade of violent civil war. The October 23, 1983 bombing of the Marine barracks in Beirut, Lebanon was the tipping point in U.S. planning to combat terrorism. Only a month earlier terrorists attacked the American embassy. The killing of 241 U.S. Marines in Beirut stirred U.S. action. After the American embassy in Kuwait was attacked in December 1983, planning began for retaliation. Meanwhile, a wave of terrorist attacks around the world brought a new sense of American vulnerability, one that added to the lingering sense of helplessness felt during the Iranian hostage crises.

Although Reagan did not retaliate immediately, the Beirut bombing shook the national security establishment. NSDD-138 was signed on April 1984, endorsing "preemptive raids and retaliatory strikes" against sponsors of terrorism and terrorists themselves; it also "ordered twenty-six federal departments and agencies to develop plans for combating terrorism."[80]

That same year there was a significant increase in the numbers of Arabs arriving in Pakistan and Afghanistan to join the Afghan Mujahideen, fighters waging a jihad or holy war against Soviet occupation. The Taliban, drawing its name from the Arabic word for student, emerged as a unified group with a common core of intellectual thought based on shared experience in Pakistani refugee camps and madrassas (religious schools). Two years later the Mujahideen defended the mountain village of Jadji from a Soviet attack. Osama Bin Laden participated in the operation, which lasted seven weeks and ended in Soviet withdrawal. It is reported that Bin Laden took the AK-47 assault rifle he was later shown firing in globally televised videos from a dead Russian. Following the battle of Jadji, "Saudi Arabian Airlines gave 75 percent discounts on flights to Peshawar to men going to join the Mujahideen. At times, the Pakistani embassy in Riyadh was delivering up to 200 visas to the young recruits."[81]

Libya, the leading supporter of terrorism in the early 1980s, became the focus of attention. A 1985 Special National Intelligence Estimate concluded that Libyan strongman Muammer al-Qaddafi was supporting terrorism or insurgency in some twenty-five nations across the globe and backed opposition groups in a dozen others.[82] Libya ran dozens of training camps. Reagan acted on 15 April 1986 after Libya was judged responsible for the bombing of the La Belle discotheque in West Berlin, a nightclub U.S. soldiers frequented. In a strike code-named “El Dorado Canyon,” Air Force and Navy aircraft attacked Libyan terrorist training camps and other targets in Tripoli and Benghazi.

Current students of U.S. national security will find many parallels in the case of Libyan support for international terrorism in the early 1980s and the situation in Afghanistan leading up to the 2001 attacks against the United States. Although the al-Qaeda terrorism network was a much different organization and had different underlying political objectives, discussions of preemption and retaliation among national security planners in the 2000s reflected similar discussions decades earlier. Libya, moreover, was the first time since Vietnam that the U.S. had employed precision bombing.

Chapter Conclusion

By the mid-1980s, the U.S. military had emerged from a decade of retrenchment. Prevailing in third world, low intensity conflicts returned as a mission area. The strategic context had shifted, affecting change in the calculus of strategic effectiveness to include rolling back communism through covert action, training foreign militaries, and leading ‘freedom fighters’ in their struggle against Soviet proxies. Terrorism emerged as a strategic concern; some argued it would evolve into the most significant threat to U.S. national security.

Congressional involvement induced some changes the Defense Department failed to embrace quickly. For example, Congress mandated the formation of an Office of Conventional Initiatives within the Office of the Secretary of Defense to accelerate acquisition and fielding of new capabilities. In the mid-1980s, the Packard Commission recommended a number of changes in the acquisition process to expedite weapons procurement. In 1986, the Goldwater-Nichols Act mandating increased jointness was passed over the objections of senior military leaders. The Strategic Computing Initiative and other computer programs were rescued in 1985 after they were targeted for elimination as a cost saving measure. Defense spending on information technology grew the industrial base and funded research and development activities continuing to bear operational benefits in the 2000s.

It was in the early and mid-1980s that experiments and technology demonstrations confirmed the value of applying information technology. Military planners realized that information technology offered solutions to time and distance challenges. This was essence of the American RMA. Put another way, this is what made the very idea of an emerging conventional warfare RMA believable to defense intellectuals: coping with time-space problems was an ubiquitous challenge. It was the first post-World War II pursuit of conventional, offensively-minded time dominance concept of operations backed by technology.

Military leaders paid particularly close attention to information technology developments during the period discussed above. Major General Robert Scales, Jr. (retired), served in Vietnam as the commander of a field artillery battery with the 101st Airborne division. “After Vietnam,” Scales concludes, “the fortuitous development of revolutionary information and precision technologies gave the U.S. military a means to overcome past inefficiencies," giving rise to a "new American way of war" in the 1980s.[83] Its impetus included the "premise that technology could kill the enemy faster than the enemy could find the means to offset this overwhelming advantage in formation and precision."[84]

Conventional warfighting capabilities became a more important factor in deterring Soviet aggression globally in the 1980s. The conventional balance of power – quantitatively and qualitatively – returned as a central issue in NATO defense planning discussions. Some Allies continued to argue against force modernization plans or doctrine changes that might lead Soviet military analysts to conclude that NATO would demur from using its nuclear weapons early in a conflict. In the U.S., more than the majority of NATO nations, conventional force modernization became a domestic political priority, especially following the Soviet invasion of Afghanistan and the failed hostage rescue mission. Emerging peripheral threats could not be addressed, or deterred, with the threat of nuclear weapons.

The 1983 condemnation of nuclear war by the Catholic Bishops, who paradoxically did not outright condemn the building of nuclear weapons as long as they were used to deter war, added to long-standing discomfort with a defense posture based on global annihilation. Senior defense department analyst and head of DoD's Alternate Futures Project, Paul Herman, recognized in 1996 an "internalized" and "widespread revulsion" to "weapons whose main property is to kill or maim people (versus destroy their armaments)" among policy makers.[85] Underlying this revulsion was, and remains, anxiety concerning the use of nuclear weapons in general, a cognitive tension wrought from the dissonance of simultaneously relying on these weapons for peace and security while morally rejecting their existence altogether. This tension, as chapter 3 concluded, rendered the narrative of nuclear strategy ineffective as the surrogate for U.S. grand strategy, which it ultimately became in the guise of deterrence.

AirLand Battle and FOFA sought to leverage technology and doctrine to increase the power of existing weapon systems and restore deterrence stability by providing a credible defense and retaliation alternative to first use of tactical nuclear weapons. In addition to target acquisition, command and control, and guidance systems, new technology promised to improve overall warning of attack and to generally increase the accuracies of long-range strikes. They also presupposed better coordination and collaboration between air and ground forces. Army-Air Force cooperation ended some program duplication between the two services and enabled some "$1 billion in associated savings."[86]

Some criticized AirLand Battle and FOFA for relying on immature and costly technologies. Others contended that relying on deep strike instead of additional front-line defenses would leave forward forces vulnerable to OMG and other penetration units, opening opportunities for subsequent echelons. Analysts concerned with Soviet reactions and potential escalation questioned how Soviet theater nuclear commanders would discriminate FOFA conventional missiles from nuclear ones. FOFA was also criticized as further evidence that the U.S. wanted to lessen reliance on nuclear weapons, a potential weakening of the credibility of NATO's nuclear deterrent. Still, the operational ideas and a shift toward reliance on information systems marked a turn in thinking about warfare.

Although there were already "some seventy battlefield systems and subsystems in various stages of conversion to automation" before AirLand Battle Doctrine was adopted, the new FM 100-5 helped shape thinking about modernization and integration. Drawing on the new doctrine, "the Army was eventually able to conceptualize a tactical command

and control architecture" for controlling maneuver and coordinating fires, automating some indirect support, and revising approaches to intelligence support (including electronic warfare).[87] Planning strikes to battlefield depths of 150 to 300 kilometers galvanized new thinking about tightening intelligence, command and control, and fire support relationships. Targeting at such ranges required near real time intelligence to be exploited and disseminated to commanders and fire support centers. Subsequently, "commanders were now told unequivocally of their new responsibilities for the effective management" (though their [intelligence] officers) of the three major intelligence disciplines: human intelligence, signals intelligence, and imagery intelligence. Making the three work together would allow the commander to "see" his adversary on the battlefield, to pinpoint the location of his main forces, and to engage them at long ranges, thereby reducing the numbers that would survive to attack American front-line units."[88]

Extending the battlefield was a natural evolution of integration thinking within the Army and Air Force and reflected a refined understanding of the Soviet threat. Analysis of Soviet military forces and operational art in the mid- and late 1970s and more sophisticated modeling of different defense strategies suggested that conventional deep strike utilizing sensors able to provide warning and targeting data, combined with precision delivery capabilities, could sufficiently relieve front-line troops from being overwhelmed by Soviet armored echelons. General Starry reflected on the 'extending the battlefield' construct in a 1981 *Military Review* article, recalling that the evolving face of battle and the historical imperative of command, unit missions "were measured in time rather than distance." [89]

Deep attack was recognized as critical for winning close-in fights. Noteworthy here is the relationship between U.S. Army discussions of deep strike and traditional Soviet deep strike arguments extending back to the 1920s. For early Soviet theorists, deep battle was a means of reclaiming the initiative and restoring maneuver on a static battlefield. In the 1940s and again in the 1970s, Soviet military theory focused on combined arms operational art involving division-size maneuver forces. In the early 1980s, such thinking evolved into the OMG. AirLand Battle mirrored many of the developments Soviet theorists and planners pursued within the last phases of the nuclear RMA. It also engendered more sophisticated thinking about integration and extension.

AirLand Battle proponents did not argue that deep strikes or interdiction could win battles or campaigns alone. Rather, they contended that deep strike could shape the strength of enemy forces, impeding the enemy's ability to control space and time during engagements along NATO's front lines of defense. Because Soviet mobilization routes and potential invasion paths were known, planners could prepare fire missions based on Soviet doctrine. Time was a fundamental issue; resolving it required more than doctrinal changes. This is as much an information management problem as a weapon systems one.

Long-range strike capabilities evolved slowly, with envisioned levels of Service integration coming only in the 1990s. Assault Breaker was a successful concept demonstration despite Army-Air Force collaboration problems. Services championed their own programs and technologies at the expense of collaboration, partly fearing the joint program would delay or disrupt their own. Some concluded that "any transition" of Assault Breaker technologies before their own programs were finished would mean competition "for scarce Service resources."[90]

Regardless, the required operational concepts and doctrine did not yet exist to capitalize on new technology or implement the vision of joint air-land deep battle. The DSB's projection upon endorsing the concept proved correct: success "would require an unprecedented degree of interdependency" between the Army and Air Force.[91] Organizational barriers to cooperation remained a major reason why Assault Breaker-like capabilities were realized only after the Soviet threat waned.

Despite setbacks, operational prototyping, exercises, and concept demonstrations emerged as important tools in the innovation process. They facilitated new thinking, largely by enabling operational assessments of innovations by organizations envisioned to implement them. Successful military innovation depends in part on proving something – confirming the value of a new or revised tactic, process, technology, weapon, or operational concept, experimenting with operational changes and new technologies, and demonstrating to skeptical observers the merits of "new" or at least unfamiliar capabilities. Successful innovation is strongly correlated to the effectiveness of "gaming" exercises and their level of realism. In many respects, the advent of the information revolution has made realistic gaming more feasible. Not only has the increased number of information systems in force structure enabled their virtual representation, information technology enables more sophisticated simulations.

Advances in air-launched ground attack munitions and indirect fire weapons occurred with the perfection of guidance systems and a host of intelligence, surveillance, and reconnaissance (ISR) capabilities. Sensor-to-shooter capabilities became an operational reality. Visions of future warfare shifted from discrete, stovepipe systems to integrated networks, a term gaining prominence in the 1980s. Over the next two decades, the most difficult and important systems integration tasks would involve improving and integrating advanced ISR systems.

Integration was an overarching theme in the maturation of the American RMA, an argument developed further in chapter 6. It reflected increased acceptance of a systems development and modernization imperative wrought from coupling mission effectiveness with applied information technology. Such coupling has not been successful in every case. Overall, however, it has sustained an American advantage over adversaries.

Organizational integration to achieve operational synergy was part of this. After a decade of consolidation and despite need for continued integration, the 1986 Goldwater-Nicholas Act continues to be prove itself among the most important military reforms of the last century.

An important "integration" development concerned what Barry Posen argued is fundamental to the military elements of grand strategy. For him, grand strategy, "a chain of political ends and military means" measures effectiveness in terms of "the extent to which the ends and means are related to one another." "The 'knitting together' of political ends and means," furthermore, is basically "political-military integration."[92] Whereas the degree of integration between political ends and military means was blurred by the treatment of nuclear strategy as *the* military means for achieving grand strategy, the resurgence of conventional strategy in the early 1980s realigned national security strategy with national military strategy. Concepts and capabilities for extending the battlefield using long-range, information-enabled precision strike remained among the most important manifestations of tightened political-military integration.

Chapter 5 Notes

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6. Back to the Future? From RMA Thesis to Transformation Planning

From roughly 1973 through the 2003 liberation of Iraq, a thirty-year transformation has played out in American military thought and defense planning. This is not to imply that periods of transformation have clear beginnings and ends. They are, like all historical partitions, references to the rise and fall of key ideas, technologies, social outlooks, and ways of thinking about change from one period to the next. Noteworthy here is the degree to which the last several decades evolved as an American-dominated period of change in military history that diverged from the narrative of nuclear strategy. Other historical periods bounding major changes in U.S. defense strategy during the last century include World War I through the early 1940s and the end of World War II through the mid-1970s.

This study of military innovation and the origins of the American RMA began with an overview of the immediate post-World War II period, a time when U.S. defense strategy muddled toward an atomic-weapons dominated view of warfare. In the aftermath of 1945 London Conference of Foreign Ministers, with the Grand Alliance disintegrating, as diplomats grappled to prevent an escalation of the emerging Cold War, and while statesmen struggled to understand the implications of the dawning nuclear era, Soviet and American ground forces proceeded along different evolutionary paths.

Soviet strategists had no choice other than strengthening conventional warfighting capabilities until their own strategic bomber and rocket forces emerged in the 1960s. American ground forces were initially neglected or assigned low priority; subsequently mobilized for peripheral contingencies to the detriment of modernization in the European theater; and later considered a strategically viable solution to deterrence credibility problems after the Soviets achieved nuclear parity. Air-ground cooperation followed a similar path. Despite important advances in conventional armed forces, nuclear arsenals became the linchpin of Cold War deterrence stability and the cornerstone of U.S. and Soviet grand strategy. Sustained quests to achieve, preserve, or reclaim this idealized, yet abstract, stability relationship drove military strategy and defense planning for the remainder of the Cold War.

U.S. military thought and defense strategy emphasized nuclear strategy and capabilities in a way that limited the evolution of conventional warfighting strategy and military thought. Changes arose on the margins of nuclear strategy in the late 1970s and early 1980s after William Perry and Harold Brown articulated the offset strategy.

In the late 1970s, few defense analysts argued that envisioned conventional warfare capabilities would mature into a new, dominant form of strategic warfare. None projected the marginalizing of nuclear doctrine in defense planning a decade after the Warsaw Pact dissolved without a shot fired. Moreover, no mainstream analysts envisioned the emergence of national military strategy dominated by information superiority.

On the other hand, *did* conjecture that proposed conventional systems, including organizational adaptations redressing long-standing Army-Air Force issues, might make it possible to operate on a "porous battlefield," one without massed forces or linear battle lines, in a manner that did in fact render tactical nuclear weapons "redundant."[1] In doing so, policy makers and analysts built on early 1970s arguments that emerging technology opened new possibilities for the "dispersal of small ground combat units" possessing a level of effectiveness sufficient to resolve inherent "contradiction between massing for conventional combat" and dispersing for "a 'nuclear-scared' configuration."[2]

Drawing on the argument that the ability to merely defend against attack was not sufficient to create a deterrence relationship, conventional force initiatives aimed to both blunt an attack outright and enable accurate, rapidly prosecuted, conventional strikes deep into enemy territory. Doctrinally and operationally, the offset strategy was manifested by “Deep Attack” concepts and reflected in the evolution of the U.S. Army’s successive doctrines, culminating in the 1986 iteration of AirLand Battle. Advanced surveillance and reconnaissance systems were integrated with weapons systems to make them more effective against a potential Soviet attack into NATO territory and more flexible against other foes. If accompanied by “improved posture and tactics, and improved night and low-visibility target acquisition and guidance systems,” analysts argued, “the contribution of these weapons systems to stopping a Pact ground offensive could be decisive[;] a prudent Pact commander would not assign to an offensive a high probability of success.”[3]

The technologically advanced weapons systems proposed to achieve the offset strategy were “largely conceived and developed during the 1970s…in response to the then-perceived threat of an armored assault by the Warsaw Pact forces in central Europe.”[4] Writing on the future of military affairs and national strategy in the aftermath of the 1991 Gulf War, Perry argued that the offset strategy, which simply “sought to use technology as an equalizer or ‘force multiplier,’ was in fact “pursued consistently by five administrations during the 1970s and 1980s.”[5] Former Assistant Secretary of Defense for International Security Affairs (1993-1996) Ashton Carter echoes Perry, arguing the after the offset strategy’s precepts were “dramatically demonstrated during Operation Desert Storm” in 1991 they became “key to Washington’s way of waging war.”[6]

Chapter Overview

In the early 1990s, the offset strategy was globalized. No longer aimed at offsetting the Soviet military threat, the underlying logic, using the power of information to synergistically link capabilities into a purposeful network, became the core of post-Cold War national security strategy as well as military strategy. In regional conflicts, Perry contends that the offset strategy's net effect was "the ability to win quickly, decisively, and with remarkably few casualties."[7] Put another way, the offset strategy's weapons, doctrine, and operational art became the chief elements of a "dominance strategy" after the Soviet Union dissolved and Cold War systems designed for the plains of Europe were adapted to other missions.

Information technology, operational concepts, and organizational developments associated with the offset strategy or its resulting weapons systems were adapted as central tenets of an RMA-related goal of achieving 'dominant battlespace knowledge' so that U.S. forces themselves can achieve 'battlespace dominance.' Achieving the force multiplier effect of information technology required innovations in situational awareness, inertial guidance, target location at night and in all types of weather, air defense suppression, precision guided munitions, and an operational approach to war planning.[8] Related programs included the Joint Tactical Information Dissemination System (JTIDS), JSTARS, AWACS, GPS, new sensors for the U-2 and SR-71 reconnaissance planes, and automated precision targeting capabilities.

An evolutionary process can be traced to the early 1980s decision to develop a more integrated nuclear-conventional deterrent based on more robust conventional strike options. Doctrinal revisions were encouraged in the early 1980s, force structure changes were legislated in the mid-1980s, rapid dominance concepts were adopted in the early

1990s, and refined views of preemption as a viable option crystallized in the late 1990s and early 2000s.

In tying together major study themes, the sections below review developments related to the globalization of the offset strategy. The section immediately below summarizes key developments addressed in chapters 4 and 5. Another section reviews the digital computer information revolution to provide insights into the evolution of the new American way of warfare.

Information technology, as chapter 1 argued, suggested new possibilities for operational and organizational innovation. Students of current transformation discourse will benefit from some discussion of the evolution of reliance on information technology terms, metaphors, and systems to link together a cacophony of disparate concepts and programs. Subsequent sections review discursive aspects of post-Cold War American military thought and defense policy to suggest how conceptual and intellectual factors shape strategic outlooks and organizational views of change.

Additional sections explore how, and in some cases why, 1990s RMA discourse emerged as the central organizing principle of U.S. defense modernization discussions. For example, RMA language, rhetoric, and imagery best reflected, and helped analysts make sense of, the strategic environment that emerged in the immediate post-Cold War period. Information-centric theoretical overtones resonated, albeit unevenly, both with the generation that implemented the offset strategy's legacy programs (and doctrine) and the emerging generation of policy makers – the first to mature in an era of ubiquitous computing and wireless communications. This generational intersection helped ensure the place of RMA language and imagery in a nascent defense reform debate in the mid-1990s and further encouraged the ongoing lexical turn in American military thought.

Finally, the chapter returns to a study theme: the almost wholesale rejection of the dominant facets of U.S. Cold War strategic thought. Nuclear weapons, nuclear strategy, calculations of deterrence stability, ideologically driven arms races, and the logic of mutually assured destruction all but disappeared from the public face of national security planning.

Of course, nuclear weapons continue to be a central factor in international politics and remain the cornerstone of deterrence in U.S. grand strategy. As discussed below, however, prevailing currents within U.S. military thought as well as policy developments reflected an additional turn away from the omnipresence of nuclear weapons and targeting issues in U.S. national security discussions.

The 2002 Nuclear Posture Review, for example, brought a new, capabilities-based strategic triad composed of defenses, a responsive national infrastructure, and both nuclear *and* nonnuclear strategic strike. Deterrence stability, it seems, has grown even more complex. The new strategic triad includes the traditional components of bombers, ICBMs, and SLBMs along with advanced intelligence, planning, and command and control capabilities.[9] During the Cold War, platforms and weapons systems were the essence of the triad. Now, information and knowledge management capabilities receive top billing. Time will tell if funding and leadership support for information systems matches their importance in transformation arguments.

The Thirty-Year Transformation in Retrospect

Despite horrific conventional force readiness in the aftermath of Vietnam, nuclear warfighting issues continued to dominate American defense planning. Military services were at their post-World War II nadir in terms of training, leadership, and professionalism. The political climate did not support conventional force modernization, nor were senior military and civilian leaders in a position to overhaul planning. National security strategy remained pinned to the strategic nuclear triad of strategic bombers, extremely quiet submarines carrying submarine launched ballistic missiles (SLBMs), and land-based intercontinental ballistic missiles (ICBMs) housed in protected silos. Conventional forces in Europe were a "tripwire," a symbolic representation of America's commitments to Allies. Although Soviet forces could easily overrun them, doing so would trip, or trigger, nuclear war.

Successive crises abroad, a resurgent Soviet threat in the third world, and political pressure at home encouraged a tipping point in the late 1970s as Army and Air Force leadership grappled with the operational implications of Soviet precision anti-tank weapons and a layered, integrated air defense system. Analysis of Soviet war plans and capabilities indicated that extending the battle into the Soviet follow-on echelons and the ability to penetrate air defenses would be crucial in the opening battles of any war in Europe. Threats from more capable Soviet conventional forces resurfaced questions about the European offensive-defensive balance. NATO's conventional defenses seemed less viable, less able to defend against an attack. Allies questioned the American commitment to NATO.

A set of strategic and operational challenges bounded defense strategy, warfighting vision, and operational requirements for U.S. armed forces, all of which related to the central theme of deterrence stability in Europe. They all related to attempts to stabilize perceived East-West imbalances. Raising the threshold for using nuclear weapons became a strategic priority

American military innovation during the Cold War derived from three sources: attempts to correct or stabilize imbalances in the nuclear deterrence equation, challenges in peripheral regions that had the potential to escalate into U.S.-Soviet crises, and specific operational threats to NATO forces that had strategic implications for East-West stability. In the 1980s, security challenges in each area pointed toward advanced conventional forces.

In his *The Pursuit of Power: Technology, Armed Force, and Society Since A.D. 1000*, historian William H. McNeill argues that this “competition between the USA and the USSR” during the late 1960s and 1970s “attained a new and enlarged scale” that reinforced the pursuit of “new technologies and new weapons.”[10] This reinforced the quest for progressively better weapons systems. Especially prominent were Army and Air Force initiatives that, in part, responded to perceptions of weakness in their core conventional warfighting competencies.

In this climate, civilian strategists and military officers – the latter sometimes called ‘mavericks’ in innovation literature – set about transforming training, revising doctrine, and seeking greater integration of technology on the margins of the scramble for new strategic systems able to preserve the deterrence value of the triad. Lacking a conventional defense and retaliation alternative, awakening to the post- Vietnam imperative for radical reform, and succumbing to political pressure at home and abroad to reduce reliance on nuclear deterrence, U.S. planners undertook a series of initiatives that coalesced into a significant increase in U.S. military effectiveness. Post-Gulf War defense pundits characterized these advances as an American RMA.

A culture proclivity to leverage available technology was reinforced. McNeill concludes that, as the East-West climate evolved, the pace and scope of research and development (R&D) efforts "mattered more than current capabilities."[11] Alex Roland sums up what has been a steadily more important feature of post-World War II American military planning: "[q]uality of arms replaced quantity as the desideratum of warfare."[12] The offset strategy, at its heart about qualitative advances in capabilities, aimed to raise the nuclear threshold in Europe at the same time it placed defense research and development on a path to create new weapons systems and operational.

For the U.S., this included the application of systems integration skills to the vision of leveraging emerging information technology and information-enabled weapons to counter Soviet armored echelons. "Numbers," as former deputy director of the Central Intelligence Agency Herbert Scoville found, did not "make much difference anymore; the real threat" was "new types of weapons."[13] "Instead of assuming that the old weapon will serve," Roland posits, planners "assume that the old weapon is obsolete, or at least obsolescent."[14] This seemed particularly true in the early 1980s as the maturation period began.

In this study, "maturation" did not mean the realization of the full RMA but the maturing of a host of capabilities that, by the end of the decade, gelled into what observers discussed as an emergent RMA. As one assessment of capabilities to implement Follow-On Forces Attack concluded in 1986, "the technologies of primary interest [were] relatively mature, and could result in fielded systems over approximately the next decade."[15] Indeed, this is what happened.

Crucial during the years giving rise to the American RMA were visions for the future, including those articulated by prominent Generals William Westmoreland, William DePuy, and Don Starry. Each emphasized information technologies as key to future performance on the battlefield. Information technology became the fundamental domain for such improvements, known as "force multiplying" initiatives. In other words, information technology enabled new sources of combat power by linking together existing capabilities and adding important new ones. In the language of more recent U.S. defense planners, this was an attempt to create new sources of power, a new competitive space.

The Ethernet, telecommunications deregulation, satellite communications, and other factors meant the period studied in chapter 5 was also the maturation period of the digital computer information revolution. Expectations for technology shifted as the information revolution increased interdependence between technological and doctrinal change.

Studies of the 1973 Yom Kippur War shaped visions for information technology and precision weapons. Notable among them was Starry's detailed analysis of armored battles and the effectiveness of anti-tank munitions. Others assessed the implications of Soviet air defense systems, which downed some one hundred Israeli aircraft in eighteen days. Comprehensive studies of Soviet armored and air defense capabilities, some of them sponsored by DARPA, identified vulnerabilities and recommended technological and operational alternatives to exploit them. The 1976 Defense Science Board Summer Study on conventional capabilities set the stage for projects liked Assault Breaker which, in turn, demonstrated the inherent value of greater Army-Air Force cooperation. Revolutionary stealth fighters and bombers were developed to penetrate Soviet air defense systems.

Technology developments and organizational reforms reinforced one another as the reciprocal relationship between air-ground technology and joint doctrine crystallized. A conceptual revolution occurred as additional attention was devoted to conventional warfighting. An associated training revolution transpired. These and other developments both reflected and reinforced the rise in professionalism. Expectations about the efficacy of new technology applied to solve operational challenges evolved. Concept demonstrations and experiments provided evidence for the near- and long-term potential for new systems to resolve operational challenges.

They also fueled debate, much of it focused on strategic plans for the defense of Europe and the overall viability of nuclear deterrence. A tripwire mentality relying on nuclear deterrence no longer assuaged Allies fearful that, after theater nuclear weapons were employed on Allied territory to blunt a Soviet advance, a cease-fire negotiation would trade Allied territory to prevent global nuclear war.

Conventional force modernization proponents were ready to offer alternatives to nuclear weapons when the strategic and operational needs to do so became an imperative. Discussions about the future of European security were paralleled by arguments for more a capable conventional deterrent in strategically important regions. American grand strategy was infused with a renewed appreciation for the strategic and operational utility of conventional forces.

Evolutionary threads in the larger history of twentieth century warfare converged in the late 1980s. Like yeast rising, they gave form to a new American way of warfare, one that helped support a new national security strategy in the early 2000s. Numerous developments contributed, including GPS, new sensors and intelligence capabilities, aerial refueling, night vision, a systems approach to warfighting, increased jointness, and the maturation of an all-volunteer, professionally trained – and led – force. Developments derived from numerous factors: changes in the strategic context, resulting changes in the calculus of strategic and operational necessity, technological developments involving the information revolution, doctrinal changes, and general agreement on visions for an integrated, extended battlefield.

What emerged from all of this? Not merely a single sensing system: an entire new way of sensing, acting, and achieving on the battlefield by leveraging the power of information technology. Indeed, a revolution occurred in battlespace awareness and operational decision-making.

"To a much greater extent than ever before," Douglas Macgregor observes, military commanders are "technologically positioned to influence action on the battlefield by directing global military resources to the points in time and space. . .critical to the campaign's success."[16] Essential elements in doing so include: quickly and accurately visualizing the battlespace; identifying, geopositioning, and characterizing enemy forces; optimizing one's own capabilities to strike the enemy with minimal casualties; efficiently developing campaign plans; and, conducting long-range strikes with more precision, fewer forces, and greater lethality than any time in human history.

By the mid-1990s, the organizing power and widespread presence of RMA arguments, and the proliferation of RMA-associated terminology, influenced the major themes of defense modernization. These concepts emerged as likely threads of a new U.S. national security strategy and military strategy in the 1990s just and they seemed likely enablers of an RMA when the Office of Net Assessment studied perceived changes in warfare.

The identification of conventional capabilities with a turn in the history of warfare, together with favorable disposition for any "newness" associated with the sudden end of the Cold War, further encouraged RMA thinking. For a brief period, much talk ensued about a peace dividend. Military manpower and material force structure declined, the

CIA closed a large number of their overseas stations, and debate ensued over the best way to stockpile thousands of nuclear warheads withdrawn from operational units.

The Cold War's rapid, bloodless end, the feeling of renewal and national pride in U.S. military forces after the Gulf War, and the removal of the threat of nuclear war contributed to contextual ripeness for an RMA discourse to take root. Programmatic and conceptual elements discussed in chapters 4 and 5, demonstrated in the Gulf War, continued to provide the substance underlying the rhetoric.

The Spirit of the Age: Information Technology and Rapid Dominance

Throughout history technology, doctrine, and operational innovations have been applied to offset an adversary's qualitative or quantitative advantages. Proclaiming an 'offset' approach is therefore on the surface somewhat uninspiring and potentially *ahistorical* in terms of research on any particular era. A contention of this study is that information technology and a systems view based on an American approach to systems integration made the offset strategy different from previous cases of technology applied to solve strategic challenges.

Information technology enabled a more symbiotic relationship among weapons system and platforms, on the one hand, and the resulting system-of-systems and its human operators on the other. A unique co-evolutionary process inhered in which an emerging operational cognition among warfighters, a systems view of applying technology among planners, and a leadership vision for joint capabilities all reinforced pursuit of a core set of capabilities to resolve specific battlefield challenges. Historically unprecedented changes resulted. Building on capabilities conceived in responses to the Soviet threat to NATO, information technology is now being leveraged to conduct complex, dispersed, rapid military operations at night supported by the near-ubiquitous application of GPS technology.

At the beginning of the formative period in the American RMA, as reported in the 1974 Intelligence Organization and Stationing Study mentioned in chapter 4, ‘the integration of intelligence from all sources into a single product was largely a myth.” [17] Lieutenant General (retired) James Clapper’s “frustration” about the lack of “actionable intelligence” (discussed in chapter 4) was widespread. Recognizing that organizational changes and conceptual innovations are crucial to what this study terms the American RMA, Clapper nonetheless maintains that the advent of the computer information age in all of its dimensions drove innovations in intelligence, weapons development, and doctrine. Noteworthy is the fact that Vietnam was the first conflict in which military personnel were deployed with a specialty designation “computer specialist.” Hundreds operated intelligence and communications equipment. By the end of the 1980s, obtaining computer training and experience in the armed forces would be among the top recruiting draws and a critical readiness area.

Some might interpret the centrality of information technology to the American approach to warfare as a case of where military strategy being determined by a larger techno-centric theme in American strategic culture. On the surface, history supports this view. For the U.S., seemingly more so than other nations, seeking technological answers to operational challenges reflected a cultural affinity for science and technology, for innovation, and a cyclical turn toward aggressive ideational approaches to conflict punctuated by periods of withdrawal, isolation, or retrenchment. American strategic culture, more than most, copes with challenges to national interests by leveraging technology at hand or, when needed, creating the technology required. It is this entrepreneurial quality, the penchant for innovation, that partly defines the American spirit.

It is easy to over-emphasize technology qua technology when discussing the antecedents to the American RMA or, more generally, when considering military innovation adoption and diffusion processes. It is instructive, on this point, to consider Martin van Creveld's admonition to those ascribing too much importance to technology itself. For Van Creveld, "behind military technology there is hardware in general, and behind that there is technology as a certain kind of know-how, as a way of looking at the world and coping with its problems."[18]

The offset strategy certainly reflects an American way of looking at the world and coping with its problems. Part of this concerns the leveraging of available technology. Colin S. Gray found that "American preference for the use of machines in war lies rooted in the sparse people-to-space ratio of frontier America, and in the acute shortage of skilled artisans that lasted well into the nineteenth century." [19] "American fascination with technology," he contends, "resulted from conquering the wilderness" where the "relative absence of societal support on the frontier bred a pragmatism that translated into an engineering, problem-solving approach – an approach that at times has dismissed conditions as merely problems" to be solved only "by embracing machines."[20]

Martin Gannon argues that, because the U.S. has "historically been 'short' on labor and 'long' on raw materials," using "their abundant raw materials" required substituting "machinery and equipment for unskilled labor."[21] Gannon further contends that, for Americans, "the success of their highly mechanized industry in the late 1800s" reinforced "the power of machines and technology" which, once "proven to stimulate growth and success," ensured that "their dependence on machines grew heavier."[22]

“Dependence on machines” is probably too strong. Dependence has a negative connotation and understates the issue of what socio-economic and other attributes make the existence and use of machines more likely in some cultures. More appropriate, perhaps, is an understanding of how available resources can be exploited to solve strategic and operational problems more efficiently, with less human cost, and in ways that minimize the strategic downside of demographic and geographic limitations.

“Every culture,” Geoffrey Parker observes, eventually “develops its own way of war”; for John Keegan, culture remains “a prime determinant of the nature of warfare” across historical periods.[23] Considering the post-World War II period, student of U.S. airpower Michael Sherry assigns culture a central role in determining the behavioral and material characteristics of warfare, observing that the defining components warfare are “generally the product of the political, cultural, and intellectual environment in which they worked.”[24] Even Clausewitz, Christopher Bassford suggests, focused on cultural aspects of warfare. According to Bassford, the Prussian concluded that “the nature of war” is ultimately “determined by a complex of social forces, by the ‘spirit of the age,’ rather than by the conscious desires of individuals or theorists.”[25]

American military strategy, while not dependent on machines or technology per se, nonetheless has co-evolved with strong links to the prevailing, dominant technologies in U.S. culture. In many cases defense spending has driven important new technologies, including information technology. America led the early decades of computer technology and was the first to bring its armed forces into the computer age. U.S. military thought and defense planning remain inundated with language and concepts associated with computers and information technology. Network centric, to take one example, represents the spirit of the age.

One operational goal of the offset strategy was to quantitatively expedite, and qualitatively enhance, the knowledge cycle-times that embody operational decision-making process so that NATO forces could defeat Soviet armored attacks as their echelons assembled for movement. Central to the information-enabled offset strategy were changes in the way leaders viewed the relationship between the cost of speed (how fast end-to-end information services can function) and the value of time (the premium placed on shorter decision- making cycles).

This is a difficult concept to many to grasp; one derived from a fundamental aspect of the modern information age; one at the heart of ongoing changes in the art of war. Space and time considerations drove the evolution of the Army's FM 100-5 from Active Defense through two iterations of AirLand Battle. A larger sociological trend underscored developments in military thought, what social scientist and postmodern theorist Paul Harvey terms "space-time compression." For him, "the time horizons of both private and public decision-making have shrunk, while satellite communications and declining transport costs have made it increasingly possible to spread those decisions immediately over an ever wider and variegated space."[26] The problem comes from the destabilizing effect this compression has cognitively and culturally, specifically its affect on "our capacity to grapple with the realities unfolding around us."[27]

As military capabilities are increasingly designed for and used in rapid, distributed, complex actions, information technology both resolves and complicates time-space compression issues.

When time is of the essence, the high cost of speed is moderated, especially if one treats the cost of systems, infrastructure, tools, and trained analysts as an opportunity cost in the larger realm of operational success. As computerized, digital information technology became a more important arbiter of military effectiveness during the 1980s, military planners began addressing the issue of information and knowledge velocity. The information revolution was the real, tangible side of the American RMA.

Defense analysts recognized in the 1990s that the "historical limitation" on military capabilities "has been the length of time required to correlate and fuse data from a variety of sources, process it into information and communicate and display that information to intelligence analysts" and then provide actionable information to decision makers.[28] The larger issue for U.S. national security was characterized Joseph S. Nye and William A. Owens in their influential 1996 *Foreign Affairs* article, "America's Information Edge":

> The one country that can best lead the information revolution will be more powerful than any other. For the foreseeable future, that country is the United States. America has apparent strength in military power and economic production. Yet its more subtle comparative advantage is its ability to collect, process, act upon, and disseminate information, an edge that will almost certainly grow over the next decade."[29]

Strategically, the information edge is "a force multiplier of American diplomacy" in the same fashion that the U.S. "offset strategy" of the 1970s used information to multiply the power of existing conventional forces to offset Soviet numerical advantages in Europe. It is also the essence of the current way of looking at the world and coping with its problems, the spirit of the age in contemporary military thought.

The information edge benefits those able to collect, process, disseminate, and act upon information faster and better than others. Widespread agreement that information technology could indeed multiply the power of existing weapons systems led to an understanding of information as a weapon in its own right. This represented the natural progression of an overarching theme of integration coursing through late twentieth century military thought. It is also a key part of the RMA that began in the 1970s and reached initial operational maturity in the late 1980s.

Trends originating or accelerated in the 1970s due to technological advances included “greater emphasis upon sensor systems. . .relative to the decreased emphasis upon firepower delivery systems”; highly evolved command, control, and communications (C^3) systems; and precision weapons.[30] Reflecting prevailing needs on the battlefield, such trends reinforced the need to collect, fuse, and make sense of information. A simple mantra emerged among commanders: Tell me where I am, where my buddies are, and where the enemy is. Tell me these things all the time in time and with the tools to act decisively, and I will prevail – on the plains of Europe or in the desert.

This was, of course, a wish of all combat leaders throughout military history. In the 1980s, however, it appeared as such capabilities were in reach because of the digital information revolution. As the cost of computing power decreased, a “revolution in data processing and communications capabilities” reduced “ this entire series of activities to near real-time.”[31]

For Norman C. Davis, the digital revolution was “based primarily on significant technological advances that have increased our ability to collect vast quantities of precise data; to convert that data into intelligible information by removing extraneous ‘noise’; to rapidly and accurately transmit this large quantity of information; to convert this information through responsive, flexible processing to near-complete situation awareness; and, at the limit [of this awareness], to allow accurate predictions of the implications of decisions that may be made or actions that may be taken.”[32] What Davis describes is an order of magnitude change in the way we collect, aggregate, analyze, store, retrieve, and exploit information. When considered from the perspective of competition in the international system, it is Nye and Owen's information edge.

Many of the specific operational problems responsible for Clapper's comment that the lack of operational intelligence's utility to warfighters in the 1970s was "frustrating" were being resolved. But new operational and tactical challenges continue to emerge, expectations continue to outpace capabilities, and knowledge dominance remains at the forefront of military effectiveness.

Major General Robert Scales, Jr. (retired), who led the Army's official post-conflict study of the 1991 Gulf War, observes that the war represented a transition "between two epochs: the fading machine age and the newly emerging information age."[33] Herein lies the underlying historical turn on which the RMA thesis drew its strength as an organizing construct for post-Cold War defense modernization discussions. It is also a major area of concern for defense transformation scholars in the 2000s, as many promising areas of sensing, supplying, communicating, and striking involve extremely small, self-organizing, 'smart' avatars.

Management guru Peter Drucker similarly argues that some three hundred years of "technology came to end after World War II. During those three centuries the model for technology was a mechanical one: the events that go on inside a star such as the sun."[34] The post-World War II era, he continues, brought a shift from mechanical models of technology to "biological processes" encompassing "the events inside an organism" where "processes are not organized around energy in the physicist's meaning of the term. They are organized around information."[35] In his *The Advent of the Algorithm*, David Berlinski agrees with Drucker, opining that "great era of mathematical physics is now over. The three-hundred-year effort to represent the material world in mathematical terms has exhausted itself."[36] The idea of an algorithm may by as old as the logic of mathematics, but its realization as a valued tool of mathematics, logic, and computation would not come until the twentieth century. "An algorithm is a scheme for the manipulation of symbols," concludes Berlinski, and symbols "are instruments that convey information."[37]

Important in an age of information plenty, the algorithm enables compression, extrapolation, and visualization. It facilitates the manipulation of symbols representing the complex interplay of objects moving through space and time, two fundamental domains of warfare. More importantly for the growing cadre of military analysts and theorists favoring networked, biological (e.g., swarming), and other new models to characterize information-dominated military operations, the algorithm enables new sources of power and new levels of effectiveness to be derived from information technology.

At the very heart of many advanced military capabilities are algorithms in the form of computer code, fusion techniques, and data models expressly designed to manipulate and display knowledge about the battlefield. Visions for future battlefield situational awareness and automated targeting increasingly point towards smart software agents, self-learning and self-tasking sensor networks, automated dissemination of targeting data to weapons, and intuitive visualization and modeling tools that allow planners to dynamically simulate potential scenarios.

Data fusion for situational awareness involves four basic elements. First, different signals within spectra (e.g., various electronic waves, levels of thermal radiation) are fused into a single uniform signal that is greater than the sum of signals considered separately. This provides greater sensory information to answer the question "is there anything out there?" Second, fusing of different spectra (e.g., thermal, electromagnetic) provides answers to the question "what are the characteristics of what is out there?" A third factor is tracker correspondence, which provides insight into the location and movement of sensed objects. Finally, advances in situation awareness allow information warriors to better determine intent.

These four elements underscored early data fusion work during the maturation period of the American RMA that was first battle tested in the 1991 Gulf War. Performance of all systems was by no means perfect. Some capabilities, including JSTARS, were still in their prototyping phase. Their use, nonetheless, demonstrated new potential for dominating the battlefield by leveraging the power of information.

Through the 1990s and into the 2000s, expectations and requirements for information gathering, integration, exploitation, and dissemination capabilities expanded. During this time, language and visions associated with the RMA thesis continued to draw on terms, concepts, and capabilities from information technology and its application for knowledge management. By the end of the decade, many argued that the rhetoric was outpacing reality, that the promise of information technology was not being fulfilled.

Rethinking the RMA Thesis in Defense Policy Discourse

In the immediate post-Cold War period, observations of U.S. performance in the 1991 Gulf War provided the initial foundation for American defense analysts' arguments that a profound change in warfare had occurred. Precision strike, ISR capabilities, and stealth were the exemplars of new capabilities underwriting the American RMA thesis discussed in chapter 1. It was the interaction of these capabilities, their operational use within a maneuver-oriented doctrine, and the ability to fight throughout the depth and breadth of the battlefield in near-real time that gave the pro-technology slant of the RMA thesis its staying power. Present but muted in RMA discussions were the more critical advances in training, professionalism, and operational proficiency.

Discourse on a new American way of war, therefore, derived its immediate post-Cold War empirical basis from perceived effectiveness of forces fighting a 100-hour war, and an enemy, that in many ways seemed similar to Soviet forces in Central Europe. For sure, stark differences in terrain, weather conditions, the enemy (Iraqi rather than Soviet armor), the conduct of the battle, and the entire strategic situation inhered. Analysts, including Soviet observers, however, believed U.S. long-range precision strike, stealth, space-based situational awareness, and global communications networks did indeed represent an advance in effectiveness worthy of a revolutionary descriptor.

Soviet military analysts were not comparing themselves to the Iraqis. As previous chapters noted, their comments addressed the ability of U.S. nonnuclear forces to exhibit the theater strike potential of tactical nuclear weapons, thereby replicating the effectiveness of the early nuclear RMA. For them, U.S. military performance in the 1991 Gulf War verified nearly a decade of analyses of what they dubbed a new American reconnaissance-strike complex capable of a theater strategic offensive.

Perry himself views the 1991 Gulf War as the first and only "test" of the systems built in the 1970s specifically to achieve the offset strategy. Their success demonstrated that the much ballyhooed RMA of the 1990s was merely the offset strategy renamed.[38] Defense analyst Ken Allard similarly argues "victory in the desert was the culmination of more than two decades of post-Vietnam renewal" and "the payoff for an investment strategy that had consciously sought to offset enemy strengths with technological expertise."[39] Noted strategic analyst Edward Luttwak does not state outright that the

American RMA is the offset strategy renamed. He does, however, suggest that Deep Attack aspects of the offset strategy, the core of the reconnaissance-strike system, represented the “concrete expressions” of the “RMA that occupied military bureaucrats on both sides of the Atlantic at the turn of the millennium.”[40]

Why the ascent of RMA language? One reason is that defense intellectuals and analysts sought to escape decades of strategic thought dominated by nuclear targeting and deterrence theory. The language of revolutionary change breathed life into what many considered benign neglect of conventional strategy and doctrine within national security strategy. After living with the necessary evil of nuclear warfare – including a declarative first strike doctrine, the RMA thesis was at the very least liberating. The American collective consciousness had always abhorred the threat of a non-proportional use of military force.

Advanced convention forces were first used operationally to remove a tyrant from Kuwait and defend principles of international law. Judicious, restrained use of precision strike reinforced an American sense of mission and leadership in the international community. A national sense of burden, of responsibility to the world, lost to a generation who matured in the Vietnam years, returned. It was a fitting end to what was supposed to be the ‘American century.’

RMA arguments, in this sense, also tapped aspects of American strategic culture, including an affinity for a progressive worldview. They reinforced the sense of American dominance or at least superiority missing from the cultural psyche a decade earlier.

Other factors encouraged the rapid ascent of ‘revolutionary’ references to U.S. military capabilities after the Gulf War, including a focus on the future. A “post-ism” *gestalt* swept through academic and policy communities, with the new world order described as post-Cold War, post-industrial, post-modern, post-positivist, post-nuclear, and post-communist. Swirling in the cognitive landscape during this time, and adding to the sense that a watershed had occurred, were popular discussions of "the end of history,"[41] and the irrelevance of Clausewitz's theory of warfare.[42] Anticipation mounted that additional epochal events would add to the so-called Velvet Revolution in Eastern Europe, the tearing down of the Berlin Wall, and the disintegration of the Soviet Union.

Additional revolutionary language came from business and management circles, at the time dominated by business process re-engineering theories that Defense management proponents fashioned into their own 'revolution in business affairs' to compliment the RMA.

Bill Clinton's 1992 election slogan "It's the economy, stupid!" resonated with a public interested in economic growth. Change management theorists pushed quick fix solutions that fed on an atmosphere supportive of sudden change. Business process revolution approaches were characterized by a "change or die" philosophy, which became a mantra in boardrooms.

Indeed, across government and industry, there was widespread acceptance of the idea of, if not an expectation for, rapid modernization and reform. Drawing on, and later reinforcing, pro-change mindsets were a cadre of reformers seeking to revolutionize government processes and improve responsiveness to citizens. Significant progress occurred in areas such as streamlining administrative processes, reducing paperwork requirements, and transitioning services to the private sector.[43]

Moore's law, which holds that computer processing power doubles roughly every eighteen months, became something of a cognitive schema. Information technology fed revolutionary fervor as the Internet and web applications surged. E-business best practices were instantiated in government with expectations for significant savings in process cycle time and the number of layers required to do business. An institutionalization of a pro-innovation *zeitgeist* occurred. The National Performance Review (NPR) was announced by the Clinton administration on March 3, 1993. Later renamed the National Partnership for Reinventing Government, the NPR was among several initiatives reflecting the post-Cold War emphasis on making government more efficient by reengineering it.

As reformers sought to reinvent government, institute performance measurement, and overhaul financial management practices, defense reformers aimed toward new organizational, fiscal, and administrative efficiencies. A defense reform initiative was launched, base closures and re-alignment commissions recommended infrastructure cuts, intelligence and defense budgets were slashed, and nuclear weapons were withdrawn from most deployed military units. Themes associated with the dominant narrative of nuclear strategy (discussed in chapter 3) were downplayed.

National security strategy was overhauled. A new grand strategy, discussed in earlier chapters as how a nation essentially causes security for itself, was needed to reflect the new era. Specific references to nuclear weapons or nuclear deterrence decreased. Material and intellectual resources discussed in chapters 4 and 5 emerged at the center of defense planning and military thought. Substituting nonnuclear strategic strike for the nuclear deterrent in situations other than conflicts involving weapons of mass destruction also reinforced the attractiveness of operational art and campaign planning.

From the perspective of the late 1970s, American military thought and defense discourse underwent a near complete revolution by the end of the 1990s. Had they possessed a window into the future, many defense analysts would find the terms, images, and ideas fundamentally different. Only the group of thinkers and policy makers on the margins of mainstream defense planning in the late 1970s and early 1980s, including those involved in programs like Assault Breaker and in technology planning for Follow On Forces Attack, would recognize the future in terms of their visions and initial efforts to create a reconnaissance strike complex.

One of the noteworthy developments during the 1990s was the emergence of information warfare as a distinct subset of war planning and operations at the strategic level. Military education institutions made information warfare part of their curriculums. The National Defense University began offering classes the subject and created a School of Information Warfare and Strategy. In June of 1995, sixteen men and women graduated from the school as the nation's first accredited "infowar" officers. Meanwhile, the Joint Chiefs of Staff created an information warfare directorate. Its special technical operations component would lead highly classified information warfare developments. On the defensive side of the security equation, a National Infrastructure Protection Center assessed and monitored the nation's information, power, and other critical grids. In 1998, Deputy Secretary of Defense John Hamre announced the creation of a Joint Task Force Commander for Computer Network Defense. Information warfare was indeed an area of profound organizational change and intellectual activity.[44]

As the RMA thesis jelled among policy makers and defense analysts, its central themes were aggregated and projected into new, information-centric warfighting visions. *Joint Vision 2010*, for example, placed information superiority as the overarching enabler for four key future operational concepts: dominant maneuver, precision engagement, focused logistics, and full dimensional protection. Time dominance, situation awareness, and the ability to coordinate activities of distributed forces gained currency in these and later visions partly because their essential, operational capabilities were at hand. Such factors dominated during debates over AirLand Battle and Follow On Force Attack and figured prominently in discussions of the Rapid Deployment Force.

Despite the emergence of information warfare as a new area of military affairs and newfound interest in the ability of information technology to resolve strategic and operational challenges, few sought to place perceived, revolutionary increases in military capabilities in historical context. Fewer looked at them from a Cold War, evolutionary perspective.

When everyone else is speaking the language of revolutionary change, perhaps, peering into the future from the past offers at best a lackluster view. As is argued below, this left defense reform and force modernization discussions without a clear sense of how important new combat capabilities and associated theories of success evolved.

Vision documents failed to go beyond general themes in setting the objectives for change, leading Douglas Macgregor to posit that the 1990s witnessed “no progress” in realizing the promise of joint warfighting. *Joint Vision 2010* and *Joint Vision 2020*, capstone joint visions containing warfighting concepts meant to guide Service doctrine and modernization objectives, became “simply bumper stickers” that did “not prevent competing service requirements from dominating joint integration efforts.”[45]

Admiral Bill Owens (retired), Vice Chairman of the Joint Chiefs of Staff from 1994 to 1996, the period in which *Joint Vision 2010* was coordinated and published, provides another perspective. In terms of concepts and attempting to chart a vision for the future, this was indeed a time of significant change in how defense modernization was characterized. During it, the RMA thesis ascended in American military thought. Owens was among the most vocal advocates for change.

Inside the Pentagon and in front of Legislative committees, Owens canvassed for integrating the large and in many cases impressive array of ISR and situational awareness systems being developed independently by the military services. Although not entirely successful, his efforts helped lay the foundation for later acceptance of a network centric, integrated vision of how air, land, space, and sea assets could leverage their information systems to mutual advantage. Among his legacies are a strengthened Joint Requirements Oversight Council (JROC) and more rigorous Joint Warfighting Capabilities Assessment (JWCA) process, more forward looking joint vision, and widespread buy-in to the argument that military planning should adopt a systems-of-systems approach.

Reflecting on the pace and scope of force modernization changes in the 1990s, however, Owens later conceded that the "Pentagon was not really interested in pushing a revolution in military affairs, and few in other parts of the executive branch or in Congress were either."[46] "We changed the vocabulary" and "modified planning processes, established new planning instruments, and adjusted the style, stakes, and procedures in the planning process," he recalls, but "we made less progress than we had hoped" in transforming "the future size, structure, and character of the U.S. military."[47] An old wine, new bottles syndrome inhered in many programs.

Owens describes the underlying pathology. Although much "rhetoric filled military journals and public pronouncements about 'new eras,' 'peace dividends,' and 'military revolutions,' the U.S. military was quite happy to avoid" significant change while defense leadership merely rode the post-Gulf War "crest of victory."[48]

Successive planning activities and documents record this lamentable reality. The 1993 *Report of the Bottom-Up Review*, the 1994 *Nuclear Posture Review*, the 1994 commission on the roles and missions of the armed forces, and the 1997 *Report of the Quadrennial Defense Review* all failed at being "decisive in setting clear guidance" or establishing "a consensus for policy objectives."[49] "In each of these cases," American foreign policy scholar Janne Nolan concludes, "senior leaders, beginning with the president, proved reluctant to engage the issues directly or to provide leadership to guide the outcome."[50]

Major defense planning documents, including the three cited above, drew heavily from Cold War assumptions in terms of the planning scenarios underscoring force structure decisions. For example, a significant cross-border armored attack remained the chief planning scenario driving force allocation requirements despite the marked decline in the mechanized forces of potential enemies. Planners framed regional instability and political violence as lesser, wholly included scenarios that forces designed for cross-boarder contingencies could cope with.

Political and fiscal realities were ill suited to furthering the innovation paths begun in earlier decades. Modernization efforts were delayed, with funding directed to redressing critical readiness issues associated with successive military interventions abroad. Worsening the situation, recruitment and retention levels declined. Services temporarily lowered aptitude standards, accepting category IV recruits (scoring the lowest on tests) at a time when the operational environment grew more complex and weapons systems more complicated to operate.

For these and other reason, the 1990s is best considered a transition period in which leaders did not seize opportunities for defense transformation, a topic warranting further study. Important to this study are developments in how defense intellectuals used RMA terminology to define defense modernization as they struggled with an uncertain threat landscape.

Even as the RMA thesis became ubiquitous in defense planning discourse and security studies, it failed to provide a policy-relevant framework to inform decision-making. It could not transition beyond sketching – in very broad strokes – the prominent features of change occurring in the history of warfare.   Nor did RMA theory, or even military innovation studies focused on the interwar period, provide the rich historical context required to understand specific antecedents to ongoing changes in warfare and their implications for grand strategy.

Theory continued to focus on describing significant military change as policy analysts turned from grappling with the reality of change to the starker reality of declining defense budgets, increased operations tempo, and rising costs of weapons systems. RMA works, meanwhile, focused on the interwar period. A paradoxical situation emerged. Students of defense policy sought a lexicon of defense modernization attuned to describing, not prescribing change at a time when vision documents pointed to gaps between rhetoric and funding for new systems.

By the end of the decade, prominent public policy scholars would identify concerns about RMA works and the rapid incorporation of the RMA thesis into the official lexicon. In 1997s, for example, Colin S. Gray called for "scholarly literature expressing deep skepticism about RMA concepts and [information] warfare" to balance a priori assumptions about assumed revolutionary changes in military affairs.[51] He deemed RMA discussions a "Big American Defense Debate" that yielded "much more noise than illumination."[52]

Defense analyst Michael O'Hanlon also expressed concern. For sure, a general RMA thesis existed in U.S. defense discourse that reflected "current rhetoric and official documents as well as in a host of writings of independent scholars and strategists."[53] Overall, however, he concluded that the "RMA literature" of the 1990s failed to provide "a systemic assessment of where defense technology [was] headed."[54] Indeed, O'Hanlon's 2000s *Technological Change and the Future of Warfare* opened with a chapter entitled "The So-Called Revolution in Military Affairs" that considered evidence for an existing American RMA was at best "inconclusive."[55]

Military effectiveness scholars whose research did inform defense planning subsequently took aim at the broad discussion of the American RMA. In assessing RMA theory as a guide to understanding strategic history, Williamson Murray and MacGregor Knox conclude that "few works throw light on the concept's past, help situate it or the phenomena it claims to describe within a sophisticated historical framework, or offer much guidance in understanding the potential magnitude and direction of changes in future warfare."[56] Their criticism reinforced previous concerns with the RMA thesis, including O'Hanlon's.

In sum, 1990s RMA literature devoted too little attention to the synergistic or additive aspects of seemingly disparate innovations in command and control, technology, doctrine, acquisition, and operational art that occurred during the 1970s and 1980s.[57] It is for this reason, among others, that the end of the 1990s brought a transition from RMA references in defense planning discussions to transformation processes. An additional development seems to be the mere loss of earlier affinity for revolutionary monikers as the post-Cold War era lost its halcyon quality. Although the basic elements of the conventional warfighting RMA retained their currency (e.g., stealth, precision strike, joint warfare, information dominance), analysts at the end of the decade seemingly recognized that a lack of significant departures from Cold War force structure questioned the appropriateness of RMA defense planning discourse. The reason was not that defense intellectuals and military theorists rejected the premises of the RMA thesis or its many conceptual frameworks for thinking about military change. Rather, the shift represented the degree to which the RMA thesis was insufficient to move beyond descriptions.

This does not mean RMA discussions were altogether feckless. As Gray argues, "the raising of the RMA flag mobilized a wide variety of perspectives and skills" and "enabled some long antecedent ideas and streams of analysis to play significantly in a contemporary debate."[58] Indeed, they set the stage for later policy discussions and provided much of the language used to frame a new transformation strategy.

From RMA Thesis to Transformation Policy

Important areas for advancing military effectiveness emerged during the 1990s as American military forces were tested in successive conflicts against weaker adversaries. Operation Allied Force in Kosovo, for example, engendered greater awareness that additional end-to-end intelligence, surveillance, and reconnaissance capabilities were needed. As information technology facilitated the compression of decision cycles and enriched situational awareness, new operational challenges exposed shortcomings in a key end-to-end process. Specifically, the capacities available to sureveil the battlefield, detect enemy forces, assess their intent, target them, pass accurate coordinates, facilitate navigation of platforms and weapons, dynamically retarget if needed to ensure precision strike, and provide nearly immediate post-strike assessments.

The relationship between the discursive (ideational) and material (existential) aspects of the American RMA thesis, including information technology, and early 2000s transformation activities is metaphorically one of a fulcrum and lever. That is, transformation is being considered a way to leverage the RMA, or more accurately technologies and capabilities labeled RMA-like, to transform the Services. Partly this is reflects the widely held belief that we *are* witnessing an RMA. As Andrew Krepinevich notes, the turn toward transformation is in fact a "product of the belief that you are in a period of military revolution. Otherwise, why transform, especially if you're the dominant military."[59] The pivot around which this leverage is exerted is a nexus of information technologies and decision support capabilities at the core of significant changes in warfare over the last three decades.

To continue the metaphor, if information (or knowledge) management advances represent the pivot for leveraging RMA technologies and concepts, the actual work, or energy, used in the process consists of *innovation* with those capabilities across the Services, combat support agencies, combatant commands, and other Defense Department support activities. Greater appreciation for the decades-long processes and inherent difficulties of applying information technology to military problems encouraged the change from RMA discussions to transformation discourse.

The term 'transformation' was present but not centered within 1990s defense policy discourse. References to transformation during much of the decade appeared primarily within RMA discussions about historically profound changes in military history or leaps in the effectiveness of one or more combat arms.

Now, "transformation" refers to defense transformation strategy and visions associated with the George W. Bush administration's attempts to remake U.S. armed forces in the model of a lighter, more agile, information-enabled precision force wielding greater lethality over greater distances in less time. ‘Transformation’ became shorthand for policies and processes to bring about long-term shifts in strategic effectiveness while waging a global war on terrorism.

The shift in the discourse of defense policy is more than merely semantic. Labels and ideology are important in policy making. Perception matters in planning. Discourse counts in terms of shaping expectations. Indeed, discourse remains an important area of study for students of national security affairs.

“As determinants of what can and cannot be thought,” Karen Litfin argues, “discourses delimit the range of policy options, thereby functioning as precursors to policy outcomes. . . .The supreme power is the power to delineate the boundaries of thought – an attribute not so much of specific agents as it is of discursive practices.”[60] Labels, concepts, and ideas influence how people think about the world and conditions behavior within it.

Paul N. Edwards concludes in *The Closed World: Computers and the Politics of Discourse in Cold War America*, that the realm of “discourse goes beyond speech acts to refer to the entire field of *significant* or *meaningful practices*: those social interactions – material, institutional, and linguistic – through which reality is interpreted and constructed for us and with which human knowledge is produced and reproduced.”[61] And as Ronnie Lipschutz observes, “Winning the right to define security provides not just access to resources but also the *authority* to articulate new definitions and discourses of security.”[62]

As the case of the RMA thesis suggests, the discourse of national security shapes how defense policy issues are conceptualized and, ultimately, the lenses through which planners sketch the contours of grand strategy. As stated above, transformation terminology is being used to condition views of defense policy in the George W. Bush administration as being progressive or about forward-leaning change. The term's ascent in defense planning discourse was facilitated by a number of widely cited sources, some warranting mention here because they provide some insights into how defense planning discourse evolved.

Among the earliest and most notable was Martin Van Creveld's 1991 *The Transformation of War*, a book length essay on the changing nature of warfare and what such changes suggested for the future of modern armed forces.[63] Assigned reading for military officers, the key aspects of Van Creveld's arguments incorporated into RMA discussions addressed the changing face of warfare. But his thesis, that Clausewitz's theories no longer applied, and that armies postured to fight other nation states would be useless in the coming era of terrorism and civil wars, was difficult for many military leaders to accept.

Why mention it? In a tragic turn of events, lessons for defense policy embedded in Van Creveld's 1991 treatise on the end of traditional, mass-army warfare would go largely unheeded by the Army deployed to build a new Iraq. His thesis bears revisiting in light of events of the past decade and the seemingly prescient arguments about the changing nature of warfare, the end of the mass mobilization army, and shifts in the social and political undercurrents on which soldiers would choose to bear arms.

Among the benchmarks in the shift toward transformation dialogue was the 1997 National Defense Panel report "Transforming Defense – National Security in the 21st Century." Reflecting a larger questioning of the pace and scope of defense modernization, it represented an evolution in thinking among defense interlocutors about the pace and scope of defense modernization. Around this time, defense analysts and military theorists began addressing the issue of defense transformation and called for a renewed planning debate. Public discussion of force readiness and reactions to ballistic missile proliferation contributed.

The 1998 Department of Defense *Annual Report to the President and the Congress*, through which the Secretary of Defense communicates the status of defense readiness and planning, is a second document marking the shift from RMA language to transformation processes.[64] Previous annual reports contained rather pedestrian discussions of RMAs as historical phenomena or construct to conceptualize historic changes in the nature or war. In 1998, of the five main sections, one addressed Service transformation and another Department-wide transformation. Additional text was devoted to "New Operational Concepts" and "Implementation" needs, including experimentations, demonstrations, and other activities encompassing a larger strategy of transformation.[65]

Subsequent annual reports would address transformation strategy in lieu of RMA chapters. This represented the socialization of 'transformation' as a term of art within defense planning and policy circles and the realization that something more prescriptive than existing RMA language was needed.

Another benchmark was the September 1999 Defense Science Board (DSB) report entitled "DoD Warfighting Transformation." The report defined transformation as "a process that seeks fundamental change in how an enterprise conducts its business" in pursuit of "discontinuous change in the nation's capabilities to conduct" military operations. [66] Departing from the deterministic and exogenous view of organizational change inherent in some RMA discussions, transformation was defined as a "self-inflicted" process seeking "very big change."[67]

It is noteworthy that, unlike studies earlier in the decade, the report did not begin with assumptions about an ongoing or imminent RMA, choosing instead to focus on transformational aspects of U.S. defense modernization that address issues of military effectiveness. Presumably, had the same report been commissioned two years earlier, the title and tone of the report would have reflected the centrality of the RMA thesis in official and scholarly thinking about defense modernization.

Among the few muted references to RMAs was the recognition that "very big change" was "sometimes characterized by the term revolution in military affairs."[68] Apparently, rather than accepting the passivity of an "RMA-is-certain" approach, the DSB articulated a view of defense reform and modernization that sought an alternative to RMA-associated rhetoric.

Instead of questing after immediate, revolutionary reforms, transformation was characterized as "defining and implementing a vision of the future different from the one embedded, if only implicitly, in DoD's current plans and programs."[69]

The DSB, moreover, "did not find much sense of urgency" for significant changes in Service warfighting capabilities in the documents addressing force modernization. Their report concluded that "the focus and effort needed" to transform was being underestimated.[70] Although the DSB is not an official voice of U.S. defense policy, its views and arguments often anticipate policy decisions by defining the major issues of the day and recommending solutions. Frequently, as was the case in Assault Breaker, a DSB study will shape the parameters of an argument and provide the initial recommendations leading to discussion and ultimately a decision. In this case, the DSB's conclusions about transformation directly informed the defense policy debate during the 2000 election.

Additional discussion is warranted on the "lack of a sense of urgency" comment. Despite concerted efforts within the Office of the Secretary of Defense to push modernization, the Clinton administration did not make transformation a priority in terms of leadership attention, a willingness to expend political capital to influence Service decisions, or a clear vision for change conjoined with 'sticks' to induce compliance. This left the military services to define their own visions without an overarching mandate to change – or to integrate. Defense transformation did not seem to be getting any traction.

The pace of operations did not help, a fact the Joint Chiefs made clear in September 1998 Congressional testimony by highlighting inconsistencies between policy objectives for change and resources available. Because defense budgets did not increase, this meant less funding for new procurements and modernization. The future was mortgaged to pay for current operations, a reality that was also true in the intelligence community. Agencies watched their budgets decline as the appetite for intelligence exploded.

Department of Defense planning guidance for 1994 and 1995, moreover, anticipated savings of some twenty-five billion dollars from cutting force structure and reducing support infrastructure. The General Accounting Office "blasted these assumptions" in 1996, arguing "'there is no significant infrastructure savings.'"[71] Modernization funding continued to suffer, leading analysts to conclude in 1998 that "defense procurement" was "down by more than 70 percent since its high point in the mid-1980s" and "billions below the requirements to recapitalize America's defense forces."[72]

An absence of urgency for transformation in part reflected the lack of a compelling political reason to embrace it. Voters were not concerned about the level of defense spending. One 1995 survey "revealed that 73 percent of Americans polled believed there were no threats for which the U.S. military was unprepared"; 53 percent believed the U.S.

was spending too much on defense; less than 10 percent rated defense as an important issue.[73] Defense issues did not factor into either party's 1996 convention speeches.

Without political support for changing the direction of defense modernization, and absent an existing or projected threat, Services lacked motivation and sufficient assurances required to initiate their own, internal changes. Admitting that any funded weapons system or program was irrelevant risked losing both the system and the funds for it. In this political context and associated fiscal situation, protecting existing resources meant recasting old programs as transformational.

Complicating matters, the climate of reform and fascination with 'reengineering' in Washington gave the appearance that much was already changing. Champions of the status quo continued to use the 1991 Gulf War to rationalize organizational structure and technology prioritization. This was still the case in September 1999 when then presidential candidate George W. Bush evoked the term transformation in a speech on defense issues at the Citadel military academy in South Carolina.

The pace and scope of U.S. defense modernization was scrutinized during and after the 2000 election. Writing in 2004, Eliot Cohen recounted the essence of the ensuing criticism. Strategically, American defense strategy was too wedded to "a Cold War-derived understanding of military power" and failed to "focus on the challenges of the new century: homeland defense, a rising China, and what can only be termed 'imperial policing.'"[74] Even after a decade of an RMAized defense discourse and numerous visions for future warfighting, technology development and procurement processes adhered to "Cold War paths," leaving "systems suited for a war in Europe with the defunct Soviet Union rather than hardware optimized for" emerging threats.[75] Former defense official Ashton Carter urged the incoming Bush administration to transform defense and to revamp research and development. The U.S., he argued, was "not fully exploiting or staying abreast of the information revolution."[76]

Despite a renaissance in American military thought, and perhaps because new thinking was not affecting change evenly across mission areas or quickly enough within Services, Cohen noted "a sense of intellectual and doctrinal stagnation" among some military leaders.[77] For these and other reasons, Cohen posits, emerging transformation discourse represented "more than politics or the quest for novelty": defense reform was in need of an overhaul.[78]

Additional concerns surfaced about joint experimentation and operational prototyping, two primary routes for integrating new technology into operations. Secretary of Defense Bill Cohen and Chairman of the Joint Chiefs of Staff General Hugh Shelton had attempted to bolster experimentation in October 1999. Their creation of a Joint Forces Command, which incorporated the U.S. Atlantic Command, was intended to transform joint warfighting capabilities and champion long-term innovation.

Progress remaking the armed forces continued to draw criticism from across the political spectrum in the early 2000s. The Army's modernization plan for the 21st century, dubbed the "Army Transformation Strategy," was criticized for being more about process and theory than substantive change in force structure. According to Andrew Bacevich, furthermore, although transformation across the Defense Department portended something novel or new, in reality transformation discussions indicated that "the debate over military reform" in the post-Cold War era "had come full circle" back to the early 1990s.[79]

No prominent changes occurred during the Bush administration's first year in office. Critics resorted to citing Bush's own campaign speeches lamenting that the American military was “still organized more for Cold War threats than for the challenges of the new century – for industrial-age operations, rather than information age battles.”[80] They asked when he would live up his promise to correct what he called the “the last seven years” of “inertia and idle talk.”[81] The Bush administration adopted a strategic approach, preferring to study the issues before acting.

Soon after assuming office in 2001, the administration convened several panels and commissioned numerous studies to chart a new course for U.S. defense modernization. Of note is the reinvigoration of the role assigned to Andrew Marshall and the Office of Net Assessment after the office’s participation in defense planning was marginalized during the Clinton administration. Marshall was tasked to rethink, re-look, and revitalize efforts to modernize the U.S. military. Ostensibly, Marshall returned to first instincts, in this case the approach taken in the early 1990s when the idea of an MTR (and then RMA) took root among defense planners. Managed by the Office of Net Assessment, the panels and studies revisited many of the issues, arguments, and innovation discussions of the previous decade’s RMA debate. These studies benefited from a decade of thinking about changes in how warfare should be waged in the information age.

Many argued for lighter, more lethal forces able to befuddle opponents with rapid dominance. Heavy, armored forces would not be needed if units were enabled by information technology. Superior knowledge-to-action capabilities would wrap troops in a protective layer of information.

Operationally, the Army gained what would be invaluable operational experience in regional conflicts during the 1990s. Somalia offered a lesson in the stark reality of urban combat against an enemy that could not be distinguished from the civilian population. It was an enemy aided by radical Islamists teaching local militiamen to down American helicopters with rocket propelled grenades, a tactic battle-tested against Russian forces in Afghanistan a decade earlier.

Meanwhile, the Air Force employed precision strike capabilities during the 1990s in diverse combat environments. Doing so exposed inherent limitations of systems and targeting processes conceived for the battlefields of Cold War Europe. Operation Allied Force in Kosovo exposed apparent shortcomings in heavy lift, logistics, and intelligence support to military operations. Failure to find Serbian armor in Kosovo, or to prosecute timely attacks after they were located, revealed gaps in the 'kill chain' that questioned the effectiveness of precision air strikes. Apparent shortcomings in intelligence support to military operations questioned progress achieving information dominance. This was predictable given the lack of funds for intelligence modernization and the strategic approach to intelligence support inherited from the Cold War.

The United States has traditionally relied on a 'surge' approach to intelligence support to national security. The theory of surge intelligence support assumes that sustaining a baseline of collection coverage, analytic capabilities, and other assets will sufficiently inform policy and action across the range of known threats and identify emergent issues or concerns in time to shift resources and meet crisis needs. Practically, the approach assumes technical and human resources allocated to sustaining 'readiness' are fungible: they can be temporarily reallocated to meet emergent needs. An alignment is therefore assumed between investments to create a baseline surge capability, including a knowledge base to monitor, report, and inform on a range of issues, and the anticipated needs during a surge.

A decades-long learning curve about intelligence requirements co-evolved with a surge strategy and set of planning practices that helped win the Cold War. The learning curve included understanding of risks associated with shifting resources during times of surge. Issues and crises warranting intelligence surge were expected to relate to an overarching security regime with a known, relatively stable set of 'strategic' challenges. Periodic miscues and failures to anticipate occurred. They were infrequent and usually linked to an existing issue or threat. The surge strategy assumed resources could be re-aligned without placing national security at risk.

Intelligence, surveillance, and reconnaissance capabilities developed to counter Soviet armored forces were essentially a sophisticated collection enterprise to detect war preparations. Systems and analytic processes scrutinized troop cantonment areas, submarine pens, rail yards, munitions plants, and the daily behavior of Soviet leaders and generals to behavior of out specific indications of larger activities suggesting mobilization. They did not immediately transfer to new operational situations.[82]

Drawing on assessments of military operations in the 1990s and recognition of intelligence shortcomings, a Transformation Study Group report was provided to Secretary of Defense Donald Rumsfeld in late April 2001. By then, it appeared a new process of transformation was being institutionalized. The Transformation Study Group described the process as facilitating "changes in the concepts, organization, process, technology application and equipment through which significant gains in operational effectiveness, operating efficiencies and/or cost reductions are achieved."[83] As stated above, however, the administration delayed significant changes in defense programs pending a more thorough strategic planning process and consideration of risks involved. Much uncertainty remained in terms of where and how fast defense transformation would proceed.

Defense planning discourse and military thought continued to evolve away from Cold War formulas and strategy. Visions for smaller, more lethal, information-enabled forces solidified. But students of military change remained without military innovation frameworks structured in a way that lessons could be synthesized from past RMAs, or for that matter from specific innovation cases, to inform defense transformation decisions within the organizations ultimately responsible for their success.

Defense transformation discussions were themselves transformed by the September 2001 terrorist attacks on the World Trade Center and the Pentagon and, subsequently, by the global war against terrorism. Indeed, in a November 1 *Washington Post* op-ed Secretary of Defense Donald Rumsfeld referred to the attacks on American as "a wake up call" that created a "new sense of urgency" for modernizing and transforming the armed forces. The bottom line: "Transformation cannot wait."[84] Similarly, then Undersecretary of Defense for Acquisition and Technology Pete Aldridge viewed the war on terrorism as creating "a springboard to transformation" and as stimulating the impetus to overcome the "status quo."[85]

The war on terrorism actually accelerated and refined an emphasis on transformation processes and policies that began, albeit slowly, in the late 1990s and was used by the Bush campaign to criticize the Clinton administration. The war on terrorism wrought greater sensitivity to military innovation and other processes aiming to increase military effectiveness and, subsequently, homeland security.[86] The promise of increased defense spending conjoined with this renewed sense of urgency to open a window of opportunity for overcoming cultural, organizational, and philosophical barriers to significant change. It helped forge an organizational and political context, a milieu, supportive of innovation.

Expectations for change increased as a wartime footing provided a context for lowering bureaucratic barriers to innovation.

In the December 2001 Department of Defense *Annual Report to the President and the Congress*, talk of transformation assumed the tone of a strategic imperative. The language of the report implied an accelerated pace and broadened scope, although the administration announced it would delay making significant programmatic changes until all the newly commissioned transformation studies were completed, fully analyzed, and utilized to inform a new defense transformation strategy. Underlying the report was a clear message: the global war on terrorism would not delay transformation.

Discussions of transformation objectives revealed some confusion over the pace and scope of transformation activities. How much change would be attempted at once? As Rumsfeld related in his December 2001 annual report, the Department intended to transform "a portion of the force" to "serve as a vanguard and signal of the changes to come."[87] Among the vanguard models cited was the German experience building a force able to implement the so-called blitzkrieg tactical doctrine of rapid, combined arms mechanized maneuver and attack.

Reawakened interest in military innovation studies refocused attention on factors associated with the rise and diffusion of innovations. Additional thought was given to strategic planning processes and frameworks to manage change. Drawing on business management literature, policy discussions increasingly referenced the need for a mix of innovations, including discontinuous, transformational advances in military effectiveness.

The Bush administration used the change in strategic context to move forward with plans conceived *prior* to 9.11 with less public political opposition than they faced in early 2001. Among the planning documents drafted prior to the terrorist attacks was the new

Quadrennial Defense Review, which placed transformation at the center of U.S. defense planning. Drawing in part on the above mentioned DSB report on transformation, which called for a transformation cadre to champion reform, an Office of Force Transformation (OFT) was formed to encourage discovery and invention, to help formulate prototyping activities, and to expedite the delivery of new capabilities and technologies to deployed forces. OFT Director Vice Admiral (Retired) Arthur Cebrowski described the objective of transformation as fielding “new sources of power” that “yield profound increases in competitive advantage.”[88]

The resulting climate for innovation was thus much different in the mid-2000s than it was at the end of the 1990s. Defense spending increased, defense policy decisions were firmly in the hands of the Executive Branch, profound shifts were underway in the fabric of national security, and intelligence budgets increased dramatically. A new Department of Homeland Security and increased cooperation between law enforcement and intelligence agencies created new paths for integration. DARPA realized in a fourteen percent funding increase in fiscal year 2002 and an additional nineteen percent increase (to 432 million dollars) a year later. During this period, the program responsible for bringing new technologies into operation using Advanced Concepts Technology Demonstrations realized a sixty-five percent increase (to seventy-nine million dollars).[89] Joint Forces Command changed its focus to participate in many more experiments, looking to find promising new capabilities and practices, rather than focusing on one or two large, overly scripted exercises per year.

Chapter Conclusion

"The study of rapid and radical military change," military historian John A. Lynn noted in 2001, "currently enjoys a vogue among historians, social scientists, and even national security types."[90] Writing on the issue of military innovation, and after surveying studies taking "innovation and transformation as their theme," Lynn opines that the study of military innovation "remains theory-poor."[91] Lynn surfaces an argument reinforcing my own concern about the contribution RMA works made to understanding military change during the 1990s and the need for policy-relevant military innovation frameworks. This concern was heightened in summer 2004 as the U.S. struggled to defeat Iraqi insurgents.

Those seeking insights into military innovation behavior are likely to find the period of the early and mid 1990s unsatisfactory. Instead, they find a period replete with rhetoric about change that already occurred but little explanation of how these changes came about, and why. It is also a period defined by missed opportunities to extend and refine RMA studies into a framework for thinking through innovation decisions regardless of whether contributing studies characterize findings as applying to only one innovation type (e.g., peacetime, wartime, or technological innovation).

A window appears to be opening for security studies scholars to provide case studies and theoretical tools to policy makers interested in understanding military innovation management and the characteristics associated with planning increases in military effectiveness.

The George W. Bush administration empowered a more activist civilian leadership in the Pentagon to first understand the pace and scope of defense transformation and then accelerate and expand it. Transformation initiatives refocused attention on strategic management of defense modernization, including the need for new operational constructs, different priorities for force structure evolution, strategic planning, and governance of department-wide implementation processes. Willing to challenge military leadership on their priorities for funding and overall defense modernization plans, the administration continued to focus on transformation throughout operations Enduring Freedom (Afghanistan), Iraqi Freedom, and the Global War on Terrorism (GWOT).

Defense spending increased significantly to support military operations as well as to fund transformation in the military services. Experiments and prototyping were encouraged. A formal roadmap process was established to guide modernization efforts. Pursuit of new technology was eased by revision of acquisition rules. The intelligence community's military and civilian components received historically unprecedented increases in funding.

Yet to be fully addressed are the strategic management questions driving the 1991 Office of Net Assessment study of post-Cold War military change mentioned in chapter 1. Specifically, the "how to" questions regarding identifying and successfully diffusing innovations to increases military effectiveness deserve additional consideration. The Office of Force Transformation is attempting to address these questions, but few scholars have stepped up to the task of helping. Fewer have offered analytic efforts to keep the underlying premises honest.

Future historians may in fact denote a single American RMA that began in the early 1970s, matured in the 1980s, and achieved its full potential in the 2000s. Many of the advances demonstrated in Afghanistan, Iraq, and more generally in the war on terrorism were extensions of the capabilities developed or conceived during the innovation period studied in chapters 4 and 5. Others are what chapter 2 labels “converging innovations” that brought existing capabilities to bear on new problems or that concerned the combination of capabilities to address a specific operational challenge.

This is not to say that all of the capabilities existing in the early 2000s are refinements to or realizations of early innovations or innovative concepts. Indeed, an underlying argument of the study, one revisited in the concluding chapter, is that the early 2000s represents a transition period from one period of transformation to another.

Still, a thirty-year transformation that began in 1973 seems to coming to a close in the aftermath of the operational Iraqi Freedom. The initiation of a new defense transformation process by the early 2000s was a recognition that the concepts, technologies, and operational constructs that matured in the 1980s (e.g., space and mobile electronics, communications, weapons guidance) had been fully incorporated into the Services, providing a foundation to pursue further innovation. The 2000s also seems to be pointing to a new period in military affairs, one that is likely to be characterized by beam weapons, bio-warfare, robots, persistent surveillance, nanotechnology, new sources of power (e.g., hydrogen fuel cells), and much more lethal small units controlling stand-off, unmanned precision arsenals. Algorithms, interfaces, and automation, important to the emergence of the American RMA, are also likely to become more influential in terms of shaping capabilities and the pace of both decisions and behavior.

For sure, a number of developments anticipated in several decades imply significant change. Robotics, rail or coil guns using electro-magnetic energy to fire munitions rather than chemical explosions, nano- and biotechnology technology, radio frequency weapons, new composite materials, space transportation, and automated global precision strike capabilities suggest the potential for significantly different ways and means of warfare. None of these are prominent in Service transformation plans to achieve current visions for future Joint warfare. Candidates might be the Navy's arsenal ship, Air Force unmanned combat aerial vehicles, the Army's information-enabled Stryker brigades, and battlespace knowledge management systems. Under the definition of disruptive change presented in chapter 2, however, none of these represent new measures of effectiveness or the replacement of a traditional combat arm.

If there is a big bet, an attempt at a new measure of military effectiveness, it lies in the interaction effects of systems knitted, or networked together with profound visions for knowledge management. The cornerstone of this networked force is information technology and the combination of organizational, operational, and doctrinal factors.

Important for current students of defense transformation is the role ascribed to innovation in the gestation and blossoming of revolutions in military affairs. Similarly, the current situation calls for studies that address innovation diffusion and adoption factors (and impediments to them). Lamentably, specific discussions of innovation processes and behavior continue to receive a paucity of attention among security studies and defense transformation scholars.

Informing policy requires theoretical frameworks that facilitate the structured assessment of innovation processes and the myriad factors influencing innovation behavior. This was indeed an objective of this study, which aimed to relate important innovation activities anteceding the American RMA.

Some final comments on discourse are warranted. The French poet and philosopher, Paul Valéry, considering the widespread use of the terms *classicism* and *romanticism* among late nineteenth century scholars and philosophers, lamented that, "One cannot get drunk, one cannot quench one's thirst, with labels on bottles."[92] Valéry decried the use of descriptive labels to summarize entire systems of thought and generalize eras rich in art and prose. English dean of letters Isaiah Berlin countered this view. Despite the merits of Valéry's underlying argument, he demurred that, "unless we do use some generalizations it is impossible to trace the course of human history." [93]

What is important, pace Valéry, and taking license with his metaphor, is accurate labeling on the bottles and an understanding of what the bottle holds in store for unsuspecting imbibers. The reductionism inherent in labels and generalizations carries complex ideas and narratives through space and time, endowing discussions and communications with compressed or truncated information and knowledge. Interlocutors engaging in discussions using terms, ideas, and concepts are assumed to share common understanding of the underlying ideas, images, and meaning of terms. This includes shared understanding of causality: some events, processes, or conditions give rise to others. Inherent is the assumption that the tip of the iceberg, the acronym or term representing a phenomenon or historical process, accurately conveys the contours of what lies hidden from view. One problem with current transformation discussions, arguably, is the lack of insight into innovation processes and theories.

Chapter 6 Notes

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[3] J.F. Digby and G.K Smith, *Background on PGMs for NATO: Summarizing our Quick Look* (Santa Monica, CA: RAND, December 1973), p. 2.

[4]William Perry, "Desert Storm and Deterrence," *Foreign Affairs* (vol 70 no 4), p. 68.

[5] Ibid., p. 69.

[6] Ashton B. Carter, "Keeping America's Military Edge" in *Foreign Affairs* (January/February 2001), p. 99. **[90 105].**

[7] William J. Perry presentation to the Precision Strike Association, Arlington, VA (January 15, 1997) cited in Richard P. Hallion, "Airpower and the Changing Nature of Warfare, *Joint Forces Quarterly* (Autumn/Winter 1997-98), p. 44.

[8] William Perry, "Desert Storm and Deterrence," *Foreign Affairs* (vol 70 no 4), p. 68.

[9] Department of Defense Briefing, "Findings of the Nuclear Posture Review (January 9, 2002).

[10]William H. McNeill, *The Pursuit of Power: Technology, Armed Force, and Society since A.D. 1000* (Chicago: University of Chicago Press, 1982), p. 368. McNeill is one of the most astute analysts of relationship between warfare and technology.

[11]Ibid., p. 368.

[12] Roland, p. 461.

[13] Scoville remarks at a Congressional panel on U.S. security policies, "Documentation: U.S. National Security, 1977-2001 in *International Security* (Vol 2, No 2), p. 171 [171-183].

[14]Roland, p. 466.

[15] U.S. Congress, Office of Technology Assessment, *Technologies for NATO's Follow-On Forces Attack Concept* (Washington, DC: Government Printing Office, July 1986), p. 7.

[16] Douglas A. Macgregor, *Breaking the Phalanx: A New Design for Landpower in the 21st Century* (Westport, CT: Praeger, 1997), p. 45.

[17] Kenneth Allard, *Command, Control and the Common Defense* (Washington, DC: 1990), p. 147.

[18]Martin van Creveld, *Technology and War: From 2000 B.C. to the Present* (New York: The Free Press, 1989), p. 1.

[19] Colin S. Gray, "Strategy in the Nuclear Age: The United States, 1945-1991" in Williamson Murry, MacGregory Knox, and Alvin Bernstein, *The Making of Strategy: Rulers, States, and War* (New York: Cambridge University Press, 1995), p. 190.

[20]Ibid.

[21] Martin Gannon, *Understanding Global Cultures* (Thousand Oaks, CA: Sage, 1994), p. 190.

[22] Ibid., p. 190.

[23] Geoffrey Parker, "What is the Western Way of War?" in *Military History Quarterly* (1997); John Keegan, *A History of Warfare* (New York: Vintage Books, 1993), p. 387. Arguably the elements in most ages of warfare have been moral, technological and intellectual; Keegan's point is that they have not been consciously so, and perhaps not the primary elements.

[24] Sherry, p. xi.

[25] Christopher Bassford, *Clausewitz in English: The Reception of Clausewitz in Britain and America, 1815-1945* (Oxford: Oxford University Press, 1994), p. 220.

[26] David Harvey, The Condition of Postmodernity (Oxford: Basil Blackwell, 1989), 147.

[27] Ibid., 306.

[28] Kendall, *Strategic Review*, p. 25.

[29] *Foreign Affairs* (Volume 75 No 2, 1996), p. 20.

[30] Hoag., p. 13-14.

[31] Kendall, p. 25.

[32] Norman C. Davis, "An Information-Based Revolution in Military Affairs" in John Arquilla and Davis Ronfeldt (eds.), *In Athena's Camp: Preparing for Conflict in the Information Age* (Washington, DC: RAND, 1997), p. 83.

[33] Scales, p. 3.

[34] Peter F. Drucker, *Innovation and Entrepreneurship* (New York: Harper Business, 1985), p. 3.

[35] Ibid., p. 4.

[36] David Berlinski, *The Advent of the Algorithm: The Idea that Rules the World* (New York: Harcourt, Inc., 2000), p. xv.

[37] Berlinski, p. 309.

[38] Aston B. Carter and William J. Perry, *Preventive Defense: A New Security Strategy for America* (Washington, DC: Brookings Institute Press, 1999), p. 180.

[39] Kenneth Allard, *Command, Control and the Common Defense* (Washington, DC: 1990), p. 274.

[40] Edward N. Luttwak, *Strategy: The Logic of War and Peace* (Cambridge, MA: The Belknap Press of Harvard University Press, 2001), p. 94.

[41] Francis Fukuyama, *The End of History and the Last Man* (New York: The Free Press, 1992); see also Timothy Burns (ed.), *After History? Francis Fukuyama and His Critics* (London: Rowman and Littlefield, 1994).

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[44] See Robert R. Tomes, "Boon or Threat? Information Warfare and U.S. National Security," *Naval War College Review* (Summer 2000), p. 39. [39-59]

[45] Douglas A. Macgregor, "The Joint Force: A Decade, No Progress," *Joint Force Quarterly* (Winter 2000-2001), p, 20. [**18-23]**

[46] William A. Owens, "Creating a U.S. Military Revolution" in Theo Farrell and Terry Terriff (eds.), *The Sources of Military Change: Culture, Politics, Technology* (Boulder: Lynnee Rienner, 2002), p. 209.

[47] Ibid., p. 211.

[48] Ibid., p. 209.

[49] Janne E. Nolan, *An Elusive Consensus: Nuclear Weapons and American Security After the Cold War* (Washington, D.C.: Brookings Institution Pres, 1999), p. 86.

[50] Nolan, *An Elusive Consensus*, p. 86.

[51] Colin S. Gray, *The American Revolution in Military Affairs: An Interim Assessment* (Strategic and Combat Studies Institute Occasional Paper 28, 1997), footnote 1, p. 5. See also Metz and Kievit, p.2.

[52] Gray, *Strategy For Chaos*, p. xiii.

[53] Michale O'Hanlon, *Technological Change and the Future of Warfare* (Washington, DC: Brookings Institute Press, 2000), p. 5.

[54] Ibid.

[55] Ibid., p. 31.

[56] Williamson Murray and MacGregor Knox, "Thinking About Revolutions in Warfare" in MacGregor Knox and Williamson Murray (eds.), *The Dynamics of Military Revolution, 1300-2050* (New York: Cambridge University Press, 2001), p. 1.

[57] For additional comments on "axes of discussion" for a reinvigorated RMA debate, see Robert Tomes and Peter Dombrowski, "Arguments for a Renewed RMA Debate" *National Security Studies Quarterly* (Vol. VII No. 3), pp. 109-122.

[58] Gray, *Strategy For Chaos*, p. 17.

[59] Krepinevich cited in Vernon Loeb, "Billions, and it Can't Make Change," *Washington Post* (September 13, 2002), p. A37.

[60] Karen Litfin, "Transnational Scientific Networks and the Environment: The Limits of Epistemic Cooperation," Paper delivered at the 1991 Western Regional Conference of the ISA, November 1-2, Los Angeles, p. 18-19. Quoted in Ronnie D. Lipschutz (ed.), "On Security" in *On Security* (New York: Columbia University Press), p. 8.

[61] Paul N. Edwards in *The Closed World: Computers and the Politics of Discourse in Cold War America* (Cambridge, MA: The MIT Press, 1996), p. 34.

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[64] *Annual Report to the President and Congress* (Washington, DC, Department of Defense, 1999), chapters 13-15.

[65] Ibid.

[66] Ted Gold, *Report of the Defense Science Board Task Force on DoD Warfighting Transformation* (Washington, DC: Office of the Undersecretary of Defense, 1999), p. 3

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[68]Ibid.

[69] Ibid., p. 30.

[70] Ibid., p. 1.

[71] Robert W. Gaskin, "A Revolution for the Millennium" in Williamson Murray (ed), *The Emerging Strategic Environment: Challenges of the Twenty-First Century* (Westport, CT: Praeger, 1999), p. 133.

[72]Ibid.

[73] Ibid., p. 153.

[74] Eliot A. Cohen, "Defending America in the Twenty-First Century," *Foreign Affairs* (November/December 2004), p. 41. **[40 56]**

[75] Ibid., p. 41.

[76] Ashton B. Carter, "Keeping America's Military Edge" in *Foreign Affairs* (January/February 2001), p. 92.

[77] Ibid., p. 56.

[78] Ibid., p. 41.

[79] Andrew J. Bacevich, *American Empire: The Realities and Consequences of U.S. Diplomacy* (Cambridge, MA: Harvard University Press, 2002), p. 140.

[80] Bush cited in Bacevich, p. 140.

[81] Ibid.

[82] These comments on surge intelligence benefited from discussions the author had with the 2004 Defense Science Board Summer Study in March 2004 as the National Geospatial Intelligence Agency representative to the summer study. The text was recommended to the Defense Science Board for inclusion in its report.

[83] Department of Defense Transformation Study Group, "Transforming Military Operational Capabilities," (www.defenselink.mil.news.Nov20001/t11272001_t1127ceb.html), p. 5

[84] Donald H. Rumsfled, "Beyond This War on Terrorism," *Washington Post* (November 1, 20012), p. 35.

[85] Quoted in Adam J. Hebert, “Aldridge: War on Terrorism Demands Major Changes in Acquisition Practices,” *InsideDefense.com* (October 31, 2001).

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[88] Quoted in Tom Philpott, “New ‘Transformation Chief’ Says 9-11 Should Shake Status Quo,” *Newport News Daily Press* (November 30, 2001).

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[90] John A. Lynn, “Reflections on the History and Theory of Military Innovation and Diffusion” in Colin Elman and Miriam Fendius Elman (eds.), *Bridges and Boundaries: Historians, Political Scientists, and the Study of International Relations* (Cambridge, MA: The MIT Press, 2001), p. 359.

[91] Ibid., p. 360.

[92] Paul Valéry, *Cahiers* (from a notebook dated 1931-32), quoted in Isaiah Berlin, *The Roots of Romanticism*, edited by Henry Hardy (Princeton: Princeton University Press, 1999), p. 20.

[93] Ibid.

7. Conclusion

Paul Valéry's concern with labels seems appropriate, if not quixotic, when juxtaposed with the seemingly obsessive fascination with labels and terms in contemporary American military thought and defense policy studies. This study addressed the term RMA, which in the mid 1990s seemingly became a synecdoche for the future of American military forces. In the 2000s, the term transformation seems destine to remain the umbrella term for multifaceted initiatives to build upon U.S. military capabilities.

The centering of RMA concepts, language, and imagery within post-Cold War defense discourse signaled what this study terms a lexical turn in American military thought. Lexical turn refers to rhetorical innovation, entrepreneurial behavior, and systemic re-visioning of the language, imagery, and philosophy encompassing U.S. military and defense planning discourse. By investigating the origins of the 1990s lexical turn in American military thought, and by exploring the origins of actual military capabilities, the above chapters placed current U.S. defense transformation initiatives in historical perspective.

The chief attribute of this lexical turn stems from the decreased role of nuclear weapons in international security, reflected in the de-emphasis on nuclear deterrence and nuclear targeting in the narrative of U.S. defense policy. Nuclear deterrence, although still an important part of national security policy, no longer dominates military thought and strategy.

As nuclear deterrence became less prominent in public discussions of political-military policy, conventional warfighting doctrine experienced something of an intellectual renaissance. Fueled by conventional adjuncts to nuclear deterrence strategy conceived in the 1970s to raise the nuclear threshold, this renaissance in conventional military thought evolved in the 1980s around a core set of concepts and capabilities. As these concepts and capabilities ascended in importance on the margins of strategic nuclear thought, they came to define new doctrine and warfighting visions. Encompassing the centerpiece of the American RMA thesis, many of these doctrines and visions now define the core aspects of U.S. defense transformation strategy.

Where did RMA concepts, doctrine, and technology come from? RMA-associated visions for the future of warfare were products of a thirty-year transformation in the U.S. armed forces that began in the early 1970s, matured in the 1980s, and emerged as a dominant form of warfare in successive post-Cold War conflicts. Whereas important changes in the discourse of defense planning represented a lexical turn, the actual capabilities supporting RMA language and its associated visions are part of a decades-long co-evolutionary process that reached its apogee in the early 2000s.

Throughout the study, the offset strategy was presented as an important element of the strategic vision from which a number of conceptual, organizational, and technological initiatives evolved. It remains a central part of the history of the American RMA, as do the conditions that led to its promulgation. Consider former Secretary of Defense William Perry's testimony, which illustrates the importance attached to precision strike as an enabler of revolutionary change in military affairs during the formative years of the American RMA:

> Precision guided weapons, I believe, have the potential of revolutionizing warfare. More importantly, if we effectively exploit the lead we have in this field, we can greatly enhance our ability to deter war without having to compete tank for tank, missile for missile with the Soviet Union. We

> will effectively shift the competition to a technological area where we have a fundamental long-term advantage."[1]

The new American style of warfare is indeed a legacy of the offset strategy. As Perry later argued, the capabilities identified as an RMA derived from the larger systems of systems made up of many "links" responsible for overall effectiveness.[2]

Such thinking reinforced key aspects of the thirty-year transformation: a shift from platforms to integration across platforms, the focus on networking, recognition that overall military capabilities should be imagined as nonlinear, open systems, and greater acceptance of complexity theory into military thought.

The emerging era of U.S. defense transformation is building on developments explored above. It will also move into new areas of technology, additional organizational changes, and new operational concepts. New capabilities will integrate laser weapons, biotechnology, automated global information enterprises, hydrogen power, the ability to dwell over targets (e.g., endurance UAVs; high-flying airships), combat in space, city-crippling denial of service attacks on critical information services, and robots or semiautonomous 'thinking' machines able to self-organize and 'swarm.' Despite these and other changes, much continuity will remain from this period to the next.

Lamentably, the majority of U.S. defense transformation discussions, and perhaps more importantly scholars and policy makers concerned with military innovation, remain uninformed about the origins of, and decisions leading to, the so-called new American way of warfare that transformation aims to reinforce.

Why the relative lack of attention the offset strategy and associated developments in histories of U.S. military thought and defense planning? The reason, arguably, is directly related to the lack of interest in innovation processes and strategies during the heyday of the American RMA thesis.

Several factors contributed to lack of direction attention to the offset strategy and its chief policy adjuncts. Nuclear warfighting developments, including the development of key weapons systems like the B-2 bomber, the MX missile, and the Star Wars missile defense program dominated defense planning. Many of the offset strategy's underlying thrusts appeared on the margins of these debates because they involved conventional warfare, including research and development programs that were sufficiently novel in their technology or operational employment to fall outside mainstream channels. Despite growing interest in the possibility of nonnuclear strategic strike and widespread discussion of AirLand Battle and Follow On Forces Attack, both popular and official defense planning discussions remained focused on strategic nuclear issues. Conventional force reduction negotiations were eclipsed by theater missile treaties, Reagan-Gorbachev summits on nuclear disarmament, and Reagan's proposed nuclear missile shield.

Stealth, key aspects of Assault Breaker, and the most innovative precision strike capabilities evolved as classified programs. Knowledge of their existence entered the mainstream after the RMA thesis had already taken hold of defense discourse, perhaps rendering their intrinsic characteristics less extraordinary in the post-Cold War, post-Gulf War rush to label American forces "revolutionary." And because the concepts demonstrated in Assault Breaker took longer than initially planned to materialize, many overlooked its importance in shaping visions for future capabilities. The long-term evolution of a vision for a future AirLand force structure was lost in the focus on specific technologies.

Additionally, the information technology components of the offset strategy were no longer profound from the perspective of late 1980s analysts. By that time, information technology and personal computers were well on their way to ubiquity. Few considered the origins of the internet, research and development on microchips, and other aspects of the computer revolution within the context of Cold War military developments that created the preconditions to the American RMA.

Historical accounts of post-Cold War defense modernization are only now addressing initiatives associated with the offset strategy or other long-term development processes. Grand strategy shifts in the early 1980s provided the technologies, doctrines, and organizational constructs underwriting the George W. Bush administration's national security concepts for preemption and precision strike in the 2000s. The above chapters addressed part of the evolution of Cold War military capabilities underwriting the new American way of war. This conclusion addresses the future of military innovation studies for political scientists seeking to inform policy.

Two primary sections follow: a review of significant factors from chapters 3 through 5 from the perspective of the innovation framework presented in chapter 2; and, final thoughts on innovation theory, including thoughts on how the innovation milieu framework might be utilized by current students of U.S. military innovation. The framework for conceptualizing innovation is revisited to review select aspect of necessity, opportunity, and the innovation milieu. Doing so reinforces the argument that military innovation studies require understanding antecedent conditions and events shaping the overall ripeness of the innovation milieu. Such understanding informs assessments of the origins of significant changes in effectiveness and understanding how innovations themselves alter or otherwise influence military affairs.

Revisiting Necessity and the Framework for Conceptualizing Innovation

Earlier chapters discussed strategic and operational necessity as a key factor in the emergence of significant military innovations, meaning they had the potential to change the character of warfare or fundamentally challenge the core competency of a military organization. The innovation framework discussed in chapter 2 is reprinted as Figure 7-1 below.

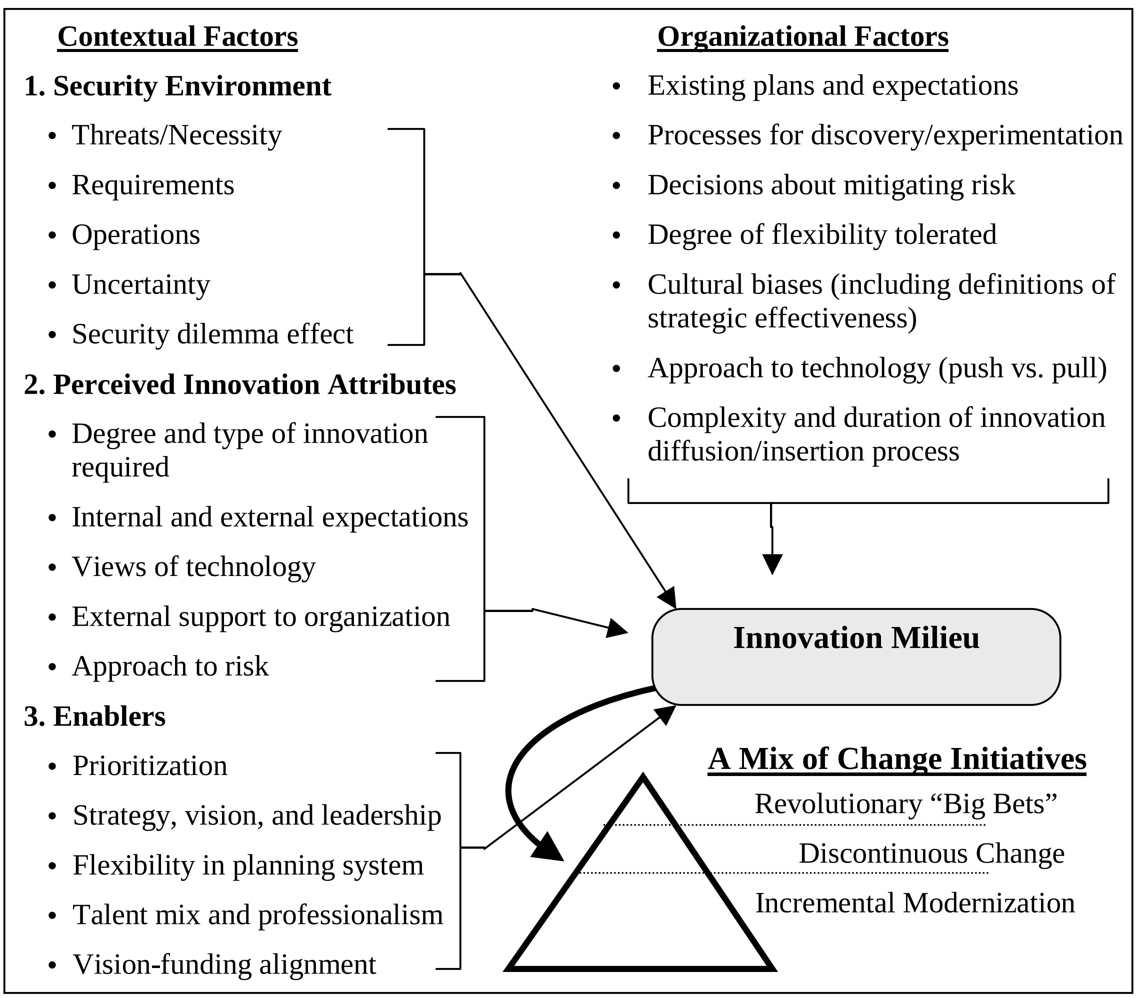

Figure 7-1: Framework for Conceptualizing Innovation

Underlying the framework is a belief that context is the key to understanding innovation behavior and outcomes. This study does not suggest that one framework fits every study or case. Not every element from previous chapters is addressed. Some are emphasized because they appear more relevant to students of military innovation interested in applying innovation theory to the study of defense transformation.

The framework suggests one way to consider the interaction effects of the full complement of influences on military innovations, their diffusion and adoption, and their effect on military effectiveness. This includes the primary elements of innovation systems, processes, and actors that exist in specific moments within specific organizational settings.

The Security Environment

Contextual factors define the general boundaries and the inherent potential of an innovation milieu. Understanding contextual elements of the larger social, technological, economic, and political environment places decisions, processes, events, and behavior in perspective. Elements include threats (capabilities and intentions), associated requirements emerging from analysis of the gaps between threats and available means to meet them, the nature of operations envisioned in future battles, and the approach taken to managing uncertainty. The interpretation of the current and future security environment in terms of the construction of necessity is another contextual component warranting scrutiny.

Necessity, an ancient concept in preparations for warfare from Homer to Thucydides to Gibbon to the present, fuels military innovation. It derives from challenges and emboldens opportunity. Cold War developments linked to necessity included the Polaris submarine launched ballistic missile, spy satellites, stealth aircraft, deep strike doctrine, and the realignment of DARPA's focus to conventional warfare. Each was also concerned with managing uncertainty in terms of mitigating against the risk of a Soviet attack.

Of course, understanding the effect of necessity on defense planning is much easier with the benefit of hindsight. Organizations, or more accurately individuals and cohorts responsible for decisions within them, do not always accurately identify or characterize the essence of a strategic or operational necessity.

Necessity need not be extant at the time of the innovation in the form of an immediate threat or challenge. Analysts may perceive a decline in capabilities or what management theorists call an anticipated burning bridge. That is, developments in foreign militaries or a shift in the strategic environment that renders one's capabilities less relevant or effective. Examples from chapters 4 and 5 included accurate Soviet surface-to-air missiles and antiaircraft radar that threatened to weaken the effectiveness of airpower. This impelled the development of radiation-seeking missiles and stealth aircraft to penetrate air defenses and attack command and control sites, air defense radars, and other targets.

Important contributions to U.S. understanding of the Soviet threat included Defense Science Board studies, intelligence analysis, and the industry study led by Joe Braddock, which provided a detailed argument for defeating Soviet armored echelons. Of course, intelligence reports often overestimated Soviet military prowess. Still, intelligence analysis of Soviet potential military capabilities did seem to accurately portray Soviet plans, potential battlefield performance, and weaknesses the U.S. could exploit with long-range precision strike and other initiatives linked to the offset strategy.

Assessments of enemy capabilities were most helpful to technology development and doctrinal innovation when they provided specific insights into tactical challenges and potential enemy weaknesses.

The components of the long-range precision strike enterprise proposed and demonstrated by Assault Breaker were based on a specific tactical problem from which requirements and new approach to operations followed. Delay in achieving the underlying vision reflected organizational and political challenges, not technological ones. A lesson for later programs was the need to link constituencies within each military organization to concept demonstrations and their outcome, finding Service champions for experiments, building partnerships when translating requirements into operational prototypes, and ensuring that champions for new capabilities clearly advocated the benefits. Today, processes for demonstrating a new capability are embodied in prototyping activities, experiments, and advanced concept technology demonstrations. The fundamental objective is sustaining warfighter advocacy based on their operational needs and commit to operationally testing new capabilities.

Many of the innovations anteceding the American RMA aimed to satisfy specific requirements related to a relatively narrow, yet related, set of strategic and operational threats. In an environment of nuclear parity, worsening East-West relations, and pressure at home and abroad to raise the nuclear threshold, stealth technology, precision strike, maneuver doctrine, and closer cooperation between air and ground forces offered operational solutions to strategic and operational problems in the European theater. Information technology promised to solve command and control, navigation, and coordination challenges. It presented options for managing uncertainty and facilitated steps toward cross-Services integration without threatening organizational autonomy.

Uncertainty about the future must factor into studies of military innovation. The central question is one of risk: what are the consequences of incorrectly identifying future requirements? Uncertainty falls into two categories. There are so-called known unknowns, the possible futures one has identified as potential scenarios from which planning proceeds. Assessing the scenarios, in other words, provides a probability estimate of each scenario occurring along with risk mitigation steps to purse in case a different, more threatening scenario develops. More difficult are what risk management theorists call residual uncertainty, or the possible futures that are unknown unknowns. Operational or tactical surprise is often avoidable from correct reading of known uncertainties. Strategic and technological surprise, which frequently compounds operational surprise, is more likely when organizations have not identified the full range of likely futures. They are more likely when there is a high level of residual uncertainty.

The degree of uncertainty about adversary capabilities and intentions determines the degree and nature of risk inherent in choosing one course of development over another. Frequently, as was the case for advanced surveillance, targeting, and strike capabilities, the need for innovation often derives from a realization that existing capabilities cannot guarantee success. Making informed decisions about risk requires some definition of success and failure.

Concerning uncertainty, the most important historical risk is a strategic surprise leading to national capitulation. A more likely threat to U.S. security involves technological and operational surprise, the most frequent surprises punctuating military history. Technological and operational surprise can be devastating, militarily and politically, at the regional level. Their occurrence often reflects faltering threat perception or bad decision-making. Even if threats are accurately perceived, organizations often make wrong investment decisions even after an operational requirement is documented. Competing solutions arise to solve specific operational problems.

Expectations and the degree of uncertainty about the future influence the degree of, focus on, and intended outcome for innovation activities. Expectations are also fundamentally constructed on perceptions, attitudes, and the cognitive lenses through which information about the world is interpreted. From the perspective of understanding innovation behavior, the construction of these perceptions and expectations forms an important part of the context in which “change” initiatives are embedded.

But innovations are often blocked or delayed for political, cultural, or other reasons. Failure to innovate was not a primary concern of this study, although examples were mentioned. Support for unmanned aerial vehicles (UAVs) and precision munitions evolved slowly within the Air Force despite operational demonstrations of their potential. The F-117 Stealth aircraft was not accepted by the Air Force until the Chief of Staff had assurances it would not affect funding for other aircraft. Many initially balked at the Army’s decision to adopt a maneuver-oriented approach along with increased reliance on air ground cooperation. Few senior military officer embraced jointness.

The global positioning system (GPS) is perhaps the most interesting example given its revolutionary influence on military effectiveness. Initiated in 1973, GPS suffered through proposed budget cuts, survived several attempts to kill the program altogether, and achieved initial operational status only after years of delay following the Challenger space shuttle disaster. After failing to receive support from the Services, civilians in the

Office of the Secretary of Defense rescued the program in the early 1980s over the objections of senior military officers. Even after initial capabilities became available in 1991, many military leaders questioned its usefulness. By the end of the decade, GPS was critical across the spectrum of military activities.

Given failures to innovate, tt is important to clarify that merely understanding the security environment does not guarantee successful innovation. Nor does it yield understanding of specific innovation processes and outcomes. It does, however, provide a critical first step for those attempting to enact change and for those studying innovation behavior. Both involve comparing perceived threats and opportunities for meeting them with defense plans, training regimes, force structure, doctrine, and other indicators of future battlefield behavior. A point for scholars and practitioners: because this process is human, it is flawed. For this reason, any innovation framework must consider the social aspects of innovation diffusion and adoption within organizations.

Requirements are operational capabilities, expressed as needs, that organizations deem critical for success on the battlefield. They can include logistics support requirements, intelligence or information needs for decision-making, or even capability descriptions to guide technology research and development or doctrinal change. Requirements generation, gathering, aggregation into capabilities areas, and translation into new research and development initiatives works best when operators define the specific capabilities required based on specific knowledge of the enemy or a specific tactical problem. Innovations frequently evolve from a recognition that requirements cannot be met with current or projected capabilities, when more efficient, more optimal, new capabilities are socialized by advocates of a new approach, or when new missions or core competencies suggest altogether different means to achieve the underlying operational need.

A capabilities approach emerged from extending the battlefield discussions and NATO's planning for Follow On Forces Attack. A 1986 U.S. Office of Technology Assessment report, *Technologies for NATO's Follow-On Forces Attack Concept*, argued "systems should be considered not individually, but as complete packages to support specific operational concepts."[3] Not procuring or adequately integrating into forces any one of the required sub-elements "could greatly reduce the value of investments in the others."[4] Then Deputy Director of Defense Research and Engineering Frank Kendall, furthermore, argued in 1992 that FOFA evolved into a Joint Precision Interdiction capability, "taking the emphasis off of the non-existent Warsaw Pact threat and placing it on multiple theaters and on critical military targets, including targets at greater operational depths."[5] Critical aspects included and integrated sensor system, precision geolocation and visualization tools, and near-time intelligence reporting.

Perceptions of Innovation Attributes

Perceptions of innovation are shaped by assessments of the security environment as well as existing beliefs, biases, and views of military capabilities. They influence the discourse of innovation by shaping how people think about new ideas. How leaders discuss innovations, position them on meeting agendas, and associate them with strategic objectives all influence how others in the organization react to them.

Among the prominent undercurrents from previous chapters were the adoption of a systems approach to warfighting and a capabilities approach to force modernization. These reflected perceptions of the general direction and type of innovation required. The former spawned operational art, the latter an approach to defense planning that gradually built on the idea of mission needs statements and the total cost of mission execution.

In addition to pulling ideas, technology, and operational concepts, the core set of strategic and operational threats driving European security assessments in the 1970s and 1980s provided an organizing framework to channel organizational creativity. Multiple sources of invention and innovation existed. By the end of the 1980s, a fairly well defined process for technology push and pull ensured that new technologies were at least known to the respective Services.

Military leaders think about and train for battle by first understanding the security environment and its essential threat characteristics and then attuning warfighting concepts and tactics to meet them. Social scientists would call the underlying process of understanding a theories of warfare or warfighting – the ordering of different variables involved in combat that are causally related to success. Innovation leading to significant increases in military effectiveness are partly derived from a similar process. That is, they involve a realization that some previously unknown variable, thrown into the mix, changes the outcome of battle or the underlying theory of success.

For this reason, an important element in changing perceptions of military effectiveness is the efficacy, strategic viability, and operational reliability of research and development and innovation 'demonstration' activities. It is not enough to develop technology or rethink doctrine. They must be tested, proven in realistic exercises, debated, and competed against the status quo. Without an opportunity to prove their potential, planners are hard pressed to recommend a new, potentially risky program that disrupts existing, incremental development work.

Expectations, restating the point, are important. Expectations about future capabilities cascade down and through organizations, conditioning views of behavior, performance, and all manner of priorities – from procurement, to research and development, to training and even recruitment. All of this influences how different communities of practice, either operational or applied science, initially develop options for the degree and types of innovation required to address threats, bridge gaps in capabilities, and invest in new capabilities to reduce risk. Expectations also represent the bias civilian and military leaders have about theories for achieving victory. They are not easy to change.

During most of the Cold War, for example, the U.S. military trained and equipped for scenarios involving Soviet attacks into NATO territory along several mobility corridors. They also planned for a North Korean attack into South Korea. Public servants and military officers spent entire careers planning for a handful of scenarios, each of which had a highly evolved theory for victory. The capabilities pursued in the 1970s after Soviet technology demonstrated in the Middle East focused efforts on the potential for precision strike to shift the balance of power in Europe. As long-range precision strike capabilities were integrated into U.S. forces they initially gained acceptance because they aimed to replicate the effects of small nuclear weapons on Soviet armored echelons. Despite barriers to acceptance, AirLand Battle and joint operations to coordinate the execution of Deep Attack gained acceptance. In the early 1980s, programs like Assault Breaker and Stealth were developed specifically to alter the calculus of success. Their essential operational characteristics where eventually adopted after demonstration of their operational merits. In time, the essential differences inherent in maneuver warfare, stealth, precision attack, information warfare, and other developments challenged ingrained notions of victory. Among the most important change involved the gradual ascension of intelligence and situation awareness from a marginalized support function to the primary enabler of victory.

Despite delays developing and fielding associated technology, the very existence of these programs and knowledge of experiments did affect perceptions and expectations. Three turning points in expectations about the type of military capabilities required for the evolving security environment occurred in the late 1970s. First, strategic and operational requirements for theater nuclear targeting led to the Presidential Directive 59 in July 1980, which called for a range of capabilities supporting dynamic nuclear targeting, including distributed, security communications and in-route retargeting. Further refinements in precision location, dynamic targeting and retargeting, the tighter coupling of command, control, communications, intelligence, surveillance, and reconnaissance suggested new opportunities for nonnuclear theater strike. A second shift involved Soviet force structure and doctrinal changes, which surfaced concerns about increased operational tempos and the spillover of superpower competition into peripheral regions, most importantly the Persian Gulf. Expectations for campaign planning evolved as domestic and international pressure mounted to raise the nuclear threshold. The rapid deployment approach to regional conflict encouraged additional changes in U.S. force structure, support for nonnuclear long-range strike, and the diversification of associated planning, training, and doctrine. Military responses to aggression required lethal strikes with smaller forces wielding weapon systems capable of greater precision.

Another shift in expectations involved warfare itself, or more accurately new definitions of success. In the early 1980s, planners considered possibilities for prevailing in a future European conflict as well as reversing nearly decades of reluctance to engage militarily abroad. Partly this reflected responses to the evolving Soviet threat and the recognition that military capabilities were needed for new regional missions. The attack on Libya, the first combat use of precision munitions since Vietnam and the prototype counter-attack in the current global war against terrorism, was the culmination of years of shifting expectations about military force. These changes, among others discussed in chapters 4 and 5, involved changing views of technology, especially the value of information technology.

The above framework includes both internal and external expectations as factors to be included in the contextual domain of perceived innovation attributes. They are elements of the cognitive context. Innovations are nested within organizations themselves embedded in larger organizations, themselves in larger social-political contexts, and so on. Internal and external expectations are among the most important for military innovation scholars to understand. Difficult to empirically document, expectations nonetheless play a large role in how innovations diffuse within and across organizations.

Internal expectations apply to organizations that will actually implement the innovation, external expectations to those organizations, leaders, and other entities for which support is required to successfully diffuse the innovation. Expectations about a potential NATO-Warsaw Pact war were for decades driven by a belief that any future war would involve nuclear weapons. Conventional operations on nuclear battlefields were expected to be minor in scale, with NATO having to resort to theater nuclear weapons early in the conflict. The Air Force corporately held very low expectations for long-range conventional precision strike or, for that matter, for precision munitions, until facing external pressure from Congress and others. Much of this changed in the late

1970s and early 1980s. New exercise and training initiatives, some linked to concept demonstrations and prototyping activities – Assault Breaker was one of them – helped leaders and decision makers visualize the potential of new capabilities.

Along the way, the Army refocused its efforts on indirect fire missions, maneuver, and expediting the flow of data from theater surveillance assets to decision makers. Noteworthy is the fact that none of the Army's "big five" weapons systems were indirect fire systems. Key systems on which the Army assumed its post-Vietnam future rested included the M1 Abrams main battle tank, M2 Bradley armored infantry fighting vehicle, AH-64 Apache combat helicopter, UH-60 Blackhawk utility helicopter, and the Patriot air defense missile system. Each was in fact critical, but by the early 1980s it was clear that defeating Soviet armored forces required additional systems, including multiple launched rockets systems and tactical missiles with submunitions. Long-range precision strike emerged as a competency the Army had to master to succeed at its larger ground combat mission. Some concepts called for delivering thousands of precision munitions in opening battle.

Succeeding at ground attack missions required theater intelligence capabilities able to "see" forward some 300 kilometers into enemy territory. This required reliance on both national technical means (satellites) to monitor readiness and indications of war preparations, develop target reference points, and generate maps. Airborne capabilities were needed to provide more responsive intelligence, targeting data with within much shorter operational timelines, and to identify the current status, direction, and speed of enemy forces moving toward NATO front lines.

During the Cold War, a spectrum of ISR systems evolved to improve national security decision-making by also enhancing strategic military capabilities. From the earliest days of the American RMA, end-to-end intelligence, surveillance, and reconnaissance (ISR) capabilities were a priority and viewed as *the* fundamental enabler of success. Over time, especially after the 1981 Polish crisis, an imperative was placed on better warning and crisis monitoring capabilities. Increasing concern about the combat capabilities of Operational Maneuver Groups made moving target ground surveillance radars and dynamic retargeting systems more important. Intelligence co-evolved with military capabilities, gradually overcoming traditional bias as a secondary factor in operations. By the end of the Cold War, thanks in large part to the integration of digital information technology into intelligence processes, intelligence support activities began to overcome criticism that its ability to inform battlefield decision making always lagged behind doctrine and operational concepts.

Military innovation scholars will need to adopt a more balanced approach to understanding the origins and evolution of current ISR capabilities if they hope to inform defense policy in the 2000s. This requires greater attention to innovation in intelligence operations, processes, and policies to assure that military *and* civilian, foreign *and* domestic ISR requirements are understood and met. In the emerging round of national security transformation decisions and funding prioritizations, the tendency will undoubtedly be to continue the trend found in defense reform decisions – to pursue advances in surveillance and monitoring capabilities (e.g., the drive for "persistence surveillance") without overhauling or bolstering the intelligence functions that turn such capabilities into a strategic advantage. Additional sensing does not equate to more insight. Particular attention must be paid to leveraging the most important strategic asset in the ISR domain – the analysts.

Enablers

Another aspect of context factoring into military innovation studies are what is best termed enablers. Other names for them? Catalysts, facilitators, or influence paths. From one perspective, they are resources to leverage. From another, they represent the linkages between the security environment, perceptions of that environment, and specific organizational factors or influences on innovation decisions. For innovation champions within specific organizations, they are enablers because their disposition in relationship to a specific innovation or change proposal is a barometer for how well the external context supports their work within the boundaries of the organization. For this reason, innovation champions often seek to effect change in the external domain concurrent with activities within their organization.

Resources are not limited to fiscal concerns. Vision and leadership, the mix of available talent, the prioritization of development initiatives, and views of technology are all "resources" from the perspective of their ability to influence the innovation milieu. Vision and leadership are the most important factors for enabling large-scale innovation. Strategic communications and an ability to engender cultural change are two attributes required to succeed. Both are core competencies for change managers. In the order of importance for innovation, funding is certainly a close second in terms of enabling factors.

Getting strategy right is critical to innovation, as are the twin pillars on which a good strategy is conceived and implemented: vision and leadership. "With the offset strategy as a guide," William Perry worked to focus "the attention and support of high-level DoD decision makers, Service chiefs and Congress to speed several important technologies from concept to implementation.[6] Visions of future warfighting thereafter built on the key thrusts of situational awareness capabilities for intelligence gathering, target identification, navigation, precision strike, and expedited logistics.

Perry's support for innovative approaches to technology continued throughout his government service. Later, as Secretary of Defense in the first Clinton Administration, Perry would team with Director of Central Intelligence John Deutch, and Vice Chairman of the Joint Chiefs of Staff Vice Admiral William Owens to form the National Imagery and Mapping Agency (NIMA) in 1986 (renamed the National Geospatial-Intelligence Agency, NGA, in 2003).

A controversial decision at the time, NGA's successful integration of national imagery intelligence capabilities with defense mapping and charting services provided many of the crucial targeting, navigation, and precision strike innovations demonstrated in operations Enduring Freedom and Iraqi Freedom. In some ways, NGA's integration of information technologies and analytic expertise to provide geospatial intelligence represents the evolution of core aspects of the offset strategy and the realization of Perry's precision strike vision on a global basis.

Vision and leadership were also important enablers for the Army in the years immediately following Vietnam. Army and Air Force leaders agreed on the vision of AirLand Battle, expending organizational capital in the process. Vision was provided by the most senior leaders down to combat leaders in the field pushing innovation at the tactical level. The Reagan administration's defense buildup and National Security Decision Directives to bankrupt the Soviet Union reflected the president's "belief that the Cold War was not a set of problems to be fixed, but a situation to be ended."[7] Reagan's vision solidified into policies that prepared the road to Reykjavik and helped bring the Cold War to a peaceful resolution.

An earlier example of vision impelling military innovation was the offset strategy and its range of initiatives. Assault Breaker, with its integration of intelligence, targeting, information dissemination, weapons platforms, command and control, and munitions systems was a defining “force package” of the era, one that encouraged further thinking about long-range precision strike. Most of the weapons systems developed since the 1970s have relied on some information “brains” to work, a continuation of the underlying strategy.

Cruise missiles required terrain contour following maps. Stealth materials and technology were possible only because Cray supercomputers were available. Stealth combat operations required sophisticated mission planning and execution tools for route selection and optimizing the low radar cross section. Precision bombs required geospatial terrain models, including elevation data. Navigation, maneuver, targeting, and precision strike required GPS. By the late 1990s acquisition processes would address total information costs for new weapons systems in detail, pressing military services to identify information requirements earlier in the acquisition cycle.

Programs are traditionally managed by balancing adherence to the schedule coordinating sub-component delivery, integration, and testing, the performance characteristics of the overall system or platform, and the overall system or program cost – including initial transition to service. Risk assessments are performed during the process to identify and prevent schedule slips, degradations of performance, and the myriad exigencies leading to cost overruns. Rarely are systems on time, within budget, and as capable as initially specified. Frequently, one of the three program management elements is considered more important. A particular performance threshold, for example, may be critical, with additional funding and time provided to overcome technological or systems integration challenges. Cost constrained programs, on the other hand, tend to focus on the bottom line rather than maturing capabilities or meeting a specific deadline.   They stabilize cost by shaving performance parameters or extending the schedule so costs are addressed over more fiscal planning years.

Significant innovations aiming to fundamentally alter the effectiveness of military organizations usually require a more flexible approach to the balancing of cost, schedule, and performance. In wartime, schedule is usually the most important, with cost less of a concern if the innovation has strategic importance. In other times, cost is considered the most important, especially when the battlefield effectiveness of a significant innovation is relatively uncertain.

Funding alignment is an important indicator of what organizations consider both important and what leaders thing is possible in terms of changing the calculus of military effectiveness. In the early 1970s, for example, the allocation of defense dollars to new strategic nuclear systems indicated not only what defense planners considered a key requirement for national security but also what Secretary of Defense Melvin Laird considered possible given the political situation.

Increased defense spending at the end of the decade was a key contextual enabler for DARPA activities. Indeed, DARPA's budget nearly doubled from 1977 through 1981. DARPA realigned its activities to solve operational challenges posed by Soviet conventional forces in large part because of shifts in the security environment, greater willingness to support advanced technology development, visions for how technology could be applied, the empowerment of leaders with specific agendas, and recognition that funding needed to be aligned with strategic objectives for raising the nuclear threshold.

Talent mix is another aspect of the contextual environment military innovation scholars should consider. Organizations cannot develop and diffuse significant innovations without some measure of diversity in its talent base. Internal and external expectations influence the evolution of skill sets within societies and security regimes, creating guild-like cohorts whose self worth and value is directly related to views of current and future technology, the degree and type of innovations perceived as beneficial, and approaches to risk. An important development during the maturation period of the American RMA was the rise of information technologies on the margins of traditional military occupation specialties and, over time, the migration of almost every occupation specialty into the information technology domain.

Increased professionalism, a factor related to talent mix, underwrote the American RMA. Major General (MG) Stan McChrystal was the Deputy Director of Operations, Joint Chiefs of Staff during Operation Iraqi Freedom and assumed Commander of the Joint Special Operations Command in October 2003. He contends that the return of professionalism to the Army – indeed to all of the Services, in the late 1970s and through the 1980s – is the most important antecedent to what observers dubbed an RMA in the 1990s. Arguing that the true revolution was one in training and education, MG McChrystal concludes that any leaps in strategic effectiveness associated with American forces at the end of the Cold War derived from a culture valuing learning and the development of leaders. American troops now demonstrate a penchant for innovation in the field – the institutionalization of innovation. The ability to harness technology, using it to offset strategic and operational challenges, to innovate organizationally and operationally: these are the foundations of the American RMA for McChrystal, hallmarks of a modern professional force.

Where MG McChrystal correlates military professionalism with innovation, retired Admiral Bill Owens sees professionalism as "synonymous with military effectiveness."[8] Innovation in the planning for and conduct of warfare is in fact a key enable of increased effectiveness. After decades of relative stagnation, a return to a culture of innovation occurred in the late 1970s.[9]

Another dimension of talent mix is the breadth of skills within an organization folded into the innovation consolidation and diffusion process. Beginning in the late 1970s, significant military innovations involved systems integration, spawning several lines of planning and operational processes on which current transformation activities rest. Systems engineering, discussed below, emerged as a skill to facilitate intra organizational planning as well as help organizations develop requirements and plans based on externally driven requirements.

Flexibility in the planning process is critical. Leaders activity promoted innovation in the late 1970s to a much greater degree of self-determination than their immediate predecessors. They fostered greater appreciation for the value of doing things differently and, as the Soviet threat became politically more pronounced, they accepted a greater degree of flexibility in designing solutions to operational challenges.

Things were broken, they needed fixing – or at least this is what a new generation of military and civilian leaders believed. They shared a larger vision for offsetting Soviet advantages without relying on nuclear weapons. More importantly, they realized a critical need for organizational renewal and concerted efforts to instill pride, confidence, and a sense of purpose among the ranks. From the perspective of post-World War II American military thought, these same leaders advocated new approaches to warfighting and promoted greater imitative among junior commissioned officers and senior enlisted service members.

It took at least a decade for an air-ground maneuver doctrine, the operationalization of air-ground cooperation, and information-enabled weapons systems to evolve into a new, joint approach to warfighting. The cultural sensitivity and operational outlook required to implement the envisioned dynamic, integrated, rapid-dominance style of warfare continues to mature Doctrine, technology, and organizational innovations, moreover, retain their currency in part because they evolved in an organizational context that favored initiative and operational flexibility. The fungibllity of information technology and 'how-to' knowledge about its applications was increasingly embedded in institutional practices and cognitive schemas.

Then, as now, planners design flexibility into future operational capabilities because of the uncertainty present in the security environment. Operational flexibility did not manifest itself until the late 1990s – when planners in the 1980s had projected that precision nonnuclear strike, intelligence capabilities, and maneuver doctrine would coalesce into a Follow On Forces Attack capacity. The end of the Cold War delayed the schedule and new operational requirements shifted the orientation of further developments. Essential characteristics, including precision strike, Stealth, and time-critical targeting remained at the center of military doctrine.

Operational flexibility seems even more accepted in the 2000s than it was during the late 1970s and 1980s. Then, flexibility and agility increased in defense policymaking, research and development, and doctrinal change – but flexibility in operations paled in comparison to the 2000s. Now, it appears that the U.S. is pursing greater flexibility in military activities, but it is not clear that the strategic planning environment reinforces creativity and risk taking to the degree present in the early 1980s.

Despite continued emphasis on operational flexibility, it is not clear that the anticipated degree of *planning* flexibility matured in the 1990s as force structure and defense budgets declined. In many ways, much of the flexibility and adaptability inherent in the Department of the Army's planning succumbed to process rigidity at the same time that operational flexibility manifested itself.

Organizational Factors

The security environment, perceived innovation attributes, and enabling characteristics are closely linked to organizational factors. In the real world, of course, these analytic distinctions fade. Perceptions of the security environment, for example, are part of a larger overlapping flow of influences that are unconstrained by what scholars label behavioral, interpersonal, or structural boundaries. Scholars reduce the complex milieu of agency and structural conditions into frameworks to facilitate analysis and render judgments. Part of the reason for the innovation milieu construct, therefore, is to focus on both the deconstruction (and reduction) of reality into piece parts to facilitate military innovation studies *and* orient military innovation studies away from frameworks that privilege only parts of the larger milieu, claiming that only one sector or set of factors is important.

Not all of the organizational factors involved in the emergence of the American RMA can be summarized here. Students of military innovation must continue to press for understanding of the formal and informal structural constructs that cohere in the form of organizational factors. They remain important contextual influences shaping how organizations defined and redefined missions and operating procedures in response to both international and domestic influences. And they condition innovation diffusion and adoption processes through which new ideas, technology, and operational approaches emerge, prove themselves, and displace established practices.

The military's 1970s training revolution reflected a shift in organizational priorities in the aftermath of Vietnam. Closely related were doctrinal shifts, some specifically aiming to integrate new technology and weapons systems. The Army's creation of the Training and Doctrine Command (TRADOC), for example, stemmed from recognition among senior leaders that doctrine and tactics required reinvention to push new procedures as well as integrate new technology. Subsequent Army and Air Force decisions to cooperate reflected organizational acceptance of relationships required to both meet the operational threat and facilitate development of envisioned weapons systems. The Army needed Air Force acceptance for long range, deep strike missiles and cooperation in the targeting mission. The Air Force, on the other hand, needed Army anti-aircraft support to attrit Soviet tactical aviation and to suppress enemy air defense with long-range fires.

Both services needed research and development assistance to bring new technologies to the fight. Malcolm S. Currie's 1973 decision to reorient the Defense Advanced Research Project Agency (DARPA) reflected a national focus on pursuing technologies to resolve strategic and operational challenges. Across Stealth, Assault Breaker, and information technology projects, DARPA worked closely with the Services to understand how new doctrine and technology could be applied to operational problems in ways yielding new measures of strategic effectiveness.

Students of military innovation should also consider how, and to what degree the security environment, perceptions of innovation, and enabling resources influence organizational plans and expectations. Military innovations introduced into organizations for experimentation and then adoption tend toward path dependency in terms of evolving in relationship to their initial operational purpose. Organizationally, it is difficult for innovation champions to achieve buy-in for new ideas or capabilities that diverge from established practices without processes for discovering organizational benefits and proving them in realistic experiments. This was certainly true for maneuver warfare doctrine, Stealth, and Assault Breaker. Each of these evolved within military organizations only after proponents successfully argued their utility for mitigating, or reducing, risk posed by Soviet capabilities such as the Operational Maneuver Group and a very capable, integrated air defense network. Only after the domestic political context changed to support conventional warfare innovations, moreover, would such arguments make headway.

Throughout, integration emerged as a more important theme in U.S. military thought and defense planning. A key part of the offset strategy, integration initially concerned concepts, changes in strategic doctrine, and new conventional initiatives aiming to strengthen the relationship between nuclear and nonnuclear forces.

In addition to largely overlooking the evolution of the offset strategy, histories of advanced U.S. conventional forces sometimes overlook the origins of arguments for an integrated deep strike, rapid dominance approach. Only recently have analysts turned to the integration of intelligence, surveillance, and reconnaissance (ISR) capabilities with organizational and doctrinal innovations.

Tightening and adapting the relationship between operations and intelligence emerged as an integration theme in the early 1980s. This included ISR capabilities developed specifically to raise the nuclear threshold in Europe by strengthening the deterrence relationship between conventional and theater nuclear weapons. By the end of the 1980s, this relationship matured such that Soviet observers viewed U.S. conventional forces as capable of "strategic theater" operations. U.S. military planners began using the term strategic *nonnuclear* strategic strike. This trend was reinforced in the late 1990s as operations demanded more precise geopositioning. A 1998 Defense Intelligence Agency report, for example, concluded "that precision strike weapons demand precise intelligence" and the ability "to operate effectively in the high-tempo, complex, and more lethal battlefields of the future."[10]

This study does not assess the myriad advances in satellite communications and other space-based capabilities that occurred over the past three decades. It is important, nonetheless, to note that the American RMA relied in large part on the communications, geo-positioning, surveillance, and guidance systems that exploit the coverage, perspective, timeliness, and access over denied areas gained by locating capabilities in space.

Among the benchmarks was the 1980 launch of Intelsat 5, an American communications satellite able to simultaneously relay two color television signals and some twelve thousand telephone calls. Operation Iraqi Freedom in 2003 was made possible in part because the U.S. leased large amounts of bandwidth from commercial space telecommunications providers. Integrating space with other domains of operations remains an organizational priority among all the Services and a key source of operational innovation.

Another form of integration brought together the combat arms (armor, infantry, artillery, aviation), capabilities for joint command and control, shared pursuit of common weapons systems, and mutually supportive doctrine. Such organizational issues were perhaps the most important and far-reaching of the proliferating integration thrusts that continues to be a primary axis of defense transformation in the 2000s.

The most important integration theme concerned information systems. Indeed, information technology figured prominently in successive visions for addressing strategic and operational challenges over that last three decades. The promise of information technology was increasingly linked to operational approaches to deter, defeat, and now dominate adversaries. *Washington Post* reporter Vernon Loeb observed in December 2002 that, "It took years, and increasingly impressive proof on the battlefield, before these inspirations were recognized for what they were – a new way of fighting that would change the calculations of war and peace in unprecedented, and still uncertain ways."[11]

Integration-focused concept demonstrations like Assault Breaker were essential for gaining insights into cumulative, some would say emergent, outcomes from combining warfighting capabilities with information technology. It is not surprising that the primary architect of the offset strategy, former Secretary of Defense William J. Perry, was an engineer with experience integrating systems when he directed defense research and engineering in the late 1970s. Indeed, Perry was instrumental in the development of an important signals intelligence satellite system in the 1960s that fundamentally altered the effectiveness of U.S. collection against a range of sensitive targets for several decades.

He was also a systems integrator who understood the travails of large project management. Systems engineering (SE) and integration (SI) capabilities are key socio-technical enablers of the shift in military effectiveness associated with the end-to-end precision strike capabilities, including intelligence, surveillance, and reconnaissance systems. They represent an important organizational approach to delivering effective military capabilities; they are unsung organizational factors, reflective of a larger approach to problem solving, that helped the U.S. win the Cold War.

As chapter 1 briefly discussed, SE and SI practices emerged and were perfected in large-scale, complex systems for strategic missile defenses and nuclear command and control. SE, in particular, evolved as a distinct socio-technical approach to problem solving that more closely linked mission needs and warfighting requirements to research and development, program planning, and capability insertion than at any other time in military history. Nuclear launch warning networks and associated nuclear command and control systems evolved in response to specific needs to identify an enemy nuclear missile launch and rapidly set in motion a U.S. retaliation. This was the heart of deterrence. Over time, the cornerstone of deterrence became not the individual weapons platforms and guidance systems but the network that linked intelligence and surveillance capabilities with nuclear weapons release processes facilitating assured retaliatory strikes.

In an era dominated by a systems of systems approach to modernizing and transforming the armed forces, one defined by sophisticated information systems and their interfaces, systems engineering and integration have became even more important. Indeed, SE/SI skills are central to managing the knowledge burden, a term applied to the process of creating and maintaining large information enterprises operating in complex environments bordering on chaos. These skills are fundamentally management ones, a conclusion Thomas Hughes deduced from study of large-scale systems engineering projects. In large, technologically complex integration processes, "management has presented more difficult challenges than research and development."[12]

Experience managing large-scale systems engineering and integration problems shaped approaches first to information technology research and development and then to applying information technology to battlefield problems. All aspects of defense strategy have been affected, including the venerable strategic triad of bombers, intercontinental ballistic missiles (ICBMs), and submarine launched ballistic missiles (SLBMs). The new triad is specifically depicted as including command, control, communications, and intelligence as the central enabler of deterrence – not specific weapons or platforms.

Revisiting the Innovation Milieu

Widespread support for conventional modernization emerged during the mid- to late-1970s. Planners recognized that current NATO modernization efforts were not sufficient to counter Soviet advances. After years of negotiations, diplomatic initiatives proved unsuccessful in moderating what the West perceived as Soviet foreign policy adventurism coupled with increased defense spending. Economic conditions improved, especially in the U.S., dampening domestic opposition to defense spending.

Underlying all of this was an important organizational development in the U.S. Army. Paralleling the quest for renewed innovation in DARPA and other research and development arenas, and reflective of the approach to innovation pursued by Generals DePuy, Starry, and Gorman, senior Army leadership on the front lines in Europe encouraged innovation at all levels. A mix of innovation activities ensued.

Chapter 2 argued that military innovation theory is primary focused on significant innovations that alter the course of military history. Often they focus on what might be called the “big bets.” Qualifying as a big bet, or true ‘game changing’ development, requires a fundamental shift in the core competencies or missions of an organization that allows one to dominate an adversary. They often change the character of warfare.

A handful of discontinuous innovations emerged within operational sectors during the maturation period of the American RMA.   Stealth was in many ways one of these. Like many innovations its evolution was uncertain. The Air Force accepted fielding of F-117s only on the condition that other programs, including a new air superiority fighter, would not lose funding. Organizationally, therefore, the Air Force did not bet on Stealth to secure victory.

Nor did Assault Breaker lead to any big bet investments. Neither the Army nor the Air Force choose to commit resources to field the elements of the demonstration even after it successfully tested critical capabilities. Instead, the Services allocated resources to their own, similar programs to prevent losing funding or having their programs tied to a joint initiative.

Organizationally, rather than a series of big bets, the U.S. seems to have pursued significant military innovations that encouraged discontinuous change in specific domains of operations. Alone, none was intended to revolutionize warfare. Instead, they were considered key innovations at the operational level of warfare that, properly utilized in concert during a campaign, could exploit known vulnerabilities in Soviet forces and doctrine. As an integrated enterprise, planners intended innovations to enhance overall capabilities, increase U.S. military effectiveness against Soviet forces, and yield new measures of military effectiveness.

From the perspective of a wired, network centric approach, the promise of leveraging information technology as a force multiplier represented a big bet. For decades, risks inherent in 'betting' operational success on the promise of information technology led to a cautious investment strategy. As the costs of information technology declined, the underlying argument of the offset strategy was more feasible. Operations in the 1990s demonstrated information sharing and knowledge management shortfalls. Arguments for increased spending on information systems were more tenable, something reflected in changes in investments and reprioritization of key systems. In the early 2000s, the Army altered its transformation strategy, opting for a lighter, more mobile combat brigade over heavier units. Instead of armor, combat forces would be wrapped in a protective layer of information systems enabling the avoidance of enemy fire while bringing rapid, decisive combat power to bear anywhere on the battlefield.

Services did not necessarily place faith in information technology until *after* it was proven in battle. Information systems were not funded at a level suggesting that organizations considered them the arbiters of victory. Few senior leaders placed their weapons systems at risk by moving funds into information sectors. The lack of full funding for Assault Breaker, Service reluctance to push GPS, delays developing joint doctrine, and other decisions suggest that innovation is not an isolated variable. Extraneous factors are involved. The contextual and organizational factors, therefore, are not directly influencing the mix of innovations.

In terms of thinking through frameworks for conceptualizing innovation, this adds a degree of contingency and uncertainty more reflective of reality than a deterministic model possess. Using the idea of a milieu, or a point of point or coordinate in space and time, evokes the image of the core organizational processes scholars are interested in studying in light of multifaceted, often indirect, influences external to the organization.

Chapter 2 suggested three questions an innovation framework should help scholars and policy practitioners address to help identify innovation diffusion and adoption processes within a specific organizational context.

- Does the acceptance and diffusion of the innovation require incremental or discontinuous shifts in the organization?
- Do the required policy, organizational, technological, or other types of changes required lead to the sustaining of current policies or technologies (adapting or extending them) or their disruption?[13]
- Does change promote a convergence of the old and new or a divergence?

The questions assume knowledge of, or access to knowledge about, relevant contextual and organizational factors. The innovation milieu construct can be further decomposed to inform scholarly assessments of innovation cases and suggest additional insights into strategic policy making. Figure 7-2 (which also appeared in chapter 2) is a recommended first step.

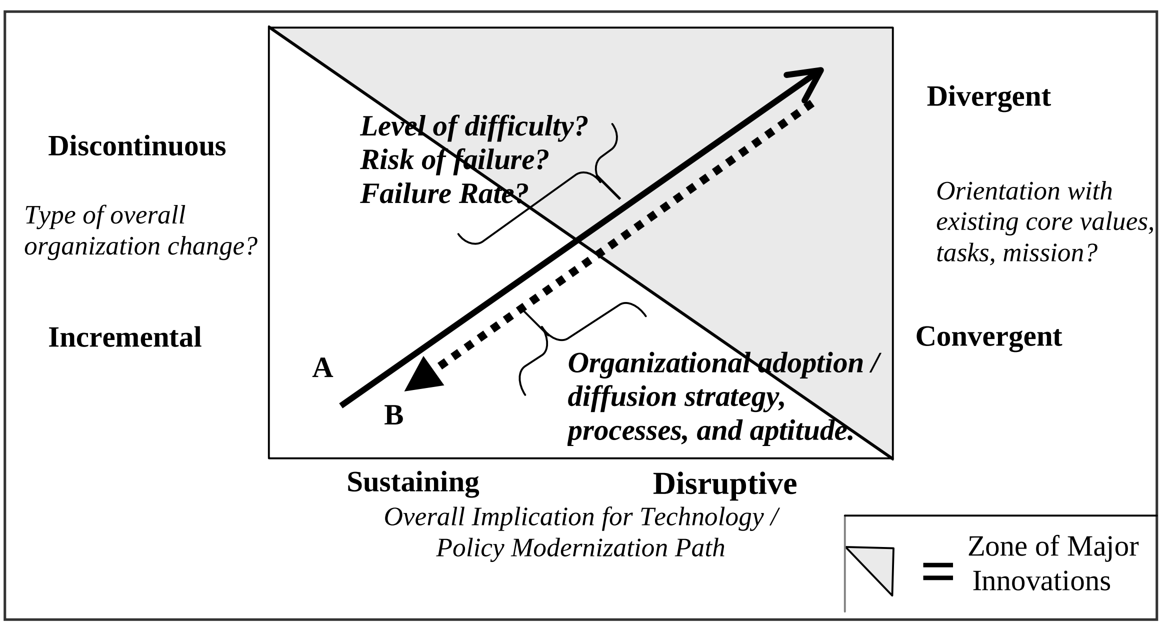

Figure 7-2: An Operational View of the Innovation Milieu

Figure 7-2 is not proposed as a framework for thinking about types of organizational behavior; nor is it proposed as a model inclusive of all innovation cases. Adaptive change falls in the lower left-hand corner while “big bets” indicative of major military innovations aiming to engender transformation fall in the opposite corner.

The intent of asking the above three questions if to identify characteristics of innovations within their organizational context as well as think about socialization and diffusion capacities needed to achieve adoption. By working through them, one can attempt to locate the innovation along the range of difficulty (line A in figure 7-2) and then pursue activities (line B) to decrease or mitigate the risk of failure. The intent, over time, is to change the organization so new missions or capabilities are accepted as mainstream or at least considered as central to the achievement of the mission. They then become part of new overall capability level from which additional adaptations on the original innovation are pursued.

This is a critical part of the innovation diffusion and adoption process. As father of modern economics Alfred Marshall concluded, innovations rarely achieve their full potential until “many minor improvements and subsidiary discoveries have gathered themselves around it.”[14]

Additional analysis must be done to identify what types of risk mitigation and organizational change activities will address concerns about why a particular innovation is difficult to institutionalize. Experiments, prototyping, and incubation activities can be structured and pursued in business units or operational areas most conducive to the particular technological, operational, or organizational innovation. This includes identifying the strategic or operational necessity for the innovation and pursuing diffusion or insertion in ways most conducive to their acceptance. It also requires assessments of what, if any, additional innovations (new capabilities, ideas, operational concepts) are needed to enable the core innovation.

Underscoring the above operational view of the innovation milieu is a belief that military innovation is a social process in which technological, operational, and organizational elements conjoin in a specific context.

Many approach defense transformation planning from the perspective of technology invention. Research and development to produce new technology, for example, is equated to military innovation. Like other areas of innovation, however, technological innovation is a fundamentally social behavior involving diffusion and adoption processes. For Harvey Brooks, it is "sociotechnical rather than technical," an argument that extends to other areas, including the management domain.[15] Because "managerial revolutions are becoming an increasingly important aspect of technology," he continues, management, "insofar as it can be described by fully specified rules, is thus a technology."[16]

Why bring this up? Current defense transformation strategy appears to be pursuing a mix of technology innovation and diffusion processes as well as fostering management capabilities to support, lead, and execute transformation plans. Within defense agencies and the armed forces, much of this involves business process innovation, particularly those involving knowledge management and information technology. This is a profoundly *social* area of innovation that, although technology intensive, is fundamentally about organizational cultures and workforce communication.

Informing Defense Transformation

Ten years after the 1991 Gulf War, in the aftermath of operations Enduring Freedom (Afghanistan) and Iraqi Freedom, there is much talk about a new American way of warfare – one with strong resemblance to the original RMA thesis. Consider the vision embedded in the 2003 defense transformation strategy: "an enhanced forward deterrent posture through the integration of new combinations of immediately employable forward stationed and deployed forces; globally available reconnaissance, strike, and command and control (C2) assets; information operations capabilities; and rapidly deployable, highly lethal, and sustainable forces that may come from outside a theater of operations."[17] Contributing aspects included the technologies and concepts central to the offset strategy, the rise of operational art and a systems approach to warfare, and the evolution of rapid deployment planning. Another area of continuity is increasing importance assigned to systems integration across all domains of national security decision-making, including the information and intelligence arenas.

The task for military planners and strategists is, arguably, to build on past successes and develop appropriate capabilities (technological, organizational, and operational) to meet future threats. An issue not addressed above is whether current transformation planners and military theorists are taking the U.S. military in the right direction. Are U.S. forces being prepared to fight and win future conflicts? What are the right investments to make to prevail in future conflicts? Such questions, likely to dominate the 2004 presidential election, are beyond the scope of this study.

The fundamental issues for current students and practitioners of defense transformation involve the diffusion, adoption, and sustained adaptation of innovations. Technology development is not the main concern. Issues associated with the management and oversight of strategic planning and implementation processes, including strategic communications and leadership attention to cultural change, are the chief impediments. Accordingly, the continued evolution of management capabilities within the armed forces, along with application of emerging cross-organization integration approaches, are both critical to leveraging knowledge management capabilities.

In this area, defense transformation strategists can learn from the first generation of innovators to exploit the computer information revolution. Many of the same issues and organizational challenges to the diffusion and adoption of critical innovations persist.

Military innovation studies are not considered a primary field in political science, history, or international relations sub-fields like security studies. Partly this is because no single academic discipline can legitimately claim a comparative advantage in the underlying methods, data, or explanatory power when *their* methods are applied to a fundamental question: What behavior, processes, and antecedent factors lead to significant leaps in military capabilities and seemingly revolutionary jumps in military effectiveness?

Military affairs span across disciplines: military history, autobiography, psychology, theory building case studies of political-military decision making, arms proliferation, political-economic studies of war making potential, international relations theories derived from correlates of war databases, action-reaction phenomena, and so on. This is a mixed blessing for scholars and decision makers looking for empirically derived insights into military innovation phenomena. Since the study and practice of military change management necessarily involves understanding multifaceted contextual elements, a cross-disciplinary approach is needed. This seems particularly true when considering the strategic aspects of military change management and relationships between strategic and operational necessity and innovation activities.

In their survey of the military effectiveness of nine military organizations in the early twentieth century, Williamson Murray and Allan Millet found that “nations that got their strategy right were able to repair tactical and operational deficiencies in their military organizations. But nations that got the strategy wrong, no matter how effective their military organizations on the battlefield, *always lost*."[18] The very issue of an "innovation strategy" as part of an overall defense transformation strategy is difficult for many to comprehend.

One reason military history is replete with failed transformations and failures to adapt military organizations is that leaders simply got the strategy wrong. Other times the strategy is not implemented correctly. Increasing the overall strategic effectiveness of U.S. national security processes will remain an elusive goal without a more comprehensive national strategy for innovation. Although pieces of this strategy exist in the form of national security plans, defense transformation visions, and homeland security reforms, no unifying study of the evolving strategic context for innovation has begun. For the still disparate arms of U.S. national security, this leaves organizations without a clear template to priorities innovation activities relative to current and future needs.

Defense transformation is fundamentally a strategic planning and execution process. There is no lack of strategic planning approaches suitable to the task. Critical is designing and faithfully implementing a strategic plan that aligns resources to achieve the optimal capabilities for the situation. When this calls for successfully adopting disruptive or a significantly different technology or doctrine, the strategy must address diffusion and adoption processes.

Most strategic change efforts requiring the introduction of a new order of business or a capability alien to the organizational culture fail not always because the strategy is wrong. They fail because the process does not address barriers to diffusion and the implementation of plans are too inflexible in the face of disparate organizational exigencies, including deliberate attempts to block change.

This is where innovation studies and frameworks are useful, something businesses are discovering after a decade of re-engineering and process revolution models insensitive to end-to-end aspects of innovation. Compared with RMA-associated defense modernization policies in the early 1990s, initiatives associated with official defense transformation strategy in the 2000s reflect greater sensitivity to factors identified in strategic innovation literature as critical for successful change management. These include cultural change, strategic communication, the identification of risk associated with change, and the importance of winning the battle of perception – which includes managing expectations.

Allan Millet cogently defines the utility of military innovation studies for policy makers. "Knowing how and why innovation flourished or lagged," he contends, "is an essential step toward understanding the enduring dynamics of military innovation and the challenges of military reform."[19] Similarly, political scientist Stephen Peter Rosen intended his *Winning the Next War: Innovation and the Modern Military* to inform military reform in the 1990s, offering "conclusions about the role of resources, intelligence, and civilian control in military innovation."[20]

Among the benefits of exploring defense transformation through a lens attuned to innovation is the ability to tap existing insights in the historical, sociological, economic, technical, and organizational aspects of innovations processes and outcomes. From this perspective, historical RMA works become a source of data for innovation studies. Focus differs. The former yields understanding of levels and types of large-scale military change and associated effects on battlefield performance; the latter yields understanding of the multi-faceted initiatives and circumstances that enabled change in the first place.

One addresses revolutionary change in military history from one period to the next; the other studies the intricacies of bringing such changes to fruition.

Adoption, the institutionalization of innovation as it diffuses, "represents a departure from standard practice" for an organization, often occurring when ideas challenging core practices and established concepts are, at least partially, assimilated and incorporated into an organization's activities.[21] This process is difficult to enact and fundamentally *not* deterministic, rife with what organizational theorists describe as "inherent tensions that must be accommodated."[22] Success or failure, therefore, usually hinges on how these tensions are resolved. Indeed, *how* leaders and organizations go about introducing, diffusing, and institutionalizing innovations is, perhaps, the most critical part of the innovation process. Most military innovation studies, like similar works in management sciences, aim to organize and synthesize information about the causal relationships among innovations themselves, processes organizations use to adopt them, and the outcomes produced.

A RAND Corporation study on predicting military innovation suggests one route to including technology issues within an overall framework of military innovation. In focusing on technology integration, what others discuss as diffusion processes, Jeffrey A. Isaacson, Christopher Layne, and John Arquilla operationalize the following definition in their analysis of factors useful for predicting future military innovations. "For a *specific* military, innovation is manifested by the development of new warfighting concepts and/or new means of integrating technology. New means of integrating technology might include revised doctrine, tactics, training, or support."[23]

This study was primarily interested in those military innovations involving discontinuous or disruptive change altering an organization's core missions, tasks, or capabilities in a way that shifts how an organization defines and achieves strategic and operational objectives. Regardless of the historical data, theories, or methodological bent pursued, military innovation studies seeking to inform policy must provide policy makers with some framework consisting of structural interfaces, insights into human behavior, and contextual factors influencing both.

John Lewis Gaddis concludes that, "studying the past has a way of introducing humility – a first stage toward gaining detachment – because it suggests the continuity of the problems we confront, and the unoriginality of most of our solutions for them. It is a good way of putting things in perspective, of stepping back to take in a wider view."[24] True enough. Such perspective is important on many levels. In addition to infusing additional background information into the continuously evolving discussion of the American RMA, historical perspective on the antecedents to current technologies and operational concepts provides a sense of historical continuity into ongoing defense transformation decisions. It demonstrates how much has not changed in terms of visions for future warfighting capabilities at the same time as suggesting paths of divergence demonstrated in recent conflicts. This is where military innovation studies offer to fill an important niche in policy analysis.

Chapter 7 Notes

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[1] Richard H. Van Atta, Jack H. Nunn, and Alethia Cook "Assault Breaker" in Richard Van Atta et al, *Transformation and Transition: DARPA's Role in Fostering and Emerging Revolution in Military Affairs, Volume II – Detailed Assessments* (Alexandria, VA: Institute for Defense Analyses, IDA Paper P-3698, November 2003), p IV-1.

[2] William J. Perry, "Military Action: When to Use and How to Ensure its Effectiveness" in James E. Nolan (ed.), *Global Engagement: Cooperation and Security in the 21st Century* (Washington, DC: Brookings Institution Press, 1994), p. 240.

[3] U.S. Congress, Office of Technology Assessment, *Technologies for NATO's Follow-On Forces Attack Concept* (Washington, DC: Government Printing Office, July 1986), p. 7.

[4] Ibid.

[5] Frank Kendall, "Exploiting the Military Technical Revolution: A Concept for Joint Warfare" in *Strategic Review* (Spring 1992), p. 24. **[23-30]**

[6] Richard Van Atta, *Transformation and Transition: DARPA's Role in Fostering an Emerging Revolution in Military Affairs*, Volume I: Overall Assessment (Alexandria, VA: Institute for Defense Analyses, April 2003), p. 10.

[7] Derek Leebaert, *The Fifty-Year Wound: The True Price of America's Cold War Victory* Boston: Little, Brown and Company, 2002), p. 584.

[8] Owens, *Lifting the Fog of War* (New York: Farrar, Straus, Giroux, 2000), p. 52.

[9] Interview with MG Stan McChrystal, Pentagon, 9 September 2003.

[10] Defense Intelligence Agency, *Collection/C4ISR Support to Targeting and Precision Strike* (August 1998), pp. 18; xvii.

[11] Vernon Loeb, "Bursts of Brilliance," *Washington Post Magazine*(December 12, 2002), p. 8.

[12] Hughes, p. 5

[13] On sustaining versus disruptive change, see Clayton M. Christensen, *The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail* (Boston: Harvard Business School Press, 1997).

[14] Cited in Frances Cairncross, *The Death of Distance* (Boston: Harvard Business School Press, 1997), p. 3.

[15] Harvey Brooks, "Technology, Evolution, and Purpose" in Stephen R. Graubard (ed.), *Modern Technology: Problem of Opportunity?* (Daedalus Vol. 109 No. 1), pp. 65-66.

[16] Ibid..

[17] *Military Transformation: A Strategic Approach*, (Washington, DC: Director, Force Transformation, Office of the Secretary of Defense, Fall 2003), p. 6.

[18] Williamson Murray, "Afterward" in Williamson Murray (ed), *The Emerging Strategic Environment: Challenges of the Twenty-First Century* (Westport, CT: Praeger, 1999), p. 269. Emphasis in original.

[19] Allan R. Millet, "Patterns of Military Innovation in the Interwar Period" in Williamson Murray and Allan R. Millett (eds.), *Military Innovation in the Interwar Period* (New York: Cambridge University Press, 1996), p. 335.

[20] Rosen, p. 251.

[21] Nicholson., p. 237.

[22] Deborah Dougherty, "Organizing for Innovation" in Stewart R. Clegg, Cynthia Hardy, and Walter R. Nord (eds.), *Handbook of Organizational Studies* (London: SAGE Publications, 1996), p. 425.

[23] Jeffrey A. Isaacson, Christopher Layne, and John Arquilla, *Predicting Military Innovation* (Washington, DC: RAND, 1999), p. 8.

[24] *The United States and the End of the Cold War: Implications, Reconstructions, Provocations* (New York: Oxford University Press, 1992), p. 3.