NAVAL WAR COLLEGE **NEWPORT PAPERS** 17

The Limits of Transformation

Officer Attitudes toward the Revolution in Military Affairs

Thomas G. Mahnken and
James R. FitzSimonds

Cover

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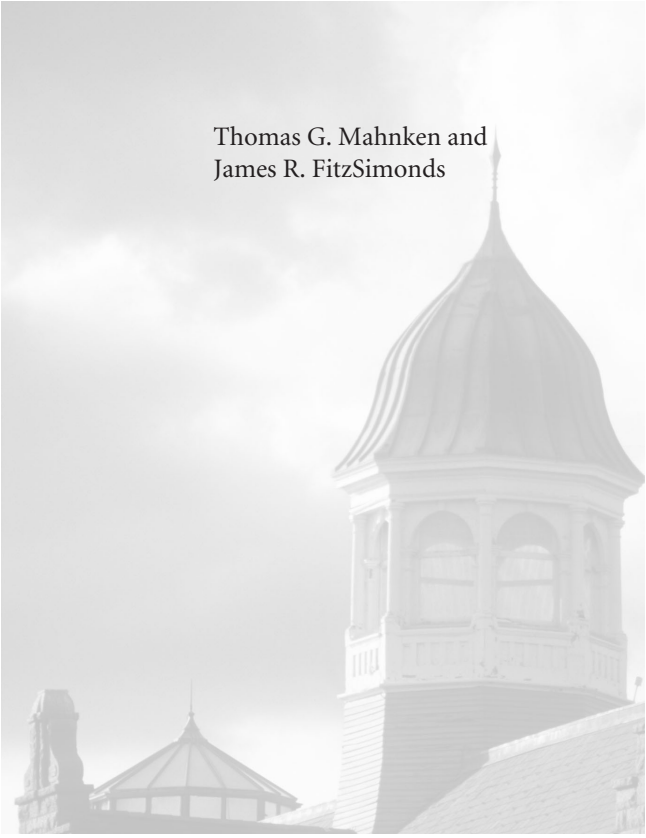

Thomas G. Mahnken and
James R. FitzSimonds

NAVAL WAR COLLEGE
Newport, Rhode Island

Naval War College

Newport, Rhode Island
Center for Naval Warfare Studies
Newport Paper Number Seventeen
2003

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Naval War College Press

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Web: http://www.nwc.navy.mil/press

Printed in the United States of America

The Newport Papers are extended research projects that the Editor, the Dean of Naval Warfare Studies, and the President of the Naval War College consider of particular interest to policy makers, scholars, and analysts. Candidates for publication are considered by an editorial board under the auspices of the Dean of Naval Warfare Studies. Published papers are those approved by the Editor of the Press, the Dean of Naval Warfare Studies, and the President of the Naval War College.

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Correspondence concerning The Newport Papers may be addressed to the Dean of Naval Warfare Studies. To request additional copies or subscription consideration, please direct inquiries to the President, Code 32A, Naval War College, 686 Cushing Road, Newport, RI 02841-1207.

The Newport Papers are edited and prepared by Patricia A. Goodrich, Associate Editor, Naval War College Press.

ISSN Pending

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Foreword

In the shadow of the recent Iraq war, it is easy to accept that "growth and diffusion of stealth, precision, and information technology" has truly heralded the long-awaited revolution in military affairs. American leaders—from the President to the Pentagon military and civilian leadership—have called for dramatic transformation of each of the services to fit this revolution. In many ways, this is a far harder task.

It is the purpose of this Newport Paper to examine the views of military officers on that prospect, a critical and unstudied factor in the implementation of transformation. Its coauthors, Professors Mahnken and FitzSimonds, are members of the Naval War College faculty—Dr. Mahnken in the Strategy and Policy Department and Captain FitzSimonds (U.S. Navy, Retired) in the War Gaming Department's Research and Analysis Division.

The authors argue that the opinions of military officers on transformation are crucial, and not just because these attitudes guide the transformation process. They are critical also because receptivity to change in this group will affect innovation, both now and when today's mid-grade officers assume senior leadership posts. It is from some, but not all, of today's military officers that further transformation impulses will come.

Accordingly, Mahnken and FitzSimonds explore a number of questions fundamental in the present and for the future of the American military establishment. What is the level of enthusiasm among officers for transformation? How compelling do they perceive the need for transformation to be? How extensive a change do they believe is necessary? How confident are they in the ability of the U.S. military to carry out transformation?

We believe that this study is in itself as innovative as the military transformation that forms its broad subject, and we are pleased to bring it to the attention of a broad range of naval, academic, and policy readers. We are grateful for the generous support of the Smith Richardson Foundation for this publication and wish specially to thank Jo-Ann Parks of JIL Information Systems and David Chapman of Chapman and Partners for their skillful preparation of the many tables that undergird this most impressive analytic monograph.

Catherine McArdle Kelleher

CATHERINE McARDLE KELLEHER
Editor, Naval War College Press

Acknowledgments

We received a great deal of assistance in this project. First and foremost, we would like to thank Captain Frank Petho, MSC, U.S. Navy, for his assistance in designing the survey instrument and analyzing the data. At the Naval Postgraduate School, Iliana Bravo provided invaluable assistance in entering the data and beginning the literature review. At the Naval War College, Commander Larry Flint and Christopher FitzSimonds assisted us in completing the literature review. We could not have administered the survey without the assistance of Dave Bitters, John R. Goss, Major John P. Klatt, U.S. Air Force, Cheryl Monday, Colonel Dennis Pippy, U.S. Army, and Colonel Tom Smith, U.S. Army. Eleanore Douglas, Stephen Downes-Martin, John Maurer, Andrew Ross, and Commander Jeff Smith provided valuable comments on the draft of this monograph. We would like to thank the Naval War College Foundation, particularly Rear Admiral Joseph Strasser, U.S. Navy (Ret.), Sharyl Jump and Deb Marro, for their administrative support of the project. Finally, this project would have been impossible without the generous financial support of the Smith-Richardson Foundation in general, and of Marin Strmecki and Nadia Schadlow in particular.

CHAPTER ONE

Innovation and the U.S. Officer Corps

Over the past decade, a significant number of defense analysts, government officials, and military officers have argued that the growth and diffusion of stealth, precision, and information technology will drastically alter the character and conduct of future wars, yielding a revolution in military affairs (RMA). The idea that the emergence of new technology, combined with innovative operational concepts and organizations, would transform the conduct of war, first appeared in Soviet military writings in the late 1970s.[1] It was, however, the seeming ease with which the U.S.-led coalition defeated Iraq during the 1991 Gulf War that led many observers in the United States and elsewhere to conclude that significant changes in the character of warfare were underway.[2] Since the mid-1990s, exploiting the emerging RMA has been an explicit goal of the Defense Department.[3] The Chairman of the Joint Chiefs of Staff promulgated *Joint Vision 2010* with great fanfare in 1996 as the "conceptual template" for how the armed forces would "leverage technological opportunities to achieve new levels of effectiveness in warfighting."[4] Each of the services has devoted considerable attention to developing new technology as well as the concepts and organizations needed to employ it most effectively.

George W. Bush campaigned on a pledge to exploit the information revolution by skipping a generation of technology. In a September 1999 speech at the Citadel military college, then-governor Bush noted that "our military is still organized more for cold war threats than the challenges of the new century—for industrial-age operations, rather than information-age battles."[5] Transforming the U.S. armed forces became one of the Bush administration's top priorities when it took office. Speaking at the Norfolk Navy Base in February 2001, President Bush promised to "move beyond marginal improvements to harness new technologies that will support a new strategy." He called for the development of ground forces that are lighter, more mobile, and more lethal, as well as manned and unmanned air forces capable of striking across the globe with precision.[6]

Soon after assuming office, Secretary of Defense Donald Rumsfeld directed Andrew W. Marshall, long time director of the Office of Net Assessment, to conduct a fundamental

review of U.S. strategy and force requirements. He also commissioned a panel of senior experts to develop a transformation strategy for the Pentagon.[7] However, early proposals to reduce the size of the U.S. armed forces and cancel major acquisition programs to fund the development of new weapon systems garnered opposition among members of Congress and senior members of the armed services.[8] The Defense Department's 2001 *Quadrennial Defense Review* contained none of the radical changes that had originally been discussed within the Pentagon.[9]

The seemingly unique demands of the war on terrorism led to renewed attention to the issue of transforming the U.S. armed forces. In a second speech at the Citadel on 11 December 2001, President Bush repeated his call for military transformation. Arguing that "the conflict in Afghanistan has taught us more about the future of our military than a decade of blue ribbon panels and think-tank symposiums," Bush called upon the military to field forces that would rely more heavily on unmanned air vehicles and precision-guided munitions. He also warned that "every service and every constituency of our military must be willing to sacrifice some of their pet projects. Our war on terror cannot be used to justify obsolete bases, obsolete programs, or obsolete weapons. Every dollar of defense spending must meet a single test: It must help us build the decisive power we will need to win the wars of the future."[10]

While the proposition that the advent of the information age demands that we transform the U.S. armed forces has received considerable attention in the press and has been discussed widely by academic experts and defense analysts, one of the elements that has so far been lacking is a systematic analysis of the attitudes of military officers toward the transformation. The purpose of this study is to fill this void. Specifically, it addresses the following questions:

- Are officers enthusiastic, ambivalent, or skeptical toward the proposition that we are today in an RMA?
- How compelling, in their view, is the need to transform the U.S. armed forces to exploit the emerging RMA?
- What is the depth and character of change that they believe is required?
- How confident are they in the U.S. military's ability to innovate?

Innovation and the Officer Corps

There are several reasons why an understanding of the attitudes of most officers would seem to be very important to the process of transformation. First, they will be the ultimate practitioners of the new (or old) ways of warfare. The extent to which they approach change with a positive attitude may have much to do with the success or failure

of new technologies, operational concepts, and organizations. A second reason is that although very few officers will likely emerge as true innovators, it would seem that the existence of a general climate within the officer corps that is open to change will encourage individuals both to generate new ideas and to remain in the service to help them come to fruition. A third reason is that a large percentage of career-oriented officers will rise to senior leadership positions within their services in the next 10 to 20 years. In those roles, they will establish command climates that will either support or inhibit risk-taking and innovation. Past research has demonstrated the importance to innovation of senior officers who protect and nurture the careers of young innovators under their command who are willing to take risks.[11] Finally, military officers are the recognized experts in military affairs in the United States. They are, or should be, expected to take a leading role in determining the need for adopting different approaches to warfare.

Strategic analysts differ over just how enthusiastic the U.S. armed forces are about emerging warfare areas. In each case, however, judgments are the result of anecdotal evidence rather than systematic study. Williamson Murray, for example, has portrayed the current officer corps as wildly passionate about technology. He argues that "The new generation of officers, with the exception of the Marine Corps, has proven far more attracted by technological, mechanistic solutions to the complex problems raised by war" than their predecessors.[12] Citing public statements and articles written by high-ranking officers, he concludes that the Army, Navy and Air Force more and more see technology as a "silver bullet," a development he characterizes as "dangerous."[13]

Andrew Krepinevich, by contrast, argues that the services are profoundly conservative, and that their planning and acquisition are governed by questionable—and potentially outmoded—assumptions drawn from the Gulf War. He argues that by preparing for the last war, officers can avoid challenging existing cultures and the dominance they accord to armored combat on land, carrier battle groups at sea, and tactical fighters in the air. They are reluctant to embrace new ways of war, such as unmanned aerial combat, which threatens the Air Force's pilot culture. They also resist the growing role of non-warfighters. As he puts it, "if history is any guide, the combat culture will prove reluctant to accept a growing role for such nontraditional warriors."[14]

Similarly, Eliot Cohen paints a picture of services that are dominated by officers who are wedded to technology and concepts that are of declining utility. He argues that "the services cling to established ways of war, and to combinations of technology, organizations, and personnel systems that have come to acquire value in and of themselves—even if they are no longer entirely functional." He notes, however, that each service also contains groups of officers who are enthusiastic about new ways of warfare. Some Air Force generals, for example, are eager to see uninhabited combat aerial

vehicles (UCAVs) supplement manned aircraft; some Army generals are interested in experimenting with light infantry and long-range precision strike systems; and some Navy admirals are in favor of network-centric warfare. "Behind them are far greater numbers of junior officers ready to experiment with the technologies and operational concepts that can make such notions reality."[15]

The officer corps is hardly united over the implications of the information revolution for the conduct of war. Rather, several schools of thought have emerged. Eliot A. Cohen, Michael J. Eisenstadt, and Andrew J. Bacevich, for example, divide the strategic studies community into disciples of the technological enthusiast Admiral William Owens, "Uncertain Revolutionaries," "Gulf War Veterans," and "Skeptics."[16] The authors of the International Institute for Strategic Studies *Strategic Survey*, by contrast, view the debate over the emerging RMA in terms of "Platform-Oriented Traditionalists" and "Information-Oriented Modernists."[17] Ian Roxborough and Dana Eyre argue that the services are pursuing four radically different images of future war, ranging from a high-technology "systemic war" dominated by precision-guided missiles and space weaponry to a gritty "peacewar" characterized by constabulary missions among failed states.[18] Scholars who have studied foreign writings on future warfare have detected contending schools of thought as well. In his study of Russian lessons of the Gulf War, for example, Stuart Kaufman identified three different views of future warfare.[19] Michael Pillsbury, for his part, has identified a major school of thought among Chinese military theorists that advocates exploitation of the emerging RMA.[20]

If significant differences in officer attitudes do exist, then what is their source? What, in other words, accounts for an officer's attitude toward innovation? Studies of past innovations indicate that an officer's rank may influence his enthusiasm toward new ways of war. In his study of innovation in the U.S. Navy, Vincent Davis concluded that the small number of true service innovators come from officers from the middle ranks with approximately 15 years commissioned service. He also observed that the innovation advocates are generally officers who possess unique, specialized knowledge and are passionate zealots who subordinate concerns for their own professional careers to the promotion of new concepts.[21] It is worth noting, however, that Davis' conclusions rest upon a relatively small number of cases. Barton Hacker's study of the attitudes of British army officers toward mechanization between the two world wars revealed that lower- and middle-ranking officers were more enthusiastic about mechanization than senior and retired officers.[22]

An officer's service affiliation may also influence his attitude toward innovation. Carl Builder has argued that each service has its own personality, one that has been shaped by its experience and in turn shapes its behavior. The Air Force, for example, places

greater emphasis on technology than do the other services. The Army and Marine Corps, by contrast, place much greater emphasis on the human element of combat.[23] It is reasonable to expect, therefore, that Air Force officers may be the most enthusiastic and Army and Marine Corps officers the least enthusiastic about emerging warfare areas. Robert Leonhard and Don Vandergriff—both Army officers—have argued that the Army's culture has led it to ignore the potential of new ways of war.[24] Navy officers may be more enthusiastic than Army and Marine Corps officers, but less enthusiastic than Air Force officers.

An officer's branch affiliation may similarly affect his attitude toward innovation. Barton Hacker, for example, found that British army officers' branch affiliation strongly affected their views of armored warfare: an overwhelming number of officers from the infantry and cavalry opposed mechanized forces, while many from the technical branches favored them.[25] One should similarly expect that officers from combat arms and branches would be less enthusiastic about emerging warfare areas than others.

Combat experience may also influence attitudes toward innovation. Cognitive research shows that people learn most from firsthand experience, from events early in life, and from events that have important consequences.[26] Combat experience provides one of the most compelling sources of expectations about the character and conduct of future wars.

It is reasonable to expect that combat veterans of a given service may be less enthusiastic about the emerging RMA than non-veterans of equivalent rank. Ground combat in particular has historically been characterized by considerable "fog" and "friction," and those who have experienced it firsthand may be more skeptical of claims of radical change than those who have not. Veterans of humanitarian and peacekeeping operations such as Haiti and Somalia may be less enthusiastic about the promise of new ways of war than veterans of more technology-intensive conflicts such as the Gulf War, Bosnia, and Kosovo.

The history of military innovation indicates that the commissioned officer corps is critical to the process of force transformation. It is hoped that the data from this survey will offer better insight into the attitudes and motivations of those officers who will bear a large part of the burden for creating and leading a U.S. military force that is fully prepared for the challenges of the 21st century.

CHAPTER TWO

Project Methodology

Our study of officer attitudes toward the emerging revolution in military affairs (RMA) employed a variety of analytical techniques. First, between May and October 2000, we conducted a survey of approximately 1,900 students attending seven U.S. professional military education (PME) institutions. The survey provides an overview of officer attitudes toward the emerging RMA as of mid-2000—before the election of George W. Bush and the 11 September 2001 terrorist attacks. Second, to explore issues that emerged from the study in greater depth, in September-October 2001 we convened four focus groups of 10–12 officer students attending the U.S. Naval War College. These groups were held after the 11 September attacks but before the launch of Operation ENDURING FREEDOM in Afghanistan. Finally, to explore trends in officer attitudes over time, we analyzed 340 articles on innovation that appeared in eight military professional journals between 1990 and 2000. This chapter describes the methodology employed to carry out each of these tasks.

Officer Grades or Ranks.

	NAVY	ARMY/AIR FORCE/MARINE CORPS	APPROX YEARS OF SERVICE AT THAT GRADE
O-1	Ensign	Second Lieutenant	1–2
O-2	Lieutenant (JG)	First Lieutenant	2–4
O-3	Lieutenant	Captain	4–8
O-4	Lieutenant Commander	Major	8–14
O-5	Commander	Lieutenant Colonel	14–20
O-6	Captain	Colonel	20–30
O-7	Rear Admiral (Lower)	Brigadier General	22–35
O-8	Rear Admiral (Upper)	Major General	22–35
O-9	Vice Admiral	Lieutenant General	22–35
O-10	Admiral	General	22–35

Survey

Between March and October 2000, we conducted a survey of students at seven premier PME institutions: the Naval War College (the College of Naval Command and Staff and College of Naval Warfare), Air Command and Staff College, Air War College, Army Command and Staff College, Army War College, National War College, and National Defense University's Capstone Course. The survey focused upon officers' attitudes toward the emerging RMA,[27] its perceived impact upon the character and conduct of war, the perceived need for the services to change to exploit the information revolution, and the character and depth of change required.

By surveying officers at these institutions, we were able to assess attitudes of junior officers (O-3 through O-4), senior officers (O-5 through O-6), and flag officers (O-7 through O-8), as well as foreign officers and U.S. government civilians (table 1). Responses from today's senior and flag officers offer insight into the attitudes of those who will be responsible for making decisions about how the armed forces transform themselves over the next five to ten years. By contrast, today's junior officers will occupy the leadership of the U.S. armed forces in 2020–2025. Army, Air Force, and Marine Corps officers in particular are selected to attend PME institutions based upon their potential for higher command. These officers represent the future leaders of their services.

TABLE 1
PME Institutions Surveyed.

PME INSTITUTIONS	PRIMARY STUDENT BODY*
Naval War College, Newport, RI	Navy Lieutenant Commanders (O-4) to Captains (O-6)
Air Command and Staff College, Montgomery AFB, AL	Air Force Majors (O-4)
Air War College, Montgomery AFB, AL	Air Force Lieutenant Colonels (O-5)
Army Command and Staff College, Fort Leavenworth, KS	Army Majors (O-4)
Army War College, Carlisle, PA	Army Lieutenant Colonels (O-5)
National Defense University, Washington, D.C.	All service Lieutenant Colonel/Commanders (O-5) to Major General/Rear Admiral (O-8)

The project utilized a written survey instrument. We developed a draft instrument, administered pilot surveys to students at the Naval War College and Naval Postgraduate School, and revised the instrument based upon feedback from the respondents. The faculty of the Operations Research Department at the Naval Postgraduate School also reviewed the instrument. We mailed written surveys to each PME institution, where they were administered. Completed surveys were sent to the Naval

* Each PME institution contains students drawn from all services. Most also include U.S. Government civilians and international officers.

Postgraduate School where survey data were entered into a computer database and analyzed.

The survey consisted of 36 statements. Respondents were asked to agree or disagree with each on a scale of 1 to 7, where 1 indicated strong disagreement, 4 uncertainty, and 7 strong agreement. For analytical purposes, we considered answers of 1, 2, or 3 to indicate disagreement with the statement, and 5, 6, or 7 to indicate agreement. We also adopted two different measures of uncertainty: we considered answers of 4 to reflect genuine uncertainty, while those responses with values of 3, 4, and 5 were considered to be tending toward uncertainty. The survey also included two sets of pair-wise comparisons. Finally, respondents were asked to provide demographic data, such as age, years of commissioned service, service affiliation, designator/military operational specialty (MOS), rank, highest degree received, and combat experience. The survey instrument is presented as Appendix A.

The vast majority of the officers surveyed had been commissioned prior to 1989. The decade of the 1990s saw the introduction and popularization of the concept of a revolution in military affairs and the following major world events that likely served to shape officer attitudes:

1990:	Sandanista regime turned out in Nicaragua Iraqi invasion of Kuwait
1991:	Operation DESERT STORM; widespread use in combat of stealth aircraft, cruise missiles, satellite navigation, and UAVs Dissolution of the Soviet Union
1992:	U.S. military intervention in Somalia
1993:	Start of the eight-year Clinton administration Terrorist bombing of the World Trade Center in New York The Battle of Mogadishu
1994:	Russian military operations commence in Chechnya U.S. military intervention in Haiti Civil war in Rwanda
1995:	Bombing of the federal building in Oklahoma City
1996:	*Joint Vision 2010* issued by CJCS
1997:	Hong Kong reverts to China
1998:	U.S./U.K. air attacks into Iraq (Operation DESERT FOX) Terrorist bombings of U.S. embassies in Kenya and Tanzania Nuclear weapons tests by India and Pakistan
1999:	Nato air operations in Kosovo and Yugoslavia (Operation ALLIED FORCE)

The survey was conducted before the terrorist attacks on USS Cole in Yemen (October 2000), the start of the George W. Bush administration (January 2001), the terrorist attacks on the World Trade Center and the Pentagon (September 2001), and U.S. military operations in Afghanistan (2001–2002).

Several caveats are in order. First, we did not assume that the officers that we surveyed would have expertise in new ways of war—or would even be familiar with many of these concepts. We were interested in their attitudes, not their expertise or their education. Second, we cannot know the officers' frame of reference in completing the survey. Finally, although we tried to make the survey as self-explanatory as possible, we cannot be certain how individual respondents interpreted individual statements. However, we feel that the focus groups that we convened to discuss the individual statements did provide us an adequate understanding of how most officers interpreted the language of the survey instrument.

Description of Survey Population. The survey population consisted of 1,916 individuals attending seven PME institutions.[28] While it is not a fully representative cross-section of the entire officer corps (that is, a proportional representation of all services and all specialties within each service), it is representative of the subset of the officer corps that gets an opportunity to attend military education institutions. Moreover, these are career officers on track for future leadership roles.

As table 2 shows, the largest number of responses came from the Army's Command and General Staff College, followed by the Air Force Command and Staff College. The survey instrument was provided to all of the students at each institution rather than a statistical sampling. We considered using statistical sampling, but it proved impractical because (with the exception of the Naval War College) we lacked access to the demographic data that would have been necessary to ensure that our sample was representative of the student body.

The response rate ranged from 27.9 percent at the Air War College to 81.6 percent at the Army Command and General Staff College (see table 3). The overall response rate was 66.7 percent, which is considered statistically adequate.[29]

TABLE 2
Responses by Institution.

PME INSTITUTION	NUMBER OF RESPONDENTS	PERCENTAGE OF TOTAL SURVEY POPULATION
Army Command and General Staff College	862	45.1
Air Force Command and Staff College	414	21.7
Naval War College	328	17.1
Army War College	134	7.0
National War College	77	4.0
Air War College	73	3.8
Capstone Course	22	1.1

TABLE 3
Response Rates.

PME INSTITUTION	NUMBER OF STUDENTS	NUMBER OF SURVEYS RECEIVED	RESPONSE RATE %
Army Command and General Staff College	1057	862	81.6
Naval War College	448	328	73.2
Air Force Command and Staff College	596	414	69.5
Capstone Course	40	22	55
Army War College	264	134	50.8
National War College	195	77	39.5
Air War College	262	73	27.9

The officers we surveyed ranged in age from 31 to 63; their median age was 38. Their commissioned service ranged from 8 to 31 years (see figure 1). The largest segment—70 percent—was composed of officers with between 11 and 15 years of commissioned service.

The survey included officers ranging in rank from O-3 (Army, Air Force, Marine Corps Captain; Navy Lieutenant) to O-9 (Army, Air Force, Marine Corps Lieutenant General; Navy Vice Admiral). As table 3 shows, the largest portion of the survey population was composed of O-4 and O-5 level officers.

Current Department of Defense regulations require officers to retire after thirty years of commissioned service unless selected as flag officers. If current regulations remain in force, then today's field-grade officers, the largest proportion of the survey population, will be able to remain in uniform until 2020–2025 (see figure 2). Some portion of this group will remain in the armed forces until 2025–2030.

FIGURE 1
Respondents' Years of Commissioned Service.

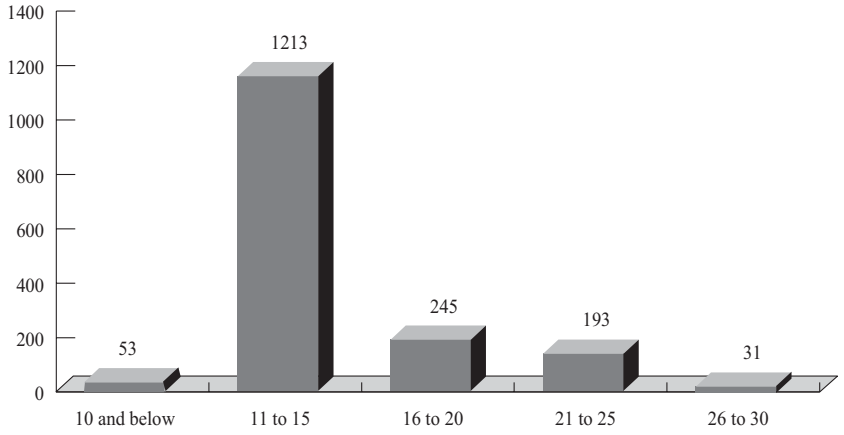


TABLE 4
Respondents' Rank.

RANK	NUMBER OF RESPONDENTS	PERCENTAGE OF TOTAL
O-3	8	0.4
O-4	1354	71.9
O-5	359	19.1
O-6	111	5.9
O-7	19	1.0
O-8	31	1.6
O-9	1	—

The survey included officers from all services, their reserve components, and the National Guard. It also included international officers and U.S. Government civilians.

The survey population included 173 officers (9.8 percent) who served in Haiti, 158 (11.1 percent) who served in Somalia, 444 (25.2 percent) who served in the Balkans, and 679 (38.6 percent) veterans of the Gulf War.

Focus Groups

To explore issues raised by the survey, we convened four focus groups—one each for the Army, Navy, Air Force, and Marine Corps—at the Naval War College between 24 September and 1 October 2001. Each focus group consisted of 11–12 O-4 and O-5 officers drawn from the student body of the College of Naval Command and Staff and the College of Naval Warfare. They were representative of their services' combat and combat support career fields.

FIGURE 2
Maximum Retirement Age of Respondents.

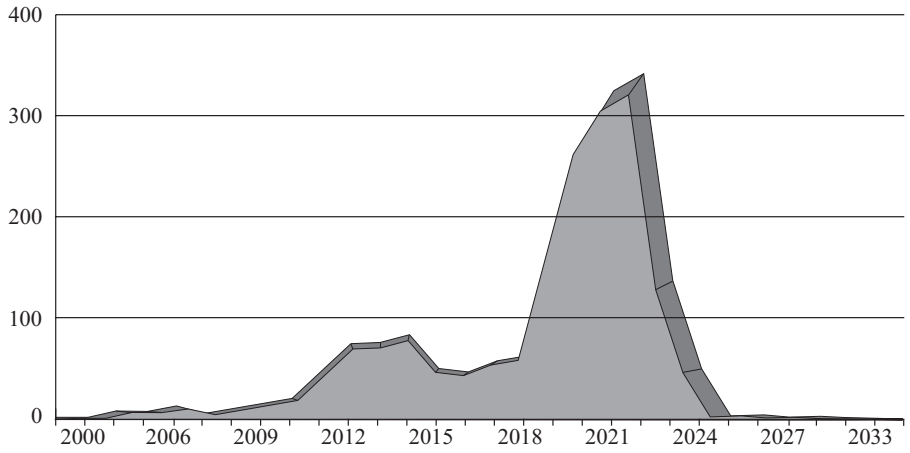


TABLE 5
Responses by Service.

SERVICE	NUMBER OF RESPONDENTS	PERCENTAGE OF TOTAL
U.S. Army*	900	46.9
U.S. Air Force*	472	24.6
U.S. Navy*	249	13.0
U.S. Marine Corps*	79	4.1
International Officers	104	5.4
Civilians	54	2.8
Army National Guard	39	2.0
U.S. Coast Guard	7	—
Air National Guard	15	—

Focus group participants filled out an abbreviated survey instrument. We then conducted a roundtable discussion of the questions in the instrument. The focus group instrument is presented as Appendix B.

Literature Review

To assess trends in officer attitudes over time, we analyzed articles on innovation, transformation, the impact of the information revolution on warfare, and the military exploitation of new technologies published in professional military journals from 1990–2000—the decade leading up to the officer attitude survey conducted as the first part of the project.

We selected eight journals for analysis. These represent the primary venues for the transmission of ideas by and for the officer corps of all four armed services.

- *Military Review* is a bimonthly publication prepared by the U.S. Army Command and General Staff College as "the professional journal of the U.S. Army."
- *Joint Force Quarterly* is a quarterly publication "published for the Chairman of the Joint Chiefs of Staff by the Institute for National Strategic Studies, National Defense University."
- *Proceedings* is a monthly publication of the U.S. Naval Institute—an "independent forum for the sea services."
- *Aerospace Power Journal* is produced quarterly as "the professional flagship publication of the United States Air Force."

* Includes reserve component.

- The Marine Corps Association publishes the *Marine Corps Gazette* as "the professional journal of the U.S. Marine Corps."
- *Parameters* is produced quarterly as "an official US Army periodical published by the US Army War College."
- *Naval War College Review* is published quarterly by the U.S. Naval War College as "a forum for discussion of public policy matters of interest to the maritime services."
- *Strategic Review* is a quarterly publication of the United States Strategic Institute in association with the Center for International Relations, Boston University.

We reviewed every issue of each of the eight journals for the 11-year period. A total of five individuals—four military and one civilian—were involved in the process. The references for each of the articles were cross-checked against the list to ensure the inclusion of nearly every relevant work that had been published during the time frame of the study. During the review process, about 5 percent of the initial articles were discarded as not being relevant, and about an equal number were added as having missed the first cut. A total of 345 articles were identified as meeting the survey criteria and analyzed for content. We also collected data on the principal author of each article, including their affiliation (military, civilian, retired, or military reserve), country of citizenship, military rank, and service.[30]

Analysis of the content of the articles was intended to mirror, to the extent possible, the survey of officer attitudes conducted in 2000. Each article was assessed in terms of three perspectives:

- Attitude. The attitude of the article was considered *Positive* if the author concluded that major change in warfare (e.g., the RMA) is attainable and will undoubtedly favor the United States. It was considered *Ambivalent* if the author concluded that it was too early to determine the outcome of such change. The attitude was considered *Skeptical* if the author concluded that major change is unwise, unattainable, or irrelevant.
- Imperative. The primary catalyst for change was considered to be *Threat* if the author concluded that the United States must take action to avoid an unacceptable risk or penalty posed by major changes in warfare in the coming decades. It was considered to be *Opportunity* if the author felt that change would provide the United States significant future military advantages over an opponent. The imperative was considered *Both* if the author concluded that future change offered the prospect of both threat and opportunity.
- Call for Action. Articles were differentiated as to whether the author concluded that *Action* is needed to achieve the desired technology-based future, or whether he felt

that such change is *Inevitable* (although may be attained sooner if the United States acts to speed the process).

Finally, the appearance of the specific terms "revolution," "innovation," and "transformation" was recorded in order to track trends in terminology in the post-Cold War decade.

Several caveats are in order. Analysis of articles appearing in military professional journals, even over a period of more than a decade, is far less definitive than a direct officer attitude survey and may offer only limited insight into dominant trends in professional thinking. In the first place, the authors were self-selecting. Even among those officers having worthwhile ideas with respect to the future of warfare, the articles only reflected those who could communicate effectively in writing and who chose to devote their own time to the task of having their ideas published. For the most part, they can be considered to be individuals with very strong opinions on the subject. An interesting feature of the officer attitude survey conducted in 2000 was the extent to which most opinions were clustered in the middle of the response range, reflecting a good deal of uncertainty among most officers with respect to the issues. Although we did not determine which, if any, of the authors of the professional articles participated in the survey, it would probably be safe to conclude that they would be more likely to answer at the extremes of most of the attitude survey questions.

Another limitation is the extremely small data set that is available for analysis. During the last six years of the literature survey period, when the majority of the articles were published, the average number of military officers publishing on such subjects probably did not exceed 30 per year—an almost inconsequential percentage of the overall officer corps. There were undoubtedly articles on this subject submitted to the journals that were not selected for publication. But it would seem unlikely that the number of well-written and well-reasoned articles that went unpublished would add considerably to the totals. Nevertheless, the editorial selection process may very well have introduced biases in publication of articles that may skew the overall analysis. For instance, the nearly even distribution of attitudes reflected in those articles appearing in *Parameters* over the 11-year period is at least suggestive of an effort to offer their readers a balanced number of opinions on the subject. Although all of the journals profess editorial independence, only the *Strategic Review* has no institutional ties to the U.S. military services.

Finally, the evaluation of the articles was necessarily subjective. Unlike the officer attitude survey, there is no common definition of terms in the professional literature. All of the articles reflect a broad array of approaches and attitudes that cannot be strictly categorized in a small set of criteria. Nevertheless, we consider the methodology employed in this study to have produced a data set as complete and objective as could reasonably be expected for a project of this scope.

CHAPTER THREE

Attitudes toward the Emerging RMA

We presented respondents with six statements to measure their attitudes toward the emerging revolution in military affairs (RMA). These were designed to determine whether officers were skeptical, ambivalent, or enthusiastic about the proposition that we are experiencing an RMA, as well as how demographic variables affected their attitudes.

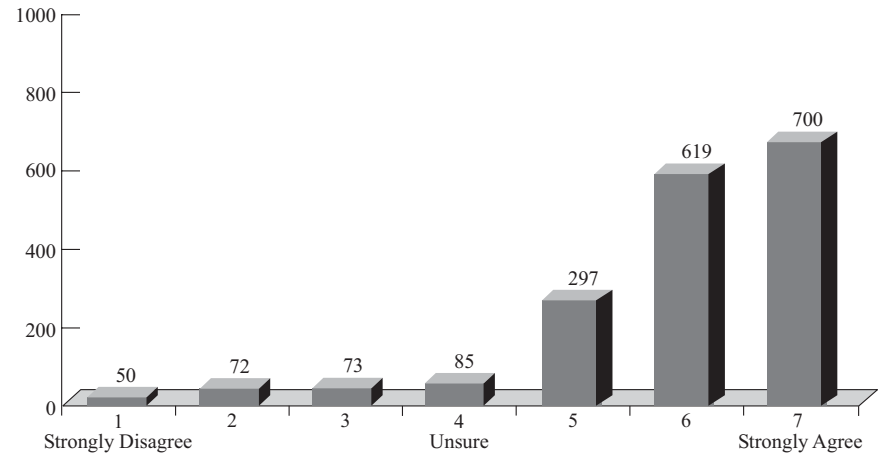
1. Military forces employing information-age technology, doctrine, and organizations will enjoy a substantial edge over those that do not.
2. The exploitation of new technology, doctrine, and organizational concepts will favor the United States over the full spectrum of potential adversaries.
3. Other states have no incentive to exploit new technology, doctrine, and organizational concepts.
4. Adversaries will exploit new technology, doctrine, and organizational concepts before the U.S. can field similar capabilities.
5. New technology, operational concepts, and organizations will give adversaries an advantage over the United States in future conflicts.

10.[31] Those who believe that emerging technology will substantially alter the conduct of war are unrealistic.

Statement 1: Military forces employing information-age technology, doctrine, and organizations will enjoy a substantial edge over those that do not.

Strategic analysts differ over the benefits that may accrue to the United States if it transforms its armed forces through the widespread adoption of information-age technology, doctrine, and organizations. *Joint Vision 2010* explicitly stated that the successful adaptation of new technologies through the application of new operational concepts would enable the U.S. military to "dominate an opponent across the range of military operations."[32] RMA enthusiasts such as James R. Blaker argue that "The potency of the American RMA stems from new military systems that will create, through their interaction, an enormous military disparity between the United States and any opponent. Baldly stated, U.S. military forces will be able to apply military force with dramatically greater efficiency than an opponent, and do so with little risk to U.S. forces."[33] Others are skeptical that information technology will give the United States a meaningful—or durable—advantage.[34]

FIGURE 1
Military forces employing information-age technology, doctrine, and organizations will enjoy a substantial edge over those that do not.



The officers we surveyed believed strongly that information-age ways of war will give the United States considerable leverage (see fig. 1). Eighty-five percent felt that forces employing information-age technology, doctrine, and organizations would enjoy a substantial edge over those that do not; only 10 percent felt they would not. The mean response was 5.72 on a scale of 1 to 7. This represents the strongest positive response in the survey.

Air Force and Navy officers were more confident than their Army and Marine Corps counterparts that information-age ways of war would confer a substantial battlefield edge upon those possessing them (see table 1). While 93 percent of Navy officers and

TABLE 1
Military forces employing information-age technology, doctrine, and organizations will enjoy a substantial edge over those that do not.

	AGREE	UNSURE	DISAGREE
Overall	85%	5%	10%
Army	79%	6%	15%
Marine Corps	81%	5%	14%
Navy	93%	2%	5%
Air Force	92%	3%	5%
Junior/Field Grade Officers	82%	6%	12%
Senior Officers	91%	3%	6%
Flag Officers	86%	8%	6%

92 percent of Air Force officers agreed with the statement, only 81 percent of Marine Corps officers and 79 percent of Army officers agreed. Similarly, senior officers were more confident than junior officers. Ninety-one percent of senior officers agreed with the statement, while only 82 percent of junior and field-grade officers agreed. Whether or not an officer had served in combat did not appear to affect his attitude. For example, 85 percent of Gulf War veterans and 83 percent of Somalia veterans agreed with the statement.

Statement 2: The exploitation of new technology, doctrine, and organizational concepts will favor the U.S. over the full spectrum of potential adversaries.

This statement is an explicit theme of *Joint Vision 2010*. Moreover, RMA advocates argue that the exploitation of new ways of war will give the United States an edge across the spectrum of conflict. William Owens has written "if we decide to accelerate the [transformation] process by emphasizing those systems and weapons that drive the revolution, we can reach our goals years—perhaps decades—before any other nation."[35] Owens and Joseph Nye have argued that the emerging RMA will not only give the United States a battlefield edge against regional powers, but will also bolster efforts to deal with such dangers as international crime, terrorism, the proliferation of weapons of mass destruction, and environmental damage.[36] Others have argued that information-age ways of war are likely to be irrelevant in a world dominated by ethnic hatred, terrorism, and transnational crime.[37] As Commander William Toti put it, the:

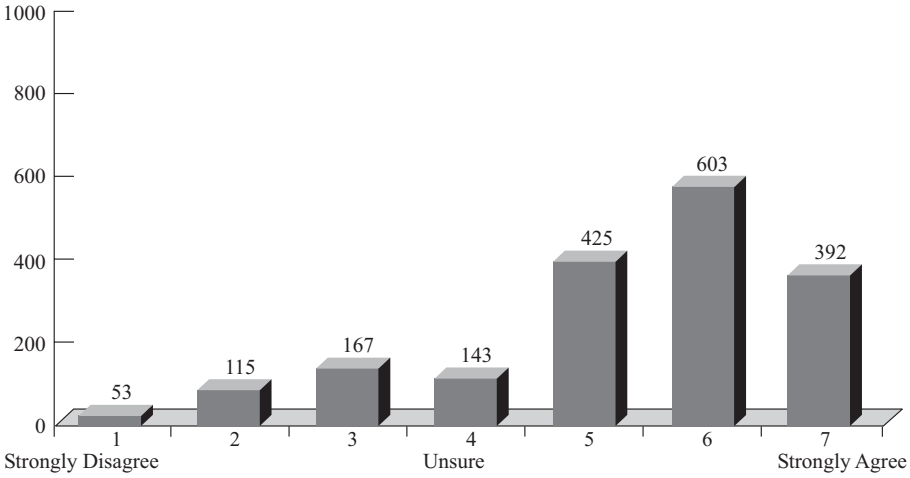
> RMA will have little impact on the kind of wars we see today. For example, RMA would have done nothing to help us prevent the slaughter of 800,000 people in 100 days in Rwanda. It would have done nothing to prevent a few thousand boys with rifles and rocket-propelled grenades from overwhelming our best troops—Rangers and Deltas—in Mogadishu. Nor would it have improved our capability to fight the kind of battle we saw in 1995 in Bosnia, where 7,000 men were killed in 48 hours. All our improved sensors would have allowed us to do there would have been to locate the gravesites more quickly.[38]

Ralph Peters, at the time a lieutenant colonel in the U.S. Army, feared that "our post-RMA military may prove the most expensive white elephant in the history of mankind."[39]

The officers that we surveyed appear to be highly confident that the emerging RMA will give the United States leverage over the full spectrum of potential adversaries. Seventy-five percent agreed that new technology, doctrine, and organizational concepts will give the U.S. armed forces dominance over the full spectrum of potential adversaries; 18 percent disagreed, while 7 percent were unsure. The mean response was 5.19.

Officers' confidence in the effectiveness of the emerging RMA is corroborated by their lack of concern about potential threats, a subject we explore in chapter 7. However,

FIGURE 2
The exploitation of new technology, doctrine, and organizational concepts will favor the U.S. over the full spectrum of potential adversaries.



discussion during the focus group sessions suggests that the positive response to this statement might be conditional. Focus group participants expressed strong confidence that the United States would maintain significant technological superiority over any potential adversary. They were also uncertain as to whether the United States will have the political and military will to acquire and exploit these technologies. This might explain why 39 percent of the survey respondents tended toward uncertainty on this issue. Thus a more accurate interpretation of the responses to Statement 2 might be that the United States will be favored *if* it actually chooses to exploit new technology, doctrine, and organizational concepts.

TABLE 2
The exploitation of new technology, doctrine, and organizational concepts will favor the U.S. over the full spectrum of potential adversaries.

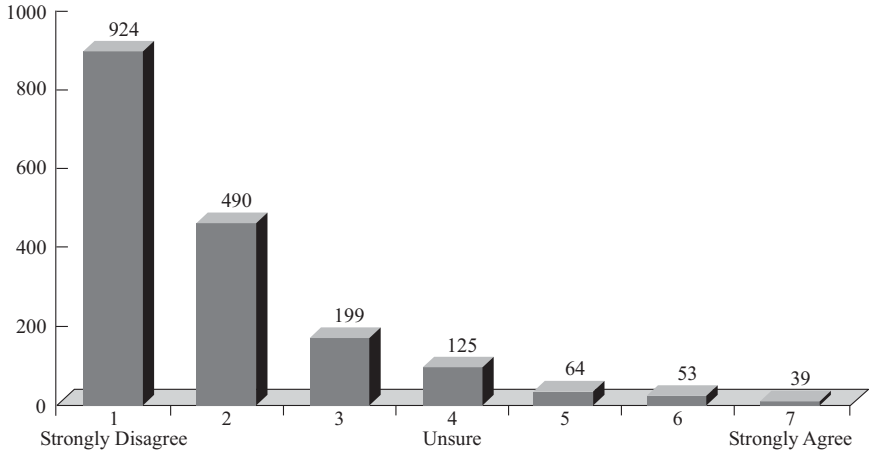
	AGREE	UNSURE	DISAGREE
Overall	75%	7%	18%
Army	70%	10%	20%
Marine Corps	67%	9%	24%
Navy	74%	8%	18%
Air Force	80%	6%	14%
Junior/Field Grade Officers	74%	8%	18%
Senior Officers	74%	8%	18%
Flag Officers	75%	17%	8%

Air Force officers agreed most strongly with the proposition that the emerging RMA will favor the United States over the full spectrum of adversaries; their Army and Marine Corps counterparts, by contrast, were more skeptical (see table 2). While 80 percent of Air Force officers agreed with the statement, only 70 percent of Army officers and 67 percent of Marine Corps officers agreed. The fact that ground forces are involved in low-technology contingencies such as peacekeeping and humanitarian operations more often than air forces may help explain this difference. An officer's rank did not appear to influence his response.

Statement 3: Other states have no incentive to exploit new technology, doctrine, and organizational concepts.

Joint Vision 2010 justified the requirement of Full-Dimensional Protection as necessary "to protect our own forces from the very technologies that we are exploiting," thus suggesting not only an incentive, but a likelihood that other states would seek to compete with us in the high technology arena.[40] Many RMA critics, but also some RMA enthusiasts, echo this sentiment.[41] They point out that most if not all of the technologies that are central to information-age warfare are available on the open market. In addition, a growing number of states are developing competence in information technology.[42] But other RMA enthusiasts argue that potential adversaries have no incentive to compete with the United States in emerging warfare areas. As Joseph Nye and William Owens have written, "There is no particular incentive for [other] nations to seek the system of systems the United States is building—so long as they believe they are not threatened by it."[43] As a result, they forecast a prolonged period of unchallenged U.S. dominance.

FIGURE 3
Other states have no incentive to exploit new technology, doctrine, and organizational concepts.



The officers we surveyed disagreed strongly with the contention that other states have no reason to exploit new technology, doctrine, and concepts. Indeed, they expressed the overwhelming belief that potential adversaries have every motivation to compete with the United States. Eighty-five percent agreed that adversaries have an incentive to compete with the United States, while only eight percent disagreed and only one in five showed any tendency toward uncertainty. The mean response was 2.07. This was one of the strongest negative responses of the survey. However, while most officers felt that potential adversaries will have an incentive to compete with the United States, the responses to other statements imply that they believe that adversaries will not in the end be successful (see chapter 7).

Statement 4: Adversaries will exploit new technology, doctrine, and organizational concepts before the United States can field similar capabilities.

A slim majority of officers—54 percent—agreed that the United States would retain its lead over potential adversaries in exploiting the emerging RMA, while a significant minority—27 percent—predicted that potential adversaries would be able to exploit new ways of war before the United States. Nearly sixty percent of the respondents tended toward uncertainty on this issue, suggesting that a relatively large percentage of the officer corps is essentially unsure how the emerging RMA will develop and who it will favor. The mean response was 3.53.

FIGURE 4
Adversaries will exploit new technology, doctrine, and organizational concepts before the U.S. can field similar capabilities.

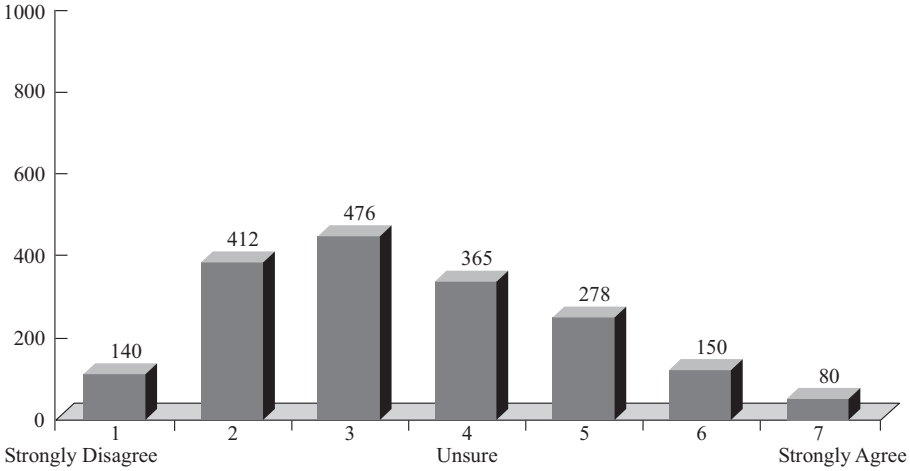
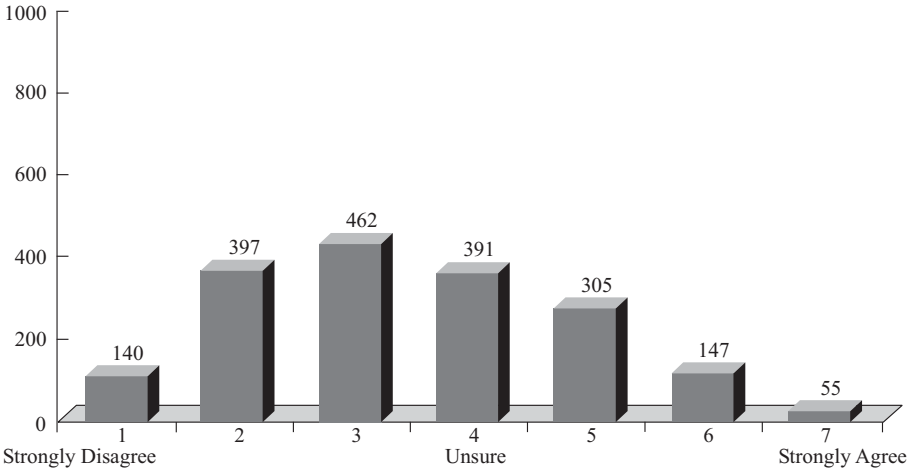


FIGURE 5
New technology, operational concepts, and organizations will give adversaries an advantage over the U.S. in future conflicts.



Statement 5: New technology, operational concepts, and organizations will give adversaries an advantage over the U.S. in future conflicts.

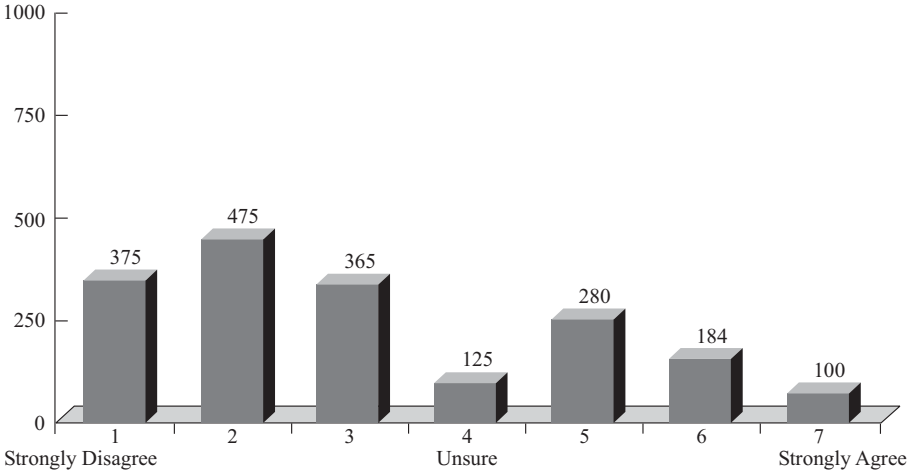
Joint Vision 2010 promised the achievement of Full-Dimensional Protection against a future enemy's efforts to exploit vulnerabilities that will arise from our exploitation of advanced technologies. Most officers—53 percent—agreed that the emerging RMA will not give potential foes an advantage over the United States in future conflicts. However, a significant minority—26 percent—felt that the RMA might favor adversaries. The mean response was 3.52. Sixty-one percent of respondents tended toward uncertainty on this issue, reflecting perhaps a high level of uncertainty as to whether the United States has the political and military will to both field and protect its technological advantage.

Statement 10: Those who believe that emerging technology will substantially alter the conduct of war are unrealistic.

Some argue that it is unrealistic to expect information-age technology to yield a major change in the conduct of war. Frederick W. Kagan, for example, has written that such a view "is not merely wrong, it is highly dangerous. If put into practice along the lines conceived by its proponents, it is likely to lead to embarrassments, defeats, high casualties, and the loss, at least temporarily, of America's position in the world."[44]

This statement produced a bimodal response. A significant majority of officers—64 percent—were open-minded about technology-driven changes in warfare. Only 30 percent felt that those who believe that emerging technology will substantially alter the conduct of warfare are unrealistic. Forty percent tended toward uncertainty. In other

FIGURE 6
Those who believe that emerging technology will substantially alter the conduct of war are unrealistic.



words, there is a general expectation that new technology will substantially alter the conduct of war. Nevertheless, more than forty percent of the respondents tended toward uncertainty on this issue, again reflecting a broader uncertainty about how the emerging RMA will develop.

Air Force officers felt most strongly that those who believe that emerging technology will substantially alter the conduct of war are realistic: only 22 percent agreed with the statement, while 74 percent disagreed (see table 3). Similarly, only 18 percent of flag

TABLE 3
Those who believe that emerging technology will substantially alter the conduct of war are unrealistic.

	AGREE	UNSURE	DISAGREE
Overall	30%	6%	64%
Army	32%	8%	60%
Navy	34%	5%	61%
Marine Corps	48%	5%	47%
Air Force	22%	4%	74%
Junior/Field Grade Officers	30%	7%	63%
Senior Officers	30%	8%	62%
Flag Officers	18%	2%	80%

officers agreed with the statement, while 80 percent disagreed. Marine Corps officers, by contrast, felt most strongly that those who believe that emerging technology will substantially alter the conduct of war are unrealistic: 47 percent disagreed with the statement, while 48 percent agreed with it.

Summary

The survey revealed abstract enthusiasm among officers for the proposition that we are experiencing an RMA, albeit heavily tinged with uncertainty. Most officers we surveyed believed that the emerging RMA would give the United States considerable leverage over potential adversaries. They felt that it would favor the United States over the full spectrum of potential adversaries. They also believed that the United States will maintain its lead. While most officers are open to change, our survey revealed significant differences among members of different services. Air Force and Navy officers tended to be more enthusiastic about new ways of war, while Army and Marine Corps officers were generally more skeptical. As noted above, there is a good deal of uncertainty about all of these issues, perhaps reflecting both uncertainty as to how the RMA may develop, and some skepticism as to whether the United States will have the political and military will to actually exploit its continuing technological advantage.

CHAPTER FOUR

Impact of the Emerging RMA on Dominant Weapons

To a large extent, today's armed forces resemble those that fought and won World War II. Manned aircraft dominate war in the air, while on land the main battle tank is the king of the battlefield. The aircraft carrier remains the capital ship. *Joint Vision 2010*, "the conceptual template for how America's Armed Forces will . . . leverage technological opportunities to achieve new levels of effectiveness in joint warfighting," featured prominent pictures of manned strike aircraft, the M-1 main battle tank, and the *Nimitz*-class aircraft carrier in presentations of the "more capable" future force.[45] RMA advocates argue, however, that the growth and diffusion of information technology may erode the dominance of such weapon systems in favor of new ways of war.[46] Some believe, for example, that over the next several decades unmanned systems could dominate air warfare, ground combat could become highly distributed and non-linear, many naval combatants could be driven underwater, and space and the information spectrum could emerge as increasingly important domains of military conflict.[47]

We presented respondents with four statements to measure their attitudes toward the impact of the emerging revolution in military affairs (RMA) on today's dominant platforms. We were interested in learning how they felt the importance of current systems might change over the next two decades.

7. Armored and mechanized formations will be as important in 2020 as they are today.
8. Manned aircraft will be as important in 2020 as they are today.
20. Within the next 20 years, uninhabited combat aerial vehicles will become the predominant means of conducting strike warfare.
9. Carrier Battle Groups will be as important in 2020 as they are today.

Statement 7: Armored and mechanized formations will be as important in 2020 as they are today.

Armored and mechanized formations have dominated the U.S. Army since World War II. Some have argued, however, that their utility is declining. In particular, they argue

that heavy armored formations are poorly suited to humanitarian and urban operations.[48] Moreover, in recent years the Army has begun to transform itself from a tank-heavy force designed to protect Western Europe to one that is more versatile, mobile and lethal. In October 1999 the Army Chief of Staff, General Eric Shinseki, announced a goal of transforming the Army into a medium-weight force capable of deploying a 5,000-man combat brigade anywhere in the world within 96 hours, a division in 120 hours, and five divisions in 30 days.[49] He designated two brigades at Fort Lewis, Washington, as testbeds to explore new concepts and organizations. These units have traded in their tracked M1A1 Abrams tanks and M2 Bradley fighting vehicles for lighter vehicles. They are also examining innovative tactics and organizations. Beginning in 2012, the Army plans to begin replacing its 70-ton M1A1 Abrams main battle tanks with the 20-ton Future Combat System (FCS), a network of light vehicles—possibly including unmanned systems.[50] Some have argued for even more radical changes, including the development of ground forces that are dramatically smaller and stealthier, with most of their combat power exported offshore.[51]

The officers we surveyed fell into two groups: a slim majority of the officers (51 percent) who believed that armored and mechanized formations will be as important in twenty years as they are today, and a significant minority (34 percent) who felt they would be less important. Fifteen percent were unsure (see figure 1). However, 53 percent of respondents fell into the middle categories of 3, 4, and 5, reflecting considerable uncertainty about the future of armored forces. The mean response of 4.34 reflected this. It is worth pondering whether the effectiveness of light special operations forces in Afghanistan during Operation ENDURING FREEDOM will affect perceptions of the

FIGURE 1
Armored and mechanized formations will be as important in 2020 as they are today.

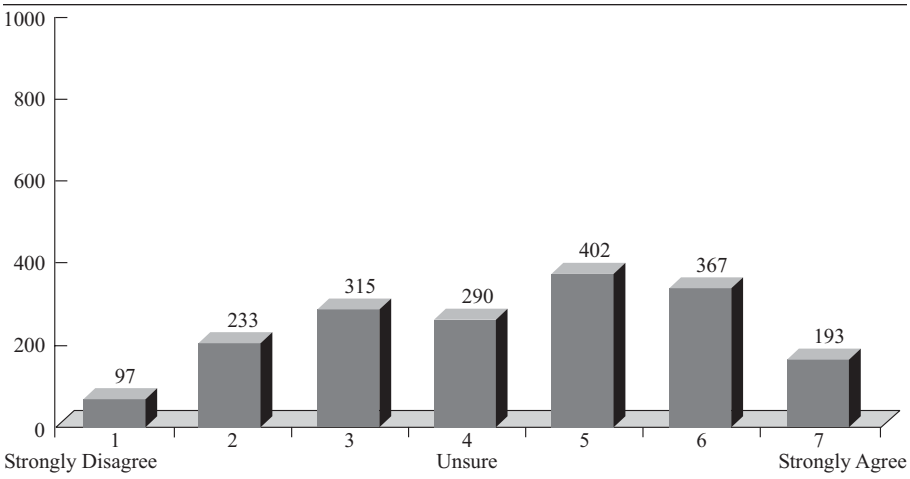


TABLE 1
Armored and mechanized formations will be as important in 2020 as they are today.

	AGREE	UNSURE	DISAGREE
Overall	51%	15%	34%
Army	56%	15%	29%
Marine Corps	53%	16%	31%
Navy	54%	19%	27%
Air Force	40%	16%	44%
Junior/Field Grade Officers	54%	15%	31%
Senior Officers	43%	17%	40%
Flag Officers	39%	20%	41%

future importance of heavy armored forces. Army Captain Bob Krumm, for example, has argued that the U.S. Government dispatched Marines to Afghanistan because the Army lacked units that were light yet lethal enough for the mission. As he put it, "The Marines are doing what needs to be done in an ever-changing world—adapting. The Army, meanwhile, is content to build a smaller version of its former self."[52]

Not surprisingly, Army officers believed in the enduring importance of armored and mechanized formations more strongly than did their counterparts in other services (see table 1 and figure 2). Fifty-six percent of Army officers believed that armored and mechanized formations would be as important in 2020 as they are today. Navy and

FIGURE 2
Armored and mechanized formations will be as important in 2020 as they are today.

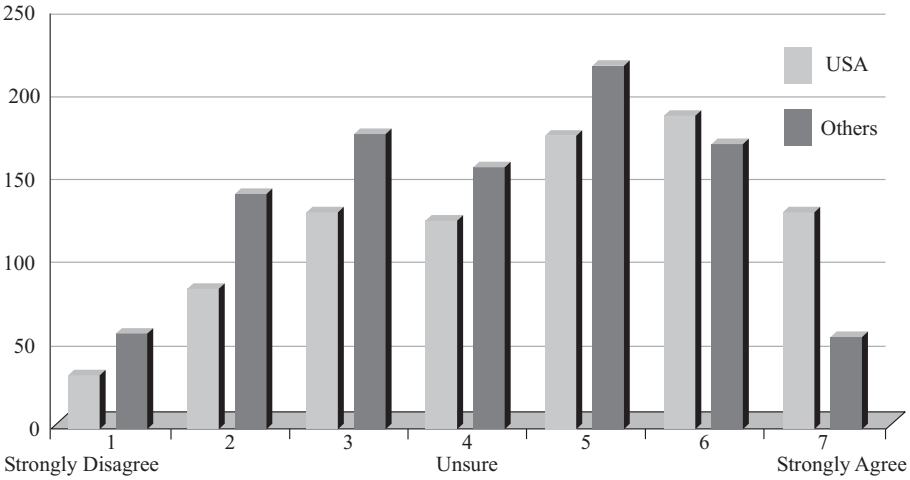
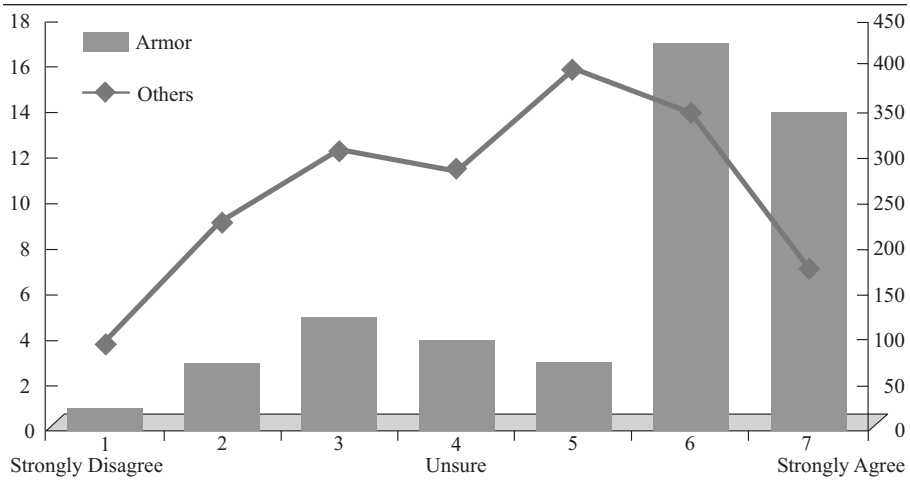


FIGURE 3
Armored and mechanized formations will be as important in 2020 as they are today.



Marine Corps officers were only slightly less confident in the future importance of armor. Only 40 percent of Air Force officers, by contrast, believed that armored and mechanized formations would continue to be as important as they are today.

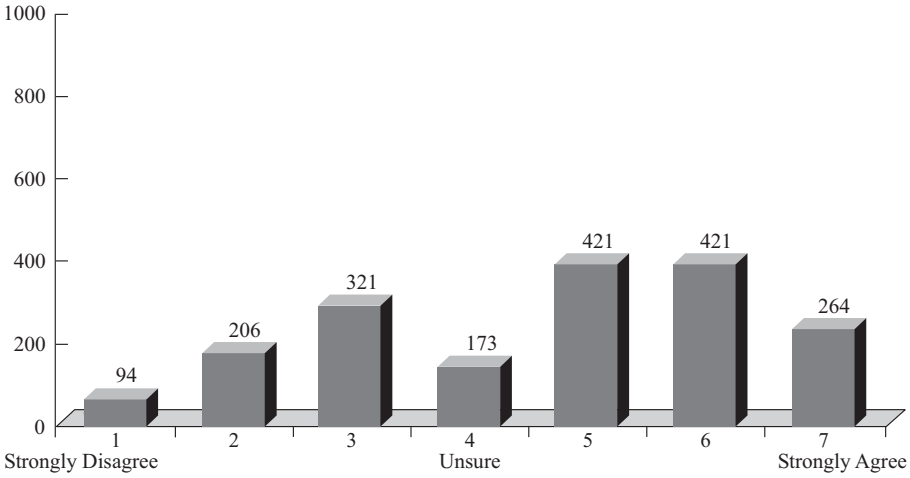
Not surprisingly, armor branch Army officers believed strongly in the enduring importance of armored forces (see figure 3). Indeed, 72 percent of armor officers felt that armored and mechanized formations would be as important in 2020 as they are today. Such results corroborate anecdotal evidence of opposition from active-duty and retired armor officers to General Shinseki's attempts to replace armored and mechanized divisions with medium-weight units.[53]

Statement 8: Manned aircraft will be as important in 2020 as they are today.

Some RMA advocates have argued that air power will increasingly feature the use of unmanned systems, a trend that may challenge the Air Force's institutional culture and warrior ethos.[54] UAVs have seen extensive use in all military operations since the 1991 Gulf War. Some have recommended cutting manned aircraft—particularly tactical fighter forces—in favor of greater investment in UAVs and UCAVs, stealthy long-range cargo aircraft, advanced precision-guided munitions, and satellites.[55]

The officers we surveyed split into two distinct groups: 58 percent believed that manned aircraft will be as important in 2020 as they are today, while 35 percent felt they would be less important. Nine percent were unsure. As with the previous statement, however, a much larger percentage—48 percent in this case—tended toward uncertainty. This was reflected in the mean response of 4.55.

FIGURE 4
Manned aircraft will be as important in 2020 as they are today.



While Army officers had the greatest confidence in the future of armored and mechanized formations, surprisingly, Air Force officers had the least faith in the continued importance of manned aircraft. Only 43 percent of Air Force officers felt that manned aircraft would be as important in 2020 as today (see table 2). By contrast, 66 percent of Marine Corps, 61 percent of Army, and 57 percent of Navy officers believed in the enduring value of manned aircraft. The focus groups shed additional light upon these results. It appears that an officer's attitude toward the future importance of manned aircraft depends upon which types of aircraft he feels are most important. While many Air Force and Navy officers who participated in the focus groups equated manned aircraft with reconnaissance and strike missions, Army and Marine Corps officers tended

TABLE 2
Manned aircraft will be as important in 2020 as they are today.

	AGREE	UNSURE	DISAGREE
Overall	58%	9%	33%
Army	61%	11%	27%
Marine Corps	66%	6%	28%
Navy	57%	7%	36%
Air Force	43%	7%	50%
Junior/Field Grade Officers	58%	11%	31%
Senior Officers	56%	8%	36%
Flag Officers	55%	16%	29%

to think about transport and close air support—missions that are likely to require a human operator for the foreseeable future.

Not surprisingly, aviators had greater confidence in the future importance of manned aircraft than the general population. Sixty-five percent of the aviators in the survey population believed that manned aircraft would be as important in twenty years as they are today; only 29 percent believed they would be less important. An officer's combat experience did not appear to affect his attitude. Sixty-three percent of Gulf War and 57 percent of Somalia veterans believed in the continuing importance of manned aircraft; Haiti and Balkans veterans held similar views.

Statement 20: Within the next 20 years, uninhabited combat aerial vehicles will become the predominant means of conducting strike warfare.

Recent years have seen the increasing use of unmanned air vehicles (UAVs) for reconnaissance and surveillance. The Air Force operates squadrons of RQ-1 Predator medium altitude and endurance UAVs. It is also acquiring the RQ-4 Global Hawk high-altitude, long-endurance UAV. The Army, Navy, and Marine Corps use UAVs for reconnaissance and surveillance. They are also developing more advanced designs, including man-portable micro-UAVs for tactical reconnaissance and vertical-takeoff systems. The services are also exploring the use of uninhabited combat aerial vehicles (UCAVs) to suppress enemy air defenses and launch strikes. The Air Force is examining the X-45A UCAV, an aircraft designed to fly as high as 40,000 feet, have a 1,000-mile range, and carry 12 miniature bombs. It has also launched Hellfire anti-tank guided

FIGURE 5
Within the next 20 years, uninhabited combat aerial vehicles will become the predominant means of conducting strike warfare.

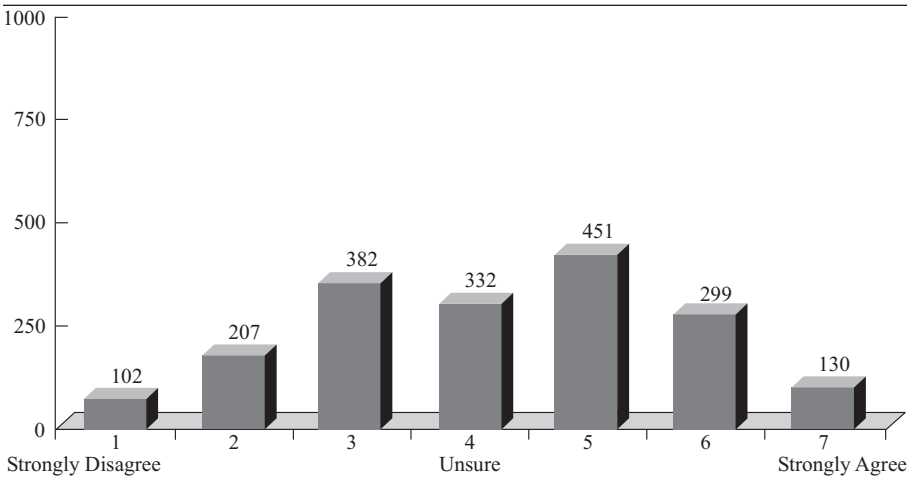


TABLE 3
Within the next 20 years, uninhabited combat aerial vehicles will become the predominant means of conducting strike warfare.

	AGREE	UNSURE	DISAGREE
Overall	46%	18%	36%
Army	42%	21%	37%
Marine Corps	43%	11%	46%
Navy	47%	14%	39%
Air Force	53%	13%	34%
Junior/Field Grade Officers	47%	20%	33%
Senior Officers	47%	13%	40%
Flag Officers	43%	24%	33%

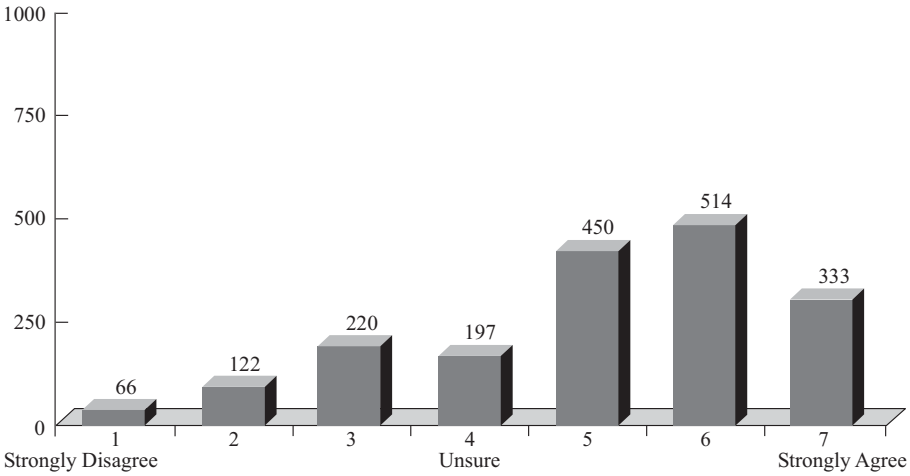
missiles from the Predator. RMA advocates argue that such vehicles will play an increasingly important role in future operations. [56]

Forty-six percent of the officers we surveyed felt that UCAVs would become the predominant means of conducting strike warfare within the next twenty years. Thirty-six percent disagreed, and 18 percent were unsure. However, 61 percent of respondents tended toward uncertainty, indicating that most officers really don't know what to think about this possible development. This was reflected in the mean response of 4.18. The highly touted use of UCAVs for strike missions in operations after the survey was conducted may change this view.

Air Force officers were the most enthusiastic about UCAVs. Fifty-three percent of Air Force officers believed that UCAVs would become the predominant means of conducting strike warfare within the next twenty years (see table 3). By contrast, only 42 percent of Army officers and 43 percent of Marine Corps officers held the same view.

Our focus groups indicated that an officer's assumptions about the rate of technological development and cultural acceptance of unmanned systems conditioned his response. There was a general consensus that UAVs were increasingly important, particularly for reconnaissance and surveillance missions. Officers differed, however, as to whether it would be feasible for unmanned systems to perform strike missions reliably within the next twenty years. Their assessments of the rate at which the culture of the services would change to accept unmanned strike systems also diverged. These focus group findings likely explain much of the high degree of uncertainty that surrounds this issue.

FIGURE 6
Carrier Battle Groups will be as important in 2020 as they are today.



Statement 9: Carrier Battle Groups will be as important in 2020 as they are today.

RMA advocates have predicted that carrier battle groups may decline in importance over time. Andrew Krepinevich, for example, has argued that aircraft carriers are of decreasing utility due to their high cost and growing vulnerability, and because of the increasing availability of substitutes for carrier air power for presence and power projection.[57] He has argued that the Navy should reduce its carrier force while increasing its investment in concepts such as the "arsenal ship" and cruise missile carrying submarines.[58] Some envision the capital ship of the future to be a submersible vessel armed with large numbers of cruise and ballistic missiles.[59]

TABLE 4
Carrier Battle Groups will be as important in 2020 as they are today.

	AGREE	UNSURE	DISAGREE
Overall	68%	11%	21%
Army	68%	12%	20%
Marine Corps	71%	7%	22%
Navy	80%	7%	13%
Air Force	63%	10%	27%
Junior/Field Grade Officers	69%	12%	19%
Senior Officers	64%	9%	27%
Flag Officers	63%	17%	20%

The responses to this statement exhibited a bimodal distribution, though skewed considerably to the right. Sixty-eight percent of the officers we surveyed believe that carrier battle groups will be as important in twenty years as they are today; 21 percent believe they will be less important and 11 percent were unsure. Forty-six percent of the respondents tended toward uncertainty on this issue, compared with nearly seven in ten in agreement, indicating much more confidence in the continued viability of the carrier battle group than with manned aircraft and armored formations. The mean response was 4.95.

Navy officers were the most enthusiastic about the future of carrier battle groups, with 80 percent arguing that carrier battle groups would be as important in 2020 as they are today (see table 4). The prominent role of carrier-based tactical aircraft in major military operations since this survey was conducted may reinforce this view. Air Force officers were most skeptical. But even among Air Force officers, 63 percent believed in the enduring importance of carrier battle groups.

Officers who participated in our focus groups argued that carrier battle groups would continue to be important because they perform valuable roles such as presence. The statement did not stipulate that the carrier battle group mission would not change in the future, but focus group participants generally understood that to be implied. A number of officers observed that the United States would still have a large number of *Nimitz*-class aircraft carriers in 2020 in any event. Others, however, noted that they represent lucrative targets and may be becoming increasingly vulnerable to long-range targeting and attack.

Summary

The officers we surveyed believed that the emerging RMA would not reduce the utility of today's dominant platforms. In each case, a majority of officers felt that today's dominant systems would be as important in 2020 as they are today. However, a large percentage of respondents tended toward uncertainty in each case as well. In addition, we detected significant differences in attitudes among officers from different services. Army officers tended to be the most enthusiastic about current systems. This included not only armored and mechanized formations, but also manned aircraft and carrier battle groups. Air Force officers, by contrast, were most willing to contemplate change, even if it involved devaluing manned aircraft. An officer's rank also appeared to influence his attitudes. In each case, the higher an officer's rank, the less enthusiastic and more uncertain he was likely to be about the continued importance of today's dominant systems. By contrast, an officer's combat experience did not appear to affect his attitudes.

It should also be noted that the extent to which the officers surveyed were cognizant of technological developments and proposals for change to today's dominant weapons is

not clear. The focus groups indicated that most officers do not stay abreast of such developments outside of their narrow tactical-technical specialties, and therefore might not be sensitized to the prospect for major change. This lack of information may explain the high degree of uncertainty evidenced in the responses to these statements.

CHAPTER FIVE

Emergence of New Ways of War

Many of those who argue that we are in the midst of a revolution in military affairs predict that the information revolution will not only change war on land, at sea, and in the air, but also that it will bring war into space and cyberspace. Such a view is implicit in *Joint Vision 2010*. We presented the respondents with four statements intended to assess their perceptions of the emergence of these domains as important venues for military operations.

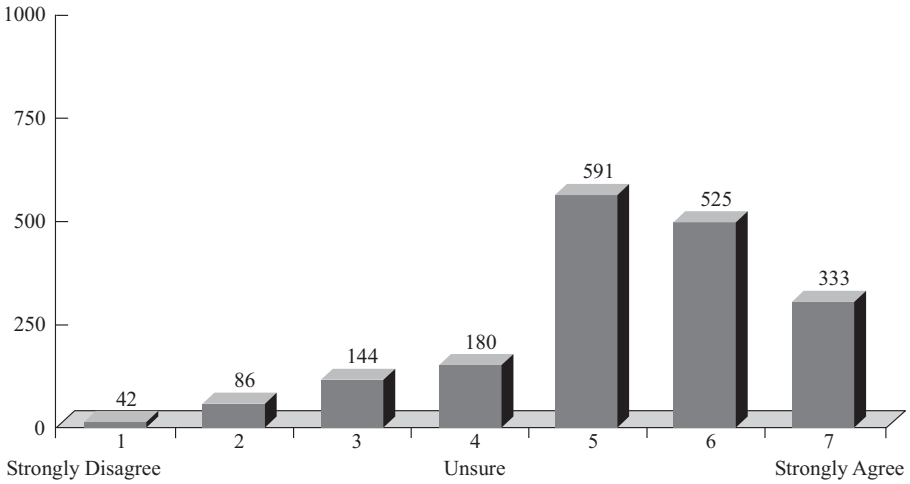
17. Within the next 20 years, conflicts will include combat operations in or from space.
18. Within the next 20 years, attacks upon computer networks will become a central feature of military operations.
6. Information systems and networks are highly vulnerable to enemy countermeasures.
22d. Future adversaries will be able to deny the U.S. the use of information networks.

Statement 17: Within the next 20 years, conflicts will include combat operations in or from space.

Space systems have for decades supported terrestrial military operations. Ground, sea, and air forces have relied upon satellites for reconnaissance and surveillance, communications, weather prediction, and navigation. Military and civilian experts alike have long discussed the possibility of conducting combat operations in and from space. Combat operations in space could include ballistic missile defense and antisatellite warfare. Those conducted from space could include strikes launched from space on terrestrial targets. However, a number of arms control agreements currently constrain the deployment and employment of weapons in space. Some argue that the deployment of weapons in space would provoke an arms race that would ultimately hurt the United States the most because we rely upon space the most. In addition, there are those who question the maturity of space weapon technology.

RMA advocates have argued that space is likely to play an increasingly important role in future conflicts. Indeed, some predict that it may be considered an independent theater of military operations.[60] Russian analysts have forecast that future conflicts will be characterized by the dominance of aerospace and information warfare over traditional

FIGURE 1
Within the next 20 years, conflicts will include combat operations in or from space.



ground combat.[61] Chinese military authors have accorded increased attention to combat in space as well.[62] The report of the 1997 National Defense Panel cited the possibility that future adversaries may challenge the United States' control of space.[63] Similarly, the 2001 Quadrennial Defense Review argued that:

> Space and information operations have become the backbone of networked, highly distributed commercial civilian and military capabilities. This opens up the possibility that space control—the exploitation of space and the denial of the use of space to adversaries—will become a key objective in future military competition.[64]

TABLE 1
Within the next 20 years, conflicts will include combat operations in or from space.

	AGREE	UNSURE	DISAGREE
Overall	76%	10%	14%
Army	77%	11%	12%
Marine Corps	78%	7%	15%
Navy	71%	13%	16%
Air Force	76%	9%	15%
Junior/Field Grade Officers	76%	11%	13%
Senior Officers	76%	7%	17%
Flag Officers	80%	10%	10%
International Officers	71%	11%	18%
U.S. Officers	76%	10%	14%

The report also identified increasing the capability and survivability of space systems and their support infrastructure as a key objective.[65]

More than three-quarters of the officers that we surveyed believed that within the next twenty years conflicts will include combat operations in or from space; only 14 percent disagreed, and 10 percent were unsure (see figure 1). While 48 percent of respondents tended toward uncertainty, the mean response of 5.16 shows at least some level of agreement. This view held among officers of all services and ranks (see table 1). International officers were slightly less confident than their American counterparts that future wars will include combat operations in or from space. Still, more than seven out of ten agreed with the proposition.

The responses of focus group participants shed additional light upon these responses. Many viewed combat operations in space as inevitable, and nearly all interpreted the statement as implying the actual movement of kill mechanisms into or out of outer space. A number argued that potential U.S. adversaries would exploit the perceived vulnerability of U.S. military satellites to electromagnetic pulse (EMP) effects in an attempt to counter the U.S. advantage in space. Others believed that the United States would station weapons in space to strike the Earth. They also acknowledged the barriers to combat operations in space, including treaty limitations and less formal political constraints.

Statement 18: Within the next 20 years, attacks upon computer networks will become a central feature of military operations.

The increasing use of information networks has increased their attractiveness as targets.[66] The 2001 *Quadrennial Defense Review,* for example, predicted that "states will

FIGURE 2
Within the next 20 years, attacks upon computer networks will become a central feature of military operations.

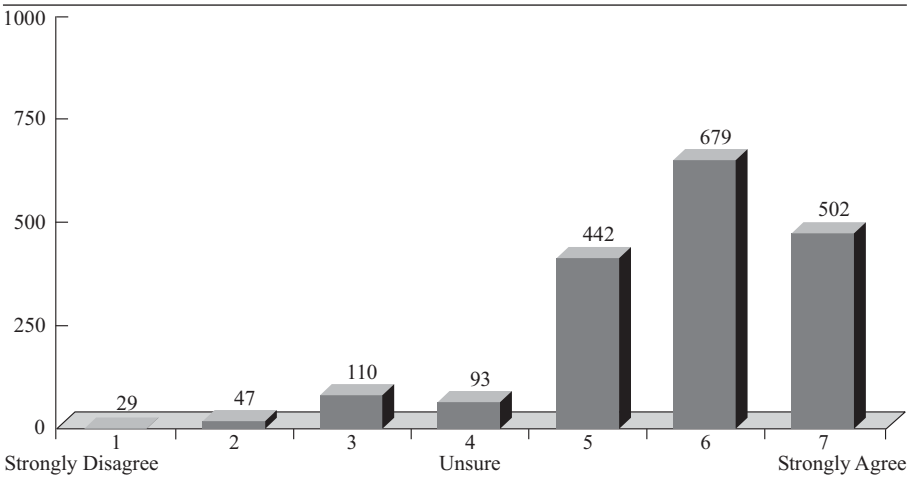


TABLE 2
Within the next 20 years, attacks upon computer networks will become a central feature of military operations.

	AGREE	UNSURE	DISAGREE
Overall	85%	5%	10%
Army	82%	7%	11%
Marine Corps	86%	4%	10%
Navy	86%	3%	11%
Air Force	88%	4%	8%
Junior/Field Grade Officers	85%	5%	10%
Senior Officers	85%	6%	9%
Flag Officers	90%	4%	6%
International Officers	84%	7%	9%
U.S. Officers	85%	5%	10%

likely develop offensive information operations and be compelled to devote resources to protecting critical information infrastructure from disruption, either physically or through cyber space."[67] Indeed, some argue that attacks upon information networks may become a new form of strategic warfare.[68]

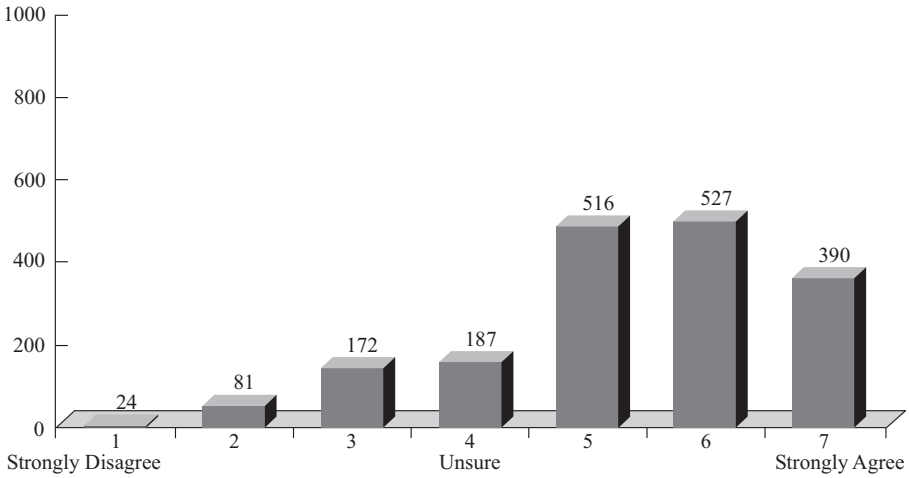
A large majority of officers (85 percent) believed that computer network attack will become a central feature of military operations; 10 percent disagreed and 5 percent were unsure. Only 34 percent of respondents tended toward uncertainty, compared to 48 percent of those who answered the previous statement. In other words, they seem to be much more certain that computer network attack will be an important feature of future conflicts than they were of combat operations in or from space.

As with the previous statement, officers of all services and ranks shared this view (see table 2). Moreover, the response of international officers was virtually indistinguishable from that of their American counterparts.

Statement 6: Information systems and networks are highly vulnerable to enemy countermeasures.

A large majority (76 percent) of the officers that we surveyed believe that information systems and networks are highly vulnerable to enemy countermeasures; 15 percent disagreed and 9 percent were unsure. While 46 percent of respondents tended toward uncertainty, the mean response of 5.26 shows considerable support for the proposition.

FIGURE 3
Information systems and networks are highly vulnerable to enemy countermeasures.

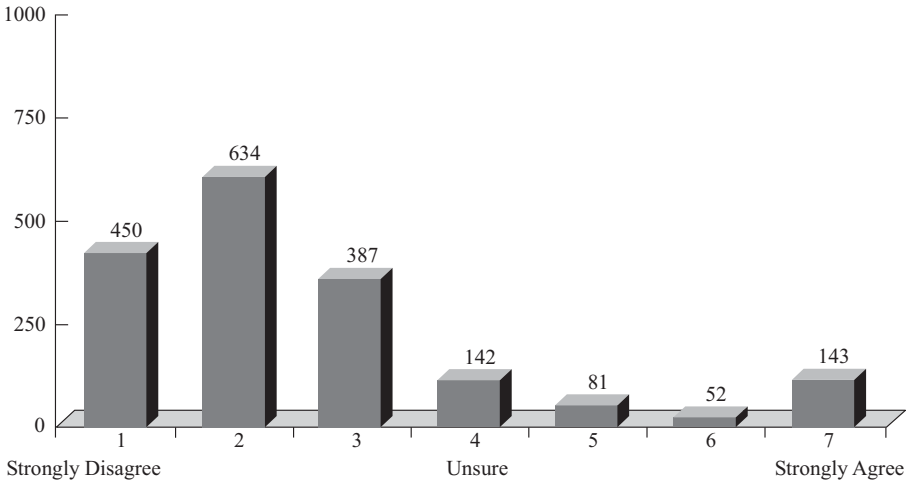


There was a consensus among officers of all services and ranks that information systems and networks are highly vulnerable (see table 3). International officers expressed both a higher level of confidence in the resistance of networks to countermeasures and a higher level of uncertainty than their American counterparts.

TABLE 3
Information systems and networks are highly vulnerable to enemy countermeasures.

	AGREE	UNSURE	DISAGREE
Overall	76%	9%	15%
Army	74%	11%	15%
Marine Corps	77%	7%	16%
Navy	75%	11%	14%
Air Force	79%	8%	13%
Junior/Field Grade Officers	76%	10%	14%
Senior Officers	74%	11%	15%
Flag Officers	70%	10%	20%
International Officers	67%	22%	11%
U.S. Officers	76%	9%	15%

FIGURE 4
Future adversaries will be able to deny the U.S. the use of information networks.



Statement 22d: Future adversaries will be able to deny the U.S. the use of information networks.

Despite the fact that a large majority of officers felt that computer network attack was becoming a central feature of warfare and a strong belief that information networks are vulnerable to enemy countermeasures, 78 percent of the officers that we surveyed

TABLE 4
Future adversaries will be able to deny the U.S. the use of information networks.

	AGREE	UNSURE	DISAGREE
Overall	15%	7%	78%
Army	12%	9%	79%
Marine Corps	16%	5%	79%
Navy	14%	6%	80%
Air Force	14%	7%	79%
Junior/Field Grade Officers	13%	7%	80%
Senior Officers	20%	7%	73%
Flag Officers	18%	6%	76%
International Officers	45%	9%	46%
U.S. Officers	15%	7%	78%

argued that future adversaries will *not* be able to deny the United States the use of information networks. Only 15 percent believed that adversaries would be able to deny us the use of information networks, and 7 percent were unsure. This result, which is somewhat surprising, appears to indicate that officers believe that the United States will be able to overcome any challenges that it will face. Such confidence is reflected in responses to other survey statements exploring potential threats to U.S. forces (see chapter 7), and was essentially confirmed by the focus groups.

Officers of all services expressed confidence that future adversaries will be unable to deny the United States the use of its information networks (see table 4). Of note is the fact that senior and flag officers were more concerned than junior officers, perhaps because they possessed a greater understanding of the information warfare threat. Most significantly, however, international officers felt much more strongly than their American counterparts in the ability of future adversaries to disrupt U.S. information networks. While only 15 percent of American officers agreed with the statement, 45 percent of international officers agreed.

Summary

The survey revealed a consensus among officers of all services and ranks that military operations in space and cyberspace will play an increasingly important role in warfare. It also revealed a consensus that information systems and networks are highly vulnerable to enemy countermeasures. However, only 15 percent of the U.S. officers we surveyed believed that future adversaries will be able to deny the United States the use of information networks in future conflict. International officers were much more concerned about the threat. Officers were more certain of their responses to this group of statements than most others. In none of the statements did more than half of the respondents tend toward uncertainty.

CHAPTER SIX

Impact of the Emerging RMA on the Character of War

We presented the respondents with nine statements that were intended to assess their general perceptions of how the emerging RMA might change the character of future conflicts.

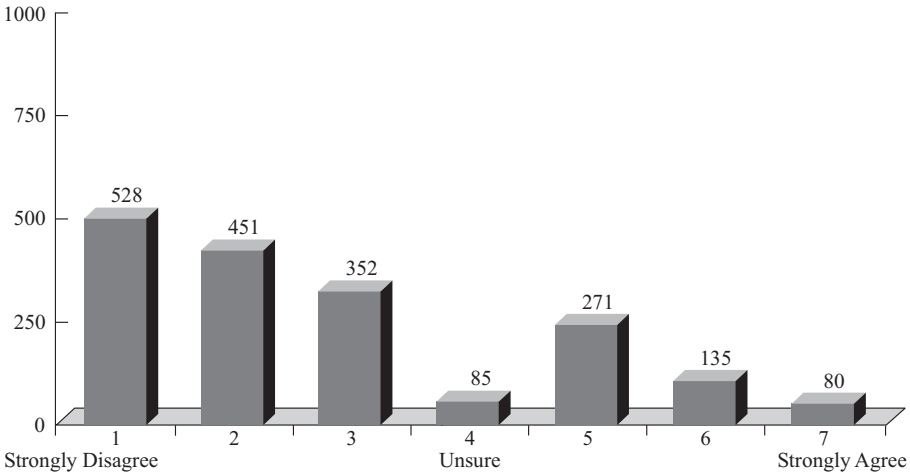
11. The ability to strike an adversary with precision from a distance will diminish the need for the U.S. to field ground forces.
16. Within the next 20 years, sensor and command and control technology will allow the U.S. armed forces to locate, track, and destroy enemy forces within a limited geographic area, regardless of enemy countermeasures.
19. Within the next 20 years, the continued incorporation of conventional precision-guided munitions into U.S. forces will permit deep reductions in the U.S. nuclear stockpile.

24a. New technology, operational concepts, and organizations will offer the ability to engage in high-intensity operations with substantially reduced risk of U.S. casualties.
24b. New technology, operational concepts, and organizations will substantially reduce the duration of future conflicts.
24c. New technology, operational concepts, and organizations will make it easier for the U.S. to use force.
24d. New technology, operational concepts, and organizations will make it easier for the U.S. to achieve decisive battlefield victories.
24e. New technology, operational concepts, and organizations will increase the importance of my service relative to the other services.
24f. New technology, operational concepts, and organizations will increase the importance of my branch relative to others in my service.

Statement 11: The ability to strike an adversary with precision from a distance will diminish the need for the U.S. to field ground forces.

Some proponents of the emerging RMA argue that the ability to strike an enemy with standoff weaponry may eliminate many requirements to engage enemy forces with ground troops. Official publications of the mid-1990s tended to support this position. *Joint Vision 2010* predicted that "we will be increasingly able to accomplish the effects of mass . . . with less need to mass forces physically than in the past" while cautioning that "this will not obviate the need for 'boots on the ground' in *many* operations [emphasis added]."[69] The implication, intended or not, is that there will be no need for

FIGURE 1
The ability to strike an adversary with precision from a distance will diminish the need for the U.S. to field ground forces.



"boots on the ground" in many—if not most—instances in the future. James R. Blaker is representative of a number of authors who predict that the RMA will alter the traditional relationship between fire and maneuver. In Blaker's view, "indirect fire—delivered largely from non-organic sources—[would become] the primary means of destroying the opponent, while maneuver would be seen as essentially the means of directing fire."[70]

The officers we surveyed strongly disagreed with the contention that long-range precision strike would diminish the need for the United States to field ground forces (see figure 1). More than 70 percent disagreed with the statement, and more than half (51

TABLE 1
The ability to strike an adversary with precision from a distance will diminish the need for the U.S. to field ground forces.

	AGREE	UNSURE	DISAGREE
Overall	26%	4%	70%
Army	19%	4%	77%
Marine Corps	9%	1%	90%
Navy	21%	1%	78%
Air Force	42%	6%	52%
Junior/Field Grade Officers	25%	5%	70%
Senior Officers	26%	5%	69%
Flag Officers	35%	2%	63%

percent) leaned toward strong disagreement. Indeed, this statement garnered one of the strongest negative responses in the survey, as reflected in the mean response of 2.92.

As might be expected, Marine Corps and Army officers were strongly opposed to the proposition that striking an adversary with precision from a distance will diminish the need to field ground forces; Air Force officers made up the largest proportion of those who tended toward a positive view of this statement (see table 1). Of note is the fact that the survey was conducted shortly after U.S. operations in Kosovo. Ground officers may have interpreted the outcome of that conflict as a clear indication of the need for boots on the ground, and air officers may have interpreted it as ultimately a vindication of standoff strike.

Statement 16: Within the next 20 years, sensor and command and control technology will allow the U.S. armed forces to locate, track, and destroy enemy forces within a limited geographic area, regardless of enemy countermeasures.

Virtually all advocates of the RMA argue that great advances in the ability to detect, identify, and track enemy forces on the battlefield will place those enemy forces at increased risk of attack. *Joint Vision 2010* predicted an enhanced detectability of both enemy and friendly forces that would render the battle space "considerably more transparent."[71] Admiral William Owens (retired), former Vice Chairman of the Joint Chiefs of Staff, is one of the primary proponents of the idea of "dominant battlespace knowledge" and has predicted an ability to detect all activity of military interest in an

FIGURE 2
Within the next 20 years, sensor and command and control technology will allow the U.S. armed forces to locate, track, and destroy enemy forces within a limited geographic area, regardless of enemy countermeasures.

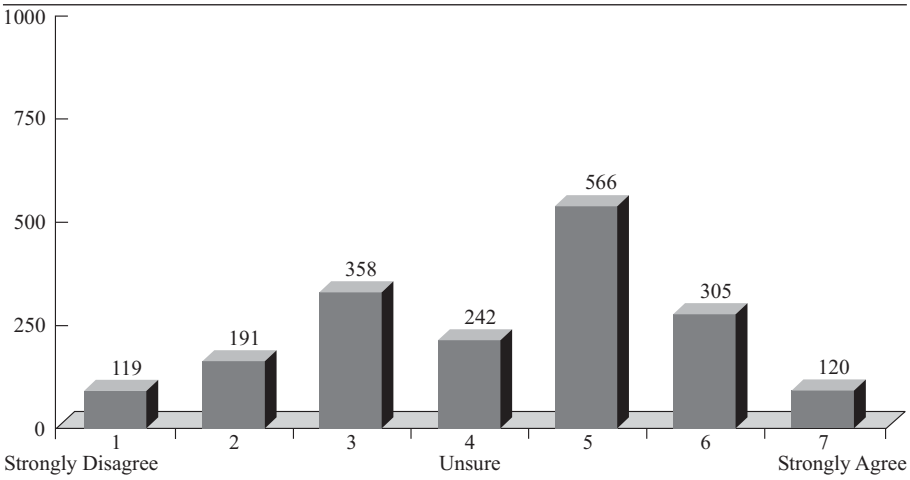


TABLE 2
Within the next 20 years, sensor and command and control technology will allow the U.S. armed forces to locate, track, and destroy enemy forces within a limited geographic area, regardless of enemy countermeasures.

	AGREE	UNSURE	DISAGREE
Overall	52%	13%	35%
Army	51%	15%	34%
Marine Corps	35%	6%	59%
Navy	47%	11%	42%
Air Force	56%	11%	33%
Junior/Field Grade Officers	51%	15%	34%
Senior Officers	53%	11%	36%
Flag Officers	55%	10%	35%

area as large as 200 by 200 nautical miles.[72] Critics argue that promises of dominant battlespace knowledge are illusory.[73]

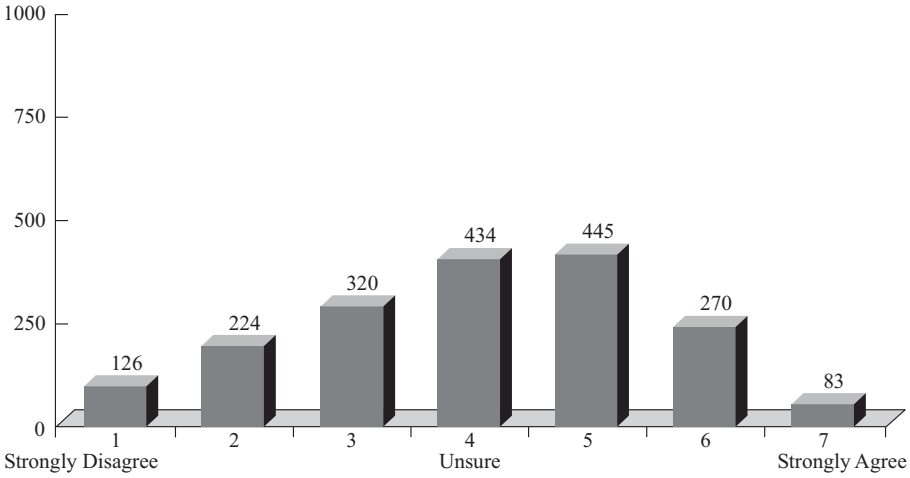
Fifty-two percent of the officers surveyed agreed with this position (see figure 2). However, responses also reflected a bimodal distribution with 35 percent in disagreement and 61 percent tending toward uncertainty. The mean response of 4.23 reflected this uncertainty. This may reflect the perception of a tremendous challenge in moving from current surveillance capabilities to a battle space that is effectively "transparent." It also may suggest considerable uncertainty with respect to prospective enemy capabilities to deny U.S. forces targeting information.

Again, the survey was conducted just after U.S. operations in Kosovo, which may have influenced many opinions about the current challenges of identifying and targeting dispersed forces on the ground (see table 2). Air Force officers were most enthusiastic about the ability of the United States to achieve dominant battle space knowledge, while Marine Corps officers were most skeptical. In addition, enthusiasm increased with an officer's rank.

Statement 19: Within the next 20 years, the continued incorporation of conventional precision-guided munitions into U.S. forces will permit deep reductions in the U.S. nuclear stockpile.

Many RMA advocates predict an increasing ability to achieve "strategic effects" with conventional weapons. Perhaps foremost among these is John Warden, who has opined that modern standoff munitions will provide the ability to strike directly at the enemy's strategic center of gravity while depriving him of the ability to respond. In his view,

FIGURE 3
Within the next 20 years, the continued incorporation of conventional precision-guided munitions into U.S. forces will permit deep reductions in the U.S. nuclear stockpile.



this capability for "parallel attack" can "render the enemy impotent" by imposing "strategic paralysis" on the enemy state, and make a rational enemy leadership prone to concessions.[74] Others, such as Seth Cropsey, have gone on to predict that conventional cruise missiles alone can "decimate an enemy's military, providing an effective deterrent against or meaningful punishment for a smaller nation's use of nuclear force."[75] The implication is that advanced conventional weaponry can take on both the deterrence and warfighting missions of nuclear weapons, and thus reductions in the U.S. nuclear stockpile might not be imprudent.

Others go farther. Andrew Krepinevich and Stephen Kosiak, for example, have argued that smarter conventional bombs will mean fewer nuclear weapons. This is so, they assert, because advanced technology offers the military "the ability to locate, identify, and track a far greater number of targets over a far greater area for far longer periods of time and to engage those targets with far greater lethality, precision, and discrimination than has ever before been possible."[76] This will, in their view, allow the United States to reduce substantially its nuclear arsenal. Others have noted that the ability of precision-guided munitions to substitute for nuclear weapons is limited.[77]

Forty-two percent of the officers surveyed agreed with the statement, but more than one-third (35 percent) tended to disagree (see figure 3). Perhaps most interesting is that nearly two-thirds (63 percent) of the officers surveyed tended toward uncertainty on this issue. The mean response of 4.05 corroborates this view. Strategic nuclear sufficiency was not a major topic of discussion or consideration by the broad officer

population during the 1990s. The uncertainty of the respondents may reflect the fact that most had simply never thought about the issue.

Statement 24a: New technology, operational concepts, and organizations will offer the ability to engage in high-intensity operations with substantially reduced risk of U.S. casualties.

The idea that the American public has developed a low tolerance for combat casualties, whether true or not, has become an axiom of the post–Cold War military mindset. *Joint Vision 2010* states that "the American people will continue to expect us to win any engagement, but they will also expect us to be more efficient in protecting lives and resources," and that "commanders will be expected to reduce the costs and adverse effects of military operations."[78] Joseph Nye and William Owens opined that the risk of casualties must be kept "low enough to maintain the American public's support for the use of force."[79] Among the explicit goals of the *Joint Vision 2010* force is a reduction in risk to U.S. troops by making it more difficult for them to be found and attacked, and by providing them "Full-Dimensional Protection" through multi-layered defense.[80]

Nearly two-thirds (63 percent) of the officers surveyed agreed that the attributes of the RMA force *will* allow the U.S. to engage in high-intensity combat operations with *substantially* reduced risk of casualties (see figure 4). The mean response was 4.59. It is not clear whether this positive response reflects a true belief that reduced risk will be provided by the future RMA force, or the conviction that future commanders and the

FIGURE 4
New technology, operational concepts, and organizations will offer the ability to engage in high-intensity operations with substantially reduced risk of U.S. casualties.

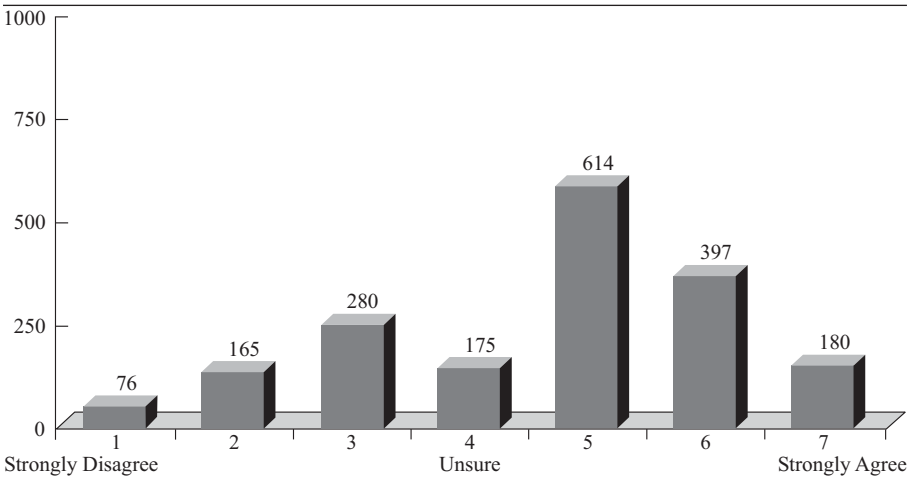
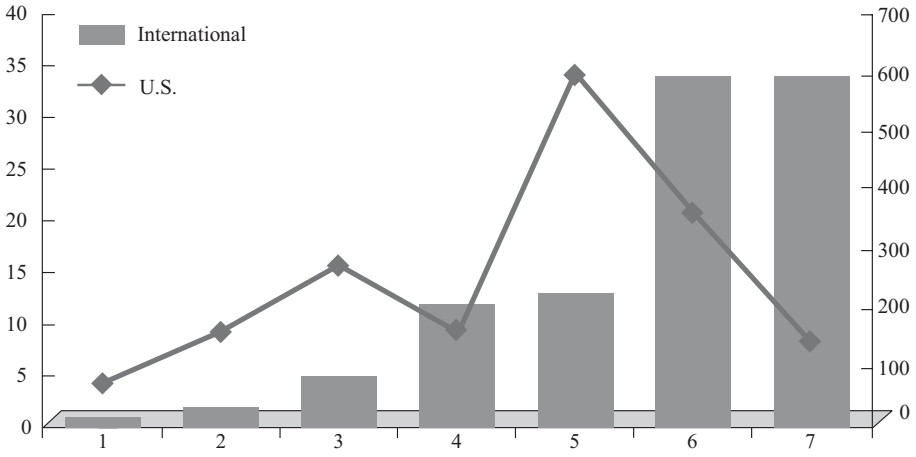


TABLE 3
New technology, operational concepts, and organizations will offer the ability to engage in high-intensity operations with substantially reduced risk of U.S. casualties.

	AGREE	UNSURE	DISAGREE
Overall	63%	9%	28%
Army	52%	12%	36%
Marine Corps	59%	8%	32%
Navy	69%	8%	23%
Air Force	74%	7%	19%
Junior/Field Grade Officers	59%	11%	30%
Senior Officers	69%	10%	21%
Flag Officers	71%	5%	24%
International Officers	80%	12%	8%
U.S. Officers	62%	9%	29%

American people will simply find anything else unacceptable. In addition, the context within which this statement was interpreted is not known. Compared with earlier wars, the U.S. suffered relatively few casualties in the conflicts of the 1990s. It is not known if

FIGURE 5
New technology, operational concepts, and organizations will offer the ability to engage in high-intensity operations with substantially reduced risk of U.S. casualties.



the average officer was thinking of Vietnam, or Desert Storm, or Kosovo as the benchmark when considering the term "substantially reduced." All of these unknowns are likely reflected in the fact that more than half of the officers (57 percent) tended toward uncertainty in their response to this statement.

While in substantial agreement, Army officers tended to be least positive about this statement in each response category. Air Force and Navy officers were considerably more positive (see table 3). In addition, the proportion of officers agreeing with the statement increased with the rank of the respondents. Most interesting was the disproportionately positive response of international officers to this statement (see figure 5). Indeed, while 62 percent of U.S. officers agreed with the statement, more than 80 percent of foreign officers agreed. At face value this reflects the foreign belief that the future U.S. force will face substantially reduced battlefield casualties. However, it also may reflect a general foreign perception of reduced U.S. tolerance for combat losses based upon the seeming unwillingness of the United States to commit ground forces to recent conflicts.

Statement 24b: New technology, operational concepts, and organizations will substantially reduce the duration of future conflicts.

Joint Vision 2010 forecast that the future force will enable "a more rapid transition from deployment to full operational capability" as well as an ability to more rapidly achieve military objectives.[81] John Warden's vision of modern warfare includes the "near-simultaneous attack on every strategic- and operational-level vulnerability of the

FIGURE 6
New technology, operational concepts, and organizations will substantially reduce the duration of future conflicts.

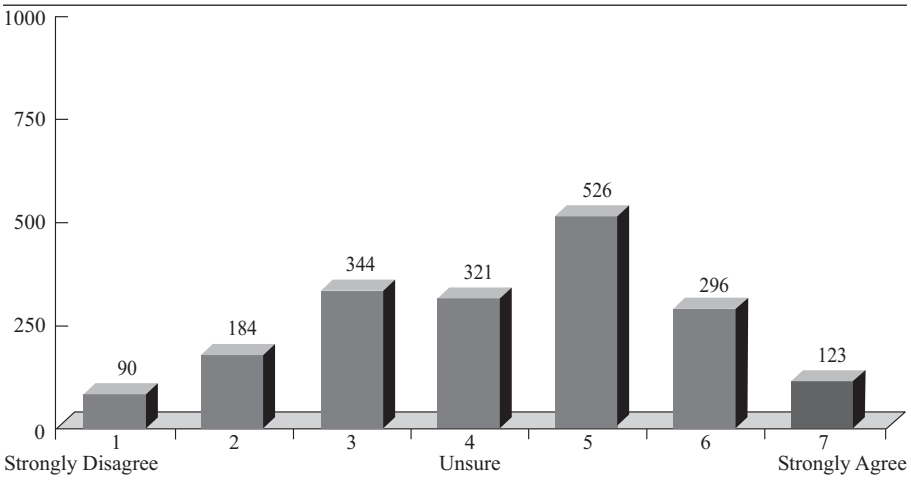


TABLE 4
New technology, operational concepts, and organizations will substantially reduce the duration of future conflicts.

	AGREE	UNSURE	DISAGREE
Overall	49%	17%	32%
Army	46%	19%	33%
Marine Corps	44%	11%	42%
Navy	49%	12%	37%
Air Force	54%	15%	28%
Junior/Field Grade Officers	49%	17%	32%
Senior Officers	48%	17%	32%
Flag Officers	65%	14%	20%

enemy" leading to his rapid collapse.[82] Increased speed of command and execution are also key features of Network Centric Warfare, which predicts the ability to rapidly "lock out" the enemy's strategic options and leave him "no viable courses of action."[83]

Forty-nine percent of the officers agreed with the notion that exploitation of advanced technology would substantially reduce the duration of future conflicts, while 32 percent disagreed (see figure 6.) As with the previous statement, Marine Corps and Army officers were more skeptical than their Air Force counterparts, while flag officers tended to be more enthusiastic than junior, field-grade, or senior officers.

FIGURE 7
New technology, operational concepts, and organizations will make it easier for the U.S. to use force.

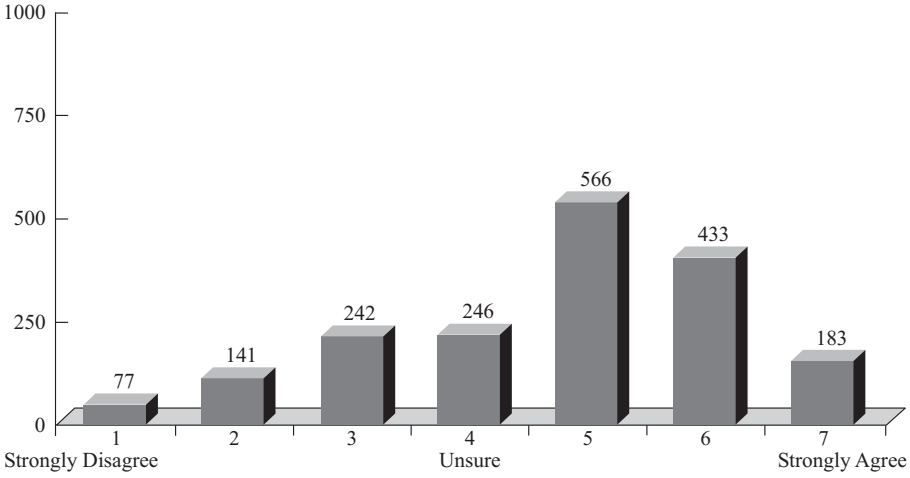


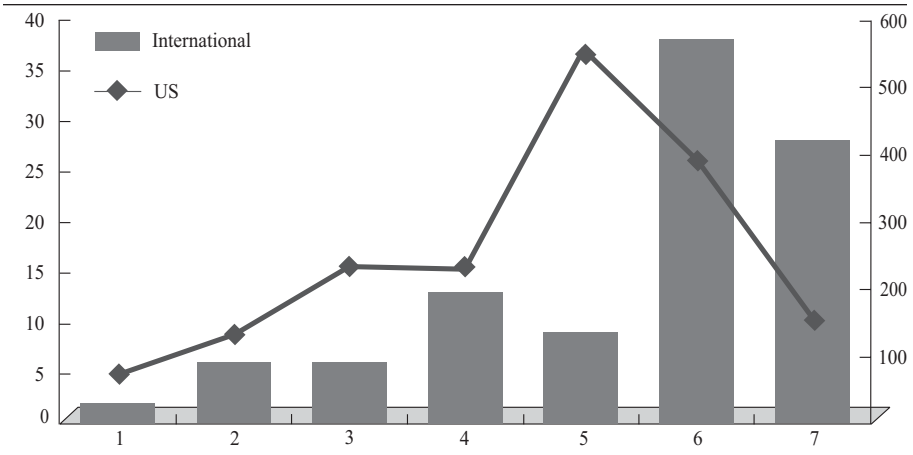
TABLE 5
New technology, operational concepts, and organizations will make it easier for the U.S. to use force.

	AGREE	UNSURE	DISAGREE
Overall	63%	13%	24%
Army	57%	15%	28%
Marine Corps	59%	13%	28%
Navy	63%	13%	24%
Air Force	69%	12%	19%
Junior/Field Grade Officers	59%	16%	25%
Senior Officers	69%	11%	20%
Flag Officers	67%	15%	18%
International Officers	74%	12%	14%
U.S. Officers	62%	13%	25%

Statement 24c: New technology, operational concepts, and organizations will make it easier for the U.S. to use force.

There were few explicit arguments in the professional literature of the 1990s that the exploitation of advanced technologies would make it easier for the United States to use military force. However, highly touted forecasts of the U.S. military being able to more

FIGURE 8
New technology, operational concepts, and organizations will make it easier for the U.S. to use force.



rapidly project power, and then more rapidly achieve a strategic victory, tended to imply that the use of military force might become an increasingly attractive option.

Nearly two-thirds of the officers surveyed (63 percent) agreed with the statement, while 24 percent disagreed (see figure 7). Nevertheless, more than half (56 percent) tended toward uncertainty, as reflected in the mean response of 4.65. It is not known whether the respondents believed that the perceived ease of using force would be more beneficial to the United States and the attainment of its strategic objectives.

Higher percentages of Army and Marine Corps officers disagreed with the statement, while higher percentages of Navy and Air Force officers agreed (see table 5). This probably reflects some level of differing confidence in the future capabilities of air power. Senior and flag officers agreed with the proposition more than junior officers. Most interesting was the disproportionately positive response of international officers to this statement (see figure 8). While 62 percent of the U.S. officers agreed with the proposition, 74 percent of the international officers agreed. It is not known whether they see an increasing ease of use of force by the U.S. translating into a more frequent use of force.

Statement 24d: New technology, operational concepts, and organizations will make it easier for the U.S. to achieve decisive battlefield victories.

An explicit prediction of *Joint Vision 2010* is that new technology, doctrine, and organizations "will provide America with the capability to dominate an opponent across the range of military operations."[84] Most professional literature of the 1990s that supported pursuit of the RMA tended to imply similar beneficial results.

FIGURE 9
New technology, operational concepts, and organizations will make it easier for the U.S. to achieve decisive battlefield victories.

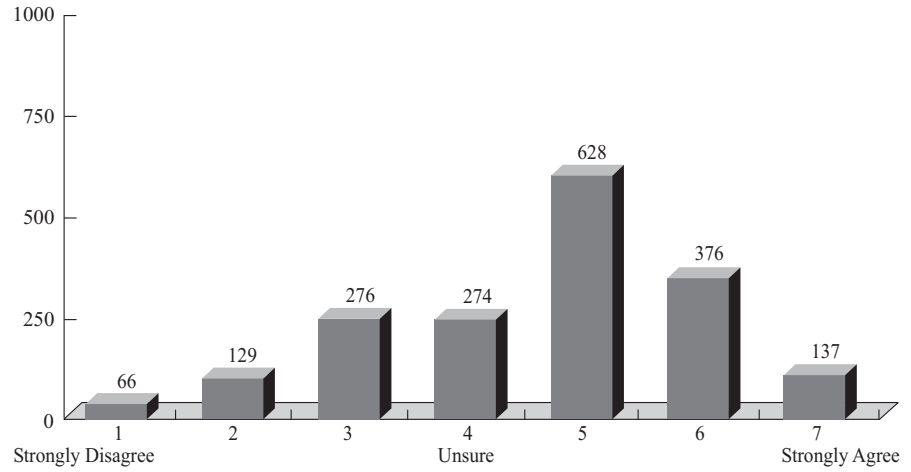
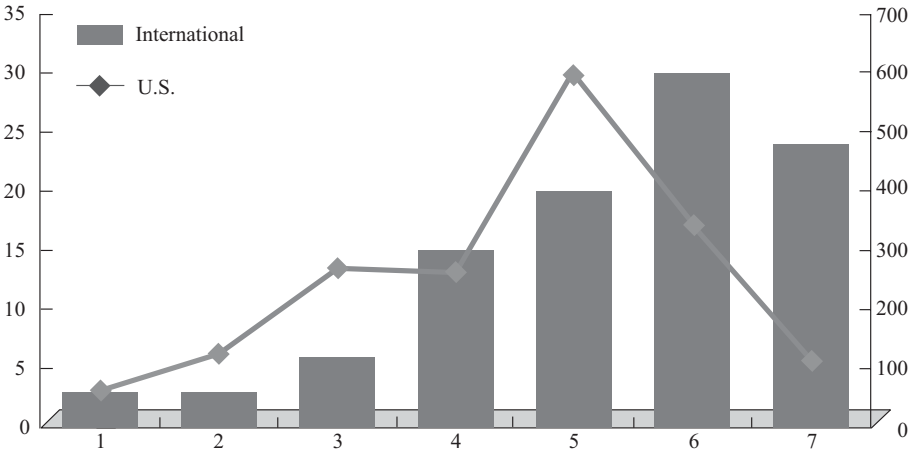


TABLE 6
New technology, operational concepts, and organizations will make it easier for the U.S. to achieve decisive battlefield victories.

	AGREE	UNSURE	DISAGREE
Overall	60%	15%	25%
Army	56%	17%	27%
Marine Corps	44%	18%	38%
Navy	57%	17%	26%
Air Force	68%	13%	19%
Junior/Field Grade Officers	60%	16%	24%
Senior Officers	59%	15%	26%
Flag Officers	73%	12%	15%
International Officers	73%	15%	12%
U.S. Officers	60%	15%	26%

More than half of the officers surveyed (60 percent) agreed with this statement (see figure 9). However a higher percentage (62 percent) of the responses tended toward uncertainty on this issue. The mean response was 4.65. It is interesting to compare these responses to those of Statement 24b in which most officers opined that the duration of future conflicts would not be substantially reduced. In responding to this statement, the officers might have been thinking of a much narrower set of high-intensity conflicts where the adversary would be very vulnerable to U.S. approaches that relied on

FIGURE 10
New technology, operational concepts, and organizations will make it easier for the U.S. to achieve decisive battlefield victories.



advanced technology. The high level of uncertainty in the responses to this statement may indicate a perception that the answer depends upon the type of conflict and the character of the opponent. Again, U.S. operations in Kosovo might have had a major influence on the responses.

Marine Corps officers were most skeptical of the proposition that new technology, operational concepts, and organizations will make it easier for the United States to achieve decisive battlefield victories; Air Force officers were most enthusiastic (see table 6). Flag officers were more enthusiastic than their juniors. As in the previous questions in this series, the most interesting aspect of the responses was the disproportionately positive views of the international officers (see figure 10). While 60 percent of U.S. officers agreed with the statement, 73 percent of international officers agreed. This suggests that foreign officers have much more confidence in the U.S. ability to exploit technology than do their U.S. counterparts.

Statement 24e: New technology, operational concepts, and organizations will increase the importance of my service relative to the other services.

A common theme within the RMA literature of the 1990s was that long-range strike would take on some of the missions that had previously required ground forces. This was also narrowly implied in *Joint Vision 2010*.[85] Another common theme was that exploitation of advanced technology would allow the United States to field a smaller but more lethal force to provide the post–Cold War "peace dividend" demanded by the American public. Analysts like James Blaker proposed significant restructuring of the

FIGURE 11
New technology, operational concepts, and organizations will increase the importance of my service relative to the other services.

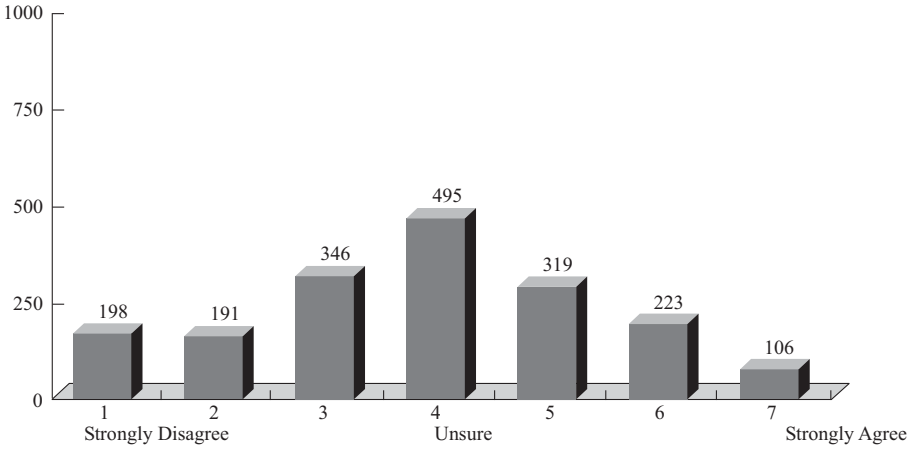


TABLE 7
New technology, operational concepts, and organizations will increase the importance of my service relative to the other services.

	AGREE	UNSURE	DISAGREE
Overall	35%	26%	39%
Army	27%	30%	43%
Marine Corps	29%	24%	47%
Navy	22%	31%	47%
Air Force	56%	17%	27%
Junior/Field Grade Officers	36%	27%	37%
Senior Officers	29%	28%	43%
Flag Officers	33%	21%	46%

forces within each of the services that could conceivably lead to a major change in the relative importance of the services.[86]

Officers were about evenly split in their response to this statement, with 35 percent in agreement and 39 percent opposed (see figure 11). Most significantly, 62 percent tended toward uncertainty regarding this issue (as reflected by the mean response of 3.87). This uncertainty tracks with responses to other statements dealing with relative service efforts and priorities, indicating that most officers felt they did not know enough about what was going on in services other than their own to make any

FIGURE 12
New technology, operational concepts, and organizations will increase the importance of my branch relative to others in my service.

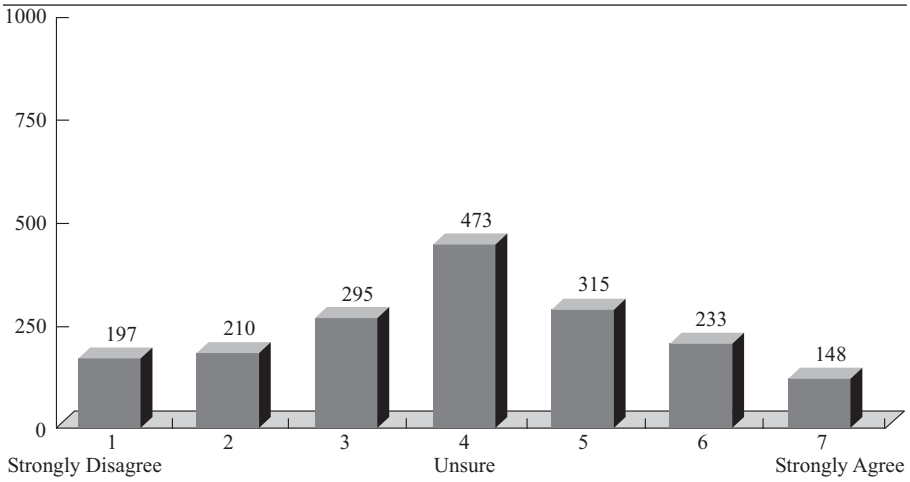


TABLE 8
New technology, operational concepts, and organizations will increase the importance of my Branch relative to others in my service.

	AGREE	UNSURE	DISAGREE
Overall	37%	25%	38%
Army	27%	30%	43%
Marine Corps	29%	24%	47%
Navy	22%	31%	47%
Air Force	56%	17%	27%
Junior/Field Grade Officers	40%	26%	34%
Senior Officers	29%	26%	45%
Flag Officers	28%	26%	46%

definitive statement about relative trends. However, it is interesting to compare these responses with those to Statement 11, in which 70 percent of the officers surveyed expressed the opinion that long-range strike would not diminish the need for ground forces. One could conclude that officers tend to be open to the idea that the relative importance of the services might change, but not that naval or air power will be able to substitute for ground troops. It is not known what other types of relative force changes they may have had in mind when responding to this statement.

Responses indicate that Air Force officers believed most strongly that new technology, operational concepts, and organizations will increase the importance of their service relative to the other services (see table 7). Officers from the other services were considerably more skeptical.

Statement 24f: New technology, operational concepts, and organizations will increase the importance of my Branch relative to others in my service.

This question sought to elicit an evaluation of whether branch or warfare specialties would change in relative importance within each of the services. Scholars have argued that revolutions in military affairs frequently alter the relationship between existing services and combat arms and have triggered the rise of new elites while witnessing the decline of previously dominant ones.[87] During the first half of the twentieth century, for example, naval aviation assumed a central role in war at sea. As the aircraft carrier displaced the battleship as the centerpiece of modern navies, naval aviators challenged the traditional dominance of surface warfare officers. During the same period, armored forces usurped the cavalry in armies across the globe, and the advent of aircraft created new elites within armies and eventually spawned new military services.

The responses are nearly identical to those of Statement 24e, with 37 percent positive, 38 percent negative, and a large proportion (58 percent) tending toward uncertainty. Again, this seems to reflect a great deal of uncertainty within the officer corps as to how advanced technologies might impact very specific warfare areas.

Air Force officers believed most strongly that new technology, operational concepts, and organizations will increase the importance of their branch relative to others in their service (see table 8). The other services were considerably more skeptical. Junior and field grade officers agreed more strongly with the proposition than did senior and flag officers.

Summary

Most officers tended to believe that the emerging RMA will make it easier for the U.S. to use force and for the U.S. to achieve decisive battlefield victories (at least in some scenarios). Most officers also believed that it will allow the United States to engage in high-intensity operations with substantially reduced risk of casualties and that it will substantially reduce the duration of future conflicts. They also tended to believe that the U.S. will have a greatly enhanced ability to locate, track, and destroy enemy forces in limited geographic areas. In general, Army and Marine Corps officers tended to be somewhat more skeptical than Air Force and Navy officers about the desirable impact of technological change.

They tended to be much more uncertain in their evaluation of the impact of the RMA on existing forces. There was substantial uncertainty as to whether the emerging RMA will allow deep reduction in nuclear forces, or whether the relative importance of their service or specialty branch will see significant change. Nevertheless, there was a general consensus that the increasing capability of long-range strike ordnance will not diminish the need for U.S. ground forces.

Of particular interest is the difference of opinion between U.S. and international military officers regarding the impact of the RMA on U.S. military capabilities. International officers tended to believe much more strongly than their U.S. counterparts that the U.S. will find it easier to use force and to achieve decisive battlefield victories—and will be able to do so with substantially reduced risk of U.S. casualties.

Impetus for Change

There is strong historical evidence to support the contention that a common perception of future threat is required for major transformation to occur. Key decision makers in the military services, as well as the executive and legislative branches, must acknowledge that the ultimate cost and risk of maintaining the current force exceeds the cost and risk of changing to a new operational concept. To this end, we presented respondents with three statements intended to elicit their views of the future threat to U.S. power projection forces. We also asked the respondents to rank the relative importance of six future military challenges.

22a. Future adversaries will be able to use long-range precision strike weapons such as ballistic and cruise missiles to attack large ground formations.

22b. Future adversaries will be able to use long-range precision strike weapons such as ballistic and cruise missiles to attack carrier battle groups.

22c. Future adversaries will be able to use long-range precision strike weapons such as ballistic and cruise missiles to destroy fixed military infrastructure, such as ports, airfields, and logistical sites.

Relative importance of six future challenges: Peer Competitor, Humanitarian Operations, Emerging Regional Power, Information Warfare, Weapons of Mass Destruction, and Terrorism.

The most compelling case for a potentially untenable threat to current and future U.S. forces arises from the proliferation of missiles with both increasing range and accuracy. The continued spread of nuclear, chemical, and biological technologies presents a threat of mass destruction to fixed and relatively immobile forces, while the growing availability of precise targeting information also increases the threat of very precise delivery of conventional explosives out to ranges in the hundreds of kilometers.[88] Given that the United States has yet to field an effective defense against the ballistic missile, many see these weapons as the leading edge of a general "anti-access" capability intended to deny U.S. forces the forward staging needed for regional power projection.[89] Foreign developments in ballistic missile technology were highlighted in the 1990s by such events as the series of Chinese ballistic missile launches to positions off the coast of Taiwan in 1995 and 1996, and the unexpected launch by North Korea of the Taepodong-1 ballistic missile over Japan in 1998. The U.S. press provided wide coverage of a series of test failures of

the U.S. Theater High Altitude Air Defense (THAAD) anti-ballistic missile system and cost overruns and delays in other theater ballistic missile defense (TBMD) programs.

The 1998 "Rumsfeld Commission" report on the ballistic missile threat to the United States contained a number of stark conclusions. The commission found that the ballistic missile "has a high probability of delivering its payload to its target compared to other means of delivery," especially with the ongoing incorporation of spaced-based global positioning guidance.[90] It went on to conclude that such missiles in the hands of hostile nations posed a "serious threat to the Unites States, to its forward-based forces and their staging areas and to U.S. friends and allies." The report specifically cited the potential missile threat to ports, airfields, communications centers, urban areas, and industry, noting that attacks on "ports and airfields the U.S. might use could severely hamper operations and could undercut the military advantages U.S. technological superiority provides."

Statement 22a: Future adversaries will be able to use long-range precision strike weapons such as ballistic and cruise missiles to attack large ground formations.

Given the widespread press coverage of missile defense issues during the 1990s, the survey responses to statements regarding the potential missile threats to U.S. power projection were somewhat surprising. Nearly 8 in 10 officers (78 percent) disagreed with the statement that future adversaries would be able to *attack* (not destroy or degrade) large ground formations with ballistic or cruise missiles (see figure 1). Slightly better than half (51 percent) tended toward uncertainty, but less than one in ten officers (9 percent) expressed any agreement with the statement—and less than 6 officers

FIGURE 1
Future adversaries will be able to use long-range precision strike weapons such as ballistic and cruise missiles to attack large ground formations.

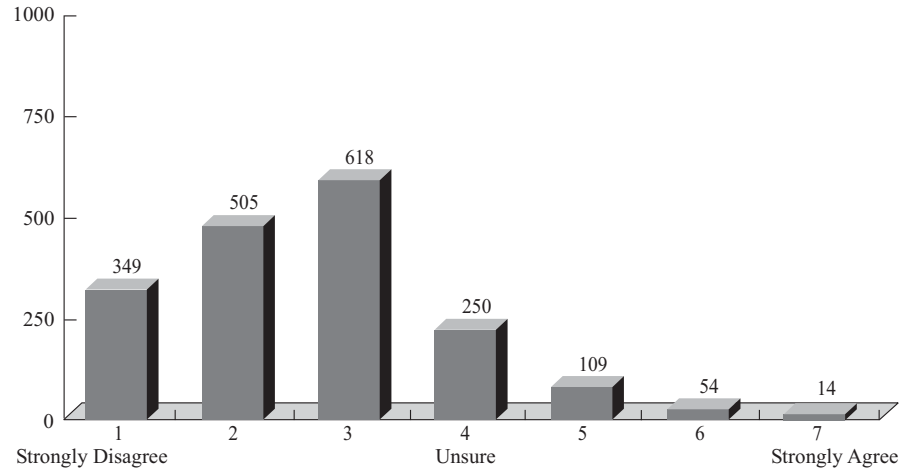


TABLE 1
Future adversaries will be able to use long-range precision strike weapons such as ballistic and cruise missiles to attack large ground formations.

	AGREE	UNSURE	DISAGREE
Overall	9%	13%	78%
Army	8%	13%	79%
Marine Corps	9%	18%	73%
Navy	9%	12%	79%
Air Force	9%	15%	76%
Junior/Field Grade Officers	8%	14%	78%
Senior Officers	13%	14%	73%
Flag Officers	12%	15%	73%
International Officers	23%	15%	62%
U.S. Officers	9%	13%	78%

in 1,000 strongly agreed. The mean response of 2.71 reflects the respondents' disagreement with the statement.

Reasons for the apparent discounting of the threat may include a disagreement about the severity of the threat, and a simple lack of knowledge among the broad population of officers with respect to ballistic and cruise missiles, and U.S. missile defenses. Among the findings of the Rumsfeld Commission was that the threat "posed by these emerging capabilities is broader, more mature, and evolving more rapidly than has been reported in estimates and reports by the Intelligence Community."[91] These conclusions have been contested. Nevertheless, the U.S. military imposes no formal requirements for knowledge about military threats outside of an officer's tactical-technical specialty, so a widespread lack of understanding of foreign ballistic and cruise missiles should not be surprising.[92]

Another reason for this seeming lack of concern may arise from official statements of confidence in the ability of the U.S. military to deal with these threats. *Joint Vision 2010,* for instance, acknowledges a growing foreign threat from advanced technologies, but concludes that our forces "*will* achieve [the] required level of protection [emphasis added]" through "multi-layered defenses of our forces and facilities at all levels."[93]

Both of these themes were evident in the focus group surveys. Most officers admitted that they did not have a full understanding of the potential threat to U.S. power

projection forces, but also expressed great confidence that the United States would build and field whatever was needed to protect existing forces.

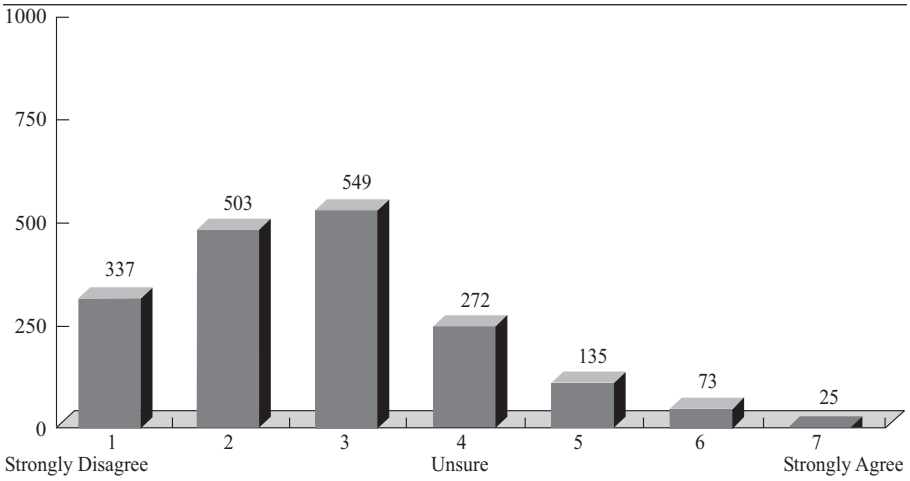
We detected no significant differences in the attitudes of officers from different services (see table 1). Senior and flag officers were marginally more concerned about the ability of adversaries to attack large ground formations with ballistic or cruise missiles than junior officers. More significant was the difference between the attitudes of U.S. and international officers. While only 9 percent of American officers agreed with the statement, 23 percent of all international officers we surveyed agreed. It thus appears that America's friends and allies see U.S. forces as more vulnerable than do our own officers.

Statement 22b: Future adversaries will be able to use long-range precision strike weapons such as ballistic and cruise missiles to attack carrier battle groups.

RMA advocates have argued that aircraft carriers will be increasingly vulnerable to attack by ballistic and cruise missiles. Andrew Krepinevich, for example, has argued that future adversaries will have an increasing capability to attack U.S. carrier battle groups.[94] In one much-publicized war game conducted by the Department of Defense, for example, Chinese forces equipped with long-range cruise missiles and satellite reconnaissance and surveillance reportedly inflicted heavy damage on U.S. carrier battle groups.[95]

The response to this statement was also somewhat surprising. Nearly three out of four officers (73 percent) disagreed with the statement that future adversaries would be able to *attack* carrier battle groups with such weapons as ballistic and cruise missiles (see figure 2). The mean response was 2.83. Significantly, the statement posed the problem in terms of a group of ships and not specifically an aircraft carrier. Moreover, it did not

FIGURE 2
Future adversaries will be able to use long-range precision strike weapons such as ballistic and cruise missiles to attack carrier battle groups.



use the terms "sink," "destroy," or "damage," but only the term *attack*—which could also be construed to include unsuccessful attacks. Half of the respondents tended toward uncertainty on this issue (50 percent), but only 12 percent of the officers expressed any agreement with this statement, and less than 2 percent strongly agreed.

Navy officers were marginally more concerned about the threat posed by ballistic and cruise missiles to carrier battle groups than officers of other services (see table 2). Senior and flag officers were slightly more worried than junior officers. Nevertheless, the consensus among officers of all services and ranks was that carrier battle groups would continue to be invulnerable from these types of weapons. As with the previous statement, international officers were considerably more concerned about the threat to U.S. carrier battle groups than were their American counterparts. While only 11 percent of American officers agreed with the statement that future adversaries would be able to attack carrier battle groups with ballistic and cruise missiles, 34 percent of international officers agreed.

Interestingly, the same question was posed to the service focus groups with a very different response. More than 86 percent of those officers (38 of 44) agreed with the statement and only three officers (all Navy officers) disagreed. However, most of the focus group participants tended to take the term *attack* at face value and were very skeptical of a future adversary's ability to find and sink, or even seriously damage, an aircraft carrier.

The reason for such high confidence in the security of carrier battle groups among the broad officer population can only be speculated upon. The focus group participants

TABLE 2
Future adversaries will be able to use long-range precision strike weapons such as ballistic and cruise missiles to attack carrier battle groups.

	AGREE	UNSURE	DISAGREE
Overall	12%	15%	73%
Army	9%	14%	77%
Marine Corps	9%	18%	73%
Navy	16%	14%	70%
Air Force	13%	15%	72%
Junior/Field Grade Officers	11%	15%	74%
Senior Officers	16%	15%	69%
Flag Officers	12%	19%	69%
International Officers	34%	13%	53%
U.S. Officers	11%	15%	74%

indicated a general lack of understanding of the current and future threats, but generally felt that the inherent mobility of the carrier would continue to offer it a high level of security from being targeted and attacked. The focus groups also expressed tremendous confidence that the technological superiority of the United States would provide whatever defenses are necessary to protect critical military assets. Responses from the focus group members indicate that the "aircraft carrier" has achieved tremendous status as an icon of U.S. military power worldwide that the United States must, and will, preserve and protect.

Statement 22c: Future adversaries will be able to use long-range precision strike weapons such as ballistic and cruise missiles to destroy fixed military infrastructure, such as ports, airfields, and logistical sites.

Recent years have also seen increasing concern over the threat ballistic and cruise missiles pose to the infrastructure that the United States requires to project power.[96] As former Air Force Chief of Staff General Ronald Fogelman put it, "Saturation ballistic missile attacks against littoral forces, ports, airfields, storage facilities, and staging areas could make it extremely costly to project U.S. forces into a disputed theater, much less carry out operations to defeat a well-armed aggressor. Simply the threat of such enemy missile attacks might deter the U.S. and coalition partners from responding to aggression in the first place."[97]

The Rumsfeld report specifically singled out ports and airfields necessary for U.S. power projection as being at risk to foreign missile attack, yet nearly 8 out of 10 officers (79 percent) surveyed disagreed with this statement (see figure 3). Indeed, more

FIGURE 3
Future adversaries will be able to use long-range precision strike weapons such as ballistic and cruise missiles to destroy fixed military infrastructure, such as ports, airfields, and logistical sites.

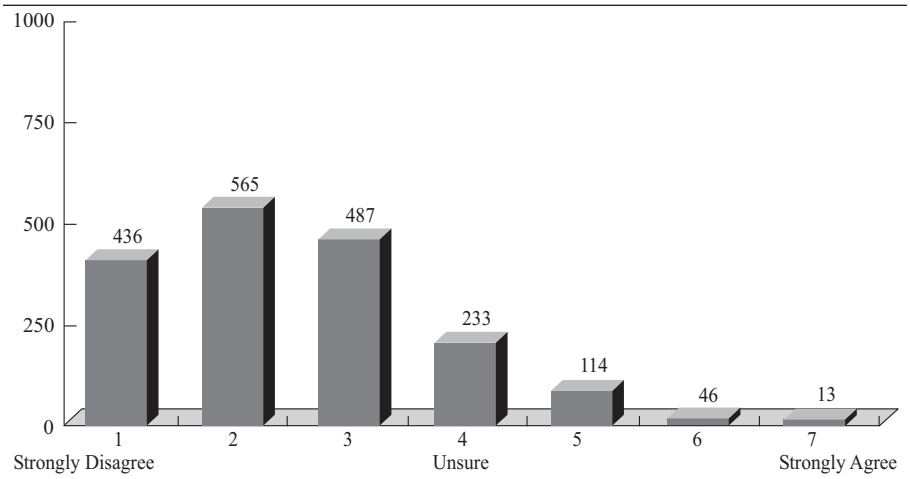


TABLE 3
Future adversaries will be able to use long-range precision strike weapons such as ballistic and cruise missiles to destroy fixed military infrastructure, such as ports, airfields, and logistical sites.

	AGREE	UNSURE	DISAGREE
Overall	9%	12%	79%
Army	8%	13%	79%
Marine Corps	8%	12%	80%
Navy	7%	13%	80%
Air Force	8%	13%	79%
Junior/Field Grade Officers	8%	13%	79%
Senior Officers	12%	13%	75%
Flag Officers	10%	17%	73%
International Officers	29%	8%	63%
U.S. Officers	8%	13%	79%

officers felt strongly about the security of fixed facilities (53 percent responding in blocks 1 and 2) than about the security of carrier battle groups (44 percent responding in the same blocks)—despite the fact that focus group participants attributed the security of a carrier battle group largely to its mobility. The mean response was 2.59.

One major reason for the disparity is likely the use of the term *destroy* rather than *attack*. Focus group participants expressed almost universal skepticism that a port or airfield could be *destroyed* in the sense that such a facility could be "put out of existence" or rendered "totally unusable." However, participants commonly said that they tended to interpret the term *destroy* to simply mean "deny use" for a significant period of time. Whether the broader survey participants had the same interpretation is unknown. Again, the responses of the focus group participants were almost the opposite to those of the survey, with 36 of 44 officers (nearly 82 percent) agreeing with the statement, and only 6 of 44 (under 14 percent) in disagreement. However, the consensus view of the focus group respondents was that the United States would assuredly field adequate defenses to ensure that U.S. forces would not be denied the use of critical bases overseas.

We found no significant differences in response among officers of different services (see table 3). Senior and flag officers were slightly more concerned about the threat than were junior officers. More interesting was the disproportionately positive response of foreign officers to this statement. While only 8 percent of American officers agreed with the statement, 29 percent of international officers agreed. At face value, this

reflects a belief among America's friends and allies that U.S. forward bases are at risk of being destroyed or being put out of service by ballistic and cruise missiles. The potential operational and strategic implications of this disparity of opinions between U.S. and foreign officers with respect to U.S. force vulnerability are worthy of deeper exploration.

Relative importance attributed to six future challenges by service

We asked respondents to provide a relative ranking of the importance of six different challenges. These were presented as a series of pairs, with the respondents asked to identify which of the two challenges is more important.

Several general insights can be drawn from the overall rankings (see table 4). The first is that virtually all officers see the emergence of a "peer competitor" as the least important future challenge. This is likely due to a perceived low probability of a military challenge of comparable power to the U.S. arising in the foreseeable future.

The second insight is that officers seemed to equate lesser importance to those missions that they had been doing or preparing for in the 1990s—perhaps because of a greater confidence in their understanding of these challenges and their ability to deal with them. The missions ranking higher in importance are probably ones that most of the officers in the survey had not yet had to confront in their operational assignments: information warfare, weapons of mass destruction, and terrorism. Officers may thus be concerned that the consequences of failure in these so-called "asymmetric" missions may be quite severe, and yet they are not able to adequately gauge the likely effectiveness of their forces to deal with them.

Finally, the relative rankings seem to correlate with the degree of individual control that an officer might feel that he has over his "enemy" in each of these missions. Other research strongly indicates that individuals tend to perceive an increasing level of personal risk with a sense of decreasing personal control over future events. The fact that traditional military tools are often seen to be ill-suited to the demands of terrorism, WMD, and information warfare might make these appear to be exceptionally risky, and therefore exceptionally challenging and important operations.

TABLE 4
Relative importance attributed to six future challenges by service.

	PEER COMPETITOR	HUMANITARIAN OPERATIONS	MAJOR THEATER WAR	INFORMATION WARFARE	WMD*	TERRORISM
Army	0	0.443	0.523	0.761	0.724	1.05
Marine Corps	0	0.321	0.582	0.713	0.825	1.168
Navy	0	0.656	0.701	0.862	0.788	1.277
Air Force	0	0.686	0.761	1.102	1.094	1.349

*Weapons of Mass Destruction

Summary

The survey results suggest that, at least in the area of potential threats posed by ballistic and cruise missiles, the vast majority of officers see no imperative for major changes to the operational concepts and principal platforms currently used to project U.S. power abroad. They would seem to have a very high level of confidence in the technological prowess of the United States to provide "full-dimensional protection" to our critical warfighting capabilities. This corroborates the confidence most officers expressed in the United States' ability to project its information networks against hostile attack, as shown in chapter 5.

By contrast, the survey indicated that international military officers have much less confidence that force defenses will be adequate, and tend to believe that major U.S. ground formations, groups of ships, and fixed infrastructure will be at increasing risk of attack, and perhaps destruction, by missile attack.

Finally, officers tend to attribute much higher importance to the so-called "asymmetric" challenges by a potential enemy—terrorism, weapons of mass destruction, and information warfare—than to the more traditional challenges of high intensity combat and humanitarian operations. This may reflect a great deal of uncertainty with respect to the consequences of asymmetric warfare and the ability of our military to deal with these missions.

CHAPTER EIGHT

Character and Depth of Change Required

Most analysts of the emerging Revolution in Military Affairs believe that major changes in operational concepts and organizations will be required to achieve the full benefits of this technology-driven revolution. We presented the respondents with twelve statements intended to assess their views with respect to the character and depth of change that might occur within the U.S. military over the coming decades.

14. The U.S. armed forces must radically change their approach to warfare to compete effectively with future adversaries.
15. The U.S. armed forces are currently embarked upon a path that will lead to a radical change in military technology, doctrine, and organization.
12. It is imperative that the U.S. armed forces become truly joint.
13. The need to maintain separate services will diminish over time.
25c. Modern conditions require significant changes to traditional service roles and missions.
25d. The Defense Department should create a new service responsible for space operations.
25e. The Defense Department should create a new service responsible for information operations.
25a. My service should reduce its force structure to invest in new approaches to warfare.
25b. My service should reduce its readiness to invest in new approaches to warfare.
25g. My service is serious about exploring new approaches to warfare.
25h. Other services are more serious than mine about exploring new approaches to warfare.
25f. The U.S. armed forces will achieve fully the four pillars of *Joint Vision 2010*—dominant maneuver, precision engagement, focused logistics, and full-dimensional protection—by 2010.

Scholars argue that a revolution in military affairs is composed of four basic elements: the emergence of new technologies, the incorporation of those technologies in new military systems, operational innovations that fully exploit those systems, and finally, organizational adaptation to a new character of warfare. Andrew Krepinevich is among those who have called for "radical" changes in both military doctrine and organization if the RMA is to be realized.[98] Eliot Cohen has suggested that "today's military organizations—divisions, fleets, and air wings—could disappear or give way to successors that would look very different."[99] He has gone on to predict that "if the forces themselves

change, so too would the people, as new career possibilities, educational requirements, and promotional paths became essential."[100] Among other developments, he suggested the possible emergence of "new elites" such as "information warriors," and a breakdown in traditional service distinctions. *Joint Vision 2010* prescribed no specific changes, but did state that "new operational procedures and organizations" would be required for implementing the basic concepts of the *Vision*.[101] It went on to suggest that more agile organizations and processes might be called for, including "increased organizational flexibility and further reductions in supervision and centralized direction."[102]

Statement 14: The U.S. armed forces must radically change their approach to warfare to compete effectively with future adversaries.

The responses to this statement resulted in a bimodal distribution, with the largest number in agreement (47 percent), but with a nearly as large percentage in disagreement (41 percent). A critical unknown is the respondents' interpretation of the term "radical." Lack of definition of this point may have been a major factor in nearly two-thirds of the respondents (64 percent) leaning toward uncertainty (the second largest response in this category throughout the survey). The mean response of 4.14 further illustrates this uncertainty. By contrast, focus group participants leaned much more strongly toward the positive categories (71 percent) than the unsure categories (44 percent)—with only 29 percent in disagreement.

An important aspect of this statement is that it does not portray radical change as an opportunity for the United States to increase its relative dominance, but rather as a

FIGURE 1
The U.S. armed forces must radically change their approach to warfare to compete effectively with future adversaries.

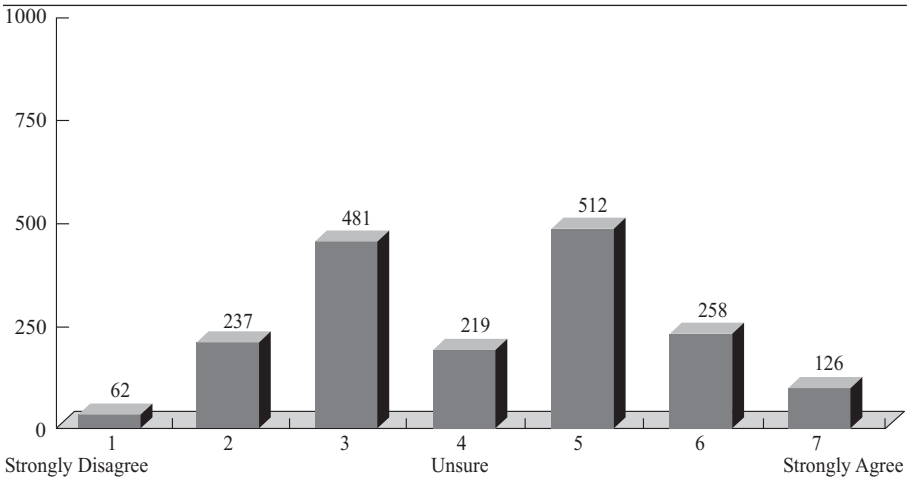


TABLE 1
The U.S. armed forces must radically change their approach to warfare to compete effectively with future adversaries.

	AGREE	UNSURE	DISAGREE
Overall	47%	12%	41%
Army	48%	13%	39%
Marine Corps	56%	6%	38%
Navy	41%	9%	50%
Air Force	43%	13%	44%
Junior/Field Grade Officers	46%	13%	41%
Senior Officers	48%	11%	41%
Flag Officers	45%	16%	39%

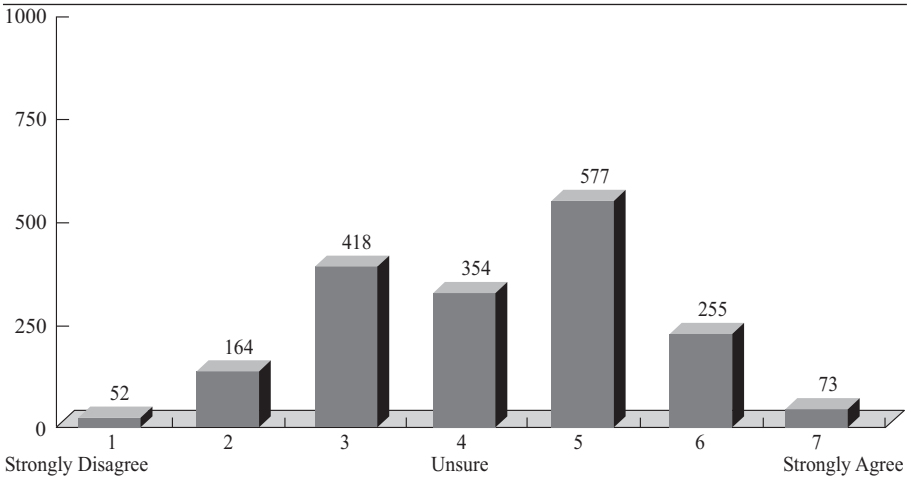
necessity for the U.S. military to simply remain competitive with future adversaries. The implication is that if the U.S. military does not change radically, it will cease to be competitive in the future. It is significant that more than half of the officers (59 percent) either agreed with this conclusion or were uncertain. Less than half of the officers surveyed believed that the U.S. military could remain competitive without radical change, and only one in five (20 percent) believed strongly that radical change was not required. This would appear to contradict earlier responses indicating that officers were not concerned with the ability of adversaries to deny the United States the use of information networks or interfere with U.S. power projection capabilities.

We noted significant differences in attitude among officers of the various services (see table 1). Marine Corps officers believed most strongly that the U.S. armed forces must radically change to remain competitive; Navy officers saw the least need to change. There were no significant differences in the attitudes of officers of different ranks.

Statement 15: The U.S. armed forces are currently embarked upon a path that will lead to a radical change in military technology, doctrine, and organization.

Nearly half of the officers surveyed (48 percent) believed that the U.S. armed forces were currently undergoing "radical" change—nearly the same number as those who believed that radical change was required. Only a third of the officers (33 percent) disagreed with this statement. The highest percentage of respondents (71 percent) leaned toward uncertainty on this issue—the highest response in this category throughout the entire survey. The mean response of 4.21 obviously suggests that most officers are very unsure about this issue.

FIGURE 2
The U.S. armed forces are currently embarked upon a path that will lead to a radical change in military technology, doctrine, and organization.



A comparison of the responses to statements 14 and 15 suggests that a large number of the respondents believed that unnecessary radical change may be underway. More importantly, nearly half of the officers surveyed (48 percent) believed that what the services were doing, or were planning to do, in mid-2000 could be characterized as a "radical" departure from the systems, operational concepts, and organizations that were dominant in the decade of the 1990s. This suggests something of a "dialogue of the deaf" between advocates of truly radical change—that is a major departure from existing systems, concepts, and organizations—and the large percentage of officers

TABLE 2
The U.S. armed forces are currently embarked upon a path that will lead to a radical change in military technology, doctrine, and organization.

	AGREE	UNSURE	DISAGREE
Overall	48%	19%	33%
Army	52%	20%	28%
Marine Corps	46%	15%	39%
Navy	36%	22%	42%
Air Force	44%	15%	41%
Junior/Field Grade Officers	50%	19%	31%
Senior Officers	41%	20%	39%
Flag Officers	37%	30%	33%

(two-thirds of those surveyed) who believed that radical change either was, or might be, ongoing. This helps explain the reported friction between Secretary of Defense Rumsfeld and other civilian leaders of the Defense Department, on the one hand, and military leaders, on the other, regarding the Bush administration's plans to transform the U.S. armed forces.[103]

Army officers expressed the greatest confidence that the U.S. armed forces were embarked upon a path that will lead to radical change (see table 2). Navy officers were least convinced. There was also a correlation between an officer's rank and his view of whether the U.S. armed forces are currently in the midst of radical change: the higher an officer's rank, the less confident and more uncertain he tended to be.

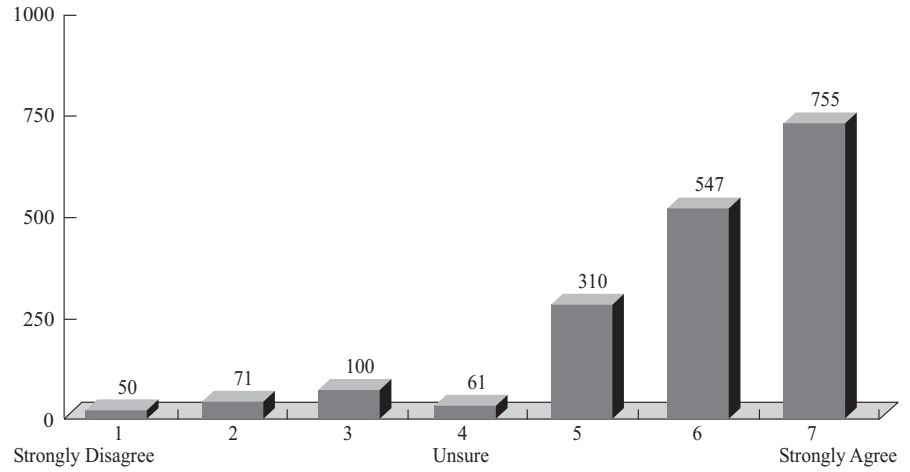
Among focus group participants, Army officers were most strongly in agreement with this statement, Navy officers fell squarely in the mid-range, and Air Force and Marine Corps officers were predominantly in disagreement. The Army officers tended to believe that "radical" change could be accomplished with current dominant ground systems (such as the M-1 Abrams MBT)—or with new types of manned, armored vehicles (such as the Future Combat System). Marine Corps officers tended to believe that "radical" change implied a much higher degree of jointness than had yet been achieved, or was likely. Air Force officers tended to equate "radical" change to developments that substituted technology for human functions (such as "100 percent man-out-of-the-loop"). Most saw such developments as inevitable, but characterized the current pace as slow evolution (one termed it "glacial") rather than rapid revolution. Navy officers were decidedly ambivalent on this issue, with some seeing ongoing plans for major crew reductions on surface ships as "radical," while others deeming as radical only some future, widespread substitution of unmanned for manned systems.

Statement 12: It is imperative that the U.S. armed forces become truly joint.

"Jointness" has been a major theme of U.S. military doctrine for nearly two decades, and was enshrined in law by the 1986 Goldwater-Nichols Act. *Joint Vision 2010* refers to the "Imperative of Jointness," driven primarily by "flat budgets" that will require us to "wring every ounce of capability from every available source."[104] It goes on to conclude that this outcome

> can only be accomplished through a more seamless integration of service capabilities. To achieve this integration while conducting military operations, we must be fully joint: institutionally, organizationally, intellectually, and technically.[105]

FIGURE 3
It is imperative that the U.S. armed forces become truly joint.



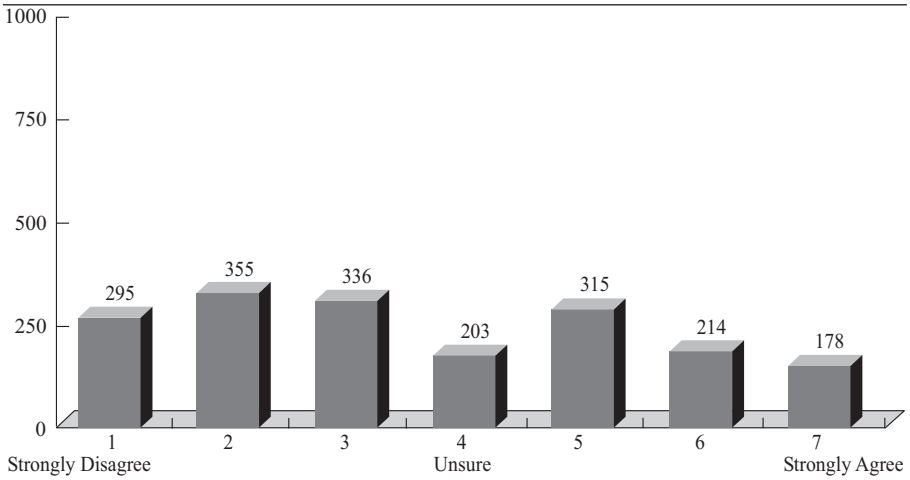
Other analysts of the RMA predict that emerging technological capabilities will serve to break down the distinction between the different regimes of warfare—sea, air, and land—and thus the traditional differentiation between the services.[106]

This statement elicited an overwhelmingly positive response from the survey participants, with 85 percent of the officers in agreement with the statement, and nearly seven in ten (69 percent) leaning toward strong agreement. The mean response of 5.73 reflects this. This of course begs the question of what these officers construed "truly joint" to mean—and how that might differ from the current organizational relationships. The responses to subsequent statements provide some indication that most officers do not foresee what might be termed "radical" change to the *status quo*. It is also

TABLE 3
It is imperative that the U.S. armed forces become truly joint.

	AGREE	UNSURE	DISAGREE
Overall	85%	3%	12%
Army	85%	3%	12%
Marine Corps	71%	2%	27%
Navy	80%	4%	16%
Air Force	88%	4%	8%
Junior/Field Grade Officers	84%	4%	12%
Senior Officers	84%	5%	11%
Flag Officers	86%	4%	10%

FIGURE 4
The need to maintain separate services will diminish over time.



unknown what the respondents considered to be the "imperative" for jointness (e.g. budget constraints or military effectiveness), and whether they believed the U.S. military was moving toward or away from a more joint force.

A substantial majority of officers of all services believed that it is imperative that the U.S. armed forces become truly joint (see table 3). Still, there were noticeable differences: while 71 percent of Marine Corps officers agreed with the statement, 88 percent of Air Force officers agreed. We detected no meaningful differences in responses by officers of different ranks.

TABLE 4
The need to maintain separate services will diminish over time.

	AGREE	UNSURE	DISAGREE
Overall	37%	11%	52%
Army	42%	13%	45%
Marine Corps	18%	2%	80%
Navy	29%	6%	65%
Air Force	33%	9%	58%
Junior/Field Grade Officers	37%	13%	50%
Senior Officers	38%	8%	54%
Flag Officers	24%	17%	59%

Statement 13: The need to maintain separate services will diminish over time.

More than half of the respondents (52 percent) disagreed with the notion that there will be a diminished need to maintain separate services. Nevertheless more than one in three officers (37 percent) agreed with the statement, and nearly half (45 percent) leaned toward uncertainty. The mean response was 3.68. It is interesting to compare these responses with those to Statement 12. Although an overwhelming majority believed that true jointness was an imperative, only a third of the officers responding equated this to a diminished need for separate services.

Army officers believed most strongly that the need to maintain separate services will diminish over time, with 42 percent agreeing with the statement (see table 4). By contrast, only 18 percent of Marine Corps officers agreed. Junior and senior officers—who have spent most if not all of their careers under the system put in place by the 1986 Goldwater-Nichols Act—felt much more strongly than flag officers that the need for separate services would diminish.

Statement 25c: Modern conditions require significant changes to traditional service roles and missions.

More than half of the survey respondents (59 percent) agreed that *significant* changes were required to traditional service roles and missions. However, only slightly more than one in four officers (28 percent) tended to strongly agree with this statement, and nearly as many officers (58 percent) leaned toward uncertainty as agreed with the statement. The mean response was 4.47. Nevertheless, less than one in three officers (32 percent) responded that significant change was *not* required. It is not known how the

FIGURE 5
Modern conditions require significant changes to traditional service roles and missions.

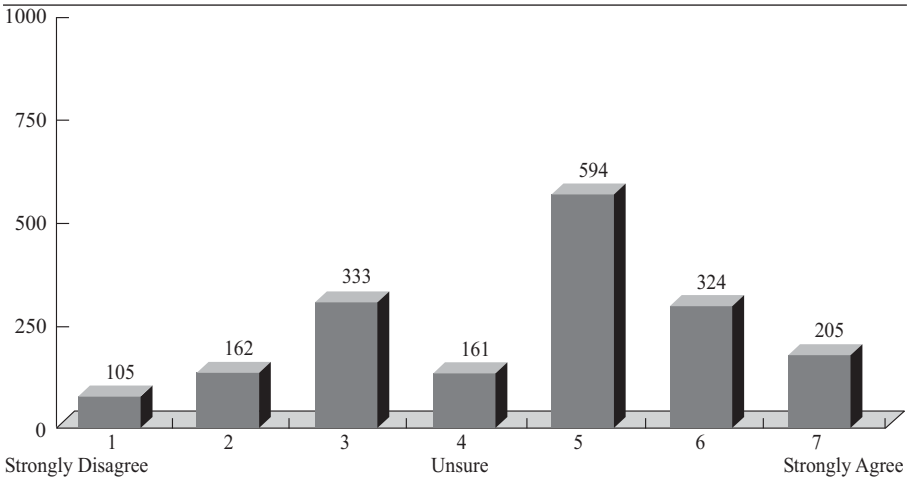


TABLE 5
Modern conditions require significant changes to traditional service roles and missions.

	AGREE	UNSURE	DISAGREE
Overall	59%	9%	32%
Army	60%	11%	29%
Marine Corps	37%	6%	57%
Navy	51%	7%	42%
Air Force	57%	8%	33%
Junior/Field Grade Officers	57%	11%	32%
Senior Officers	62%	7%	31%
Flag Officers	73%	8%	19%

officers interpreted the term "significant," nor what specifically they might have characterized as significant changes to existing service roles and missions.

Sixty percent of Army officers and 57 percent of Air Force officers agreed with the proposition that modern conditions require significant changes to traditional service roles and missions (see table 5). By contrast, only 37 percent of Marine Corps officers agreed with the statement. The percentage of officers that believed that significant changes to traditional service roles and missions were warranted increased with the respondent's rank. Whereas 57 percent of junior and field grade officers felt that a change in service roles and missions was needed, 62 percent of senior officers and 73 percent

FIGURE 6
The Defense Department should create a new service responsible for space operations.

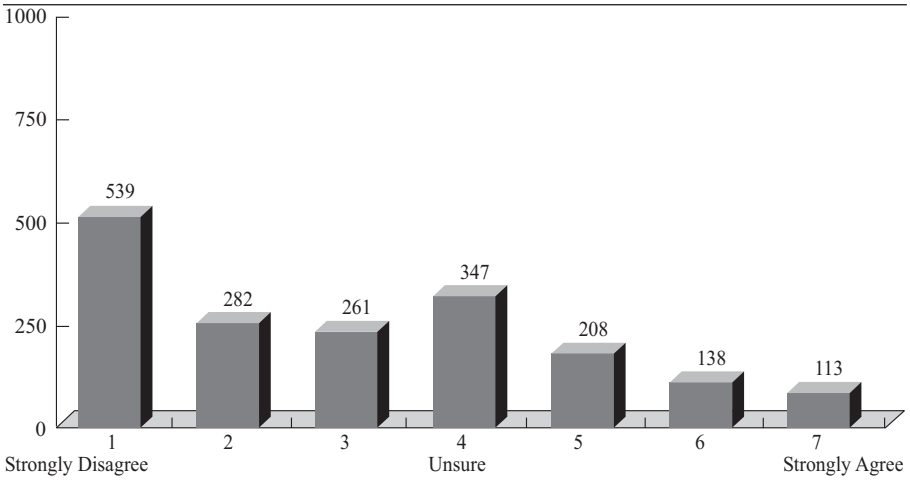


TABLE 6
The Defense Department should create a new service responsible for space operations.

	AGREE	UNSURE	DISAGREE
Overall	25%	18%	57%
Army	25%	25%	50%
Marine Corps	19%	11%	70%
Navy	20%	11%	69%
Air Force	21%	13%	66%
Junior/Field Grade Officers	24%	22%	54%
Senior Officers	23%	14%	63%
Flag Officers	22%	9%	69%

of flag officers agreed. When combined with responses to the previous question, it appears that flag officers think that while the roles and missions of individual services should change, there is still a strong need to maintain separate services.

Statement 25d: The Defense Department should create a new service responsible for space operations.

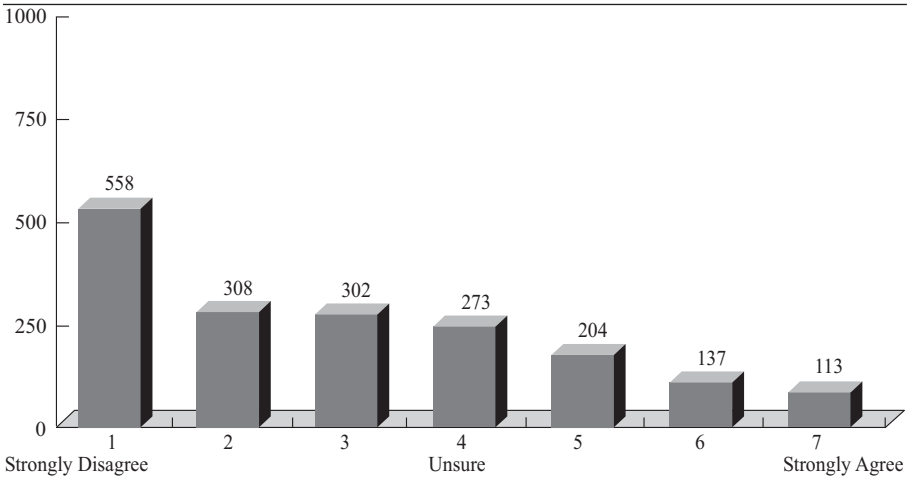
More than half (57 percent) of the officers surveyed disagreed with the notion of creating a new service responsible for space operations. Only one in four (25 percent) expressed support for the concept. However, just about the same number of respondents (43 percent) leaned toward uncertainty as did those who tended toward strong disagreement (blocks 1 and 2). The mean response was 3.14. Overall though, the responses tend to track with those to Question 12, which showed very strong support for increased "jointness" and, by implication, a reduction in service or functional specialization.

Army officers were most supportive of the proposition that the Defense Department should create a new service responsible for space; Marine Corps officers were least supportive (see table 6). These responses track closely with attitudes toward changing service roles and missions. In contrast with responses to that statement, however, here we detected no significant difference in the attitudes of officers of different ranks.

Statement 25e: The Defense Department should create a new service responsible for information operations.

Some RMA advocates have argued that information is so central to military operations and so highly specialized as a discipline that the Defense Department should consider forming an "information corps"—a new armed service that would be responsible for

FIGURE 7
The Defense Department should create a new service responsible for information operations.



managing and coordinating all defense information needs.[107] Others counter that information is so integral to all military functions that all military personnel should be "information warriors."[108] Nearly two-thirds of the respondents (62 percent) expressed disagreement with the idea of creating a new service for information operations. The number in favor of such a new service (25 percent) was about the same as those who expressed agreement with the idea of a new service for space (Statement 25d.), but more of those who were unsure about a space service expressed opposition to an information service. The mean response was 3.06. The overall reason for the strong level of opposition to a new service focused on information is not known. One can only

TABLE 7
The Defense Department should create a new service responsible for information operations.

	AGREE	UNSURE	DISAGREE
Overall	25%	13%	62%
Army	27%	18%	55%
Marine Corps	14%	11%	75%
Navy	19%	10%	71%
Air Force	16%	12%	72%
Junior/Field Grade Officers	25%	17%	58%
Senior Officers	19%	11%	70%
Flag Officers	18%	13%	69%

speculate that officers either felt that information is so integral to all aspects of military operations that it would not be prudent to establish a separate organization, or they were expressing opposition to the idea that their own services might cede important prerogatives to a new and separate bureaucracy.

As with the previous item, Army officers were most supportive of the creation of a new service responsible for information operations; Marine Corps officers were least supportive (see table 7). The percentage of officers that advocated the formation of an information service decreased with the respondent's rank. Whereas 25 percent of junior and field grade officers supported such a move, only 19 percent of senior officers and 18 percent flag officers agreed.

Statement 25a: My service should reduce its force structure to invest in new approaches to warfare.

Joint Vision 2010 reflected the predominant climate of the post–Cold War era in predicting that the military budget would remain "flat," while readiness and modernization would be "increasingly more costly."[109] The implication was that investments in new approaches to warfare could be achieved only by reducing force structure or current readiness. James Blaker, for his part, has argued that transforming the U.S. armed forces would allow the U.S. government to reduce the defense budget by $40 billion per year.[110]

As responses to this statement demonstrated, more than three out of four officers (77 percent) opposed reductions in the force structure of their own service to invest in future capabilities. More than half of the officers (57 percent) leaned toward strong disagreement, while only about a third (35 percent) tended toward uncertainty on the

FIGURE 8
My service should reduce its force structure to invest in new approaches to warfare.

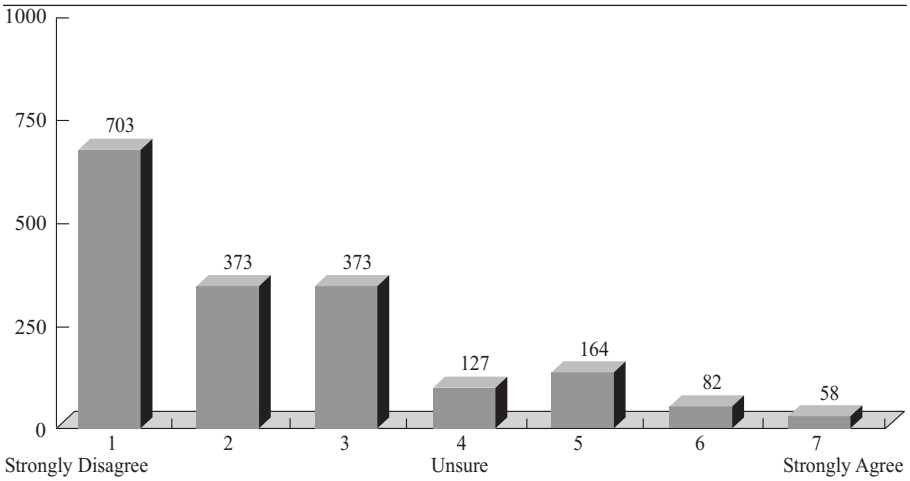


TABLE 8
My service should reduce its force structure to invest in new approaches to warfare.

	AGREE	UNSURE	DISAGREE
Overall	16%	7%	77%
Army	15%	7%	78%
Marine Corps	6%	0%	94%
Navy	16%	4%	80%
Air Force	16%	9%	75%
Junior/Field Grade Officers	12%	2%	79%
Senior Officers	26%	6%	68%
Flag Officers	24%	9%	67%

issue. The mean response was 2.55. The statement did not provide for any reduction in missions or current commitments, and so a reduction in force structure might have been interpreted as simply infeasible. Nevertheless, these responses track with those to Statement 15, which indicates that nearly half of the officers believed that radical change was already ongoing—without any reduction, or need for reduction, in force structure.

Marine Corps officers were most adamantly opposed to reducing force structure to invest in new ways of war: only 6 percent favored the proposition and 94 percent opposed it; none was unsure (see table 8). This is understandable, given that the Marine Corps' force structure of three active and one reserve division is enshrined in law.

FIGURE 9
My service should reduce its readiness to invest in new approaches to warfare.

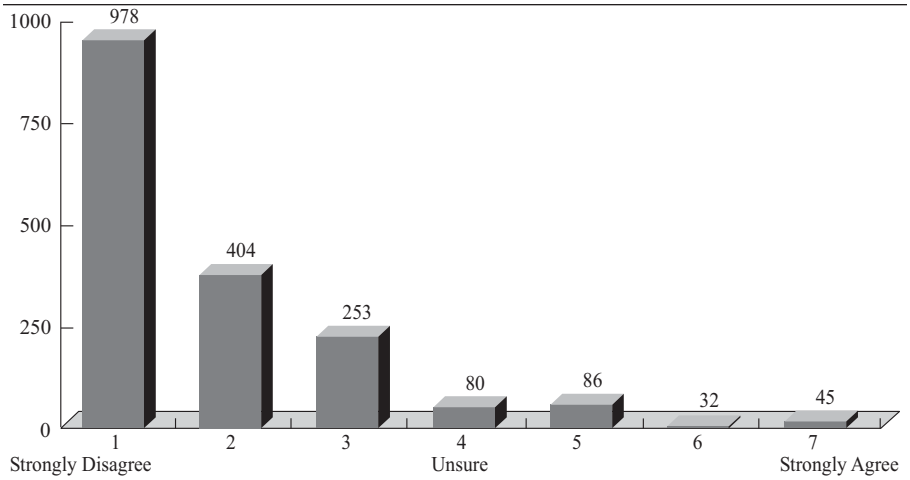


TABLE 9
My service should reduce its readiness to invest in new approaches to warfare.

	AGREE	UNSURE	DISAGREE
Overall	9%	4%	87%
Army	9%	5%	86%
Marine Corps	5%	1%	94%
Navy	6%	3%	91%
Air Force	9%	4%	87%
Junior/Field Grade Officers	8%	2%	86%
Senior Officers	9%	5%	86%
Flag Officers	11%	11%	78%

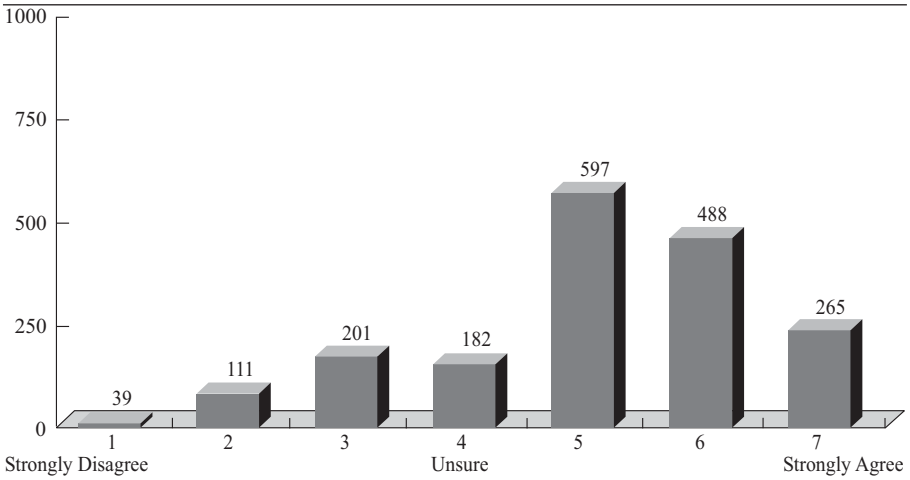
Junior and field grade officers were more strongly opposed to reductions in force structure than senior and flag officers. They may equate cuts in force structure with reduced opportunities for promotion and command; post-command senior and flag officers are presumably less motivated by such concerns.

Statement 25b: My service should reduce its readiness to invest in new approaches to warfare.

Respondents were even more adamant in their rejection of reducing current readiness to invest in new approaches to warfare, with almost nine out of ten (87 percent) in disagreement. In fact, this statement elicited the strongest negative response of any in the survey, with more than half of the officers (52 percent) responding in extreme disagreement (block 1). Nearly three quarters of the officers (74 percent) leaned toward strong disagreement, while less than one in four (22 percent) tended toward uncertainty. The mean response of 2.02 illustrates the level of disagreement with the statement.

A similar statement was put to the focus group participants, but with the stipulation that commitments would be reduced commensurate with a reduction in readiness.[111] Focus groups still rejected the proposal overwhelmingly. Respondents indicated that they tended to equate readiness to basic unit training and equipment availability across their service—and did not feel that there was any margin for reductions in these areas regardless of the level of force commitment. Moreover, these responses track with those to Statement 15 which indicated that nearly half of the officers surveyed believed that radical change was already ongoing without any need for a reduction in force readiness.

FIGURE 10
My service is serious about exploring new approaches to warfare.



Marine Corps and Navy officers were particularly averse to reducing readiness to invest in new approaches to warfare (see table 9). Flag officers were slightly more willing to contemplate such trades than junior or senior officers.

Statement 25g: My service is serious about exploring new approaches to warfare.

This statement was intended to determine the level of confidence officers had in their own services' efforts to innovate. Nearly three-quarters of the officers (72 percent) agreed with the statement, suggesting a high level of confidence in their own service. However, more than half of the officers (52 percent) leaned toward uncertainty, with a mean response of 4.97. The implication is that most officers were confident that their own service was serious about innovation, but there was a relatively high level of uncertainty as to what would be required for a "new approach" to warfare, what their own service was doing in this area, and how serious it really was about change.

At least two-thirds of the officers of each service believed that their service was serious about exploring new approaches to warfare (see table 10). Marine Corps officers were convinced that their service was committed to exploring new ways of war: 95 percent agreed with the statement, and 5 percent disagreed; none were unsure. By contrast, 67 percent of Navy officers believed their service was serious about examining new approaches to combat.

In general, these results confirm those of the Military Climate-Culture Survey conducted by the Center for Strategic and International Studies. The latter survey, which consisted of Army staff officers and the broader Army population, included two related statements:

TABLE 10
My service is serious about exploring new approaches to warfare.

	AGREE	UNSURE	DISAGREE
Overall	72%	9%	19%
Army	73%	8%	19%
Marine Corps	95%	0%	5%
Navy	67%	11%	22%
Air Force	71%	9%	20%
Junior/Field Grade Officers	71%	10%	19%
Senior Officers	71%	11%	18%
Flag Officers	72%	15%	13%

- "Our organization can adjust to new technologies and changing doctrine.
- Our leaders consider the future, exploring new doctrine, tactics, equipment and procedures."[112]

Respondents reacted quite positively to the first statement, as they did to the similar statement contained in our survey. Indeed, their response ranked in the top twenty most favorable responses in the survey. However, the CSIS survey revealed a significant split between Army leaders and the broader Army population regarding the willingness of Army leaders to adapt to such changes. Specifically, the survey's results showed that while Army leaders believe they are adapting to the RMA, soldiers do not feel that their

FIGURE 11
Other services are more serious than mine about exploring new approaches to warfare.

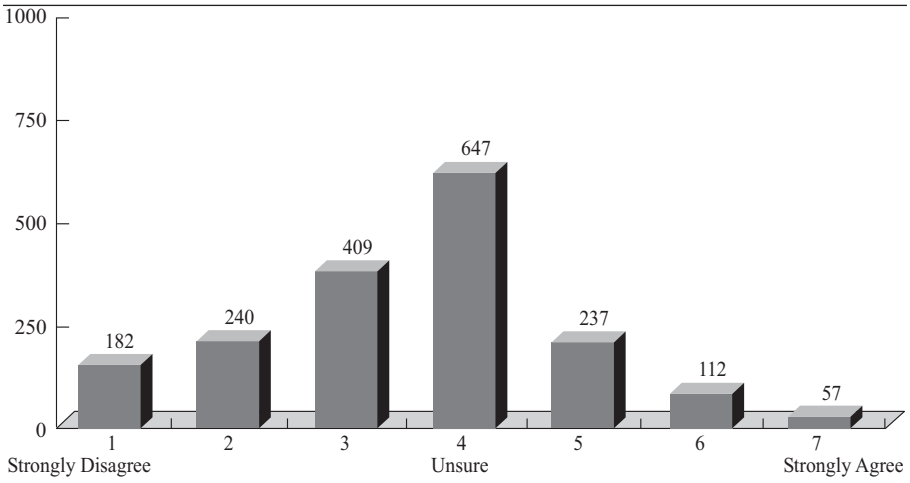


TABLE 11
Other services are more serious than mine about exploring new approaches to warfare.

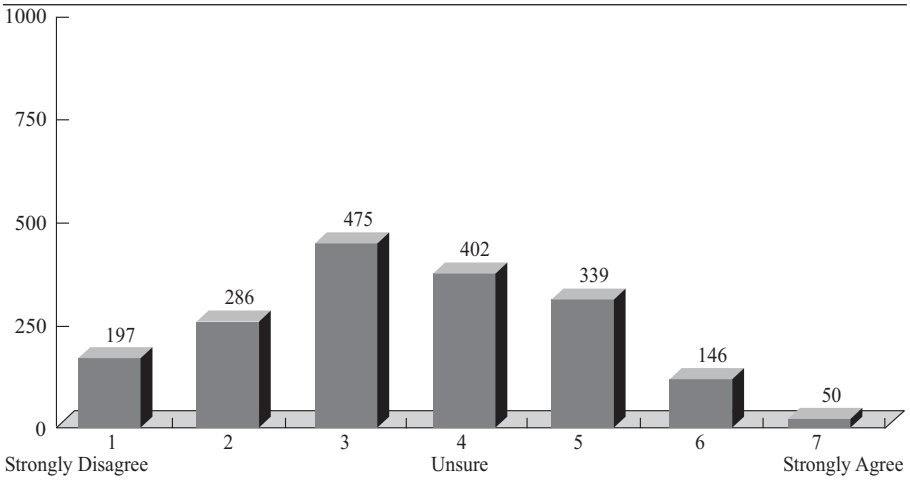
	AGREE	UNSURE	DISAGREE
Overall	22%	34%	44%
Army	25%	40%	35%
Marine Corps	5%	14%	81%
Navy	25%	32%	43%
Air Force	14%	26%	60%
Junior/Field Grade Officers	22%	37%	41%
Senior Officers	21%	28%	51%
Flag Officers	11%	37%	52%

leaders are changing fast enough.[113] Our survey, by contrast, did not yield a sharp difference in attitudes between senior and junior officers.

Statement 25h: Other services are more serious than mine about exploring new approaches to warfare.

This statement was intended to determine how officers felt about their own service's efforts at innovation relative to those of the other services. More than four in ten officers (44 percent) expressed confidence that their own service was no less serious about innovation than any of the others. However more than one-third of the officers (34

FIGURE 12
The U.S. armed forces will achieve fully the four pillars of Joint Vision 2010—dominant maneuver, precision engagement, focused logistics, and full-dimensional protection—by 2010.



percent) expressed complete uncertainty (block 4), and nearly seven in ten leaned toward that category, with a mean response of 3.57. The implication is that there was a great deal of uncertainty as to what other services are doing with respect to innovation, but also a good deal of confidence among officers that their own service could not be less innovative than any of the others.

A large majority of Marine Corps officers were convinced that no service was more serious about exploring new ways of warfare than theirs (see table 11). Only 5 percent agreed that other services were more committed than the Marine Corps, while 81 percent disagreed. Army officers were the most uncertain about the commitment of other services. Also of note is the fact that flag officers—who presumably know the most about other services—had more confidence that their service was most serious about exploring new ways of war than did junior or senior officers.

Statement 25f: The U.S. armed forces will achieve fully the four pillars of *Joint Vision 2010*—dominant maneuver, precision engagement, focused logistics, and full-dimensional protection—by 2010.

Published in 1996, *Joint Vision 2010* was presented as the "conceptual template" for achieving "full spectrum dominance" by the end of the first decade of the 21st century. It stated that, by 2010, the U.S. military should be able to exploit advanced technologies to transform the traditional functions of maneuver, strike, protection, and logistics into the four new operational concepts, or "pillars," of dominant maneuver, precision engagement, focused logistics, and full-dimensional protection. By contrast, others argue that *Joint Vision 2010*'s dependence upon information superiority makes it unrealistic.[114]

TABLE 12
The U.S. armed forces will achieve fully the four pillars of Joint Vision 2010—dominant maneuver, precision engagement, focused logistics, and full-dimensional protection—by 2010.

	AGREE	UNSURE	DISAGREE
Overall	28%	21%	51%
Army	26%	25%	49%
Marine Corps	24%	11%	65%
Navy	22%	20%	58%
Air Force	29%	16%	55%
Junior/Field Grade Officers	28%	23%	49%
Senior Officers	27%	18%	55%
Flag Officers	43%	20%	37%

Of the officers surveyed, only 28 percent agreed with this statement—and only 10 percent leaned toward strong agreement (blocks 6 and 7). By contrast, more than half of the officers (51 percent) disagreed. The mean response was 3.54. The reason for such a high level of skepticism is not known. The focus group participants indicated that organizational change (rather than technology) would likely be the biggest impediment to this type of force "transformation," and seriously questioned the "political will" of both the military and Congress to actively support the changes that would be required. Nearly two-thirds of the officers (64 percent) in the broad survey leaned toward unsure categories (blocks 3, 4, and 5), suggesting a good deal of uncertainty about the specifics of *Joint Vision 2010*, the prospects of achieving its goals, or both.

Air Force officers believed most strongly that the U.S. armed forces would achieve fully the four pillars of *Joint Vision 2010* by 2010; Marine Corps officers were most skeptical (see table 12). Flag officers believed more strongly than did junior or senior officers.

Summary

The survey results indicate that nearly half of the officers believed that "radical" change is required if the U.S. is to compete effectively with future adversaries. Perhaps more significantly, two-thirds of the officers believed that "radical" change in military technology, doctrine, and organization was, or might have been, underway (they either agreed with the statement or were unsure). These findings support the contention that there was something of a "dialogue of the deaf" between advocates of truly radical change—that is a major departure from existing systems, concepts, and organizations—and the large percentage of officers who believed that radical change either already was, or might have been, ongoing.

Strong support was expressed for the achievement of "true" jointness among the services and significant changes to traditional service roles and missions. However, most officers did not believe that the need for separate services would diminish, nor did they support creation of new military services responsible for space or information operations.

Officers expressed a very strong opposition to reducing the force structure or readiness of their own service to invest in new approaches to warfare, but most believed that their own service was nevertheless serious about innovation.

Finally, there was widespread skepticism that the goals of *Joint Vision 2010*—the "conceptual template" for future joint warfighting—would actually be achieved by the end of this decade.

A significant insight from this section of the survey was the high level of uncertainty among most officers regarding the character and depth of change that is required for the U.S. military to compete effectively with future adversaries. This uncertainty is

especially strong over the issue of whether "radical" change is required, and whether such change is currently underway. This suggests that a very large percentage of the officer corps is not confident about its understanding of how technology might change the conduct of warfare—and what changes to systems, concepts, and organizations might be desirable or necessary.

CHAPTER NINE

Trends in Officer Attitudes

While the survey provided insight into officer attitudes at a point in time, we used an analysis of articles on innovation, transformation, revolution in warfare, and the military exploitation of new technologies appearing in the primary U.S. military professional journals between 1990 and 2000 to assess trends in attitudes over time.

Findings

Authors. Figures 1 and 2 depict the affiliations of the authors by grade and service. Because some authors wrote multiple articles, there were 257 different principal authors of the 345 articles. Authors were primarily field grade or senior officers (i.e. O-4, O-5, and O-6). Of note, there was only one relevant article authored by an enlisted person. Five of the 257 authors were females—two civilians and three military officers. The female authors were all senior Air Force officers.

FIGURE 1
Authors by grade.

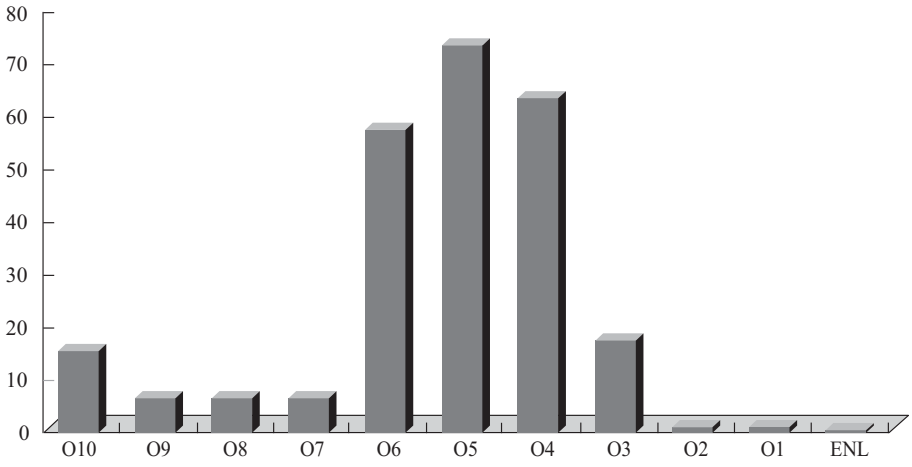
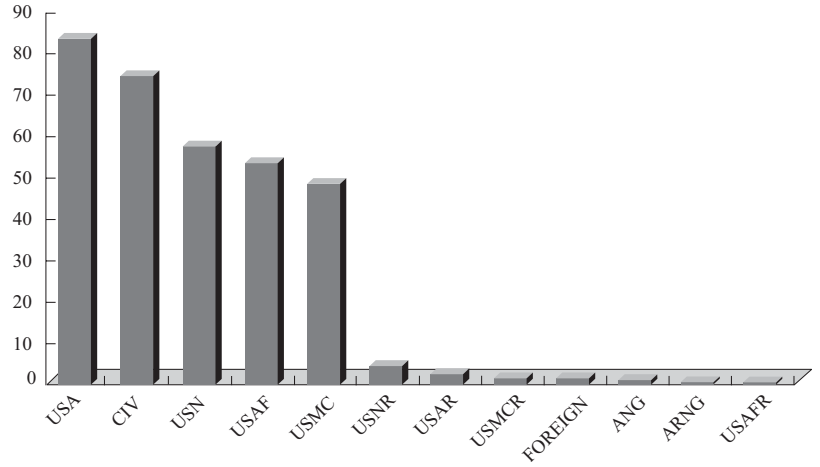


FIGURE 2
Authors by service.



The vast majority of authors were officers from the four active services and civilians. Some of the civilians were known to be military retirees, although we could not accurately determine the exact numbers from the biographical information provided in the journals. Likewise, some authors who were civilians might also have had an unrevealed affiliation with the military Reserves. Three of the articles were written by international officers from India, Brazil, and the United Kingdom.

Attitude. Figure 3 depicts the attitudes of the authors toward the revolution in military affairs (RMA) for each year of the survey. Figure 4 shows the same data presented

FIGURE 3
Attitude by year.

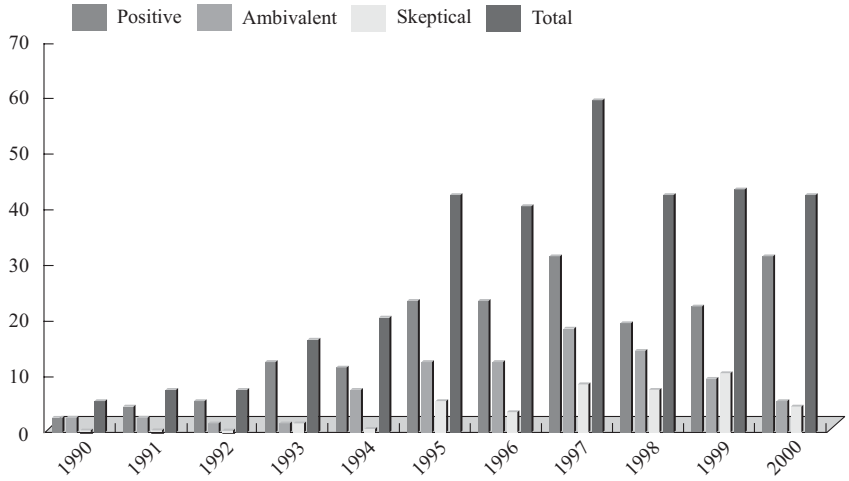
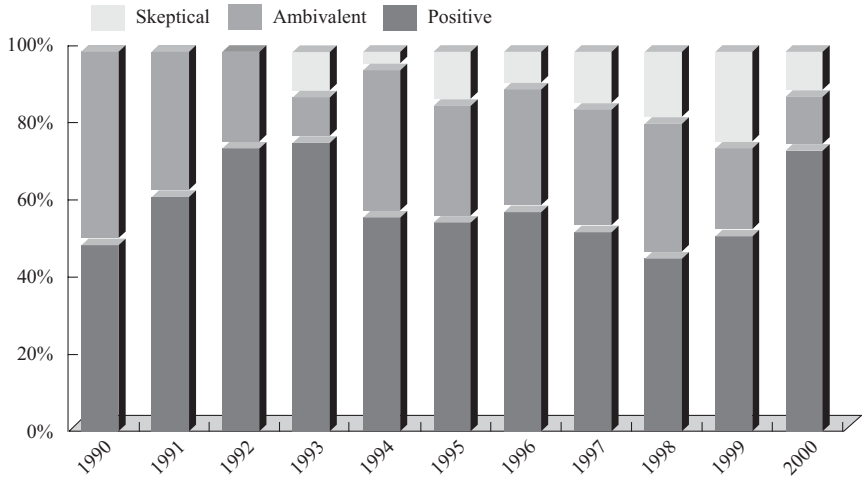


FIGURE 4
Attitude by year as a percentage of articles.



as a percentage of the total articles. After 1990, articles expressing a positive attitude toward the RMA consistently outnumbered those that were either ambivalent or skeptical. Moreover, those with a positive tone outnumbered both skeptical and ambivalent articles in all years except 1990 and 1998.

Figure 5 shows the attitudes of the authors by service affiliation. Figure 6 depicts the same data as a percentage of authors by service. As can be seen, more than two-thirds of the authors from the Navy, Air Force, and Marine Corps characterized the RMA as attainable and favoring the United States. Army authors were less enthusiastic, but

FIGURE 5
Attitude by service.

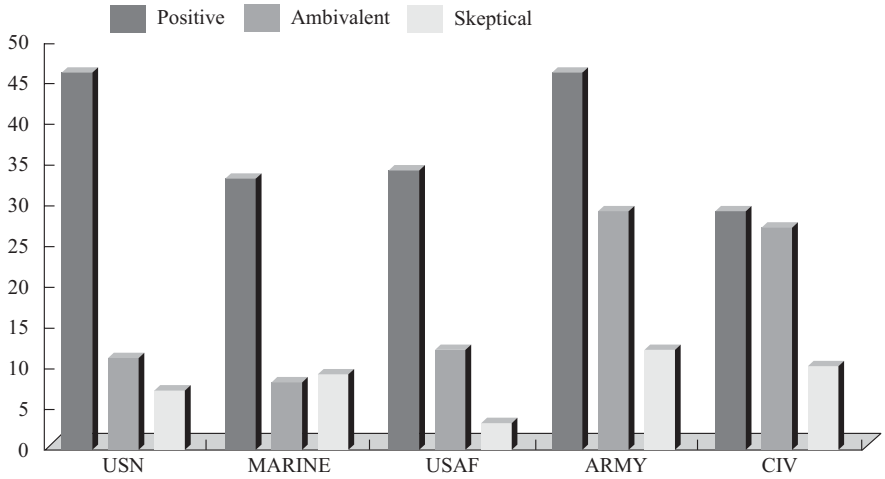
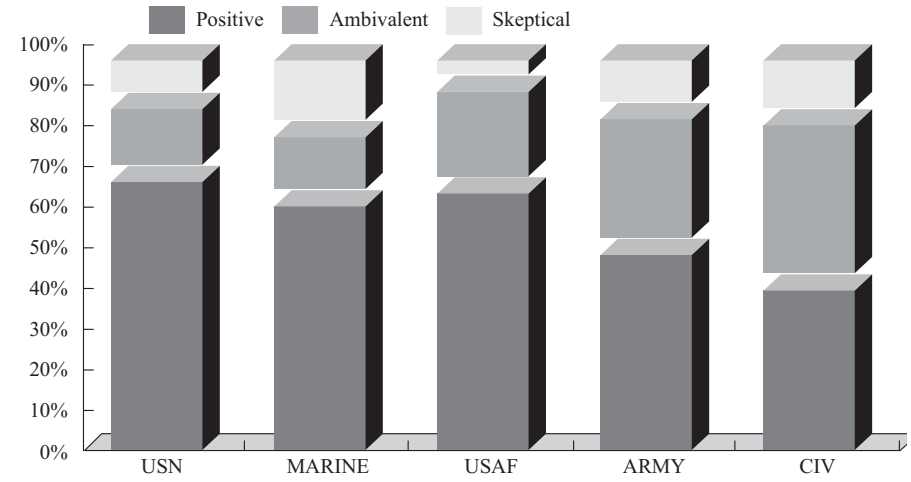


FIGURE 6
Attitude by service as a percentage of articles.



more than half were nonetheless positive about the RMA's impact. Only civilian authors demonstrated a preponderance of skepticism or ambivalence.

These results are somewhat at variance with the results of the 2000 survey. The latter indicated that Army and Marine Corps officers were consistently more skeptical of the RMA than were Navy and particularly Air Force officers. Of course, the survey involved the full range of officers attending professional military education (PME) courses, while the literature analysis involved only those officers and civilians who felt passionately enough about the subject to write about it.

FIGURE 7
Attitude by grade.

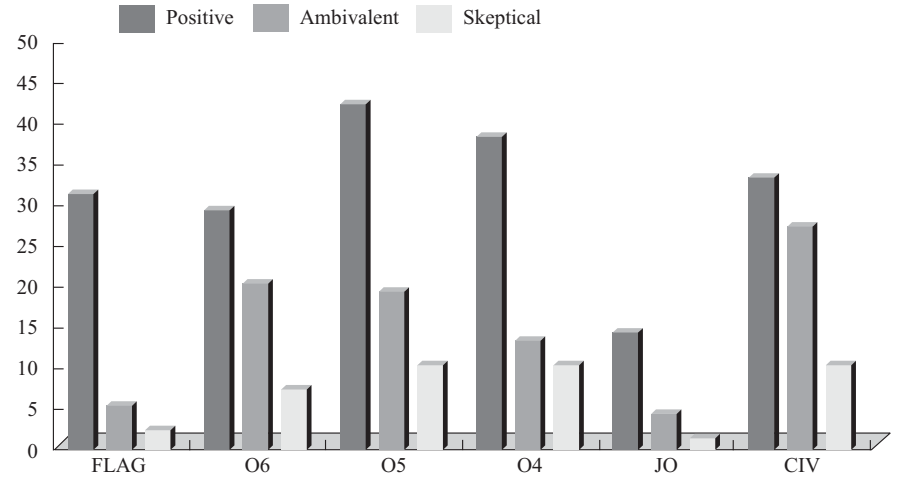


FIGURE 8
Attitude by grade as a percentage of articles.

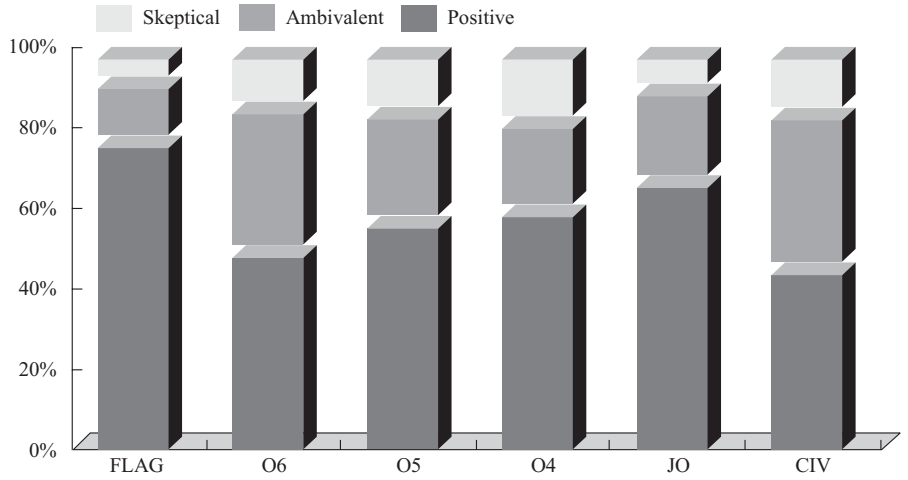


Figure 7 depicts the attitudes of the authors by grade. Figure 8 shows the same data as a percentage of authors by grade. Of note, there was an inverse relationship among the non-flag officers between positive attitude and rank—with positive attitude declining steadily from the most junior officers through O-6. However, the highest positive response, nearly 80 percent, was in the flag ranks. Although we did not specifically analyze the content of flag-authored articles to determine a possible reason for the positive tone, many tended to promote specific current military systems or programs that the author sought to associate with the positive attributes of "revolutionary" change.

FIGURE 9
Attitude by journal.

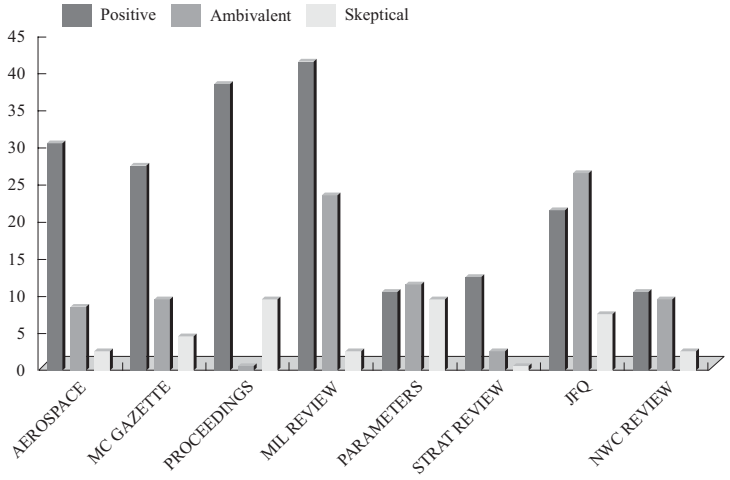
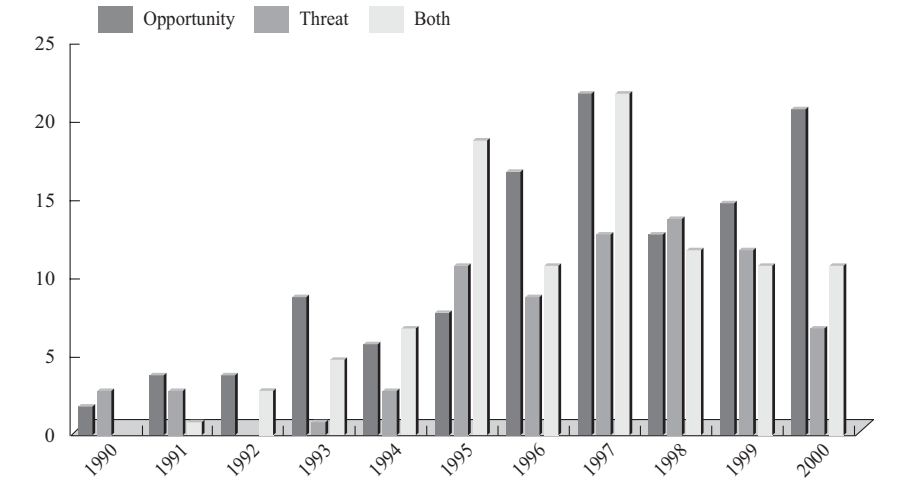


FIGURE 10
Imperative by year.



Nevertheless, at least 50 percent of all officer grades exhibited a decidedly positive attitude toward the RMA. The lowest positive response among major groupings of authors, and the only one to fall below 50 percent, came from civilians.

Here too, the results of the literature analysis differ from those of the 2000 survey. The latter found a less pronounced relationship between rank and attitude. To the extent that one did exist, it was senior rather than junior officers who tended to be most enthusiastic about the RMA. The fact that authors are self-selecting would appear to account for this discrepancy. In other words, while the vast majority of field-grade

FIGURE 11
Imperative by year as percentage of articles.

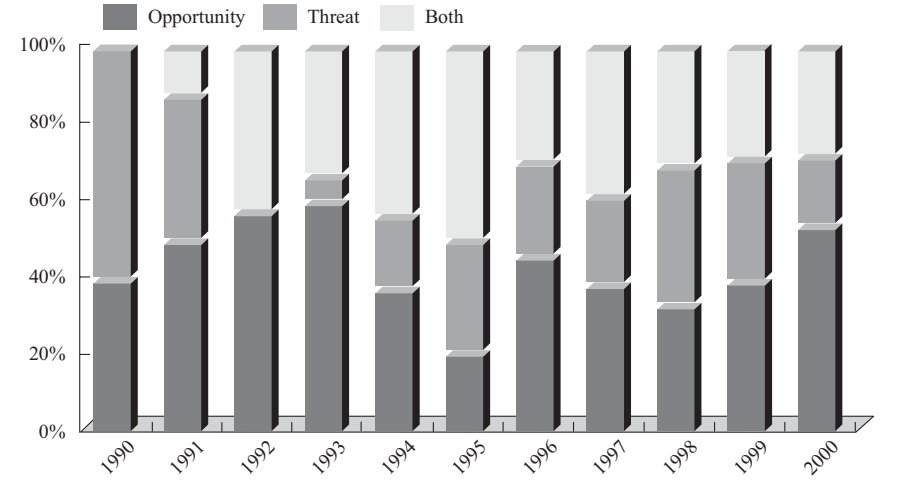
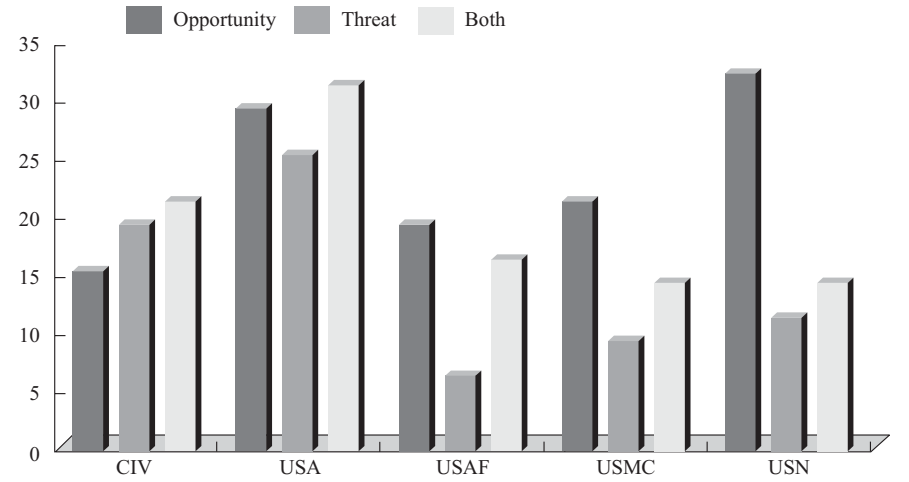


FIGURE 12
Imperative by service.



officers may be more skeptical about the RMA than their seniors, those field-grade officers who feel passionately about the subject are more positive than seniors who feel the same way.

Figure 9 depicts the attitude of the articles broken out by journal. Of interest is the high level of uncertainty that characterized the articles in the *Joint Force Quarterly* (published by the National Defense University for the Joint Chiefs of Staff), and the nearly even breakdown of attitudes appearing in the pages of the Army War College's

FIGURE 13
Imperative by service as a percentage of articles.

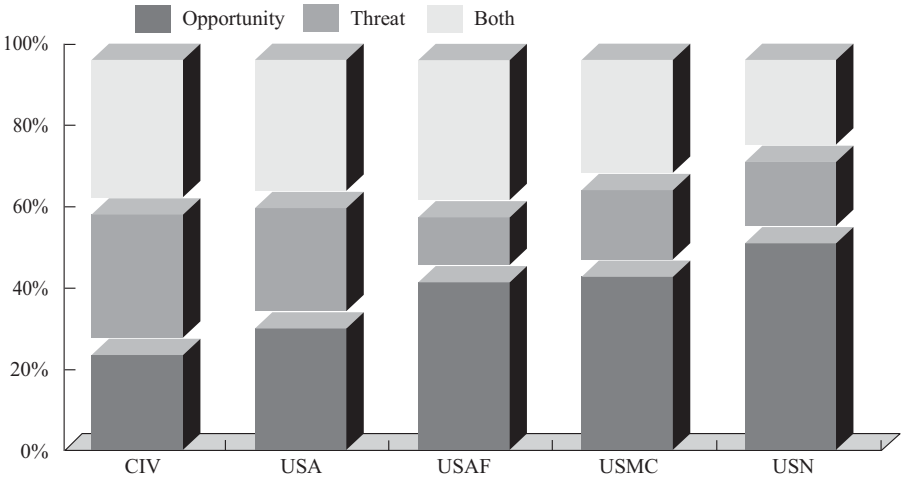
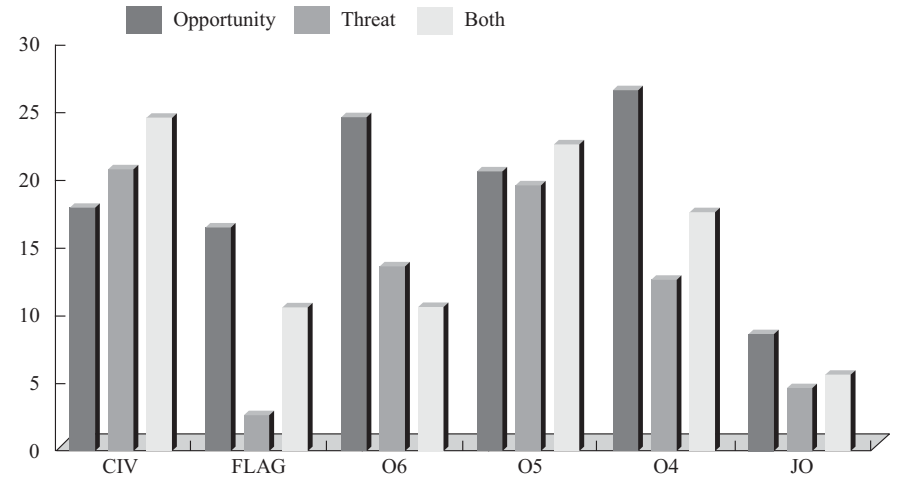


FIGURE 14
Imperative by grade.



journal, *Parameters*. We could not determine whether these outcomes were random or were the result of the journals' editorial policy.

Imperative. Figure 10 depicts the primary catalyst for change reflected in each of the articles over the period of the survey. Figure 11 shows the catalyst as a percentage of articles for a given year. Only in 1990 (the year with the fewest articles on this subject) was threat alone portrayed as the predominant reason for pursuit of the RMA. However, opportunity alone was at or above 50 percent in only three years of the survey (1992,

FIGURE 15
Imperative by grade as percentage of articles.

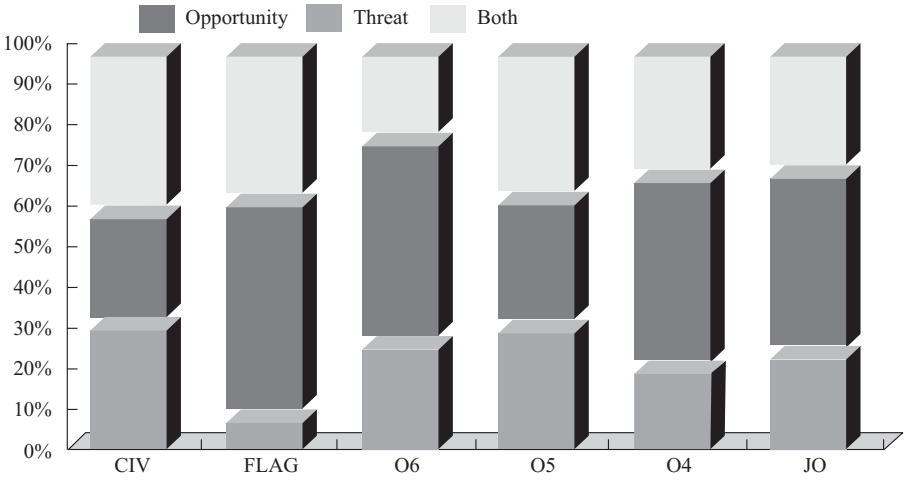
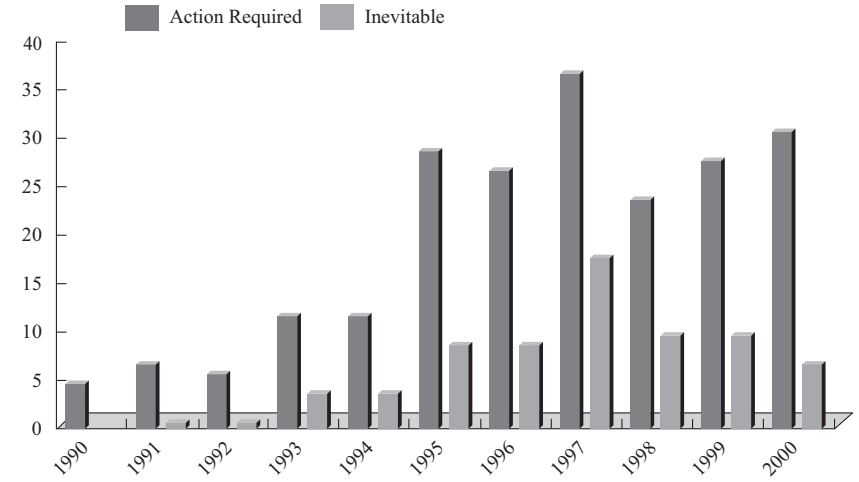


FIGURE 16
Call to action by year.



1993, and 2000), indicating that most authors in most years felt that the United States is compelled to take action to avoid some risk or penalty posed by the changing character of warfare.

The results of the literature analysis provide an interesting contrast with those of the survey. As noted in chapter 8, more than half of the officers that we surveyed felt that the U.S. armed forces needed to change radically to compete with future adversaries or were uncertain. On the other hand, large majorities of officers were unconvinced that future foes would be able to hold at risk major elements of our national power projection

FIGURE 17
Call to action by service.

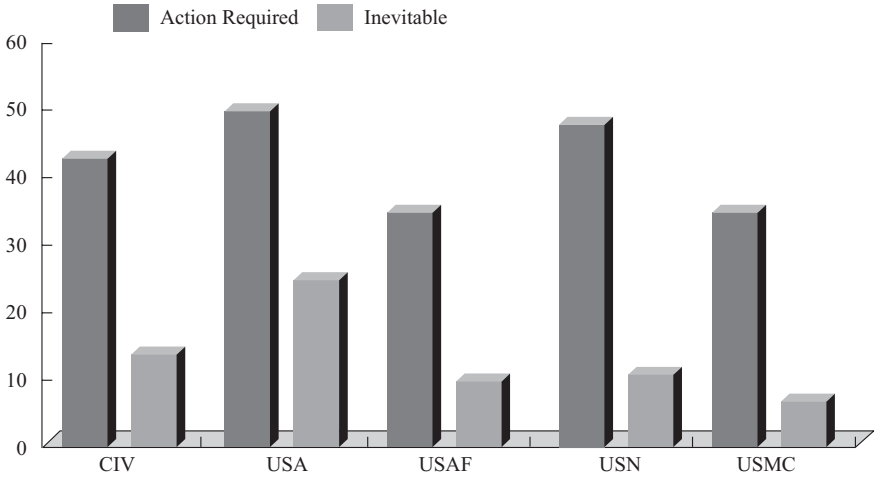
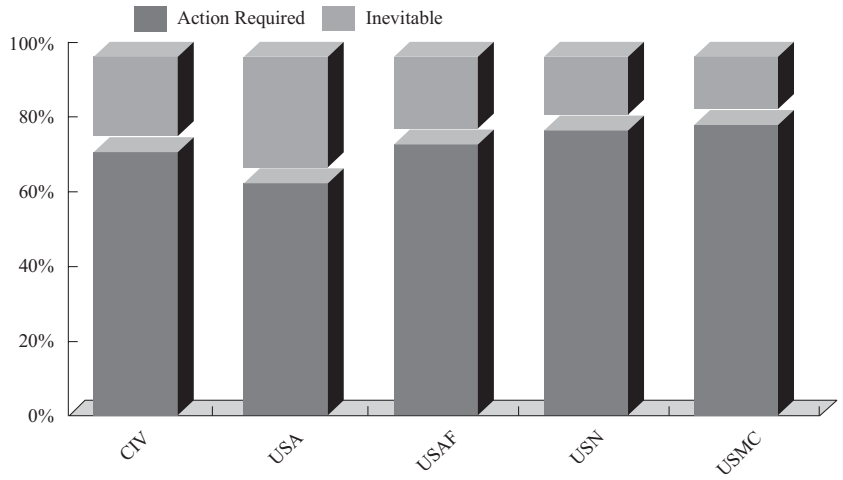


FIGURE 18
Call to action by service as percentage of articles.



capability or information infrastructure. In other words, it appears that authors are more concerned about the penalty for not transforming than are the overall officer population.

Figure 12 shows the imperative by service, and figure 13 the same data presented as a percentage of authors in each service. As can be seen, authors in the Navy were most prone to see opportunity alone as the primary reason for change—and this was the only group of authors in which opportunity was seen as the predominant catalyst in more than 50 percent of the articles. Opportunity as the primary imperative drops steadily in articles by the Marines, Air Force officers, Army officers, and finally

FIGURE 19
Call to action by grade.

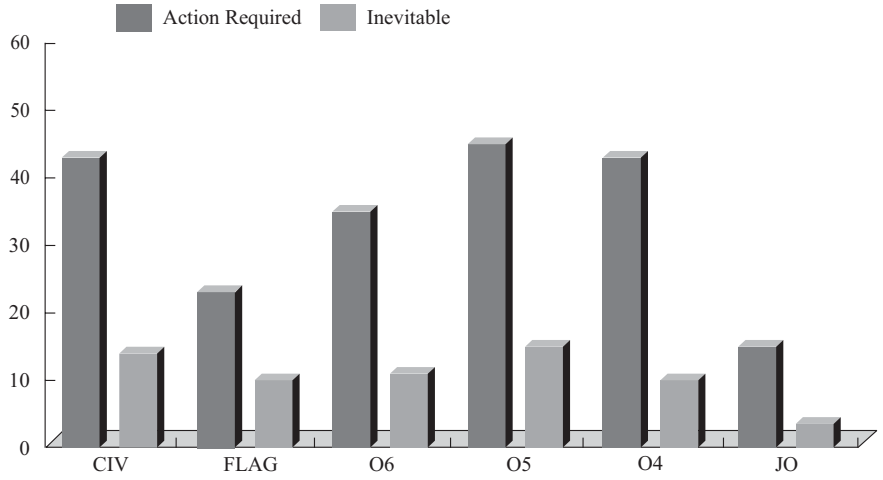
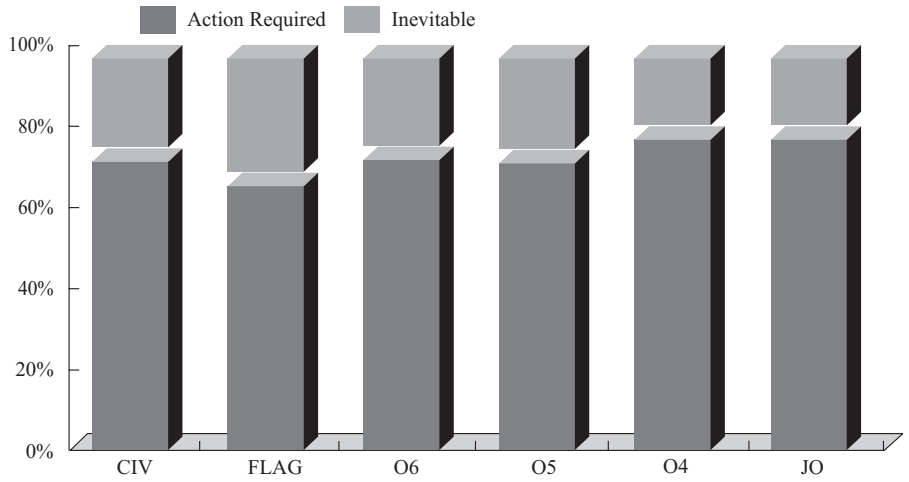


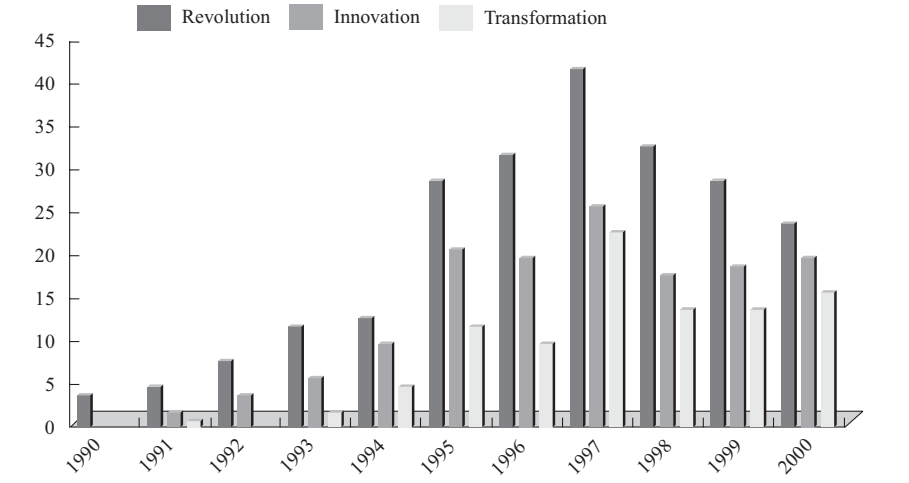
FIGURE 20
Call to action by grade as a percentage of articles.



civilians. However, only among the civilian authors did threat exceed opportunity, and in none of these groups was threat alone seen as the predominant catalyst for change.

Figures 14 and 15 depict the imperative for change by grade of author. For all groups, threat alone was seen as a minor catalyst—not rising above one in three. In contrast to the officer attitude survey, the flag-grade authors showed the least concern for the threat aspects of the RMA, with only one in ten seeing threat alone as the primary reason for change. As noted above, this may stem from the fact that many of the flag-

FIGURE 21
Terminology.



written articles were seeking to promote specific future capabilities or systems that were perhaps touted as representative of an RMA as a marketing technique rather than an objective assessment of the impact of revolutionary change.

Call to Action. Figure 16 depicts the trend by year for those authors who concluded that action is required to achieve an RMA, and for those who concluded that such an outcome is inevitable (thus the only challenge being how we are to deal with such change). Those seeing a need for action consistently outnumbered by more than two to one those who believed that the U.S. military is inexorably evolving into an RMA capability. Moreover, the call to action has continued to rise as a percentage of all articles since 1997. Figures 17 and 18 show the call to action broken out by service affiliation. Figures 19 and 20 depict the call to action by grade. As can be seen, there is no major variation among the services or grades of the authors.

Use of Terms. Finally, figure 21 shows the number of articles using the terms "revolution," "innovation," and "transformation" (with each term counted only once per article). The terms appeared in sequence in the early 1990s, as subsequent articles dealing with RMA issues began to focus more on the processes required to achieve revolutionary goals. All three terms reached a peak appearance in 1997, with the term "revolution" dropping off steadily in subsequent years, while "innovation" and "transformation" continued to hold strong. This may reflect a general perception in the literature that the term "revolution" had perhaps become so widely employed in the mid-1990s that it was losing both its impact and a consistent definition—while the need for innovation and transformation were undiminished. Nevertheless, articles using the term "revolution" continued to outnumber those using either of the other terms through the year 2000.

Conclusions

One must be careful in attempting to draw definitive conclusions from a literature analysis such as this. The attitudes of the authors of these professional journal articles do not necessarily reflect the attitudes of the officer corps as a whole. Moreover, this study covered an eleven-year period when each of the services was transitioning out of its Cold War force justification and undergoing a dramatic drawdown in personnel. Thus the articles represent an evolving series of attitudes of a small number of self-selected individuals who were conversant in this subject and felt compelled to put their ideas in print.

Since many of the authors in the survey published more than one article, an interesting question is whether a change in attitude could be tracked among those who published at different promotion levels over a sequence of years. Only 10 of the 257 different

principal authors in the survey were commissioned officers who published at different grades. Most of these (a total of six) published at both the O-5 and O-6 level. Only one officer published at three different grade levels (O-3, O-4, and O-5).

Nevertheless, there are some general insights that might be drawn from the literature survey:

First, the call for action remained very strong, but threat alone was seen as a minor catalyst for change. Most journal articles portrayed future opportunity as the primary reason that the U.S. military should transform itself.

Second, junior officers and enlisted personnel published the least among all grades on the subject of technology-driven change, yet these were the individuals who were most likely to be directly operating those future technologies with potentially revolutionary impact.

Third, the consistent call for action in the military's primary professional journals over the past decade was not reflected in the officer attitude survey conducted in 2000. It is possible that most officers do not find the argument for change compelling. On the other hand, it would appear that most officers simply do not read their own professional journals. Focus group participants were queried on the extent to which they subscribe to, or read, the eight principal journals. About half stated that they "occasionally" read articles from at least one of the journals, but less than one in ten Army and Navy officers, and less than three in ten Air Force officers said that they regularly read most or all of any one journal. This low level of readership suggests that the military professional journals are a poor venue for the promotion of new ideas within the military officer corps.

CHAPTER TEN

Conclusions and Implications

As we noted at the beginning of this monograph, analysts have characterized the attitudes of the U.S. officer corps toward innovation in various ways. Some have asserted that the culture of the U.S. armed forces emphasizes technology over other, less tangible, determinants of battlefield success, such as training and leadership.[115] To them, the U.S. armed forces have embarked upon a quest for the Holy Grail of "dominant battlespace knowledge," while ignoring the persistence of friction on the modern battlefield.[116] Others have argued, with equal force, that the U.S. military is reluctant to embrace new ways of war, particularly those that threaten existing weapons, doctrine, and organizations. Rather than adapt to the information age, they see the services as perpetuating increasingly outmoded approaches to combat.[117]

While our study yielded some evidence to support each view, it also revealed how simplistic such characterizations may be. On the one hand, our survey found that the U.S. armed forces are highly supportive of information-age ways of war, at least in the abstract. For example, 85 percent of the officers we surveyed believed that forces employing information-age technology, doctrine, and organizations would enjoy a substantial edge over those that do not. Seventy-five percent felt that new ways of war would give the United States dominance over the full range of adversaries. A majority of officers predicted that information-age ways of war would make it easier to use force with decisive results and a reduced risk to U.S. casualties. They also believed strongly in the growing importance of space and cyberspace. Seventy-six percent felt that within the next twenty years conflicts would include combat operations in or from space. Eighty-five percent believed that within the same period computer network attack would become a central feature of military operations. A large number felt that we either are, or may be, undergoing "radical" change to information age ways of warfare.

What exactly "radical" change is, however, is open to interpretation. The officers we surveyed tended to equate transformation with marginal improvements to current weapons and doctrine rather than the development of fundamentally new capabilities.

A majority believed that today's dominant systems—tanks, manned aircraft, and aircraft carriers—would be as important in twenty years as they are today. And the vast majority of officers were unwilling to reduce force structure or readiness to invest in new approaches to warfare. In fact, such statements garnered the strongest negative responses of the survey. Perhaps the fact that many officers believe that "radical" change is already underway explains why they see no reason to reduce force structure or readiness to invest in new approaches to warfare.

Our reading of past cases of transformation suggests that change is often triggered by the recognition of a pressing strategic or operational problem that cannot be handled through improvements to the existing force, but rather requires a new approach. During the 1920s and 1930s, for example, the expectation of a two-front war helped prod the German army into exploring the potential of combined-arms armored warfare and tactical aviation.[118] During the same period, the possibility that the United States would have to cross the Pacific to defend or re-conquer the Philippines from Japan drove the U.S. Navy to explore offensive carrier warfare and the U.S. Marine Corps to develop amphibious landing doctrine.[119] The 2001 *Quadrennial Defense Review*, for its part, argues that the Defense Department's transformation efforts should focus upon overcoming six emerging strategic and operational challenges:

- Protecting critical bases of operations, including the U.S. homeland, forces abroad, allies, and friends, and defeating weapons of mass destruction and their means of delivery;
- Assuring information systems in the face of attack and conducting effective information operations;
- Projecting and sustaining U.S. forces in distant anti-access or area-denial environments and defeating anti-access and area-denial threats;
- Denying enemies sanctuary by providing persistent surveillance, tracking, and rapid engagement with high-volume precision strike against critical mobile and fixed targets;
- Enhancing the capability and survivability of space systems and supporting infrastructure; and
- Leveraging information technology and innovative concepts to develop an interoperable, joint C4ISR architecture and capability that includes a joint operational picture that can be tailored to user needs.[120]

The officers whom we surveyed expressed great confidence in the ability of the U.S. armed forces to deal effectively with such threats. They did not believe that adversaries would be able to hold at risk the primary elements of U.S. power projection. Only 9 percent felt that future adversaries would be able to use ballistic or cruise missiles to destroy fixed infrastructure, such as ports, airfields, and logistical sites. Twelve percent

predicted that they would be able to attack carrier battle groups. They were also skeptical of the ability of future adversaries to deny the United States the use of information networks. In each case, they may be unaware of current and projected threats or may believe that current programs are sufficient to deal with these challenges.

Understanding Officer Attitudes

What accounts for these attitudes? Where do they come from, and what might cause them to change? Two major explanations seem plausible. The first is that the culture of the armed services plays a dominant role in shaping officer attitudes. Even in an era of jointness, an officer derives his primary identity from his service. Moreover, each service has a unique personality, one shaped by its history, traditions, mission and operational environment.[121] If this hypothesis is correct, then the views of an Army major are likely to resemble those of an Army colonel more closely than those of an Air Force major.

Another explanation is that an officer's experiences play a prominent role in shaping his views. Today's junior and field-grade officers entered the armed forces at the very end of the Cold War, if not after. To them, the U.S.-Soviet competition is an increasingly remote and abstract historical event. Rather, they have spent the majority of their military career in a period of unquestioned U.S. military, political, and economic dominance. They have witnessed or participated in a series of conflicts in which American technological superiority appears to have played a central role. Senior and flag officers, by contrast, joined the U.S. armed forces either during or immediately after the Vietnam War. They lived through the demoralization that followed the U.S. withdrawal from Southeast Asia, the hollow armed forces of the mid- to late-1970s, and a string of failed or partially successful military operations, such as the 1980 failed Iran hostage rescue mission and the 1983 bombing of the Marine barracks in Beirut. It is reasonable to suppose that these experiences have produced officers with different attitudes toward innovation and transformation. If this view is correct, then the attitudes of our hypothetical Army major are likely to resemble those of a major in the Air Force or Marine Corps or a lieutenant commander in the Navy more closely than those of an Army colonel.

Another source of experience is combat. War is one of the most intense events that a human can face. It seems plausible that those who have seen combat will have attitudes markedly different from those who have not. In particular, one might expect officers who have witnessed the friction of combat—particularly in low intensity combat operations—to be more skeptical of technology-driven changes in war than those who have not.

Service Affiliation

In chapter one we hypothesized that an officer's service affiliation might influence his attitude toward innovation. Specifically, we predicted that Air Force officers would be the most enthusiastic about, and Army and Marine Corps officers the most skeptical of, emerging warfare areas, with Navy officers in the middle. The results of this project support this hypothesis. Indeed, it is telling that more than fifteen years after the Goldwater-Nichols Act, which was designed to make the U.S. armed forces more "joint," service affiliation remains the strongest determinant of officer attitudes that we could identify.

Army and Marine Corps officers were consistently more skeptical of the proposition that we are experiencing a revolution in warfare than their Navy and Air Force counterparts. Army officers who chose to write about innovation issues were the least enthusiastic of any group of military officers. Army and Marine Corps officers who participated in the survey tended to feel most strongly that today's dominant weapon systems and organizations would be as important in the future as they are today. Conversely, they tended to be more skeptical than their Navy and Air Force counterparts that the information revolution is changing the character of warfare. They believed less strongly than other officers that the United States was embarked upon a path to radical change. Indeed, they were the most doubtful of the need for the U.S. armed forces to change radically.

Air Force officers, by contrast were as a group the most supportive of the notion that we are experiencing an RMA. Air Force authors of articles on innovation and transformation were more enthusiastic than their counterparts in the other services. Many Air Force officers who participated in our survey believed that coming years would witness a reduction in the importance of currently dominant systems. Indeed, half predicted that manned aircraft would become less important—and unmanned systems such as the UCAV more important—over time. They tended to feel most strongly that the information age would allow the United States to use force more easily, with greatly reduced chance of incurring U.S. casualties, and with a greater chance of achieving a decisive victory.

Navy officers were more skeptical than Air Force officers but more enthusiastic than Army and Marine Corps officers. Not surprisingly, they held the strongest belief in the enduring importance of the carrier battle group. However, they also felt strongly that information-age ways of war would make it increasingly easy for the United States to use force and achieve decisive victories with substantially reduced risk of American casualties.

While we detected significant service differences throughout most of the survey, several areas were marked by consensus. For example, officers of all services believed that space and cyberspace would play an increasingly important role in combat. They felt

that future adversaries would not be able to hold at risk the U.S. power projection infrastructure and information networks. They also were unwilling to support tradeoffs between force structure and readiness, on the one hand, and investment in transformation, on the other.

Enthusiasm toward the revolution in military affairs appears to be related to the service's reliance upon advanced technology. In absolute terms, of course, the U.S. armed forces utilize more information-age technology than many foreign militaries. However, not all services rely upon hardware (and software) to the same extent. The U.S. Air Force relies most heavily upon technology, followed by the Navy. The Army and Marine Corps are less technology-intensive services. It is hardly surprising, therefore, that Air Force and Navy officers are more enthusiastic than Army and Marine Corps officers about the ability of information-age systems, doctrine, and organizations to change the character and conduct of warfare.

The conduct of recent conflicts may have reinforced these tendencies. Throughout the 1990s, the United States relied heavily upon standoff, air-delivered weapons in combat. Air power—in the form of manned aircraft and unmanned cruise missiles—was the weapon of choice. Moreover, the United States' advantage in high-technology arms appeared to play a major role in its lopsided victories in the Persian Gulf and the Balkans in the 1990s. By contrast, conflicts with more ambiguous outcomes, such as Somalia and Haiti, involved ground forces. It is therefore hardly surprising that Air Force—and to a lesser extent Navy—officers believed more strongly than their Army and Marine Corps counterparts that the information revolution is changing the character of war.

Branch Affiliation

While service affiliation was a major determinant of officer attitudes, we found no overall correlation between an officer's attitudes and branch affiliation. Officers did, however, strongly believe in the enduring importance of their branches. For example, while 51 percent of all officers felt that armored and mechanized formations would be as important in 2020 as they were in 2000, 72 percent of Army armor branch officers agreed with the statement. Similarly, 58 percent of the overall survey population, but 65 percent of aviators, believed that manned aircraft would be as important in 20 years as they are today. And 45 percent of space officers were in favor of the establishment of a separate space service, compared to 25 percent of the general survey population.

These findings imply that civilian and military leaders should exercise care in finding organizational homes for innovative weapons, organizations, and concepts. Rather than trying to turn fighter pilots into unmanned aerial vehicle operators, for example, it might be worthwhile to look to other communities, such as intelligence personnel, to

fill these roles. Rather than turning tank drivers into operators of light armored vehicles, it might be worthwhile to consider vehicle operators.

Combat Experience

While we hypothesized that the attitudes of veterans would differ from those of non-veterans, we found no correlation between an officer's combat experience and his attitudes toward transformation. Rather, combat veterans and non-veterans displayed similar attitudes toward the emerging RMA, its impact on today's dominant weapons, its effect on the character of war, and the depth of change that is required to exploit the information revolution. Nor did veterans of a particular conflict have views that differed from non-veterans. It may be that the veterans' combat experience did not prove particularly compelling. Or it may have affected different people in ways that on average offset one another. In either case, combat experience did not make officers noticeably more enthusiastic or skeptical toward innovation.

Rank

We hypothesized that an officer's rank would influence his attitude toward innovation. In particular, we speculated that lower- and middle-ranking officers were likely to be more enthusiastic about new ways of war than senior officers. In fact, we found that an officer's rank had a much less pronounced impact upon his attitudes toward innovation than his service affiliation. Moreover, the influence of rank was not clear-cut. On the one hand, our analysis of articles on innovation revealed flag officers to be the most enthusiastic of any group of respondents. This was particularly true when they were advocating a particular program. Below the flag ranks, however, we detected an inverse relationship between an officer's rank and his enthusiasm toward innovation; the higher an officer's rank, the less enthusiastic he tended to be.

The results of the survey revealed a somewhat different picture. In many cases there were no significant differences in attitude among officers of various ranks. In those instances where there were significant differences, senior officers tended to be more enthusiastic than junior officers. The higher an officer's rank, for example, the less his enthusiasm and the greater his uncertainty regarding the continued importance of today's dominant weapons.

The relationship between an officer's rank and his attitude toward innovation is thus a complex one. Having spent less time in uniform than their superiors, junior officers are likely less influenced by service culture. However, junior officers have a narrow base of experience upon which they can draw. While they are experts in their specialty, they have little experience outside their branch or community. Moreover, most are quite

naturally concerned with promotion, something that their service and branch controls. Such concerns moderate any desire to challenge the conventional wisdom.

The picture is just as mixed when it comes to senior officers. On the one hand, they have had more time to become indoctrinated into their service's culture. On the other, they have served longer in the military and have had the opportunity to witness more change throughout their careers. They also have much greater experience outside their branch or service than junior officers.

It appears that junior officers do not see transformation as something that is important to them. Our focus groups show that while some junior officers think about new ways of war, few read professional journals and very few are sufficiently motivated to actually write about emerging ways of war. While junior and field-grade officers make up the majority of the officer corps, they wrote only one-third of the articles that we examined.

In short, we found that both culture (expressed through service affiliation) and experience (expressed through rank) affected officer attitudes. One way to judge the relative importance of these factors would be to examine how, if at all, the 11 September 2001 terrorist attacks on the World Trade Center and the Pentagon and subsequent events have changed officer attitudes. If organizational culture is more important than experience, then one should expect service attitudes to remain relatively stable despite these developments. Conversely, if experience plays a more dominant role, then one would expect the post-911 events to trigger attitude changes that would overwhelm service culture.

Implications for Policy

The results of this project should give policy makers pause. They reveal an officer corps that is confident in the ability of the United States to control the terms of an engagement in a war against a competent adversary. While we should wish that that would be the case, officers seem generally uninformed regarding future threats outside of their own tactical specialties, particularly those involving ballistic and cruise missiles and information warfare. Indeed, in these areas officers appear to have confidence bordering on complacency. While the officers who participated in our survey expressed great faith in their service's commitment to innovation, their understanding of current Defense Department initiatives was tempered by their limited exposure to professional military journals. In addition, by their own admission, they lacked an understanding of developments outside their service.

This lack of broad knowledge about future threats and the capabilities and limitations of emerging weapon systems and doctrine may not present a problem so long as officers are not required to make operational or programmatic decisions beyond their own tactical-technical expertise. However, as officers become more senior, they tend to be

assigned to both service and joint positions with responsibilities that extend well across many tactical specialties. This raises the questions of what specifically senior officers, and especially flag officers, need to know about warfare to be fully effective in such assignments—and how they are to gain this knowledge.

It is worth emphasizing that the officers we surveyed were students at professional military education institutions. The remainder of the officer corps is, if anything, less well informed. It would seem prudent for the military to seriously question the adequacy of our officer training and education programs in the areas of future threats and joint warfighting capabilities. Moreover, the Defense Department needs to consider ways to disseminate critical information outside of an officer's relatively infrequent assignment to formal training and education programs. The fact that officers pay little attention to professional military journals implies that this will be a challenge.

The results of this study also highlight the need for the Defense Department leadership to define what is meant by "transformation." The *Quadrennial Defense Review* notes that "Transformation results from the exploitation of new approaches to operational concepts and capabilities, the use of old and new technologies, and new forms of organization that more effectively anticipate new or still emerging strategic challenges and opportunities and that render previous methods of conducting war obsolete or subordinate."[122] While a reasonable starting point, such a definition lacks a specific articulation of the missions and attributes of the transformed force, how those attributes are to be measured, and the relevance of existing systems, concepts, and organizations to that goal. The latter is a particularly difficult problem. The leadership of the Defense Department has so far avoided the programmatic and budgetary implications of defense transformation. Early suggestions of force structure changes and program cancellations yielded a firestorm of objections from the services, Congress, and the defense industry. Since then, there has been an absence of open discussion of transformation, particularly those elements that could threaten existing programs. However, it seems unlikely that any meaningful debate over the merits of transformation can occur without a serious discussion of the viability of current systems. This includes a realistic discussion of emerging threats that might render current approaches untenable over the long term—thus requiring new approaches. This is obviously difficult, because it is hard to determine combat outcomes in the absence of combat. Moreover, it is difficult to discuss the threat objectively without moving rapidly into programmatic issues.

In short, advocates of major change have their work cut out for them. They must formulate a compelling rationale for transformation, one that will resonate with the broad officer corps. They also must develop a strategy for educating the officer corps about transformation. Our analysis suggests that most officers are open to the prospect of

change if they are provided a good rationale, but that they have yet to hear a compelling argument for adopting significant alternatives to existing forces. Efficient and timely transformation requires a clear rationale and an effective means to communicate that message.

Topics for Further Research

The results of this project suggest several avenues for future research. First, they demonstrate the need for additional research and analysis to refine further our understanding of military officer attitudes toward transformation. In particular, are there any threats or opportunities that might justify truly major force changes? What would they define as major or "radical" changes? How confident are they in their own ability to make such assessments? How concerned are those who are not confident in their knowledge/abilities? How much confidence do they have in those they believe are charged with those decisions? What do they see as the most significant attributes of the future transformed force? Why do or might they discount some of the threats posed by the QDR? How much confidence do they have in those assessments? Can they conceive of any future problems/threats that cannot be countered directly with superior U.S. technological "know-how"? Do they have confidence in advanced technological solutions to very thorny problems like defense against ballistic and cruise missiles, mines, torpedoes, submarines, and information attacks?

We would also like to know more about how officers get their information. Do they read professional journals? What do they think of them? Why do they not read journals? Do they read books? Do they read anything outside of tactical-technical manuals?

A second, related, task would be to measure the impact of the war on terror on officer attitudes toward transformation. The terrorist attacks on the World Trade Center and Pentagon may, for example, have affected officer attitudes toward the type and severity of threats that the United States is likely to face in the future. Similarly, the conduct of Operation ENDURING FREEDOM in Afghanistan and Operation IRAQI FREEDOM may have altered officers' attitudes toward the utility of current weapon systems, the desirability of emerging ways of war, or the character of information-age warfare. It would therefore be desirable to conduct a post–September 11 survey of the officer corps.

Third, this project has uncovered several areas where the attitudes of U.S. officers diverge markedly from those of America's friends and allies. International officers see the United States as more capable of using force to achieve decisive battlefield results with a substantially reduced chance of incurring casualties than their U.S. counterparts. However, they also see the United States as more vulnerable to anti-access and

information warfare threats than American officers. It would therefore be useful to survey foreign officers more systematically and in greater depth.

Finally, it would be useful to survey officers assigned to "innovative" units within the U.S. armed forces, including the Army's medium-weight Interim Brigade Combat Teams (IBCTs) and Air Force unmanned aerial vehicle (UAV) squadrons. Such a survey could help determine whether hands-on experience with innovative systems, doctrine, and organizations increases enthusiasm for transformation. It would also reveal how members of these organizations perceive their status within their respective services.

APPENDIX A

Survey Instrument

A Survey of Attitudes Toward Future Warfare

In recent years, a number of observers in the military, government, and academia have argued that we are experiencing a revolution in military affairs brought on by the growth and diffusion of stealth, precision, and information technology. They argue that emerging technology, coupled with innovative operational concepts and organizations, will substantially alter the conduct of war on land, at sea, and in the air. War may also expand into outer space and the information spectrum.

Emerging technology and concepts may alter the character and conduct of war in at least two ways. The first is that long-range precision strike weapons, coupled with very effective sensors and command and control systems, will become a dominant factor in future warfare. The second is that protection of the effective and continuous operation of one's own information systems, and being able to degrade, destroy, or disrupt the function of the opponent's, will become a priority. Other concepts may emerge as well.

This survey is designed to evaluate your attitudes about future warfare. After you answer a few background questions, you will find that the majority of items ask you to indicate the extent to which you agree or disagree with a statement by simply placing a mark at the corresponding location on a seven point rating scale. Two additional items ask you to indicate which factor in a pair of factors is most important.

DEMOGRAPHIC DATA									
What is your age?									
How many years of commissioned service do you have?									Years
What is your designator/MOS/specialty?									
Your Rank?									
	O-1	O-2	O-3	O-4	O-5	O-6	O-7	O-8	Other
Your service?									
	USA/ USAR	USN/ USNR	USMC/ USMCR	USAF/ USAFR	USCG	ARNG	ANG	Inter-national	Civilian
Your highest degree received?									
				BA/BS	MA/MS	Ph.D/ MD/JD	Other	College Major?	
Citizenship (if other than U.S.)									
• Did you receive the Kuwait Liberation Medal for participation in Operation DESERT SHIELD/STORM?								☐ Yes	☐ No
• Did you participate in combat or combat support operations in the BALKANS?								☐ Yes	☐ No
• Did you participate in combat or combat support operations in SOMALIA?								☐ Yes	☐ No
• Did you participate in combat or combat support operations in HAITI?								☐ Yes	☐ No
• Have you completed a resident PME course?								☐ Yes	☐ No

INDICATE THE EXTENT TO WHICH YOU AGREE OR DISAGREE WITH EACH STATEMENT BY PLACING A MARK ON THE SCALE TO THE RIGHT OF IT.	I STRONGLY DISAGREE ↓	↓	↓	I AM UNSURE ↓	↓	↓	I STRONGLY AGREE ↓
• Military forces employing information-age technology, doctrine, and organizations will enjoy a substantial edge over those that do not.							
• The exploitation of new technology, doctrine, and organizational concepts will favor the U.S. over the full spectrum of potential adversaries.							
• Other states have no incentive to exploit new technology, doctrine, and organizational concepts.							
• Adversaries will exploit new technology, doctrine, and organizational concepts before the U.S. can field similar capabilities.							
• New technology, operational concepts, and organizations will give adversaries an advantage over the U.S. in future conflicts.							

	I STRONGLY DISAGREE ↓	↓	↓	I AM UNSURE ↓	↓	↓	I STRONGLY AGREE ↓
• Information systems and networks are highly vulnerable to enemy countermeasures.							
• Armored and mechanized formations will be as important in 2020 as they are today.							
• Manned aircraft will be as important in 2020 as they are today.							
• Carrier Battle Groups will be as important in 2020 as they are today.							
• Those who believe that emerging technology will substantially alter the conduct of war are unrealistic.							
• The ability to strike an adversary with precision from a distance will diminish the need for the U.S. to field ground forces.							
• It is imperative that the U.S. armed forces become truly joint.							
• The need to maintain separate services will diminish over time.							
• The U.S. armed forces must radically change their approach to warfare to compete effectively with future adversaries.							
• The U.S. armed forces are currently embarked upon a path that will lead to a radical change in military technology, doctrine, and organization.							
WITHIN THE NEXT TWENTY YEARS:	I STRONGLY DISAGREE ↓	↓	↓	I AM UNSURE ↓	↓	↓	I STRONGLY AGREE ↓
• Sensor and command and control technology will allow the U.S. armed forces to locate, track, and destroy enemy forces within a limited geographic area, regardless of enemy countermeasures.							

WITHIN THE NEXT TWENTY YEARS:	I STRONGLY DISAGREE ↓	↓	↓	I AM UNSURE ↓	↓	↓	I STRONGLY AGREE ↓
• Conflicts will include combat operations in or from space.							
• Attacks upon computer networks will become a central feature of military operations.							
• The continued incorporation of conventional precision-guided munitions into U.S. forces will permit deep reductions in the U.S. nuclear stockpile.							
• Uninhabited combat aerial vehicles will become the predominant means of conducting strike warfare.							

• Four factors that play a role in the conduct of war are paired against each other below. For each pair, check the box adjacent to the factor you think is the more important of the two. While it may be difficult to choose between one factor or another, for the purposes of this survey, consider which factor in each pair is more important "after all things are considered" or "in the final analysis." In the "sample" below, the box checked adjacent to "A" indicates "A" was considered more important than "B" *after all things were considered*.

SAMPLE →	"FACTOR A" ☑	OR	☐ "FACTOR B"
	↓	or	↓
Which is more important? →	Technology ☐	or	☐ Doctrine
Which is more important? →	Technology ☐	or	☐ Manpower
Which is more important? →	Technology ☐	or	☐ Training
Which is more important? →	Doctrine ☐	or	☐ Manpower
Which is more important? →	Doctrine ☐	or	☐ Training
Which is more important? →	Manpower ☐	or	☐ Training

FUTURE ADVERSARIES WILL BE ABLE TO . . .	NOW ↓	IN 5 YEARS ↓	IN 10 YEARS ↓	IN 15 YEARS ↓	IN 20 YEARS ↓	IN > 20 YEARS ↓	NEVER ↓
a. Use long-range precision strike weapons such as ballistic and cruise missiles to attack large ground formations.							
b. Use long-range precision strike weapons such as ballistic and cruise missiles to attack U.S. carrier battle groups.							

FUTURE ADVERSARIES WILL BE ABLE TO . . .	NOW ↓	IN 5 YEARS ↓	IN 10 YEARS ↓	IN 15 YEARS ↓	IN 20 YEARS ↓	IN > 20 YEARS ↓	NEVER ↓
c. Use long-range precision strike weapons such as ballistic and cruise missiles to destroy fixed military infrastructure, such as ports, airfields, logistical sites.							
d. Deny the U.S. the use of information networks.							

• Six challenges that confront the U.S. are paired against themselves below. For each pair of challenges, place a check in the box next to the challenge you feel is more important of the two. For example, in the "sample" below, if you thought "A" was more of a challenge than "B," you'd place a check in the box next to "A."

Which will be more challenging?			
	"Challenge A" ☑	or	☐ "Challenge B"
	↓	or	↓
	Humanitarian Operations ☐	or	☐ Weapons of Mass Destruction
	Humanitarian Operations ☐	or	☐ Terrorism
	Humanitarian Operations ☐	or	☐ Information Warfare
	Humanitarian Operations ☐	or	☐ Expansionist Regional Powers
	Humanitarian Operations ☐	or	☐ Peer Competitors
	Weapons of Mass Destruction ☐	or	☐ Terrorism
	Weapons of Mass Destruction ☐	or	☐ Information Warfare
	Weapons of Mass Destruction ☐	or	☐ Expansionist Regional Powers
	Weapons of Mass Destruction ☐	or	☐ Peer Competitors
	Terrorism ☐	or	☐ Information Warfare
	Terrorism ☐	or	☐ Expansionist Regional Powers
	Terrorism ☐	or	☐ Peer Competitors
	Information Warfare ☐	or	☐ Expansionist Regional Powers
	Information Warfare ☐	or	☐ Peer Competitors
	Expansionist Regional Powers ☐	or	☐ Peer Competitors

NEW TECHNOLOGY, OPERATIONAL CONCEPTS, AND ORGANIZATIONS WILL . . .	I STRONGLY DISAGREE ↓	↓	↓	I AM UNSURE ↓	↓	↓	I STRONGLY AGREE ↓
a. Offer the ability to engage in high-intensity operations with substantially reduced risk of U.S. casualties.							
b. Substantially reduce the duration of future conflicts.							
c. Make it easier for the U.S. to use force.							
d. Make it easier for the U.S. to achieve decisive battlefield victories.							
e. Increase the importance of my service relative to the other services.							
f. Increase the importance of my Branch relative to others in my service.							

SERVICE IMPLICATIONS	I STRONGLY DISAGREE ↓	↓	↓	I AM UNSURE ↓	↓	↓	I STRONGLY AGREE ↓
a. My service should reduce its force structure to invest in new approaches to warfare.							
b. My service should reduce its readiness to invest in new approaches to warfare.							
c. Modern conditions require significant changes to traditional service roles and missions.							
d. The Defense Department should create a new service responsible for space operations.							
e. The Defense Department should create a new service responsible for information operations.							
f. The U.S. armed forces will achieve fully the four pillars of Joint Vision 2010—dominating maneuver, precision engagement, focused logistics, and full-dimensional protection—by 2010.							

SERVICE IMPLICATIONS	I STRONGLY DISAGREE ↓	↓	↓	I AM UNSURE ↓	↓	↓	I STRONGLY AGREE ↓
g. My service is serious about exploring new approaches to warfare.							
h. Other services are more serious than mine about exploring new approaches to warfare.							

Further Discussion

Would you be willing to participate in a focus group discussing your views regarding future warfare at greater length? If so, please provide your name, home phone number, and e-mail address below.

Name: _____

Home Phone: _____

E-mail: _____

APPENDIX B

Focus Group Survey Instrument

In recent years, a number of observers in the military, government, and academia have argued that we are experiencing a revolution in military affairs brought on by the growth and diffusion of stealth, precision, and information technology. They argue that emerging technology, coupled with innovative operational concepts and organizations, will substantially alter the conduct of war on land, at sea, and in the air. War may also expand into outer space and the information spectrum.

Emerging technology and concepts may alter the character and conduct of war in at least two ways. The first is that long-range precision strike weapons, coupled with very effective sensors and command and control systems, will become a dominant factor in future warfare. The second is that protection of the effective and continuous operation of one's own information systems, and being able to degrade, destroy, or disrupt the function of the opponent's, will become a priority. Other concepts may emerge as well.

This survey is designed to evaluate your attitudes about future warfare. After you answer a few background questions, you will find that the majority of items ask you to indicate the extent to which you agree or disagree with a statement by simply placing a mark at the corresponding location on a seven point rating scale. Two additional items ask you to indicate which factor in a pair of factors is most important.

DEMOGRAPHIC DATA									
What is your age?									
How many years of commissioned service do you have?									Years
What is your designator/MOS/specialty?									
Your Rank?									
	O-1	O-2	O-3	O-4	O-5	O-6	O-7	O-8	Other
Your service?									
	USA/ USAR	USN/ USNR	USMC/ USMCR	USAF/ USAFR	USCG	ARNG	ANG	Inter-national	Civilian
Your highest degree received?									
				BA/BS	MA/MS	Ph.D/ MD/JD	Other	College Major?	
Citizenship (if other than U.S.)									
• Did you receive the Kuwait Liberation Medal for participation in Operation DESERT SHIELD/STORM?								☐ Yes	☐ No
• Did you participate in combat or combat support operations in the BALKANS?								☐ Yes	☐ No
• Did you participate in combat or combat support operations in SOMALIA?								☐ Yes	☐ No
• Did you participate in combat or combat support operations in HAITI?								☐ Yes	☐ No
• Have you completed a resident PME course?								☐ Yes	☐ No

INDICATE THE EXTENT TO WHICH YOU AGREE OR DISAGREE WITH EACH STATEMENT BY PLACING A MARK ON THE SCALE TO THE RIGHT OF IT.	I STRONGLY DISAGREE ↓	↓	↓	I AM UNSURE ↓	↓	↓	I STRONGLY AGREE ↓
• Manned aircraft will be as important in 2020 as they are today.							
• Carrier Battle Groups will be as important in 2020 as they are today.							
• Conflicts will include combat operations in or from space.							
• Future adversaries will be able to deny the U.S. the use of information networks.							
• Future adversaries will be able to use long-range precision strike weapons such as ballistic and cruise missiles to destroy fixed military infrastructure, such as ports, airfields, logistical sites.							

INDICATE THE EXTENT TO WHICH YOU AGREE OR DISAGREE WITH EACH STATEMENT BY PLACING A MARK ON THE SCALE TO THE RIGHT OF IT.	I STRONGLY DISAGREE ↓	↓	↓	I AM UNSURE ↓	↓	↓	I STRONGLY AGREE ↓
• Future adversaries will be able to use long-range precision strike weapons such as ballistic and cruise missiles to attack U.S. carrier battle groups.							
• The U.S. armed forces must radically change their approach to warfare to compete effectively with future adversaries.							
• The U.S. armed forces are currently embarked upon a path that will lead to a radical change in military technology, doctrine, and organization.							
• My service should reduce its force structure to invest in new approaches to war.							
• My service should reduce its readiness to invest in new approaches to war.							

Of the following professional journals: *Parameters*, *Naval War College Review*, *Proceedings*, *Joint Force Quarterly*, *Aerospace Power Journal*, *Military Review*, *Marine Corps Gazette*, and *Strategic Review*:

- To which, if any, do you subscribe?

  _____
  _____
  _____
  _____

- Which, if any, do you read every issue?

  _____
  _____
  _____
  _____

- Which, if any, do you read occasionally (i.e., more than once per year)

  _____
  _____
  _____
  _____

- Do you ever discuss articles in these journals with your colleagues? How often?

  _____
  _____
  _____
  _____

- Give the subject of two articles from any of the journals published in the past year that you have found particularly noteworthy.

  _____
  _____
  _____
  _____

Notes

1. Stephen J. Blank, "The Soviet Strategic View: Ogarkov on the Revolution in Military Technology," *Strategic Review* (Summer 1984), p. 3.
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11. In particular, Stephen Peter Rosen has shown the importance of senior officers in providing professional support to proponents of change. Stephen Peter Rosen, *Winning the Next War* (Ithaca, N.Y.: Cornell Univ. Press, 1991) pp. 20 and 251.
12. Williamson Murray, "Does Military Culture Matter?" *Orbis* (Winter 1999) p. 37.
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16. Eliot A. Cohen et al., *Knives, Tanks, and Missiles: Israel's Security Revolution* (Washington, D.C.: Washington Institute for Near East Policy, 1998), ch. 1.
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18. Ian Roxborough and Dana Eyre, "Which Way to the Future?" *Joint Force Quarterly,* no. 22 (Summer 1999) pp. 29–30.
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26. Robert Jervis, *Perception and Misperception in International Politics* (Princeton: Princeton Univ. Press, 1976) p. 239.

27. Because the term "revolution in military affairs" means so many things to so many people, it never appeared in the survey instrument. The survey instead referred to "information-age technology, doctrine, and organizations" throughout.

28. The Marine Corps Command and Staff College and Marine Corps University agreed to participate in the survey, were sent survey instruments, but did not—despite repeated requests—submit their completed surveys.

29. Earl Babbie, *Survey Research Methods*, second edition (Belmont, Calif.: Wadsworth, 1990), p. 182.

30. Many of the articles had more than one author listed, and in many cases multiple authors. One article gave credit to more than a dozen individuals. For the purpose of simplicity, data was collected only on the first author listed for each article.

31. The numbers of the statements correspond to their order in the survey instrument. They are grouped in similar categories for analysis which results in some of them appearing out of sequence in the text.

32. *Joint Vision 2010,* p. 2.

33. James R. Blaker, "The American RMA Force: An Alternative to the QDR," *Strategic Review* (Summer 1997), p. 22.

34. Richard J. Harknett et al., "The Risks of a Networked Military," *Orbis* (Winter 2000), pp. 127–143.

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37. Charles J. Dunlap, Jr., "21st Century Land Warfare: Four Dangerous Myths," *Parameters* (Autumn 1997); Colonel T.X. Hammes, U.S. Marine Corps, "War Isn't a Rational Business," *Proceedings* (July 1998); Ralph Peters, "After the Revolution," *Parameters* (Summer 1995).

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41. See, for example, John Arquilla and Solomon M. Karmel, "Welcome to the Revolution . . . In Chinese Military Affairs," *Defense Analysis* (December 1997).

42. Alvin H. Bernstein and Martin Libicki in "High-Tech: The Future Face of War? A Debate," *Commentary* (January 1998), p. 30.

43. Nye and Owens, p. 28.

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45. *Joint Vision 2010,* p. 1.

46. Eliot A. Cohen, "Defending America in the Twenty-first Century," *Foreign Affairs* (November-December 2000), p. 52; Andrew F. Krepinevich, "Why No Transformation?" *Joint Force Quarterly* (Autumn-Winter 1999-2000); *Transforming Defense: National Security in the 21st Century, Report of the National Defense Panel* (Washington, D.C.: Department of Defense, 1997), pp. 33–41.

47. Michael G. Vickers, *Warfare in 2020: A Primer* (Washington, D.C.: Center for Strategic and Budgetary Assessments, 1996), p. i.

48. Ralph Peters, "The Future of Armored Warfare," *Parameters* 27 (Autumn 1997), pp. 50–59.

49. Jason Sherman, "Dream Work," *Armed Forces Journal International* (May 2000), p. 25.

50. Ibid., 28.

51. Vickers, p. 8.

52. Captain Bob Krumm, U.S. Army, "Why Are the Marines in Afghanistan?" U.S. Naval Institute *Proceedings* (January 2002), p. 112.

53. Rowan Scarborough, "Generals Not Fans of Lighter Army," *Washington Times*, 30 May 2000, p. 1.

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55. Andrew F. Krepinevich, Jr., *The Air Force of 2015* (Washington, D.C.: Center for Strategic and Budgetary Assessments, 1996), pp. 33–34.

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57. Andrew F. Krepinevich, Jr., *A New Navy for a New Era* (Washington, D.C.: Center for Strategic and Budgetary Assessments, 1996), pp. 37 and 45.

58. Ibid., p. 41.

59. Vickers, p. 10.

60. Vickers, pp. 11–12.

61. Mary C. FitzGerald, *The New Revolution in Russian Military Affairs* (London: *RUSI,* 1994).

62. Michael Pillsbury, ed., *Chinese Views of Future Warfare* (Washington, D.C.: National Defense Univ. Press, 1997).

63. National Defense Panel, *Transforming Defense: National Security in the 21st Century* (Washington, D.C.: Government Printing Office, 1997), pp. 12–14.

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79. Nye and Owens, p. 25.

80. *Joint Vision 2010*, pp. 18–22.

81. *Joint Vision 2010*, pp. 13–14.

82. Warden, p. 54.

83. David S. Alberts, John J. Garstka, and Frederick P. Stein, *Network Centric Warfare: Developing and Leveraging Information Superiority*, 2nd ed. (revised), (C4ISR Cooperative Research Program, Washington, D.C.: 1999) p. 165.

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86. Blaker.

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90. *Executive Summary of the Report of the Commission to Assess the Ballistic Missile Threat to the United States*, 15 July 1998 (The Rumsfeld Commission) at http://www.fas.org/irp/threat/missile/rumsfeld/index.html.

91. Ibid.

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93. *Joint Vision 2010*, p. 22.

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