



NATIONAL DEFENSE RESEARCH INSTITUTE

CHILDREN AND FAMILIES
EDUCATION AND THE ARTS
ENERGY AND ENVIRONMENT
HEALTH AND HEALTH CARE
INFRASTRUCTURE AND
TRANSPORTATION
INTERNATIONAL AFFAIRS
LAW AND BUSINESS
NATIONAL SECURITY
POPULATION AND AGING
PUBLIC SAFETY
SCIENCE AND TECHNOLOGY
TERRORISM AND
HOMELAND SECURITY

The RAND Corporation is a nonprofit institution that helps improve policy and decisionmaking through research and analysis.

This electronic document was made available from www.rand.org as a public service of the RAND Corporation.

Skip all front matter: [Jump to Page 1](#) ▼

Support RAND

[Purchase this document](#)

[Browse Reports & Bookstore](#)

[Make a charitable contribution](#)

For More Information

Visit RAND at www.rand.org

Explore the [RAND National Defense Research Institute](#)

View [document details](#)

Limited Electronic Distribution Rights

This document and trademark(s) contained herein are protected by law as indicated in a notice appearing later in this work. This electronic representation of RAND intellectual property is provided for non-commercial use only. Unauthorized posting of RAND electronic documents to a non-RAND website is prohibited. RAND electronic documents are protected under copyright law. Permission is required from RAND to reproduce, or reuse in another form, any of our research documents for commercial use. For information on reprint and linking permissions, please see [RAND Permissions](#).

This product is part of the RAND Corporation occasional paper series. RAND occasional papers may include an informed perspective on a timely policy issue, a discussion of new research methodologies, essays, a paper presented at a conference, a conference summary, or a summary of work in progress. All RAND occasional papers undergo rigorous peer review to ensure that they meet high standards for research quality and objectivity.

OCCASIONAL
P A P E R



Looming Discontinuities in U.S. Military Strategy and Defense Planning

Colliding RMAs Necessitate a New Strategy

Paul K. Davis, Peter A. Wilson

Prepared for the Office of the Secretary of Defense

Approved for public release; distribution unlimited



NATIONAL DEFENSE RESEARCH INSTITUTE

The research described in this report was prepared for the Office of the Secretary of Defense (OSD). The research was conducted within the RAND National Defense Research Institute, a federally funded research and development center sponsored by OSD, the Joint Staff, the Unified Combatant Commands, the Navy, the Marine Corps, the defense agencies, and the defense Intelligence Community under Contract W74V8H-06-C-0002.

Library of Congress Control Number: 2011924500

ISBN: 978-0-8330-5210-0

The RAND Corporation is a nonprofit institution that helps improve policy and decisionmaking through research and analysis. RAND's publications do not necessarily reflect the opinions of its research clients and sponsors.

RAND® is a registered trademark.

© Copyright 2011 RAND Corporation

Permission is given to duplicate this document for personal use only, as long as it is unaltered and complete. Copies may not be duplicated for commercial purposes. Unauthorized posting of RAND documents to a non-RAND website is prohibited. RAND documents are protected under copyright law. For information on reprint and linking permissions, please visit the RAND permissions page (<http://www.rand.org/publications/permissions.html>).

Published 2011 by the RAND Corporation
1776 Main Street, P.O. Box 2138, Santa Monica, CA 90407-2138
1200 South Hayes Street, Arlington, VA 22202-5050
4570 Fifth Avenue, Suite 600, Pittsburgh, PA 15213-2665
RAND URL: <http://www.rand.org>
To order RAND documents or to obtain additional information, contact
Distribution Services: Telephone: (310) 451-7002;
Fax: (310) 451-6915; Email: order@rand.org

Preface

This occasional paper is a think piece about the future of U.S. military strategy and forces. It was written to go beyond the important developments of the 2010 Quadrennial Defense Review (Gates, 2010). We offer a sobering diagnosis (albeit one dependent on some personal judgments) of major impending problems and suggest ideas about how to find the way ahead. The paper is intended to be of interest to those inside or outside of government who are concerned with issues of U.S. defense strategy and defense planning. Comments are welcome and should be addressed to the authors (Paul K. Davis, Paul_Davis@rand.org, and Peter A. Wilson, Peter_Wilson@rand.org).

This research was conducted within the International Security and Defense Policy Center of the RAND National Defense Research Institute, a federally funded research and development center sponsored by the Office of the Secretary of Defense, the Joint Staff, the Unified Combatant Commands, the Navy, the Marine Corps, the defense agencies, and the defense Intelligence Community.

For more information on the International Security and Defense Policy Center, see <http://www.rand.org/nsrd/about/isdp.html> or contact the director (contact information is provided on the web page).

Contents

Preface	iii
Figures	vii
Tables	ix
Summary	xi
Acknowledgments	xix
Abbreviations	xxi
CHAPTER ONE	
Introduction	1
CHAPTER TWO	
Diagnosis: An Environment with New Demands	3
Technological Developments	3
Adverse Trends	3
Collision of Multiple Revolutions in Military Affairs	3
Geostrategic Changes.....	6
China and East Asia.....	6
India and South Asia	9
Proliferating Weapons of Mass Destruction.....	10
The Struggle with International Violent Religious Extremists	10
Space and Cyberspace as New Wartime Theaters of Operation.....	11
The Looming Obsolescence of U.S. Power-Projection Forces	12
Force Projection in Traditional Conflicts but with New Challenges.....	12
Special Problems with Complex Operations.....	14
Obstacles to Action	15
Today's Wars.....	15
Disruptive Technology and the Innovator's Dilemma.....	15
Constraints After a Period of Plenty.....	16
Lack of Good, Agreed Options	18
CHAPTER THREE	
Future Capability Needs and Possible Future Directions	19
Basic Questions.....	19
Concepts of Operations for Force Projection	20
Selected Focus Areas for Capability Development.....	21
Enhanced Active Defense.....	21

Intelligence, Surveillance, and Reconnaissance, and Kinetic Strike.....	22
Comprehensive Defense Suppression.....	23
Complex Operations.....	24
Operating Against Adversaries Embedded in Populations.....	25
Major Changes in Expeditionary Ground Forces.....	26
Likely Cross-Cutting Stratagems.....	26
Dispersion and Networking.....	26
Network Security and Hedging.....	27
Massive Robotics and Remote Control (Beginning of RMA V?).....	27
Rejuvenated Efforts to Limit Proliferation of Advanced Weapons.....	28
 CHAPTER FOUR	
Perceiving the Way Ahead, Darkly	29
Rethinking the Issue of Balance.....	29
Major Issues for the Military Services.....	29
Adjusting Strategy for the Far East: Avoiding or Dealing with a Cool War Between China and the United States.....	31
Nonnuclear Restraint or Help from Arms Control?.....	32
Preparing for Across-the-Board Changes.....	33
Making Room in the Budget.....	34
 CHAPTER FIVE	
Conclusions	37
New Strategy, Capabilities, and Concepts of Operations.....	37
Overall, a National Security Strategy of Comprehensive Balancing.....	38
 Endnotes	41
 Bibliography	49

Figures

S.1.	Diagnosis: An Impending Crisis in Defense Planning.....	xi
1.1.	The Reasons for the Impending National-Security Crisis	2
2.1.	The Dynamics of Measure and Countermeasure	5
2.2.	China's Sovereignty Claims.....	8
2.3.	Federal Debt as a Fraction of Gross Domestic Product, for Two Budget Scenarios.....	16
2.4.	Past and Projected Spending Levels for National Defense.....	17
3.1.	Troops Needed per Thousand Population	25

Tables

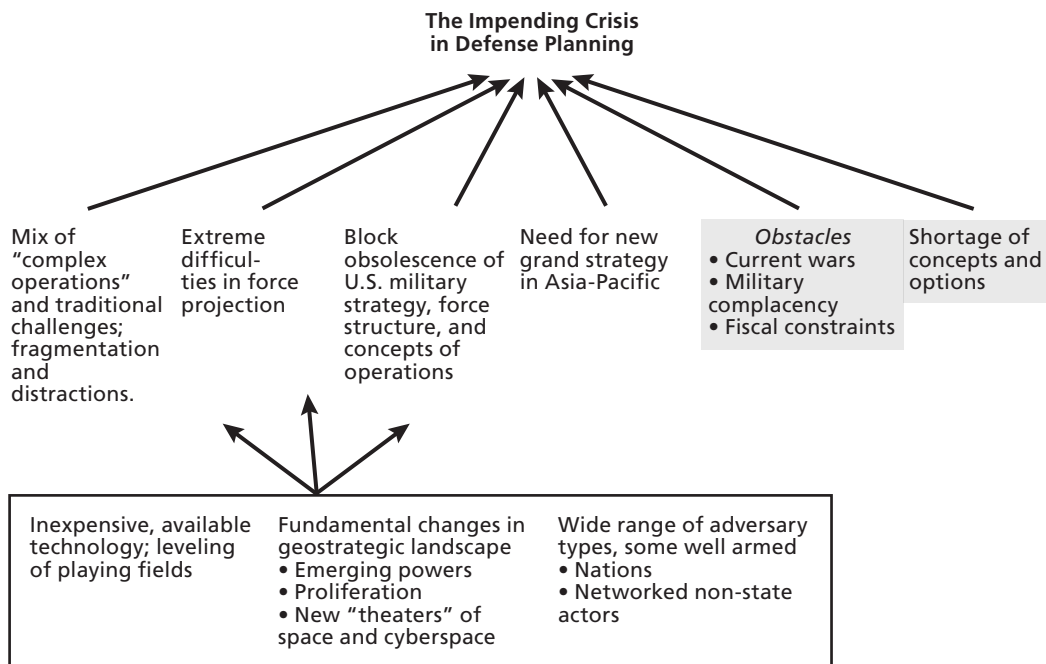
S.1.	Illustrative Dimensions of Change in Military or Dual-Purpose Technology	xii
S.2.	Fading Viability of Traditional Concepts of Operations.....	xiv
2.1.	Illustrative Technological Sources of Concern	4
2.2.	Four 20th-Century Revolutions in Military Affairs (all continuing)	4
2.3.	Viability of Classic Concepts of Operations.....	13
4.1.	Issues Ahead.....	30
4.2.	Possible Elements (all with shortcomings) of a New Thrust for Exploration and Experimentation	34

Summary

A Sobering Diagnosis

The United States is entering a period of discontinuity in its defense planning, something that may be seen by future historians as a planning crisis. As indicated schematically in Figure S.1, the discontinuity stems from technology diffusion that is leveling aspects of the playing field militarily, geostrategic changes, and the range of potential adversaries. These are leading to (1) the United States having to deal with a demanding mix of “complex operations” (e.g., counterinsurgency and stabilization) and traditional challenges; (2) the increasing difficulty of force projection in some important circumstances; (3) a related block obsolescence of U.S. forces and concepts of operations; and (4) the need for a new grand strategy in the Asia-Pacific region. Obstacles exist to taking on these challenges—notably, the demands of current wars, military complacency due to decades of military overmatch, and severe national fiscal constraints. Making things worse is the fact that incremental changes will not suffice, but no

Figure S.1
Diagnosis: An Impending Crisis in Defense Planning



RAND OP326-S.1

consensus is yet emerging about options for the way ahead. Taken together, the problems pose a once-in-a-century challenge.

Military-Technical Developments

The technological dimensions of the problem can be seen in Table S.1. The changes taking place can be seen as the collision of four revolutions in military affairs (RMAs) associated with industrialization, insurgency, weapons of mass destruction and strategic bombardment, and information technology. It is common to imagine that the RMAs occurred at a given time in history, but, in fact, they all continue to this day. Combinations are occurring with troublesome results, such as insurgents and international terrorists being able to use widely available elements of modern information technology in inexpensive weapons, such as precision mortars, while rising regional powers are deploying longer-range precision weapons, advanced air defenses, and other moderately advanced systems that undercut many traditional U.S. military strengths and concepts of operations.

Geostrategic Developments

The geostrategic changes in recent decades are many and varied. China is now a major power with impressive, high-momentum military developments in addition to its economic accom-

Table S.1
Illustrative Dimensions of Change in Military or Dual-Purpose Technology

Technology	Examples
Inexpensive communications for coordinated, distributed operations of small groups	Internet, multimedia, cell phones, commercial encryption, inexpensive GPS sets
Precision weapons	Precision mortars, guided rockets, and both short- and long-range missiles threatening ground forces, ships, air fields, and mobile air defense missiles
Advanced air defenses	Advanced mobile and man-portable surface-to-air missiles
Advanced antiship weapons	Air-independent-propulsion submarines, high-speed homing torpedoes, antiship ballistic and cruise missiles, smart and mobile mines
Cyberwar capabilities	Denial-of-service attacks, trojans and other advanced worms, nuclear and nonnuclear electronic-pulse weapons
Anti-space-system capabilities	Antisatellite systems, jammers of global positioning satellites, radio-frequency weapons
Long-range missiles for delivery of nuclear weapons	North Korea, Iran, Pakistan, and others
Space-launch capability	India, Israel, and perhaps Iran, Pakistan, Brazil, South Korea, North Korea, and others, depending on inclusion criteria
Nuclear proliferation	Pakistan, North Korea, and perhaps Iran and others
Nonnuclear mass-disruption or mass-destruction weapons	Radiological bombs, traditional bioweapons, new innovations from so-called do-it-yourself biology

plishments. In 2010, China was more strategically assertive regarding sovereignty over a number of small islands and waters, especially in the South China Sea. This caused worries among such regional states as Japan, South Korea, the Philippines, Vietnam, and Indonesia. Economic tensions are now considerable as well, and will likely continue, with even the possibility of an expanding trade war emerging as importer states consider tariffs and other measures to protect jobs and improve balances of payments. Although China need not become a threat to the United States, and the future should indeed be one of cooperation and mostly good relations, many potential flash points can be identified that justify caution. China, of course, is not the only rising power. India is emerging as a powerhouse in South Asia, and it is possible and even likely that it and the various regional states of East and South Asia will, along with the United States, provide a kind of balancing of China through a combination of economic, political, and military activities over time. What might emerge is a dynamic cool war of competition, cooperation, containment, and possible conflict. This will be an era of strategic improvisation and not the rigid and nearly monochromatic strategic competition of the early phases of the Cold War.

Other geostrategic realities include, of course, the continuing struggle with violent radical extremists, notably al Qaeda and a network of loosely affiliated jihadist organizations worldwide. No end is in sight for that struggle—even if U.S. withdrawal from Iraq occurs on schedule without civil war in Iraq, and even if progress is made slowly in Afghanistan, which is even more uncertain. Another new geostrategic reality is the advent of new wartime theaters of operation: space and cyberspace. The U.S. military is extremely dependent on both, with many serious vulnerabilities as other nations improve their own capabilities in both, and as some nations, such as China, do so zealously precisely because of U.S. dependences.

Block Obsolescence of Forces and Concepts of Operations

Against this background, we see the obsolescing of U.S. force structure and concepts of operations with respect both to a peer competitor and to lesser adversaries that combine methods of insurgency with modern technology. Problems exist across the board, but Table S.2 illustrates them for force projection. Certainly, our assessments in this think piece are inherently subjective, and some may reasonably disagree with them. The uncertainties have less to do with technology trends, which are observable, than with whether in fact potential adversaries will exploit them as we project.

Perceiving the Way Ahead, Darkly

Against this background of sobering diagnosis, we have attempted to sketch the outlines of a way ahead. That outline involves new military capabilities, concepts of operation, and grand strategy.

Directions for Capability Development

We focused largely on issues of force projection. Since traditional concepts of operation are losing viability, we sketched three illustrative possibilities for new ones to sharpen discussion

Table S.2
Fading Viability of Traditional Concepts of Operations

Component	Previously	Now, and Increasingly in Near Future
Limited forward presence	Nonproblem	Restrained but not especially risky
Large-scale deployments to regional waters and bases	Nonproblem	Risky due to vulnerable bases and regional waters; risks stem from air-independent-propulsion submarines and precision antiship weapons (including land-based missiles); large standoff ranges will likely be needed.
Broad naval supremacy	Nonproblem	Challenges exist but are much less when not in close-in regional waters.
Achieving air supremacy	Nonproblem	Nonproblem in most domains, but not, e.g., close to Chinese mainland
Suppressing air defenses	Destruction is difficult because of cover and deception but suppression is quite feasible.	Risky for above reasons and because of advanced mobile and man-portable surface-to-air missiles
Offensive air operations	Strategic strikes are possible early with stealthy aircraft; large-scale operations are a nonproblem after suppression of air defenses against fixed and known high-value targets.	Risky and difficult because of modern air defenses, the need for long-range operations, and the difficulty of finding mobile and hidden high-value targets
Entry of traditional ground forces and infrastructure	Nonproblem after gaining air supremacy	Risky because of vulnerabilities of forces during entry and of bases and other logistics. Area weapons pose special concerns.
Later ground-manuever operations with close air support and battlefield shaping	Supreme skill of U.S. forces	Moderately risky, with air support constrained due to residual surface-to-air missiles, and with vulnerabilities to residual precision weapons
Large follow-up operations (e.g., stabilization in large countries)	Feasible on a small scale, or on the Iraq scale with mobilization; forces at risk due to improvised explosive devices and other asymmetric tactics; large manpower requirements	Feasible on a small scale, or on the Iraq scale with mobilization; operations are risky for adversaries having precision or area weapons and some defenses against drones. Special needs for mine-resistant vehicles, persistent surveillance and substantial manpower.

NOTE: Red = feasibility is in question. Orange = feasible but with high risk. Yellow = risky or difficult. Green = feasible with acceptable risk.

of capability needs. They stem from asking, “How could force projection proceed given a very lethal environment (sometimes discussed as an antiaccess environment)?”

1. *Deliberate, phased entry with tactical and operational defenses.* This concept is akin to a modernized version of classic concepts but with both active and passive defenses at all levels (e.g., to counter precision mortars as well as longer-range missiles). It would probably also include mobile sea bases.
2. *Strike from afar with optional insertion of small ground forces.* This concept would avoid insertion of traditional ground forces and would instead emphasize long-range strike with the option of later inserting large numbers of small, networked ground-force units subsequently, which would use special forces–like tactics.

3. *Rapid and possibly preemptive entry.* This concept would depend on surprise and speed. It would attempt to destroy adversary defenses early so that follow-on operations could proceed.

At this stage, it is not clear which, if any, of these concepts will be viable or whether the United States will want to pursue combinations. This suggests priorities on certain types of capabilities, if they can in fact be achieved at tolerable cost. The following list is perhaps less remarkable than recognizing how challenging the related technical requirements are (and by noting differences from current de facto priorities, such as modernization of current platform types):

- high-confidence defenses at tactical and operational levels ranging from countering precision mortars to countering long-range missiles
- survivable and persistent surveillance and reconnaissance strike
- comprehensive defense suppression
- long-range sustainable strike
- effective munitions, including munitions for deeply buried targets
- survivable at-sea basing
- means of accomplishing complex operations with fewer U.S. forces, even when adversaries are embedded in populations.

We see likely cross-cutting stratagems as involving dispersion, networking, and swarm tactics; major efforts to ensure network security while hedging against network failures or penetration; and massive use of robotics and remote-control systems.

For each military service, the crucial questions seem to be these:

- What are the appropriate new-era building-block units (e.g., analogues to older units, such as brigades or squadrons but often with a more born-joint character)?
- What are the appropriate joint and component-level concepts of operations? Circumstances of feasibility?
- What is the appropriate portfolio mix of capabilities across missions (e.g., counter-insurgency versus force projection)? Circumstances of adequacy?
- What is necessary to deal with discrete, service-specific challenges? With joint challenges, such as network security and hedges against network failure or penetration?
- What is the appropriate portfolio mix of active, reserve-component, and civilian capabilities?

Again, the generic questions are less remarkable than the specifics. Should ground-force projection deemphasize large, traditional units in favor of small, networked units and, e.g., swarming tactics? What kind of sea basing makes sense, and for what distances? What is the future role of short-range tactical air forces? How will long-distance strike capability be sustained in the event of a large and lengthy conflict? And, in the realm of complex operations, what capabilities are needed to accomplish the missions with much-reduced numbers of U.S. ground forces?

Toward a New Grand Strategy

The other crucial element of the way ahead will be a new grand strategy. The most obvious need is to rethink grand strategy for the Asia-Pacific region. We conclude the following:

- Given the extent of China's developments, it is no longer appropriate to assess the adequacy of U.S. force structure by playing through simulated wars over the Taiwan Strait. The focus must change to broader conceptions of the power balance that include the arc from the Middle East through the Indian Ocean to Northeast Asia.
- Imperatives in the new conception will include deterrence and crisis stability, deterring both limited and larger-scale aggression, and ensuring that, in periods of tension, the combination of the sides' lethality and vulnerability does not create perceived imperatives for preemptive action. Avoiding errors that might cause war will be crucial for the great powers and important regional powers.
- A major issue is how deterrence can be made stronger than it has been in the past. Challenges of deterrence and, especially, extended conventional deterrence will be exacerbated by proliferation of nuclear weapons.
- A core issue is the relative emphasis on regional cooperation and power balancing, and between formal and informal balancing. And, of course, what roles should be played by the United States and the many nations of the Asia-Pacific region?
- The military component of strategy will seek to maintain conventional warfighting and war-winning capabilities where feasible but will include more deterrence-oriented capability, such as the ability to inflict serious pain with conventional strikes, to devastate infrastructure with conventional strikes, and to maintain supremacy at sea—if not in major powers' near waters, then certainly on a larger regional and global scale that includes the sea-lanes of communication to the Middle East and Africa.
- The United States has a major decision to make regarding the degree to which it should prepare for manpower-intensive operations, such as counterinsurgency and stabilization. It is not obvious that such operations should be the primary basis for force planning, despite events of the past decade. If they are, then the economic consequences will be substantial because they would come in addition to the demands of evolving balance-of-power and force-projection issues that are themselves very demanding.*

Although arms control should also be an element of grand strategy (as discussed in the main text), it is unlikely that it will substantially alleviate the major U.S. national-security challenges identified.

Necessity-Driven Experimentation

Because the way ahead militarily is not yet clear, we see the need for vigorous and competitive exploration and competition of ideas. The past decade's experiences have not been encouraging: Visions have sometimes gotten far ahead of technology and reason, criticism and competition have not been sufficiently valued, and joint experimentation has been neither sufficiently ambitious nor rigorous. A priority should be placed on rethinking how the department can do the explorations needed to inform once-in-a-century decisions. We present suggestions on the matter in the last section of the paper.

* See Gates (2011b) for related comments as this paper went to press.

Overall, a National Security Strategy of Comprehensive Balancing

Finally, we observe that, in some respects (the primary difference being the unavoidable long struggle with international violent religious extremism that threatens the United States and its worldwide interests), the United States is in a situation reminiscent of that of the Eisenhower administration as it considers grand strategy. It seems to us likely that, in broad terms, grand strategy will need to evolve with an emphasis on rejuvenating and sustaining the country's economic vitality while relying increasingly on credible forms of deterrence (rather than clear-cut superiority) in certain balance-of-power issues; and on alliances, improvement of allied capabilities, and use of international organizations. What is needed, arguably, is a national-security strategy of comprehensive balancing, rather than just a rebalancing of military capabilities.

Acknowledgments

We benefited from discussions with a number of RAND colleagues, especially James Quinlivan, Michael Lostumbo, John Gordon, David E. Johnson, and Ben Wise, and from extensive reviews by John Arquilla of the U.S. Naval Postgraduate School and our RAND colleague Ryan Henry. The views represented in this think piece, however, are our own, as are any residual shortcomings.

Abbreviations

AIP	air-independent propulsion
ASAT	antisatellite weapon
C4ISR	command, control, communications, computers, intelligence, surveillance, and reconnaissance
COIN	counterinsurgency
DARPA	Defense Advanced Research Projects Agency
DoD	U.S. Department of Defense
GDP	gross domestic product
GPS	Global Positioning System
ISR	intelligence, surveillance, and reconnaissance
IW	irregular warfare
RMA	revolution in military affairs
SAM	surface-to-air missile
SOF	special operations force
UAS	unmanned aircraft system
UAV	unmanned aerial vehicle
USJFCOM	U.S. Joint Forces Command
WMD	weapons of mass destruction

Introduction

The United States is currently saddled with several major problems, the most pressing of which have been recovery from the Great Recession and the ongoing conflicts in Iraq and Afghanistan. Addressing the skyrocketing debt by controlling growth of social programs, making other spending reductions, and effectively raising taxes will constitute another crisis in the near future. Not much discussed, however, is the need to deal with profound once-in-a-century defense-planning issues beyond those already on the nation's plate. This need exists despite the fact that the U.S. Department of Defense (DoD) is still completing the earlier transformation begun in the late 1990s and early 2000s and is still completing major unanticipated changes required by the wars in Iraq and Afghanistan. Currently, the debate within and outside of the Pentagon is over finding a new balance between investments for traditional combined-arms warfare and what are now called *complex operations*—whole-of-government actions that involve combinations of irregular warfare (IW), counterinsurgency (COIN), stabilization, and perhaps humanitarian assistance, often with other nations or groups involved.¹ As important as this balancing effort is, we believe that the national-security issues now challenging the nation are even more profound for reasons touched on by a few authors,² in portions of the 2010 Quadrennial Defense Review, and in informal but telling observations by officials.³

The problems we discuss in this paper* stem from three primary sources. The first of these is adverse technology developments and their diffusion, resulting potentially in better-armed adversaries. The second is fundamental geostrategic change with both emerging powers and proliferation of both advanced conventional weapons and weapons of mass destruction (WMD). The third is a spectrum of adversary types, some well armed and some new (notably, networked nonstate terrorist actors). These three sources are leading to the prospect of

- the need to prepare for and potentially cope simultaneously with international terrorism, manpower-intensive wars (e.g., COIN), and more-traditional challenges
- extreme difficulties for traditional forms of U.S. force projection
- block obsolescence of U.S. force structure and traditional concepts of operations
- the need to alter grand strategy, particularly in the Asia-Pacific region.

The first of these is well known. This paper focuses primarily on the remaining three.

* We do not deal with the potential need to adjust Goldwater-Nichols legislation (Project on National Security Reform, 2008), to improve DoD governance (Hicks, 2008), to reform the U.S. national-security apparatus (Project on National Security Reform, 2008), or to reform weapon-system acquisition. Nor do we deal with homeland defense.

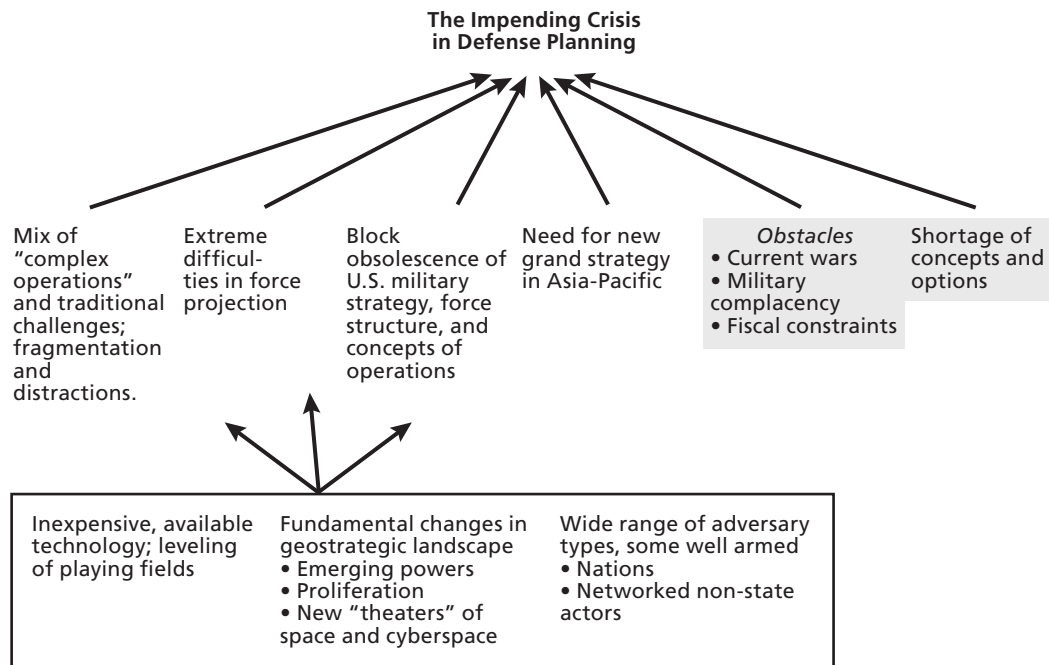
To make things worse, DoD does not yet have a sufficiently rich set of options to evaluate. Major changes will be needed (for yet another transformation), but—this time around—it is not obvious what the big changes should entail or what will work.

Impediments to action include the attention demanded by the near-term problems in Afghanistan and Iraq and what we see as military institutional complacency due to the United States having enjoyed a near monopoly in such capabilities as precision weapons and advanced intelligence, surveillance, and reconnaissance (ISR) systems. The monopoly is ending, with deep implications for U.S. power projection and the suitability of today’s forces and concepts of operations. Beyond this, DoD will be facing a tight, if not declining, budget for years to come. The issues and linkages, then, are summarized in Figure 1.1.

In the remainder of this paper, we sketch issues and suggest first steps toward addressing them. Chapter Two lays out our diagnosis, discussing the concerns mentioned above. Chapter Three identifies specific challenges and speculates about possible solution strategies that would call for concepts of operation and forces that are very different from those that exist today. Because the alternatives are not yet well developed, Chapter Four sketches our attempt to perceive the way ahead, if only imperfectly; it identifies key issues and calls for initiatives to develop and test new ideas with the concentrated attention appropriate when major changes are necessary but when the options for adaptation are not yet understood.

Unfortunately, the past decade’s efforts with the same nominal objectives of innovation and change have often gone poorly. In the years to come, strikingly different approaches to exploration and choice are necessary, which will probably require disruptive changes in organizations, practice, and even law.

Figure 1.1
The Reasons for the Impending National-Security Crisis



Diagnosis: An Environment with New Demands

Our diagnosis of the new environment addresses, in turn, technological developments, geo-strategic changes, new dimensions of warfare, the looming obsolescence of current forces and operational concepts, and obstacles to action.

Technological Developments

Adverse Trends

For decades, the U.S. military has enjoyed technological overmatch in many domains, from sophisticated communications through precision weapons and space systems.¹ This is changing, as indicated in Table 2.1, which lists classes of military technology that are now or can soon be available to some U.S. adversaries—in some cases, even to lesser states and nonstate military organizations. Some of the related items are not even expensive, such as cell phones or other devices using the Global Positioning System (GPS). Precision weapons are available today to nonstate actors, as illustrated famously by Hezbollah's effective use of guided missiles and other tactics in the 2006 Lebanon war, which surprised many military observers.² Precision mortars and other such weapons can seriously change what is feasible for ground forces.³ A larger country, such as Iran, can afford to buy significant numbers of advanced surface-to-air missiles (SAMs). Many cyberwar capabilities are inexpensive and technically undemanding, such as denial-of-service attacks. Some anti-space-system capabilities are similarly inexpensive and straightforward (e.g., jammers of the GPS).⁴ In some cases, U.S. responses are already under way and will have at least some success at affordable prices. However, more broadly, the trends are quite adverse. From the viewpoint of competitive strategies, the United States is now on the wrong side of the economics: It is much cheaper for adversaries to cause great difficulties for U.S. forces and operations than it is for the United States to respond effectively.⁵ This is true for both low-end and high-end adversaries and competitors.

Collision of Multiple Revolutions in Military Affairs

To put matters into perspective, it is useful to conceptualize changes occurring in the 21st century in terms of four revolutions in military affairs (RMAs) that occurred during the 20th century. Authors have varied the lenses through which to address such revolutions, but we find those of Table 2.2 useful for our purposes.⁶

Although building from the technological revolution occurring late in the 19th century, the RMA I, the strategy of industrial warfare, emerged conspicuously from 1917 onward during World War I with mass production of self-propelled vehicles of all types, including tanks, other

Table 2.1
Illustrative Technological Sources of Concern

Technology	Examples
Inexpensive communications for coordinated, distributed operations of small groups	Internet, multimedia, cell phones, commercial encryption, inexpensive GPS sets
Precision weapons	Precision mortars, guided rockets, and both short- and long-range missiles threatening ground forces, ships, air fields, and mobile air defense missiles
Advanced air defenses	Advanced mobile and man-portable surface-to-air missiles
Advanced antiship weapons	Air-independent-propulsion submarines, high-speed homing torpedoes, antiship ballistic and cruise missiles, smart and mobile mines
Cyberwar capabilities	Denial-of-service attacks, trojans and other advanced worms, nuclear and nonnuclear electronic-pulse weapons
Anti-space-system capabilities	Antisatellite systems, jammers of global positioning satellites, radio-frequency weapons
Long-range missiles for delivery of nuclear weapons	North Korea, Iran, Pakistan, and others
Space-launch capability	India, Israel, and perhaps Iran, Pakistan, Brazil, South Korea, North Korea, and others, depending on inclusion criteria
Nuclear proliferation	Pakistan, North Korea, and perhaps Iran and others
Nonnuclear mass-disruption or mass-destruction weapons	Radiological bombs, traditional bioweapons, new innovations from so-called do-it-yourself biology

Table 2.2
Four 20th-Century Revolutions in Military Affairs (all continuing)

RMA	Nominal Period of Change (all with older roots)	Characteristic Developments	Label for Resulting Strategy
I	1917–	Mechanization: self-propelled combat vehicles (air, sea, and land)	Industrial warfare
II	1930–	Insurgency; revolutionary, partisan, and guerilla warfare; terrorism	Insurgency
III	1945–	Nuclear weapons; long-range missile delivery	Mass-destruction weapons and strategic bombardment
IV	1980s–	Precision weapons; unmanned combat vehicles; persistent ISR; networked forces; computer-network operations	Information technology

armored fighting vehicles, aircraft, submarines, and war ships, and with mass transportation. This RMA matured in World War II, and its influence as a way of war is central in all current-day, modern combined-arms military establishments. It underlies what was long called the American way of war, which has often emphasized attrition and annihilation of the adversary.⁷

RMA II, the strategy of the insurgent, had roots in early partisan or guerrilla warfare, such as by colonialists in the American Revolution and by Native Americans in the settling of the West. However, it is associated specifically with the innovations of Mao Tse Tung in the 1930s, when it became a form of total political and cultural warfare fueled by a radical secu-

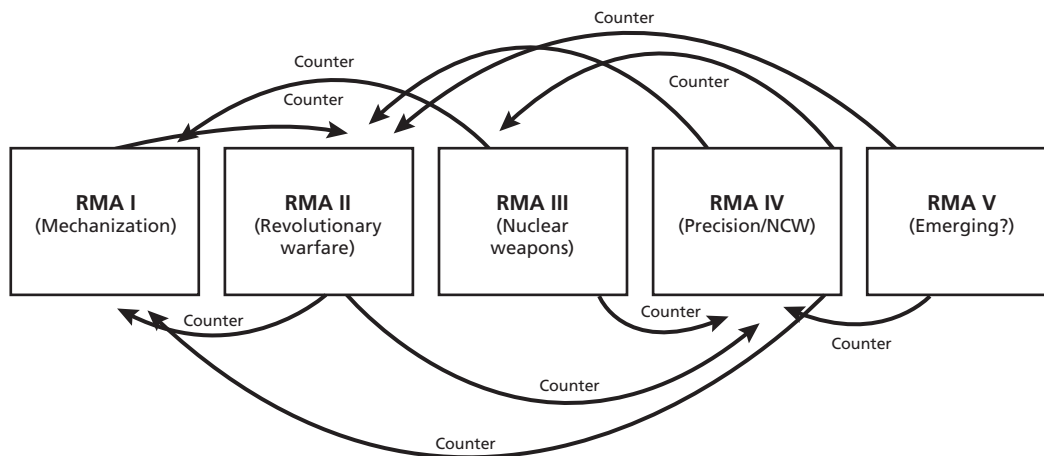
lar ideology, communism.⁸ A central feature of this type of war is often the sophisticated and sustained use of terrorism for coercion. A resurgence of this type of warfare has come from al Qaeda and its affiliates in the insurgencies in Iraq and Afghanistan fueled by a radical religious ideology, a version of Salifism. Iran, ruled by a radical version of Shi'ism, supports this type of strategy and related terrorism through Hamas and Hezbollah.

RMA III, the strategy of mass-destruction weapons and strategic bombardment, began in World War II with nuclear weapons and long-range means of bombarding the adversary's homeland (primarily with bombers, but also with Germany's first-generation long-range ballistic and cruise missiles). Since then, of course, nuclear weapons have proliferated and may continue to do so, perhaps even to nonstate actors. Other forms of WMD, especially biological weapons, are also a concern, especially for homeland defense.

RMA IV, the strategy of information technology, became increasingly visible in the late 1980s. It was marked by precision-guided weapons and the exploitation of information technology and space, as in network-centric warfare or what is sometimes referred to as sensor-enabled warfare. It was the central feature of military transformation in the 1990s and into the current century.⁹ Some aspects, such as new forms of organization and operation (e.g., swarming tactics), and exploitation of robotic or remotely controlled systems, have been only partially implemented.

A common impression is that a given RMA occurs within a nominal date range and is subsequently replaced by the next one. In contrast, we see RMAs as having started at the nominal times shown in Table 2.2 but continuing thereafter in a measure-countermeasure dynamic with competition among all four of them (Figure 2.1).¹⁰ Industrial warfare, for example, evolved to include aircraft carriers, massive tank armies, and modern air forces.¹¹ Warfare will again be undergoing major change, but we do not yet know whether the result will be a hybrid of all four RMAs or something new. We discuss some possibilities later in the paper. Wealthy countries with traditional military forces will continue to invest in tanks, aircraft, and surface ships—the fruits of industrialization and combined arms (RMA I). Many state and nonstate actors, including terrorists and criminals, will continue to adopt the insur-

Figure 2.1
The Dynamics of Measure and Countermeasure



NOTE: NCW = network-centric warfare.
RAND OP326-2.1

gent strategy (RMA II). They will benefit from selective acquisition of weapons and systems associated with RMA IV. Nonetheless, some states may conclude that their only reliable defense is through deterrence enabled by mass-destruction weapons (RMA III). A worrisome possibility is that some states, such as a future nuclear-armed Iran, might use their nuclear force (RMA III) as a shield while pursuing or supporting aggressive operations (probably indirectly) using the methods of RMA II and RMA IV. In summary, we see the future as involving a mingling, even a collision, of continuing RMAs, as well as new developments (the first genuine RMA of the 21st century).

Geostrategic Changes

Important geostrategic changes are a major element of the environment for planning. This section highlights issues involving China and East Asia, India and South Asia, nuclear proliferation, and terrorism driven by violent religious extremism. Taken together, these are also part of transition to a multipolar world.*

China and East Asia

China's regional and even global influence has grown with her economic power. With a permanent seat on the United Nations Security Council and a gross national product that has recently passed that of Japan, it is today one of the world's great powers.¹²

The comprehensive rise of Chinese power is affecting the strategic planning and behavior of such long-time U.S. allies as South Korea, Japan, and Taiwan. All the nations in the region are benefiting from the growth of China's economy and related trade opportunities; all presumably hope for good and prosperous relationships with China over time. That said, the countries are leery of China's growing military power and economic influence. China's economic power is well known, but it is appropriate to summarize military developments.

China's Military Developments. China's military developments are impressive and more comprehensive than is sometimes appreciated. The most important of them are those that undercut the clarity of long-held U.S. military supremacy in East Asia. Although China's long-term emphasis might change, it has or will soon have naval forces with supercavitation torpedoes, brilliant mines, and long-range ballistic and cruise antiship missiles (all of which pose challenges to U.S. forces), as well as a planned aircraft-carrier and amphibious fleet; an air force equipped with long-range aviation armed with land-attack cruise missiles and guided munitions and supported by aerial tankers; a strategic missile force equipped with a large arsenal of tactical and theater-range precision guided ballistic and cruise missiles; and a ground force well equipped with an array of air assault, motorized, and mechanized units protected by high-performance mobile air defenses. In South and Southeast Asia, China's improving power-projection capability will be advantaged by well-developed lines of communication between China and its periphery.¹³ To be sure, China's military still has major problems and short-

* We do not discuss Russia as a potential geostrategic challenge in this paper because we had to limit our already-broad scope and because Russia seemed less relevant to the particular problems on which we focus. Clearly, however, Russia is and will remain a major geostrategic player with nontrivial implications for U.S. planning. Even with the recent ratification of the New START (Treaty Between the United States of America and the Russian Federation on Measures for the Further Reduction and Limitation of Strategic Offensive Arms), future progress in arms-limitation agreements will require the concurrence of Moscow.

comings in dimensions of quality, training, and experience, but its buildup has consistently exceeded expectations and has become a matter of concern to regional nations.¹⁴

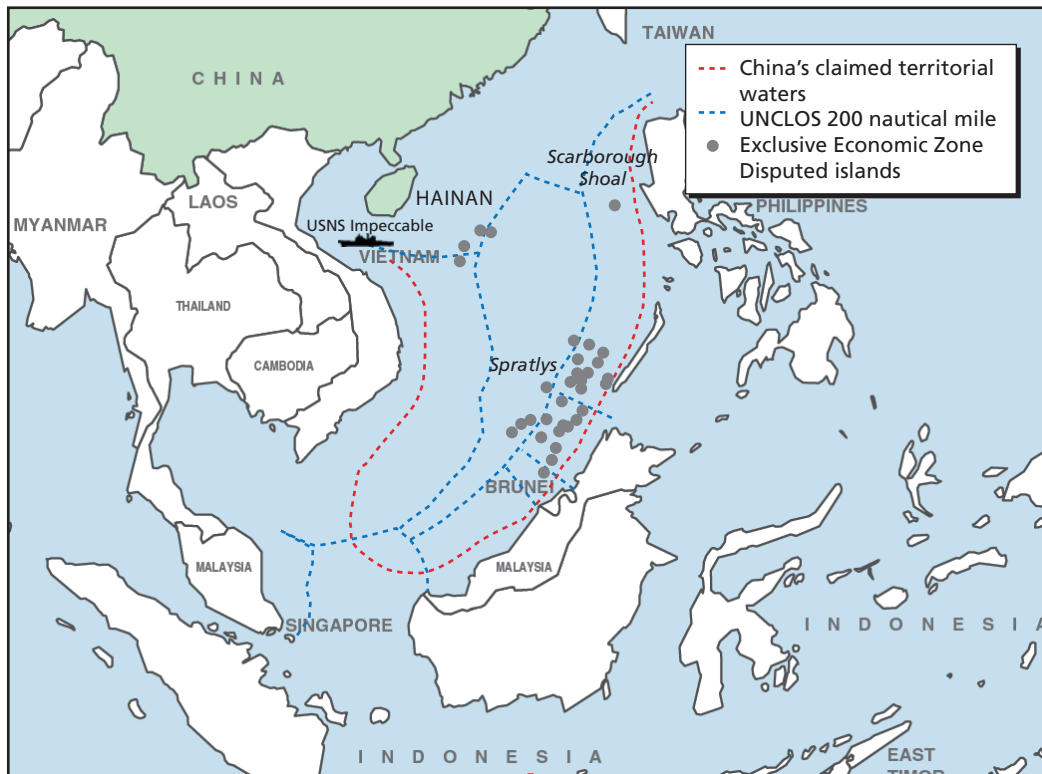
The Need to Consider Potential Sources of Crisis. The buildup of China's military and economic power has long been anticipated and can be regarded as both natural and historically normal. It is possible and perhaps even likely that China, its neighbors, and the United States will have mostly good relations for many years into the future. That would be strongly consistent with the interests of all concerned. Nonetheless, there are reasons to worry. Even a year ago, most China experts in the United States would have referred only to hypothetical concerns based on geography and historical experiences and would have ended with a recitation of why the nations have interests in continuing peace and prosperity, and how they had—so far—showed restraint and, by and large, statesmanship. Unfortunately, more signs of trouble have arisen. Some of these are economic, some military, and some political within China.

Problems Rooted in Economics. Economic problems are increasingly serious and could contribute, or even lead, to strategic crisis. This is so despite the fact that China and the United States have intertwined economies that create mutual dependencies and shared interests. The most-prominent point of tension currently is that China has tied its currency to the dollar, thereby sustaining a major export advantage—a strategy often described as economic mercantilism. China perceives sustaining its exports to be a key to domestic political stability. Further, China can reasonably assert that the vast bulk of the economic problems manifested in the recent recession and slow recovery are due to failures in the United States and other countries, not China. The economic issues are, in fact, complex, and Chinese devaluation of the renminbi would not substantially help the U.S. trade balance because of other low-cost foreign suppliers. Nonetheless, the arguments criticizing China's currency manipulation are strong, and a major political backlash is increasingly likely to occur, especially with high U.S. unemployment and the shrinkage of middle-class incomes due, in significant part, to globalization and the related outsourcing. Such a backlash is now in evidence.¹⁵ Whether wisely or not, at some point, the United States might feel compelled to embark on a trade strategy that includes punitive tariffs. At minimum, these actions on trade might act as an accelerant to the deterioration of U.S. public and elite support for a balanced approach to dealing with China on security matters. Conceivably, the result of such backlash actions could be a full-blown trade war. A global downturn might then occur, prompting efforts to regionalize the global economy. The result would probably be a kind of economic conflict as occurred in the 1930s. Although we would not expect such dire developments, their possibility is a concern.

Problems Rooted in Geostrategic Issues. Although the issues are long-standing, Beijing has recently become much more assertive about its territorial claims along its littoral in the Yellow Sea (on the west side of Korea) and the South China Sea (between Vietnam and the Philippines), which it now claims as a “core interest” of sovereignty (see Figure 2.2).¹⁶

Concerns of regional states, such as Vietnam, as well as tensions with North Korea, have prompted Washington to take a more-assertive military posture in the region symbolized by recent naval exercises in both seas. Secretary of State Hillary Clinton emphasized freedom of navigation in the seas when addressing the Association of Southeast Asian Nations.¹⁷ China responded in August 2010 with its own exercise, the largest in its history. China claims indisputable sovereignty but says that it would allow other countries to navigate through the waters.¹⁸ Later in 2010, a diplomatic and political spat arose between Japan and China when a Chinese fishing boat collided with two Japan Coast Guard cutters. The incident related to the Senkaku-shoto (Diaoyu Tai) islands and highlighted the large differences in undersea territo-

Figure 2.2
China's Sovereignty Claims



NOTE: UNCLOS = United Nations Convention on the Law of the Sea. USNS = U.S. Naval Ship. CIA = Central Intelligence Agency.
 RAND OP326-2.2

rial claims between China and Japan in an area that might (or might not) be rich in oil and natural-gas resources. After two weeks of diplomatic and economic threats by China, Japan ended the crisis by turning over the Chinese captain of the fishing vessel at the center of the controversy.

Yet another development is that the Chinese military (its People's Liberation Army) has had increasing influence on government foreign policy.¹⁹ Such military influence might elevate the perceived significance within China of various tensions or alleged threats that might otherwise be regarded as mere diversions to be suppressed or finessed to ensure continued economic growth, prosperity, and world stature. Those pushing the alarmist view within China, for example, sometimes cast the Taiwan issue as one of threat, asserting that the United States sees Taiwan as a convenient launching point for attacks against the mainland. Also, exaggerated strategic significance can be ascribed to the tiny islands in areas of disputed sovereignty, as discussed earlier. Misrepresentations and misperceptions are common in politics worldwide. China is no exception, although official documents suggest that calmer assessments prevail within elite circles.²⁰

There have been other sources of tension, including Google's threat in 2010 to pull out of China because of the demands of government-sponsored censorship and the continued assault on its network infrastructure. Within the Obama administration, there has been rising

alarm about the aggressive use of computer network exploitation, including an unprecedentedly candid public discussion by the Deputy Secretary of Defense.²¹

Potential Flash Points for War? No major power wants war any more than it wants an economic crisis. Nonetheless, it is easy enough to identify potential flash points between China and the United States. The long-standing examples involve the Korean peninsula and Taiwan. In the future, other possibilities might be at least as plausible. They include the above-mentioned tensions due to China's expansive territorial claims over the South China Sea. The Spratly Island chain in the South China Sea is often mentioned as a possible point of trouble because of possible natural resources and disputed claims by China on the one hand and by Indonesia, the Philippines, Malaysia, Vietnam, and Brunei on the other. As highlighted earlier, tensions were elevated recently between Japan and China over the unresolved dispute over the Senkaku-shoto (Daiyou Tai) islands. Other future flash points include possible U.S. strategic support for India in the event of clashes between China and India, as discussed later.

Irrespective of the diplomatic vicissitudes in relations between China and its Asian neighbors, a few facts seem indisputable:

- China already has substantial military capabilities (even if limited by reach). This is no longer something projected for the distant future. The military balance is changing now.
- Given the range of China's weapon systems, the rapid pace of its military buildup, the proximity of potential trouble spots to the Chinese mainland (Figure 2.2), and China's nuclear capabilities, it no longer makes sense to base U.S. force planning for the Pacific on the notion of a nicely contained virtual (or actual) war over the Taiwan Strait.²²
- The appropriate longer-term model appears to be one of restrained competition, balance of power, and a kind of deterrence—rather than one focused on the assured capability to defeat aggression locally.
- What is needed is a larger grand strategy that includes, if possible, political cooperation rather than competition, and a de facto balancing.

The United States will face a dilemma in this regard, as discussed later (Chapter Four).

This balance-of-power perspective leads naturally to discussion of India (and other regional states), which can act as counterweights.

India and South Asia

The other emerging great power in Asia is India, with its significant and competitive multinational corporations and major advances in information technology and software development. Given its robust economic development, India is prepared to invest substantially more in its armed forces. In addition to its continued development of an operational nuclear arsenal, it has an ambitious triservice modernization program and a number of reform initiatives.²³

Although relations are complicated by U.S. ties to Pakistan, India and the United States have substantially expanded political, economic, and military ties in recent years. This was assisted by U.S. willingness in 2008 to accept India as nuclear-armed state while still remaining a nonsignatory of the Treaty on the Non-Proliferation of Nuclear Weapons.²⁴ Recently, U.S. and India military-to-military relations have continued to expand with the first major U.S. arms sales to India.²⁵

Even if India continues a political strategy of evenhandedness between China and the United States, the stage is set for closer security ties between India and the United States. Flash

points exist for military crises involving China and Nepal, Northeast India, Pakistan, Myanmar, and the Indian Ocean littoral. Some could involve water resources. Thus, over time, India could find itself engaging in a low-key Chinese balancing strategy with the regional support of Indonesia, Vietnam, and Australia and direct and indirect support from the United States. Japan might or might not be part of such a de facto balancing strategy.²⁶

Proliferating Weapons of Mass Destruction

WMD continue to be salient because of developments by North Korea and Iran, which have had unfortunate leaderships; the potential for further proliferation in Asia and the greater Middle East as foreseen a decade ago;²⁷ the effects of proliferation on extended conventional deterrence; and the possibility of nonstate groups, such as al Qaeda, obtaining some such weapons.

At the nation-state level, nuclear weapons continue to have deterrent value and balance-of-power value. Although developed states refer to newcomers on the nuclear scene as proliferators and see them as troublemakers, the motivations of the proliferators are tied to their national-security concerns. Nuclear deterrence is powerful and efficient, even if not infinitely so. Security concerns and the continued benefits to balance-of-power considerations for many states imply to us that the lofty goal of nuclear abolition will not be achieved soon, if ever.²⁸ We also remain quite skeptical about the belief that announcing and pursuing the goal of abolition helps to limit proliferation. We have more to say about deterrence in Chapter Four.

A perennial question is how the next nuclear use might come about if deterrence fails. Foreseeable possibilities include (1) the death throes of North Korea,²⁹ (2) an India-Pakistan war, (3) a nuclear-terrorist event, (4) nuclear conflict in the greater Middle East, and (5) a conflict between great powers, such as India and China. The primary worry is that such factors as fear, anger, hate, desperation, or even apocalyptic religion might play an excessive role in some such crises.³⁰ However such wars came about, they could cause grievous damage, both locally and globally, through effects ranging from agricultural devastation (due to something akin to the nuclear winter discussed during the Cold War), to long-term shut-down of Persian Gulf oil production.³¹

Nuclear war is in a class by itself, but other major concerns exist. Biological weapons have the potential for mass destruction, and even radiological weapons have the potential for at least mass-disruption effects.³² It is conceivable that nonstate groups, such as al Qaeda, might obtain some of either, or a small number of crude deliverable nuclear weapons, although the likelihood of that is probably less than sometimes stated,³³ and there is plenty of evidence to believe that al Qaeda believes that it can make do with much more-available, familiar, and uncomplicated weapons. Most recently, it has discussed a strategy of low-risk, low-cost activities to defeat the United States “with the strategy of a thousand cuts. The aim is to bleed the enemy to death.”³⁴

It is unclear that these worrisome WMD possibilities have implications for the major features of U.S. force planning (especially force-structure planning in the large), so we do not deal with them further in this paper except to observe that even U.S. counterterrorism and COIN activities worldwide would be affected if al Qaeda or a successor had the capability to launch mass-destruction attacks in one or a few major important cities (including those of allies).

The Struggle with International Violent Religious Extremists

Whether justified or not, the Iraq war was not part of a broader geostrategic trend for the United States to invade countries to effect regime change.³⁵ The invasion of Afghanistan,

however, was in direct response to the 9/11 attacks, and, almost a decade later, the United States finds itself in extended manpower-intensive COIN operations against the Taliban in the Afghanistan-Pakistan region—even though the linkage to the al Qaeda threat is now indirect and controversial.³⁶ The United States might emerge from Iraq at least partially successful (the possibility still exists of renewed civil war with spillover effects), but there is no end in sight for Afghanistan and Pakistan. Even if the United States is wise enough, and lucky enough, to avoid analogous long-slog activities elsewhere in the world, the possibility of being tied down for many years looms large. The outcomes of these two massive interventions will strongly affect future U.S. government and public attitudes about future COIN-type conflicts.

This said, many argue that defense planning should assume that complex operations (e.g., IW, stabilization) will be the norm rather than the exception into the indefinite future and that U.S. force structure should be planned accordingly.³⁷

Skepticism is warranted. Nothing in the past decade gives compelling reason to believe that the United States is interested in, good at, or required by circumstances to engage in further long-term, large-scale, manpower-intensive conflicts half a globe away, especially when such U.S. operations create general antipathy to the United States among so many people, especially in the Muslim world, and especially when that antipathy might be a factor in generating “homegrown terrorists” who identify with the Muslim jihadist cause. There can be no doubt that the United States must have capability to engage in small-scale counterinsurgencies when necessary (even in multiple places simultaneously, as is the case today), but—in our view—it would not be surprising if the nation decides firmly against large-scale activities akin to those in Iraq and Afghanistan.* The issue then becomes “how much is enough?” for related capabilities.

Space and Cyberspace as New Wartime Theaters of Operation

Another strategic development is that two new theaters of operation are mainstream subjects rather than footnotes: space and cyberspace.

Today, the United States enjoys and exploits a rich system of capabilities in space, affecting all aspects of military operations. Within the next decade or two, however, China, Russia, the European Union, Japan, and India will all have deployed significant space systems. Much of this will be for commercial and scientific purposes by the space powers themselves and by other state and nonstate actors as well.³⁸

Some of the space powers will deploy space-surveillance and denial capabilities, as well as capability to damage other nations’ systems.³⁹ Potentially reversible forms of interference include radio-frequency jamming and optical blinding. Some powers might deploy additional antisatellite weapons (ASATs). These might include hit-to-kill interceptors, high-power radio-frequency and laser weapons, and lethal cyberwar mechanisms. All of these are a threat to low-earth-orbit systems, including most national earth-surveillance satellites. To physically attack satellites at higher orbits, such as the GPS, is much more difficult and would require either

* This assumes that engagement is a matter of choice, which may not prove to be the case. Also, attitudes might be more favorable to future interventions if the current strategy of finding and killing Taliban leaders proves highly successful. However, even “success” in this regard might lead to an uncomfortable but strategically tolerable settlement allowing U.S. withdrawal, rather than clear victory.

special-purpose interceptors or, e.g., co-orbital small satellites that could act as inspector and attack systems, perhaps launched during peacetime or at the outset of a crisis.⁴⁰

Possible international attempts to ban or restrict the full spectrum of ASATs will likely fail. To be sure, some believe that no major space power will be prepared to conduct a counter-space campaign during a regional conflict for fear of losing its own space systems. We are unconvinced by their logic because the United States appears to have far more to lose than others and because U.S. military forces have become highly dependent on space systems.

Emergence of the cyberspace theater is another manifestation of RMA IV. It will be the scene of major, continuous struggle well before the start of kinetic forms of warfare against space systems.⁴¹ The primary issue is whether a country's system for command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR) is vulnerable to threats through cyberspace. Will such systems be able to function in the face of such attacks, which could include traditional electronic warfare and more-extensive computer network attacks, as well as the possibility of threats from electromagnetic pulse and high-powered microwave weapons? Planners will have to decide "how much is enough" when improving the resilience of space systems and related critical infrastructure from such unconventional threats.⁴²

We anticipate that all major powers will make major investments to protect their military C4ISR systems from the full spectrum of electronic attack. They will also attempt to protect critical economic infrastructures. Given the dynamism of the offense-defense struggle in cyberspace, however, as well as the cost of defensive measures, there will be great uncertainty about the functioning of such systems in the event of a regional or global confrontation.

The Looming Obsolescence of U.S. Power-Projection Forces

Against this background, it appears to us that the current U.S. general-purpose force structure and associated concepts of operations are becoming obsolete faster than is widely appreciated because current conflicts have not highlighted the looming problems.⁴³

Force Projection in Traditional Conflicts but with New Challenges

With some oversimplification, the current RMA I U.S. force structure, as enhanced with the past two decades' RMA IV technology, is highly suitable to the kinds of wars fought in 1991 and 2003 with Iraq and wars that were not fought, such as a second war with North Korea. For all of these, the concepts of operations included or would have included (1) flexible deterrent options with forward-deployed forces, (2) large-scale deployments to regional bases and close offshore naval positions, (3) ensuring regional naval supremacy, (4) achieving air supremacy to an extent permitting U.S. airpower to operate with near impunity, (5) suppressing air defenses, (6) conducting large-scale offensive air operations, (7) inserting ground forces and rear-area logistical structures, (8) conducting large-scale, combined-arms maneuver operations to achieve decisive victory, and (9) following up as necessary with stabilization operations.⁴⁴

These operations have increasingly depended on an infrastructure of C4ISR that provides high-bandwidth communications and relatively persistent ISR without serious interference.

As Table 2.3 suggests, with color-coding for readability purposes, all components of this generic concept of operations are now in jeopardy. Nor do we believe that the adverse trends can be reversed with tweaks on the margin. The criteria used in Table 2.3 are that red applies

Table 2.3
Viability of Classic Concepts of Operations

Component	Previously	Now, and Increasingly in Near Future
Limited forward presence	Nonproblem	Restrained but not especially risky
Large-scale deployments to regional waters and bases	Nonproblem	Risky due to vulnerable bases and regional waters; risks stem from air-independent-propulsion submarines and precision antiship weapons (including land-based missiles); large standoff ranges will likely be needed.
Broad naval supremacy	Nonproblem	Challenges exist but are much less when not in close-in regional waters.
Achieving air supremacy	Nonproblem	Nonproblem in most domains, but not, e.g., close to Chinese mainland
Suppressing air defenses	Destruction is difficult because of cover and deception but suppression is quite feasible.	Risky for above reasons and advanced mobile and man-portable surface-to-air missiles
Offensive air operations	Strategic strikes are possible early with stealthy aircraft; large-scale operations are a nonproblem after suppression of air defenses against fixed and known high-value targets.	Risky and difficult because of modern air defenses, the need for long-range operations, and the difficulty of finding mobile and hidden high-value targets
Entry of traditional ground forces and infrastructure	Nonproblem after gaining air supremacy	Risky because of vulnerabilities of forces during entry and of bases and other logistics. Area weapons pose special concerns.
Later ground-maneuver operations with close air support and battlefield shaping	Supreme skill of U.S. forces	Moderately risky, with air support constrained due to residual SAMs, and with vulnerabilities to residual precision weapons
Large follow-up operations (e.g., stabilization in large countries)	Feasible on a small scale, or on the Iraq scale with mobilization; forces at risk due to improvised explosive devices and other asymmetric tactics; large manpower requirements	Feasible on a small scale, or on the Iraq scale with mobilization; operations are risky for adversaries having precision or area weapons and some defenses against drones. Special needs for mine-resistant vehicles, persistent surveillance and substantial manpower.

NOTE: Red = feasibility is in question. Orange = feasible but with high risk. Yellow = risky or difficult. Green = feasible with acceptable risk.

if the problems discussed apply to core challenges with China or other potential adversaries; orange applies if the problems arise in important challenges specific to China but not otherwise; yellow applies if the problems arise in noncore instances with China or other potential adversaries; and green indicates relatively favorable assessment.

To be sure, our assessments in this think piece are inherently subjective, and some may reasonably disagree with them. The uncertainties have less to do with technology trends, which are observable, than with whether in fact potential adversaries will exploit them as we project.

Some key points that underlie these conclusions relating to traditional forces and traditional operational concepts are, with some redundancy from earlier in the paper, as follows:⁴⁵

- Concentrated ground forces, and concentrated logistics, are potentially quite vulnerable to an expanding spectrum of precision weapons, including short-range guided mortar

bombs, precision-guided rockets, and precision guided short- and medium-range ballistic and cruise missiles. This has been more than hypothetical since the 2006 war in Lebanon.

- Aircraft are also potentially quite vulnerable to precision weapons if based within the countries of operations or relatively close to shore. If based at long range to improve survivability, these aircraft will be unable to maintain high sortie rates over contested areas, whether for purposes of achieving air superiority or for suppression of air defenses and support of ground operations.
- These vulnerabilities would be exacerbated if the adversary used area munitions, such as the cluster weapons that the United States has used for decades, or fuel-air explosives (thermobaric munitions), such as those developed by the United States, Russia, the United Kingdom, and China.
- The challenges to traditional forced-entry capability will continue and worsen. Arguably, the two premier forms of theater-wide forcible entry, the mass airborne and amphibious-operation mechanisms, are already obsolete for many environments.⁴⁶ Brigade-level airborne drops have long been more of a theoretical option than something anticipated; large-scale, over-the-shore amphibious assault will be seen as both risky and potentially costly given the threat from improved coastal ISR, mines, and direct and indirect precision weapons. Maneuver from the sea using longer-range, vertical-takeoff-and-landing aircraft, such as the V-22, will remain very limited in scope because of range-payload issues and vulnerability to air defenses. Heavy amphibious forces in the form of the armored expeditionary fighting vehicle will be vulnerable to direct-fire guided munitions. (Secretary Gates recommended its cancellation in January 2011.⁴⁷) Even sea bases could also be vulnerable to precision-missile fires at significant ranges offshore.

Special Problems with Complex Operations

The preceding discussion applies primarily to modern and future variants of traditional wars, albeit with more-capable adversaries. The other major class involves manpower-intensive complex operations. For nearly 20 years, the United States has found itself involved in such operations for which its force structure is also not very suitable. The interactions of political, military, social, and military challenges in the Balkans were described well by the combatant commander GEN Wesley Clark (who referred to them as issues of “modern war”).⁴⁸ Additional problems became visible in the struggle to combat the global threat from violent religious extremists, which, in turn, has embroiled the country in large-scale COIN operations for which it was ill prepared.

It remains unclear how far the balance should shift in preparing U.S. forces for complex operations rather than traditional conflicts (or whether there is even a contradiction in preparing broadly for both), but some shift has certainly been necessary, and more is needed. In pondering this, we should recognize that U.S. adversaries in such complex operations will also likely benefit, to a greater or lesser extent, from inexpensive precision weapons and other manifestations of RMA IV leveraging the insurgency tactics and criminal activities (hybrid warfare) of RMA II. Inspired in part by Hezbollah’s relative military success against Israel in the 2006 Lebanon war, many regional-power militaries (especially ground forces) will probably reorient toward revolutionary or insurgency warfare, if only for direct national defense. The Iranians have already moved in this direction. So also might U.S. specialized military assistance be more oriented in this direction.⁴⁹

Obstacles to Action

Given the looming discontinuities, major and fundamental changes are necessary in U.S. national-security strategy and military planning. However, numerous obstacles are in the way.

Today's Wars

The most important is the simple fact that the nation is deeply involved in current wars. Withdrawal from Iraq is occurring on schedule (to be complete by the end of 2011) and President Obama's intent is to begin withdrawal from Afghanistan in 2011 (with 2014 having become the target for turnover of combat responsibility to Afghan forces), but prospects for Afghanistan and bordering regions of Pakistan remain uncertain. Further, the United States continues to be very concerned about violent extremist Islamists across the globe. These militant self-proclaimed jihadists are coordinated—to some degree—by an ideology that purports to be universal, unifying, and based on God's will.⁵⁰ The challenge of networked terrorists will likely persist for many years, even though al Qaeda's strength and appeal have been much reduced in some respects. Our own assessment is somber, for reasons discussed recently by Bruce Hoffman.⁵¹

Given this context, it is difficult for the government to place as much attention as it might on what would amount to yet another transformation of the U.S. military with the longer term in mind. The priority has been on improving effectiveness in current wars. Remarkable changes have been wrought by the new Army-Marine COIN doctrine associated with GEN David H. Petraeus and Gen. James N. Mattis:⁵² so much so that senior ground-force officers are worried about the lack of training and experience that younger officers are receiving in traditional operations. That said, much remains to be done within the IW domain, as evidenced by the disappointingly slow results achieved so far in training Iraqi and Afghan armies and police forces. In the meantime, the costs associated with operations are a constant drain. Fighting today's wars, then, is a major obstacle.

Disruptive Technology and the Innovator's Dilemma

A second obstacle relates to what has been called the innovator's dilemma, a term introduced by Clayton Christensen,⁵³ who explained how it is very difficult for businesses to invest heavily in disruptive technologies because doing so would undercut their major product lines and do so before their customers even recognize different needs. By the time of eventual changes, some competitor has made the necessary investment to profit from the disruption at the expense of the fallen giant. One example is the Japanese conquering the domain of auto manufacturing in the 20th century's last decades due to complacency by U.S. corporations.

The analogue to U.S. military planning is that the United States currently possesses extremely competent, motivated, and well-equipped military forces, forces that rival any of those in history. Its military services are attached to the nature of those forces. The reluctance to tamper with the concepts that underlie these forces is understandable—especially when the changes most likely to be needed will mean the ends of eras. Also, the ends of eras have often been declared prematurely (e.g., by those claiming even decades ago that tanks, aircraft carriers, and manned bombers were obsolete; or by those in the 1990s who believed that many fewer ground forces were needed because of the capabilities of air power).⁵⁴ For a variety of reasons, then, there is always great reluctance to transform military forces until and unless the necessity of doing so is stark.⁵⁵ Historically, underdogs have found ways to defeat capabilities

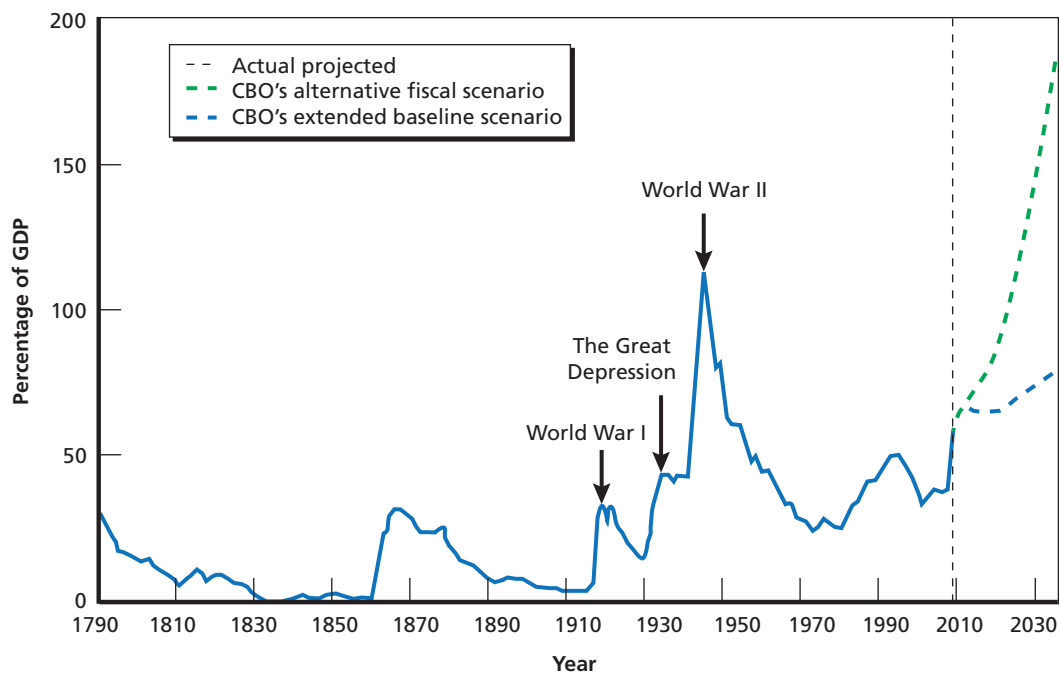
they could not match; alternatively, dominant powers have grudgingly accepted that change was necessary—but only after suffering defeats.⁵⁶

Constraints After a Period of Plenty

A third obstacle, of course, is economic. Recovery from the Great Recession is slow and uncertain, and a second economic crisis is emerging—one rooted in inexorable U.S. demographics, social programs, and the high degree of fiscal indebtedness built up over the past ten years and exacerbated by the wars in Iraq and Afghanistan and by the measures employed to moderate the recent recession. All government agencies, including DoD, will be under severe budget pressures. The debt ratio (federal debt over gross domestic product or GDP) is now projected, under current trends, to skyrocket—reaching the 90-percent point by 2020 and rising steeply thereafter (the upper line of Figure 2.3 applies; the lower, “extended baseline” is not seen as credible because it assumes unlikely congressional actions).⁵⁷ Since that explosion of debt is both alarming and unsustainable, budgetary changes will surely occur, with ramifications for defense coffers beyond the already-planned-for leveling off of real growth rates.⁵⁸

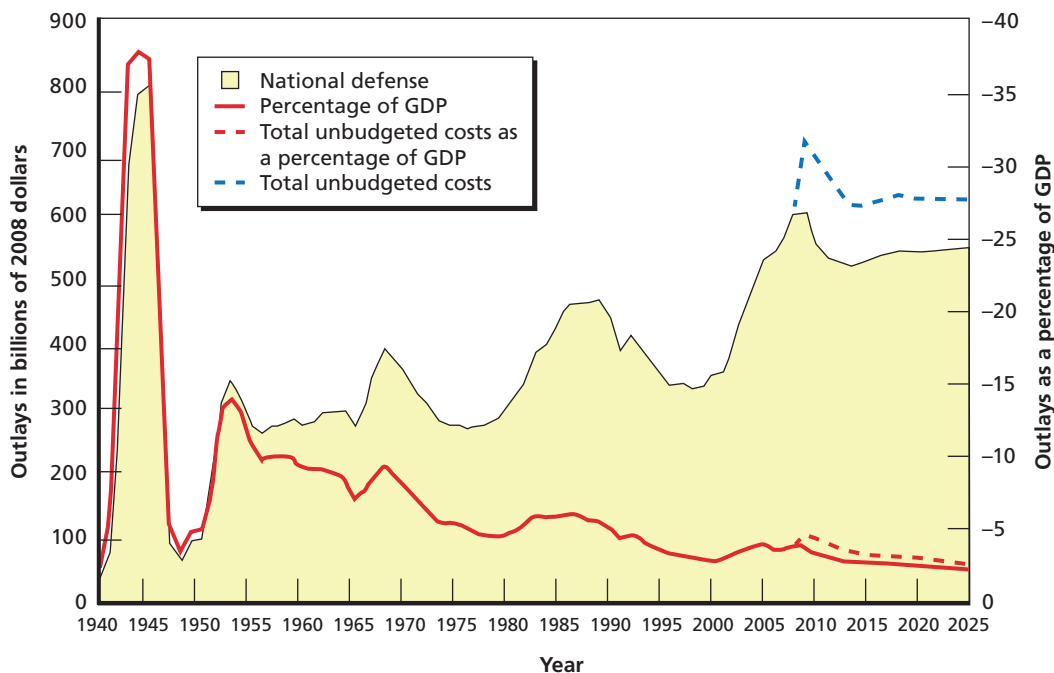
In considering prospects for defense planning, the residual effects of the financial crisis still weigh heavily. Further, the unprecedented boom in defense spending during the early to mid-2000s (see Figure 2.4) has ebbed and is unlikely to be renewed given the historically high rates of spending, public disaffection with the wars in Iraq and Afghanistan, and other national priorities. Even if the United States were hit again with a terrorist attack, it is not evident that increasing military spending would be useful.

Figure 2.3
Federal Debt as a Fraction of Gross Domestic Product, for Two Budget Scenarios



SOURCES: CBO, 2010c, 2010d.
RAND OP326-2.3

Figure 2.4
Past and Projected Spending Levels for National Defense



SOURCE: CBO, 2008.

NOTE: FYDP = Future Years Defense Program.

RAND OP326-2.4

The executive branch began planning a significant turn-down several years ago, under President George W. Bush. The expectation was that the defense program's burden would drop to perhaps 4 percent of the GDP. There have not as yet been any major changes since the election of President Obama, despite the financial collapse in 2008, the recession, and skyrocketing deficits. The Congressional Budget Office's January 2010 data and projections of defense spending are shown in Figure 2.4, with the dashed curves including Congressional Budget Office estimates of unbudgeted special costs of operations in Afghanistan, Iraq, and elsewhere.⁵⁹ As mentioned above, the total public debt will be 90 percent by 2020 in the absence of major policy changes.⁶⁰ Not since the end of World War II has the United States faced a comparable burden. These and other realities caused Secretary Gates to say recently with respect to defense spending, "The gusher has been turned off, and will stay off for a good period of time." He went on to decry excesses in "overhead" spending, cost overruns, and difficult-to-defend expression of "requirements" for the current force structure.⁶¹

What will actually transpire is hard to predict. Although the public hopes that a variety of congressional actions will reduce the generational burden implied by increasing deficits (e.g., by extending the age at which retirees receive full social-security benefits, increasing taxation to pay for those benefits, and controlling the rate of rising health costs), it seems to us implausible that defense expenditures will not also come under tight scrutiny, with many observers recommending further cutbacks as the efforts in Iraq and Afghanistan wane. Cuts on the order of 10 percent more than is currently projected are plausible, especially because it is hard to see why defense expenditures should be much higher now than in the Reagan era, even if the defense "burden" (as measured as a fraction of GDP) has continued to diminish (Figure 2.4).⁶²

We should end this discussion by observing that to say that the DoD budget will be under stress is not to argue that DoD will be money-starved in objective terms. Further, great innovations have often occurred historically in periods of austerity (one might think here of blitzkrieg tactics or development of aircraft carriers). Such budget stringency can force rethinking and large-scale changes that otherwise would be resisted bitterly.

Lack of Good, Agreed Options

Yet another obstacle to action is, in our experience as defense analysts for several decades, unprecedented: No one has yet identified solutions in a compelling way. As contrasts, consider that, in the early to mid-1990s, it was evident that precision weapons and networking were revolutionizing warfare and that the United States could greatly expand its already-formidable capabilities by exploiting them. The mechanisms for doing so were relatively clear cut,⁶³ although controversial.⁶⁴ Indeed, it was clear that it would be possible to have much more capable forces while reducing their size. The related transformation could pay for itself by substituting capital for labor in a historically familiar way. To be sure, there was an important footnote: Such an approach would not deal well with certain kinds of war that have always been (and remain) manpower intensive.⁶⁵ In the 1990s, and indeed until September 11, 2001, it seemed unlikely that the United States would be fighting large versions of such wars. Indeed, some argued for reducing the size of the Army by another 20 percent to pay for elements of the transformation. That did not occur.

Within a few years, the difficulty with manpower-intensive wars became evident with the war in Iraq and its infamous difficulties. By 2004, it was also evident that the U.S. Army needed to drastically revise its doctrine for operations to deal effectively with COIN. The character of the changes needed was there to be drawn from lessons learned (and mostly forgotten) over many decades. The changes mandated by the new COIN doctrine are notable more for them happening over a relatively short time by historical standards than for its content—admirable as that content is.

In our view, there is no such clear way ahead today. As discussed in Chapter Three, some important aspects of the way ahead can be identified now, but the future of force projection, in particular, remains quite unclear. That, in turn, has implications for both general and immediate deterrence, including what has been called extended conventional deterrence.

Future Capability Needs and Possible Future Directions

Basic Questions

If someone steps back, ponders, and then speculates about the way ahead for U.S. force planning, that person would surely have the following questions:

- Will traditional force projection be too dangerous and expensive, forcing the United States (and other nations) to shift strategies, perhaps to an emphasis on deterrence and strategic maneuvers that could exploit deterrence and various indirect and disguised forms of warfare?¹ If so, is there reason to believe that conventional deterrence will be more effective than it has been historically? After all, a considerable literature describes how and why conventional deterrence has often been ineffective.²
- Are the centuries-old concepts of military balance obsolete to the extent that they revolve around capability for large-scale battles of capital platforms and armies? If so, what will replace them, since power-balance issues will assuredly remain crucial?
- How will weaker nations protect themselves if U.S. ability and willingness to defend them in traditional ways are reduced? If the United States is unable or unwilling to provide credible extended conventional-deterrence commitments, will this prompt those nations to acquire nuclear weapons?
- What stratagems will be used to gain advantage without undue risk of larger war? Will cyberspace become a domain for protracted strategic warfare? Will state sponsorship of radical groups using terrorism become more of an international norm? Will aggression consist of a surprise take-over of an island here and an island there? Or a province here and a province there? Will tit-for-tat mechanisms be feasible because both sides will be wary of an escalating military conflict?

It is too soon to write the epitaph for traditional projection forces. It is likely that many traditional, smaller-scale operations of the sort that the Navy and U.S. Marines have long conducted, and the missions of special forces, will continue to be feasible (in part because of cover, deception, and cyberwar tactics) and important. Nonetheless, the character of military matters is changing substantially for larger-scale operations relevant to both balance of power and what have long been called major regional conflicts.

We return to these strategic issues later in the paper, but, before doing so, let us sketch the outlines of what future capability might look like if the United States takes a “we must change in order for things to stay the same” approach.

Concepts of Operations for Force Projection

As described earlier, the classic force-projection concept is no longer a good model (see Table 2.3 in Chapter Two). What, then, might replace it? A fresh round of thinking is needed, one that starts by asking what generically distinct concepts of operations are at least plausible in the future. Without elaboration, at least three replacement concepts come to mind. All would scrupulously avoid concentration of forces under vulnerable circumstances. All would exploit partnerships with local allies, with most of the fighting being done by them rather than by U.S. soldiers.³ The concepts are as follows:

1. *Make deliberate, phased entry with defense.* This concept would be, in some respects, a modernized version of the classic concept. However, significant suppression of adversary capabilities would be accomplished with long-range strike platforms (and cyberwar), after which the ground and air forces deployed into the country (perhaps from sea basing) would have reliable defenses against missile and drone attacks from short, medium, and long ranges. The defenses would be accompanied by the ability to quickly detect and attack the launch sites of any attacks (by analogy with the Army's current counterbattery fire). Further, there would be the need to support Army and Marine ground maneuver forces by long-range airlift flying from protected land or sea bases. In the near term, there is the prospect that multibrigade ground forces could be supported by airlift with the new technology of precision airdrop, although that will be very challenging for some classes of supply, such as fuel and ammunition. Airlifters would overfly low-altitude air defenses, and there would be no need to use forward airfields that were under threat from long-range precision fires. The concept of the defended sea base also appears attractive. Recently, the Navy has developed a new at-sea connector, the mobile landing platform that has conceptual promise to provide at-sea support to a multibrigade-size Marine and Army expeditionary force,⁴ although budget pressures might preclude related investments.
2. *Surveil, strike, punish from afar, and insert small, networked ground forces.* An alternative approach would be to eschew insertion of large ground forces and to instead depend on sustainable strike capabilities guided by persistent surveillance from survivable platforms. Special forces and unconventional-warfare operations working with indigenous allied forces could also play a major role. So also could the concept include large numbers of small, dispersed, networked ground forces.⁵
3. *Make rapid entry.* A third example would emphasize prior surveillance by survivable and possibly covert means; first strikes or preemptions in the form of sudden, decisive strikes with long-range missiles and aircraft, cyberattacks, and specialized ground forces; and follow-up actions by larger numbers of ground forces, both those of the country being assisted and external projection forces.⁶ Such attacks might be especially relevant to dealing with terrorist networks that cannot be deterred in the ordinary sense.

These possibilities are neither mutually exclusive nor exhaustive (for example, they do not include space-based weapons that could be used both for offensive purposes and to suppress or destroy enemy defenses), but they illustrate a range of different thrusts—each with its own severe shortcomings.⁷

Selected Focus Areas for Capability Development

The generic concepts of operations suggest to us certain focus topics for identifying future capability needs. These relate to capabilities for defense, kinetic offense, complex operations, and force structure—capabilities that loom large in the notional concepts outlined earlier. These will be needed in addition to having capabilities for, e.g., stabilization operations and COIN. Balance will be crucial, and budget constraints will be substantial.⁸

Enhanced Active Defense

As the U.S. patents on precision weapons, area weapons, global surveillance, networking, and the like expire, a dramatic implication for the United States will be the need for vastly increased defensive efforts at the tactical and operational levels:^{*}

- defenses against short-range ballistic missiles and cruise missiles of varied range
- layered defense of capital surface ships against attacks by ballistic and cruise missiles—defense with sufficient capacity and agility to deal with simultaneously arriving weapons
- small-area defenses against tactical systems, such as precision mortars and rockets
- active defenses for individual vehicles developed by Israel and Russia.

It is unclear to us how effective these defenses can be. However, such defenses could be critical for future large-scale, ground-force projection against enemies with precision weapons, area weapons, and a degree of surveillance over the high seas. Complicating operations will be the need to defend against chemical weapons. Defense planners will need to decide how much is enough for defensive interceptors, which will have a high unit cost, likely in the neighborhood of \$1 million per round. Thus, forward-deployed forces will have limited inventories and could run out of ammunition in an intense combat operation. Forward-deployed, land-based missile-defense batteries and aircraft could perhaps be resupplied by airlift or even precision airdrop.⁹ Modern surface warships and submarines, however, are not designed to be reloaded at sea and would need to transit to a secure rear-area port. A regional commander would face a similar dilemma when deciding how to husband a finite arsenal of long-range strike weapons, as discussed later.

Already, the United States has deployed a first generation of layered active defense. It includes terminal defense systems, such as the Army's Patriot Advanced Capability,¹⁰ that are the underlayment for an outer layer of exoatmospheric interceptors, i.e., the Army's Theater High Altitude Air Defense, and the Navy's Standard Missile 3 hit-to-kill systems. In time, these might be supplemented with means by which to intercept missiles in boost phase. Possibilities include the airborne laser, although its prospects have diminished because of limited slant range,¹¹ and boost-phase interceptors on low-observable fighters, such as the F-22 and F-35. The latter is being pursued in the Network Centric Airborne Defense Element program and might be feasible against, for example, North Korea because the Air Force and Navy could quickly gain something close to air supremacy. Operating against larger countries, such

* We do not discuss national ballistic-missile defense. Some such capability is operational and will likely be sustained. However, more-ambitious systems to deal with high-end intercontinental threats will remain elusive for reasons of feasibility, cost, and controversy about value. A possible exception in the future could be the capability to defend key military and industrial facilities from transoceanic-range attacks by precision-strike weapons.

as China and Iran, would require long-distance overflight and orbiting over suspect missile-launch areas in the face of more-robust and only partially suppressed air defenses.

The United States and other countries, such as Israel, are also pursuing improved air defenses, specifically against small cruise missiles, such as those posing a serious threat to ships. A particularly troubling aspect of the cruise-missile threat is that the technology is here today, and even nonstate actors can acquire and employ the technology, as illustrated in Israel's war against Hezbollah in Lebanon.¹²

Work also proceeds on systems for the counterrockets, artillery, and mortars intercept mission, the current version of which uses a ground-based spin-off of the Navy's mature Phalanx close-in system.¹³ Israel, of course, is highly motivated in this regard and recently received U.S. support for its Iron Dome system.¹⁴

It follows that a good deal of related research and development and even acquisition are in progress. However, we see the demand being for very high levels of effectiveness and reliability against adversaries that will assuredly work to counter defenses. Thus, the challenges in this domain are quite high. Indeed, one can argue that highly reliable defenses are implausible and that the way ahead for ground-force projection must be with large numbers of small, mobile, networked units, which might be less vulnerable.¹⁵

Intelligence, Surveillance, and Reconnaissance, and Kinetic Strike

Survivability. Today, the United States enjoys a wide range of relatively persistent reconnaissance systems, but these are not survivable in the face of advanced air defenses. The United States has not demonstrated the capacity to conduct a large-scale counterforce campaign that can react to near-real-time intelligence of fleeting targets of opportunity, such as mobile missile launchers in a contested air defense environment. As noted earlier, the entire inventory of low-earth-orbit satellite reconnaissance systems is vulnerable to nonnuclear (and nuclear) ASAT threats. What is needed is a variety of ISR platforms that can operate in the face of severe defenses—i.e., to provide persistence over heavily defended airspace. An example of a related current program is the Navy's Unmanned Combat Air System program,¹⁶ which would be intended, in part, to provide targeting information for long-range strike systems, such as hypersonic cruise missiles or precision-guided ballistic or boost-glide missiles.¹⁷ Another possibility for strategic investment would be the Air Force's new-generation bomber used as a survivable reconnaissance-strike platform. Yet another possibility is a wholly new generation of unmanned aircraft system (UAS).

Sustainability. An important point that is often overlooked, especially in public debate, is that the United States will need the capability for sustained attack against powerful military opponents, which makes reliance on high-cost air- and sea-launched, long-range missiles alone a dubious proposition but does invite looking at combinations of capabilities. As noted earlier, forward-deployed forces might have a limited arsenal of aerospace defense interceptors. The problem of running out of ammunition is a problem for the offense as well. This is especially true for naval forces that will require surface warships and submarines to pull offline for a protracted period of time after they have exhausted their defensive and offensive magazines. Very long-range Air Force bombers, such as the B-52, can act as arsenal bombers and fly from distant airfields with tanker support, although it is unclear that such bases would remain a sanctuary in a war with a near-peer competitor. Even if a large replacement arsenal bomber is developed, it will have the same limitation as relying on B-52s to carry out massive but episodic long-range missile strikes. These standoff missile attacks pose sensor challenges, as well

as command-and-control challenges, to dynamically control the weapons in flight. They also have targeting limitations and maybe offer less flexibility than a penetrating aircraft. This is a primary reason for the Air Force's interest in a next-generation, low-observable bomber to penetrate a major opponent's degraded defense systems.¹⁸ One of the major missions for long-range strike weapons could be to conduct a campaign to badly degrade, if not destroy, the opponent's air defenses and sea-denial and antiaccess capabilities. That is, a long-range missile strike campaign could make the battlespace safer for subsequent long-range penetrating bombers and shorter-range manned and unmanned fighter-bombers from carriers to conduct repeated strikes with more-numerous short-range missiles and guided bombs.

It is likely that careful two-sided campaign analyses and war games will reveal a need to buy a very large arsenal of air- and sea-based, long-range strike weapons to achieve ambitious military objectives in the event of a major regional war. However, an alternative campaign strategy would use a militarily less-ambitious form of punitive bombardment under the argument that it would be sufficient to deter even a near-peer competitor by imposing unacceptable costs and risks. Under that strategy, there would be no need to invest in a very large arsenal of long-range strike weapons and their associated survivable and penetrating ISR platforms. The Air Force would arguably invest in a follow-on to the B-52 to be used as an arsenal bomber. As mentioned earlier, however, the historical record on the effectiveness of conventional deterrence is discouraging.

Comprehensive Defense Suppression

Even if the future requires less emphasis on penetrating bombers, persistent and responsive reconnaissance-strike operations might require a powerful capacity for suppression-of-enemy-air-defense operations. Even regional-power opponents might have serious air-defense systems in the next several decades. One attraction of the rapid deep strike systems, such as the hypersonic cruise missile and conventionally armed ballistic missile¹⁹ is their use as counterbattery fires against mobile high-performance SAM systems that must radiate to function. That, however, is counterbalanced by the enemy's capacity to use decoy targets or use weapons that function both offensively and defensively and that can move quickly after launch. Despite decades of effort, the challenge of being able to find and kill such mobile targets remains daunting. That is, in the hider-finder dynamic that has emerged, hidiers still have the edge. This kind of problem, of course, is two-sided: It is likely that the real-world adversary capability to attack U.S. forward-deployed and projection forces will be substantially limited by tactics of stealth, deception, and cyberwar. Nonetheless, the United States has traditionally been leery about basing decisions about force structure and operational concepts on the assumption that such tactics can be counted on years into the future.

Survivable Basing. Short-range tactical aircraft will have substantial survivability issues from current forward bases and close-in aircraft carriers. Moving to longer range is unavoidable. So also, the reconnaissance-strike and suppression-of-enemy-air-defense units will need to be able to operate from either defended ships at sea or defended bases located some distance from the likely areas of attack. Navy forces provide the option of robustly defended sea mobile reconnaissance-strike forces, the rationale for developing the Unmanned Combat Air System. The Air Force, especially if there is a major investment in a new-generation low-observable reconnaissance-strike bomber, might have to operate out of intermediate support bases within the theater of operation or, more plausibly, be supported by aerial tankers. These intermediate support bases will have to be heavily defended from air, missile, and submarine attacks.

Dependence on one or two bases with powerful but unprotected reconnaissance-strike assets would be an invitation to a regional preemptive strike akin to the attack on Clark Air Base on December 8, 1941.²⁰ A variety of actions would be necessary to make these forces unattractive to attack and could include a variety of remote basing, dispersal to multiple locations, hardening, and other passive defenses, active defenses, and regional security relationships. These very difficult and costly regional-basing challenges might point to the need for a very long-range, large-payload bomber operating at great distances, perhaps from the continental United States itself, with all the military and strategic limits that would imply, and with only a dubious basis for imagining that to provide sanctuary.

Effective Munitions. Despite major progress in developing munitions designed to defeat hard targets, defeating superhard and deeply buried underground targets remains an extreme challenge.²¹ Some deeply buried hard targets might be vulnerable, if at all, only to a future generation of nuclear earth-penetrating warhead. Still others might not be easily attacked even with nuclear weapons.²² So far, Congress has denied funding related to research and development, and the Obama administration has shown little or no support. The reasons include doubts about feasibility and the administration's desires to reduce the salience of nuclear weapons in U.S. defense planning, to reduce the size of the nuclear arsenal, and to set the stage for possible eventual nuclear abolition.²³

Complex Operations

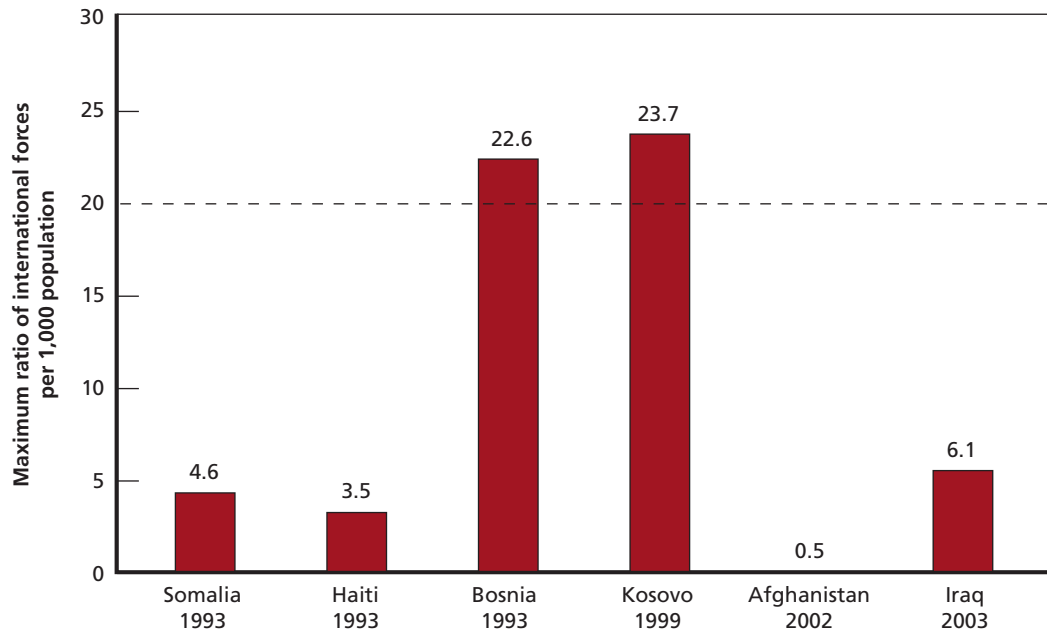
Counterinsurgency with Lower Force Requirements. So far in this section, our discussion has addressed modern variants of traditional wars. A second class of capabilities relates to complex operations, such as those in Iraq and Afghanistan. Great conceptual progress was made with the new doctrine for IW,²⁴ and wartime experience is adding a wealth of knowledge. The most-recent Quadrennial Defense Review reflects much recent work on improving capabilities for complex operations and itemizes a number of related initiatives, as do a variety of other studies.²⁵ In this paper, we do not discuss such matters much. However, the issue of force requirements as a function of focus on complex operations is very much relevant to our discussion.

We should also note that some of what is being learned from current operations is disheartening. In today's Afghanistan, for example, offensive operations intended to clear, hold, and build have sometimes been able to clear, but the challenge of holding has been elusive. The Taliban fighters have the wit to leave when U.S. and Afghan army forces are present but to return with a vengeance when they are not. Local villagers must calculate whom they must fear next week and next month, not just today.²⁶

To express the issues analytically, traditional estimates stemming originally from mid-1990s work by James Quinlivan suggest the need for 20 soldiers per 1,000 population in COIN operations (Figure 3.1),²⁷ although the number might be smaller if the United States has air supremacy and the freedom to operate large numbers of hunter-killer surveillance systems with impunity, or if COIN operations are sequential over lengthy periods of time so that the relevant population is far smaller than a country's total population. And, of course, the troop requirements might eventually be filled by local forces at least as well as, if not better than, intervener forces. These points were illustrated by U.S. COIN activities in Iraq's Anbar province in 2007–2008.

We highlight this issue because (1) it is simply not in the cards for the United States to greatly increase and sustain the size of its ground forces, which severely limits what can

Figure 3.1
Troops Needed per Thousand Population



SOURCE: Adapted from Quinlivan, 2003.
RAND OP326-3.1

be accomplished according to the classic rules of thumb, and (2) the jury remains out on whether the methods currently being employed are truly changing the rules of the game (and on whether, even if they are, the United States will like the results in the long run).

Thus, it is possible that future writers will conclude that COIN is feasible with smaller numbers than previously realized. However, there are reasons for skepticism because adversaries adapt, surveillance is imperfect, sanctuaries often exist, and so on. If the RMA IV technology-driven force multipliers do not prove out, then the alternative is to depend even more heavily on local partners. In that case, there are fundamental challenges regarding the ability to form, train, and provide effective leverage to local-partner forces. The pace of developments on such matters in Iraq, and now in Afghanistan, has been maddeningly slow.²⁸

However the questions we raise play out, there will be major consequences for U.S. doctrine and for the character and size of force structure.

Operating Against Adversaries Embedded in Populations

Another challenge in counterterrorism and COIN is dealing with adversaries that immerse themselves within civilian populations, making it difficult to attack them without collateral damage that is very troubling in its own right and that adversaries can advertise to discredit the operations. If the United States sees COIN operations as a future core competency, then it will need to address such problems, which have no neat technical solutions. The Israeli experience is informative, illustrating that—with sufficient effort and some trade-offs with effectiveness—measures can be taken to minimize collateral damage. Even so, mistakes occur, and it proves very difficult to prevent public and even international uproar in the wake of propaganda exaggerating the killing of innocents and damage to basic infrastructure.²⁹ Irregular adversaries

will most certainly use such tactics as those used by Hamas as it immersed itself in the Gaza population. How would future U.S. forces and allies conduct operations against them?

Major Changes in Expeditionary Ground Forces

If conducting major theater operations under massive precision-guided munition strikes becomes a central planning requirement, both the Army and Marine Corps will have to consider a major restructuring of their ground maneuver forces with a radically revised concept of operation. Profound issues include

1. next-generation service building blocks. Is even the brigade too large for modern conflict of most concern? Should future units be built around capabilities closer to those of special operations than traditional types of maneuver warfare?
2. How much is enough? Many today argue that more ground forces are needed, as is currently programmed. Some reformers believe that the active military could be much smaller than it is today and that the current large force structure is both expensive and highly ineffective relative to a smaller, more-networked force.³⁰
3. What sizing criteria should be used for force structure (the topic of a RAND monograph)?³¹
4. What principles should guide the future total force consisting of both active- and reserve-component forces? Should the nation continue to use reserve-component forces as readily available for extended active-combat tours, or should it revert to the concept in which reserve-component forces are primarily for homeland defense and deep strategic reserve, except for specialty capabilities? And should more of those specialty capabilities be moved into the active force? How should contract personnel be viewed in assessing requirements for the total force?

Finally, there is the question as to how big an active and reserve Army is still justified as a strategic hedge against geostrategic and military uncertainty even if this force structure is not tied to a well-defined set of potential military threats. As discussed earlier, the trend of high-end warfare is toward the likely diffusion of RMA IV-type capabilities with the plausible diffusion of RMA III-type capabilities. This might imply less emphasis on what has been called “Big Army” in debates about the merits of special operations forces (SOFs) versus traditional army forces.

Likely Cross-Cutting Stratagems

How the future will unfold is a mystery, but it seems to us likely that the United States will find the following aspects of preparing for crisis and conflict especially important.

Dispersion and Networking

An inexorable consequence of new technology has been that massed formations will be even more vulnerable, for all services, in important circumstances. Even good defenses can typically be overwhelmed, bypassed, or beset by leakage. Over the ages, forces have continued to “de-massify” (decrease in mass) as a result. The trend toward ever-decreasing unit size (i.e., smaller building-block units) is continuing and is now reaching extremes. Since precision-guided and

area-effect weapons can be very damaging,³² the trend will continue toward more dispersion into smaller and smaller units, units able to act effectively together in large part because of real-time networking.³³ All of this has many implications for unit size, command protocols, and other details. Unfortunately, this high-performance networking capability might not be available in the face of high-end opponents.

Home-base organization might still revolve around familiar structures (e.g., battalions, brigades), but concepts of operations will stress smallness (including use of special forces and forces for unconventional warfare more generally). Most SOF-type operations will be against less-technologically enabled opponents.

Network Security and Hedging

Modern concepts of operation, including the ones we have sketched for the future, require effective networking of forces, something that has been achieved to a large extent today. However, it has become increasingly apparent that the networking is potentially fragile—not only to external cyber attack, but also to the well-known but often underappreciated insider threat. Once trust in the network is lost, due to reliability problems or, worse, to “contamination” affecting data, effectiveness might drop rapidly. In this paper, we can do little more than emphasize the necessity of achieving very high levels of network security and hedging seriously—with large related investments to avoid failures. Redundant systems, methods, and tools for rapid reestablishment of networks, and parallel but independent systems not dependent on as much networking, are all needed. In this same vein, hedging is needed to reduce the critical dependence of U.S. operations on vulnerable space systems.³⁴ Such hedging is feasible but against the grain for organizations seeking to maximize performance with limited budgets. We believe that it will not happen without top-down programmatic directives.

Massive Robotics and Remote Control (Beginning of RMA V?)

On the technology end, it is predictable that robots and remotely controlled systems will play an ever-increasing role in many aspects of military operations: surveillance, reconnaissance, dealing with improvised explosive devices and comparable problems, rapid-response defenses, and even certain kinds of assaults. Many of the machines will be much more expensive than proponents might like, and the autonomous ones will be more subject to occasional inappropriate behavior, but the alternatives to their use will not be attractive (e.g., close-in defenses, or cyberspace defenses, might not work if limited by in-the-loop decisionmaking). Further, it might prove possible to develop at least some robotic systems producible inexpensively in huge numbers. This is part of the promise of nanotechnology. It would not be surprising if, for example, large swarms of insect-like nanobots became an important element of future warfare. For example, they might be used to more-precisely localize individual targets hiding in the midst of civilians—even within the same buildings.

Currently, the United States, out of necessity during wartime, has pushed the development of remotely controlled unmanned aerial vehicles (UAVs) and unmanned ground vehicles. Several major innovations have emerged from these efforts. The first has been the appearance of persistent armed UAVs being used as hunter-killers during the COIN and counterterrorism fight. A second development has been the mass deployment of unmanned ground vehicles to support infantry operations in urban terrain and specifically to support countermine or counter-improvised explosive device missions. Third has been the integration of UAV operations with manned ground and air ISR platforms to conduct battlefield surveillance, target

identification, and strike. Yet a fourth worth mentioning is the use of lighter-than-air systems for persistent surveillance (although they have obvious vulnerability problems).

For ground forces, there has been the development of unmanned ground systems for reconnaissance, bomb disposal, and combat. For naval forces, there has been the early emergence of unmanned surface vessels and unmanned underwater vehicles for use along the littoral to conduct surveillance, mining, and countermining. Noteworthy is the certain global diffusion of these capabilities, including their acquisition by nonstate actors.

One of the major unresolved legal and policy issues is what limits, if any, are to be placed on such combat machines that acquire the technological capacity for increasingly autonomous action. Further, there is the troubling prospect that the U.S. protracted form of “personalized” warfare using hunter-killer teams in Iraq, Afghanistan, and Pakistan will set the historic precedent of legitimized various forms of high technology–enabled “wars of assassination.”

Rejuvenated Efforts to Limit Proliferation of Advanced Weapons

Because of the potential dire implications of our adversaries having inexpensive modern weapons, it seems important that the United States pursue as vigorously as possible international efforts to severely limit their proliferation. This might include not just the continuing efforts in nuclear nonproliferation but also a new look at initiatives to severely constrain ballistic missiles, long-range precision missiles, and area weapons. Opinions differ about what is feasible. Currently, there is going to be a new wave of military exports by both the United States and Europe. The former is driven by the U.S. desire to greatly expand manufacturing exports to regenerate a slowly recovering economy, while the latter is trying to find work for European defense industries facing major defense cuts by all of the major European powers. They will face increasing competition from Russia, China, and other emerging regional powers, such as India, Turkey, and South Korea. Optimism is difficult.

Perceiving the Way Ahead, Darkly

Rethinking the Issue of Balance

Over the past 20 years, and in Vietnam before that, U.S. military forces have been consistently involved in operations of the nontraditional variety. As we have discussed in this paper, trends are adverse even against lesser adversaries because of the prospects of them using combinations of IW and low-cost advanced technology, as well as some potentially having nuclear and biological weapons. Further, traditional global missions have not gone away; nor has the U.S. interest in maintaining its broad military supremacy over potential competitors or adversaries.

A core element of the planning challenge, then, is the need for the United States to balance its efforts across the multiple missions effectively.¹ That might involve cutting back on some mission capabilities while increasing others; increasing the scale of the overall military establishment; finding a new division of labor;² or attempting to cope by nominally maintaining all capabilities but focusing training and operations on current complex-operation activities while continuing to invest heavily but incoherently in platforms and forces for traditional war and some aspects of future war. Balance can also be improved by designing future force units and systems to be more broadly prepared. That would reduce the difficulty of balancing across different kinds of units and systems.

What follows is an attempt to identify specific difficult issues.

Major Issues for the Military Services

Although the geostrategic and geoeconomic future is uncertain, with major shocks and historic discontinuities likely, U.S. defense planners already have a rather full list of looming defense policy issues. Each of the services, especially in the context of joint planning and investment, has major planning issues to address over the course of this next decade. Table 4.1 summarizes these questions. For each service, there are questions (although not necessarily in this order) about (1) the building-block units around which that service will build force structure; (2) concepts of operations and that service's plans to exploit joint capabilities without overly risky dependency; (3) the portfolio of capabilities across missions; (4) the approach to particular stressful challenges; and (5) the total force structure (active, reserve, and National Guard).

Some additional cross-cutting questions also come to mind. Two of those are the following:

- How can cover and deception of various types be employed to enable operations at the tactical, operational, and strategic levels? To what extent can they reduce demands for perfect defenses?

Table 4.1
Issues Ahead

Item	Questions to Be Answered
Regular Army	<p>What are the appropriate building-block units for the future Army, for diverse types of operation? Is it still the brigade combat team or something else?⁵</p> <p>How reliant should the Army be on Air Force and Navy airpower for indirect fires and ISR support, given the trade-offs between deployability and sustainability on the one hand and the threat to aircraft from defenses on the other? How does the answer change as units become smaller and single-battery indirect fires become more feasible?</p> <p>How much of the Army's structure and design take on SOF-like features?</p> <p>What should the Army's modernization objectives be, given adaptive adversaries exploiting both insurgency tactics and information-technology methods (RMAs II and IV)?</p> <p>How should the Army conceive its portfolio of capabilities and capacities across COIN operations, high-end expeditionary operations, balance-of-power considerations, and smaller-scale contingencies?</p> <p>What are the missions and investment requirements for the Army Reserve and National Guard?</p>
Navy	<p>How will the fleet fight in the face of high-end antiaccess and counter-C4ISR threats? How will the fleet prepare for combat operations in which much of the peacetime C4ISR infrastructure has been degraded or destroyed?</p> <p>How will the fleet operate in the face of precision-weapon threats and counter-C4ISR threats but the need to have on-the-scene presence for deterrence? What is the joint Navy/Air Force operational concept in the conduct of war with a near-peer opponent, as a function of policy decisions? Is it to build a comprehensive capacity to militarily defeat that major power, a capacity to reliably hold at risk a large array of targets of value, or something else?</p> <p>What should be the size, capacity, and role of the Navy and Marine concept of fighting and sustaining ground forces from the sea? What level of threat can be challenged by amphibious assault forces? Should the U.S. Navy procure a sea base capable of supporting a substantial U.S. Marine Corps/Army expeditionary force from the sea?</p> <p>What is the appropriate mix of building blocks for future Navy fleets as aircraft-carrier battle groups are forced to longer range? What is the long-term investment mix between submarines, surface ships, and carriers?</p>
Air Force	<p>How will the Air Force conduct operations against opponents well equipped with antiaccess and counter-C4ISR capability?</p> <p>How will the Air Force fight in the face of high-end antiaccess and counter-C4ISR threats? How will it prepare for combat operations in which much of the peacetime C4ISR infrastructure has been degraded or destroyed?</p> <p>How expansive should the Air Force mission be in space? What is space supremacy, how can it be made operational, and at what cost?</p> <p>As a function of policy decisions, what is the joint Navy/Army operational concept in the conduct of war with a near-peer opponent? Is it to build a comprehensive capacity to militarily defeat that major power, or is it the capacity to reliably hold at risk a large array of targets of value? How will the Air Force support Army and Marine maneuver forces during high-intensity combat operations in the presence of defenses?</p> <p>How much should the Air Force rely on UASs? How much should the Air Force invest in nonspace hedges, such as enduring UASs?</p> <p>Should the Air Force give priority to the development and deployment of a new-generation strategic bomber at the expense of its short-range, fighter-bomber modernization plan?</p> <p>What are the critical design requirements of the new-generation bomber? Should it revolve around low observability and penetration, or around it being a superheavy arsenal-ship configuration with standoff weapons?</p> <p>What are the implications of a much smaller but longer-range combat fleet on the tanker requirements?</p>
Marines	<p>Against what antiaccess threat should the Marines be prepared to conduct amphibious operations? For what size of operation?</p> <p>What is the balance between air and sea amphibious assault, maneuver from the sea by vertical takeoff and landing, and lower-level littoral operations, including protracted COIN operations?</p>
SOF	<p>Should SOF become the primary means of U.S. power projection with combined-arms forces? Should the SOF structure be expanded? Can it be, without serious degradation of quality and increased attendant risks?</p> <p>What is the relationship and relative emphasis of the foreign forces' training mission with the big services? Will that role be expanded or turned over in part to a permanent training structure within the Army, the U.S. Air Force, and U.S. Navy?</p> <p>How will SOF adapt to the diffusion of RMA IV tools and techniques to potential state and nonstate adversaries?</p>
Total force	<p>What is the appropriate mix and missions, by service, of active, reserve, and National Guard forces?</p>

- How can U.S. forces (and other organs of government) best work with those of other countries on security matters?

Adjusting Strategy for the Far East: Avoiding or Dealing with a Cool War Between China and the United States

Despite logic, a cool war might emerge between China and the United States. If so, it would likely be driven by economic and balance-of-power differences rather than ideological differences, although such differences exist between the authoritarian-state capitalist and the democratic free-market models of a political economy and are important.⁴ An important source of any such sustained geostrategic deterioration will, we suspect, be prompted by rising trade and economic disputes and China's continued global quest to gain access to key resources, such as hydrocarbons and strategic mineral resources. Severe economic disputes that lead to tariff wars could have a baleful international and domestic effect similar to the tariff competition that broke out during the 1930s. The Chinese quest for resources will not be a direct source of conflict but might be perceived by U.S. elite and public opinion as increasingly hostile behavior by Beijing, especially if China develops close ties with hydrocarbon-rich countries, such as Iran. Put simply, these nonmilitary factors might act as a powerful accelerant rather than as a direct cause of geostrategic conflict. Barring a future military crisis in which nuclear weapons come into play, it is likely that the military competition will be in the arenas of maritime superiority in Asia, space, cyberspace, and the development of high-technology power projection and antiaccess and area-denial capabilities.

The historical experience of the United Kingdom with the United States and Germany early in the 20th century is worthy of consideration. Finding itself in relative economic and geostrategic decline, the United Kingdom consciously attempted to change its strategic relations with both the United States and Germany through a strategy of accommodation.⁵ The United Kingdom acquiesced to the hegemony of the United States in the Western Hemisphere, thereby setting the stage for the United States to enter as a late ally during World War I. The strategy of accommodation with Germany failed in large measure, fueled by domestic and elite desires for Germany to challenge the United Kingdom's naval supremacy, which prompted a naval arms race.⁶ Following a series of political crises, especially in Morocco, the UK shifted toward an alliance and containment strategy that included cooperation with its historical rivals, France and Russia. The stage was set for World War I. Overdrawing historical analogies is always troublesome, but the failure of accommodation between the United Kingdom and Germany should give the 21st-century leaders of the United States and China pause.⁷

Whether China's force-projection capabilities will actually rival those of the United States in the long run will be told in a story not yet written. However, it would seem prudent for the United States to think simultaneously about (1) increased cooperation with China on sharing the burden of maintaining peace and security in the region and (2) how to compete effectively, despite the distances involved, and even how to maintain a substantial military edge overall.

U.S. defense policy and plans will influence the evolution of U.S. and Chinese relations. As already noted, a critical planning issue to be examined and debated is what military strategy is appropriate for the balance of power with China. The logical possibilities here include the following:

- comprehensive warfighting capability, which has a credible prospect for victory in the event of war
- credible deterrence
 - modest but potentially pain-inducing nonnuclear limited-escalation options (i.e., to reestablish deterrence in the manner intended for cold-war limited nuclear options)
 - strike capability sufficient to substantially damage homeland infrastructure
 - naval supremacy in the large, including long-term supremacy along the sea-lanes of communication to the Middle East and elsewhere.

In thinking about such matters, of course, the last-move fallacy should be avoided. Obviously, China would respond to deployment of capabilities that it found threatening, potentially leading to an expensive arms race and near-disintegration of relationships that no one wanted.

Other nations' decisions will also matter greatly to what emerges. Asian nations are already reacting to the buildup of Chinese military capabilities with increased efforts of their own, especially in Southeast Asia and with India. Without a coherent and credible path ahead for the United States to deal effectively with these changing balance-of-power issues, Japan, South Korea, and Taiwan could come to doubt the U.S. extended deterrent commitment that includes the full range of military (nuclear and nonnuclear), economic, and diplomatic power. They might choose (despite severe diplomatic tension with the United States) to further accommodate to China or to develop their own independent deterrent forces, which could involve substantial long-range precision-strike or nuclear capabilities.

Nonnuclear Restraint or Help from Arms Control?

Prospects for being able to project forces into troubled areas look much worse than in past decades—at least for those contingencies in which adversaries make use of potentially available technologies. A natural question, then, is whether⁸ there is a role for conventional arms control or mutual restraint.

From a logical point of view, the conclusions might be as follows:

- The United States, along with other developed nations, could impose maximum controls on the transfer of missiles, precision weapons, and area weapons or identified components (as well as, of course, WMD and even high-lethality weapons that might fall short of the WMD characterization).
- Similar restrictions could be created for platforms capable of armed surveillance.
- These controls could be pursued as a critical matter of national and international security rather than as mere virtuous political agreements.

Such controls could build on past control efforts associated with the Missile Technology Control Regime, an informal international effort stimulated by the desire to limit proliferation of unmanned delivery systems capable of delivering WMD, and the more-recent supplement, the Hague Code of Conduct Against Ballistic Missile Proliferation. Although many countries, such as China, are not signatories, and there have been many apparent violations of the controls over time, it can be argued that the control regimes have had useful mitigating effects, although mostly with respect to long-range systems.

However desirable such controls might be, we reluctantly conclude that such agreements are unlikely to transpire. Numerous nations will be fiercely marketing both RMA I– and RMA IV–type weapons because of defense-industry lobbying, economic pressures, or desire to strengthen or sustain defense industries.⁹ All of this suggests that attempts to gain a broad consensus to create a robust international arms-restraint regime would be, at best, an uphill struggle.

For similar reasons, we conclude that it makes sense for the United States to reexamine opportunities for space-related arms control, although prospects for successes that would be in the U.S. interest are questionable.

Preparing for Across-the-Board Changes

Although disruptive change is difficult, there have been some successful examples of exploiting disruptive technologies, such as (1) the Navy’s development of aircraft carriers in the 1930s,¹⁰ (2) the Navy’s development of nuclear submarines and long-range strategic ballistic missiles, (3) Air Force development of UAVs for both reconnaissance and strike, and (4) the Army’s development of special forces. All of these, however, required championing by secretaries of defense and, sometimes, presidents, as well as cooperation of or even intervention by Congress. Also, in many instances, the semi-independent Defense Advanced Research Projects Agency (DARPA) played a major role.¹¹

The natural result of such history-based reasoning is to argue for a period of vigorous exploration and experimentation, and, indeed, we believe that such is needed. The problem here is that many of us recall a previous period of such efforts: the past 15 years. One aspect that skeptics might recall with displeasure is that many visionary ideas were pursued without the benefit of sanity tests or objective analysis. It has taken years for the department to institute an emphasis on early systems analysis informed simultaneously by strategists, operators, technologists, and cost-aware analysts.¹² That emphasis should continue, although with care taken to protect pursuit of the ideas that pass basic tests of technological and engineering feasibility.

The challenge of stimulating, focusing, and managing ambitious but result-oriented exploration and experimentation is exceedingly difficult, and we do not attempt solutions in this paper. Table 4.2, however, lists some possible elements. We have chosen not to include pros and cons because the ideas are insufficiently developed. We and many others could easily describe problems with each and every idea. After all, if the U.S. Joint Forces Command has been found so wanting as to suggest its abolition after a decade,¹³ why should anyone imagine that addressing the challenges is easy?

The illustrative elements of a way ahead mentioned in Table 4.2 are motivated by our belief that all of the following will matter to success: (1) sound analysis of creative alternatives, (2) vigorous experimentation (including prototyping and the license to sometimes fail), and (3) mechanisms to improve the likelihood that good ideas rise and that good choices are made even when they seriously disrupt traditional processes and organizations. These, in turn, will not occur without leadership, appropriate organizational mechanisms, and funding.

Table 4.2
Possible Elements (all with shortcomings) of a New Thrust for Exploration and Experimentation

Element	Description
Guidance and leadership	<p>Express the related strategy clearly in official documents, including the national security strategy, and laying the groundwork in Congress. Convey a sense of urgency and impending major changes.</p> <p>Nurture and promote change-agent leaders in the services and DoD.</p> <p>Recreate the equivalent of the Office of Force Transformation, reporting directly to the Secretary of Defense.</p>
Organization	<p>Task one or more joint commands to conduct experimentation and warfighter-rooted analysis.</p> <p>Require each of the military departments to establish and protect suitable change-oriented divisions with a high degree of independence.</p> <p>Task DARPA and the Office of the Under Secretary of Defense for Acquisition, Technology and Logistics specifically for the mission of developing viable alternatives for large-scale replacement of existing forces.</p> <p>Create a national-security university (possibly virtual) and give it an elite cadre, the Office of Strategic Plans, with those chosen for it to be on a fast track to senior leadership.</p>
Quality	<p>Ensure high-quality analysis at all phases and levels, pulling together expertise in technology, systems, operations, and program analysis.</p>
Investment	<p>Invest in research, experimentation, and prototyping, changing the process so that innovators can profit without counting on production sales. Consider a percentage-rule mechanism to protect related work from continual disruptive competition from other portions of the overall defense program.</p>
Schedule and enforce reviews and choices	<p>Establish a schedule for reviews and decisions moving the country toward major changes in force structure, capabilities, organization, and posture.</p>

Making Room in the Budget

Our last subject is the troublesome issue of the budget. In this paper, we have argued for a new and vigorous round of exploration and experimentation that will have significant costs. Where will the funds come from? One of our primary concerns based on history is that cuts, when they come, will be across the board in nature and will have a disproportionate effect on fighting capability. Historically, a given percentage cut has typically resulted in twice as big a percentage cut in fighting forces—in part because it is so difficult to get at the underlying infrastructure, which contributes about half of the overall costs.¹⁴ It is noteworthy that Secretary Gates has expressed his intention to go after unnecessary layers of organizations and other sources of overhead cost. The other primary target for cost savings should be reducing the costs of personnel: by limiting the growth in benefits currently being sought by Congress and by substituting capital for labor where possible. Here, however, we encounter one of the most-consequential discrete issues. If the United States continues down a course in which manpower-intensive operations, such as COIN, are the norm, then paying for the necessary personnel will be a continuing drain. Adding extra ground-force units to the Army and Marines in the past

few years added about \$20 billion per year to the budget.^{15,*} A recent study reviews military compensation issues more generally and spells out why manpower costs are such a sizable portion of the budget.¹⁶

* As this paper was in final editing, Secretary Robert Gates announced intentions to reduce ground forces in future budgets (January 6, 2011).

Conclusions

We began this paper by asserting that the United States has extremely consequential, once-in-a-century decisions ahead in defense planning. These are due to technological changes (the collision of four continuing RMAs), geostrategic changes (notably, the emergence of China as a great power and increasing tensions due to both economics and regional-strategic matters), the emergence of space and cyberspace as theaters of operation, networked adversaries, and the obsolescent nature of U.S. forces. Major changes are needed despite the many obstacles, which include today's wars, the innovator's dilemma, the rapidly tightening budget, and the current lack of good options.

New Strategy, Capabilities, and Concepts of Operations

More specifically, we conclude the following:

- U.S. traditional capabilities for power projection could plummet soon, for some important circumstances, as adversaries, even second-tier adversaries, exploit the benefits of the information-technology revolution, such as precision-guided weapons, along with the methods of revolutionary warfare. Traditional force projection is becoming exceedingly dangerous (for other countries as well as for the United States).
- China's military power has already grown substantially. It is no longer appropriate to assess the adequacy of U.S. force structure by playing through simulated wars over the Taiwan Strait. The focus must instead change to other, broader conceptions of the power balance in Asia.
- The imperatives in the new conception will include deterrence and crisis stability; deterring both limited and larger-scale aggression; and ensuring that, in doing so, the combination of the sides' lethality and vulnerability do not give participants an incentive for, or a perception of necessity for, preemptive action. Avoiding errors that might cause war will become even more important for the great powers (and other regional states).
- Challenges of deterrence and especially extended conventional deterrence will be even further exacerbated with the continued proliferation of nuclear weapons to states with problematic leadership, as in North Korea and possibly Iran.¹ A major conceptual issue here is how such versions of deterrence can be strengthened to be more effective than has often been experienced historically.
- A new grand strategy is surely needed in the Far East and South Asia. Grand strategies tend to evolve and to be more imputed afterward than planned, but possibilities include

active regional security cooperation among the great powers (perhaps explicit external balancing), or any of several more-stressful relationships. This era provides great opportunities for visionary leaders. Vision might fail all parties, however, and the United States might then face a protracted cool war with China involving a dynamic mix of cooperation, competition, containment, and occasional confrontation.

- The military component of a grand strategy might seek to maintain conventional war-fighting and war-winning capabilities or shift to something more deterrence oriented. However, it would still have the ability to inflict serious pain with conventional strikes, to devastate infrastructure with conventional strikes, and to maintain supremacy at sea—if not in China’s near waters, then certainly on a larger regional and global scale that includes the sea lanes of communication to the Middle East and Africa.
- The United States has a major decision to make regarding the degree to which it should prepare for manpower-intensive operations, such as COIN and stabilization. It is not obvious that such operations can or should be the primary basis for force planning, despite events of the past decade. If they are, then the economic consequences will be acute because they would come in addition to the demands of evolving balance-of-power and force-projection issues that are themselves very demanding.
- In considering force changes, attention should focus not on numbers of traditional units but on the character of the future forces (i.e., the new building-block units and operational concepts). The building blocks will necessarily become smaller and smaller to avoid vulnerability and because small units can now accomplish a great deal. Reliable networking will be extremely important, but hedges are critical because network attacks are certain and could be quite effective, at least temporarily.
- Because the way ahead is not yet clear with regard to the character of forces, concepts of operations, or systems, we see the need for vigorous and competitive exploration and competition of ideas. The past decade’s experiences in this regard have not been encouraging: Pursuit of innovation has sometimes been pursuit of poorly conceived wishes; visions have sometimes gotten far ahead of technology and reason; criticism and competition have not been sufficiently valued; joint experimentation has not been sufficiently ambitious; and experimentation has been pursued with a notable lack of rigor.² Thus, a high priority should be placed on rethinking how the department can best do the exploration and assessments necessary to inform once-in-a-century decisions.

Overall, a National Security Strategy of Comprehensive Balancing

Finally, we observe that, in some respects (the primary difference being the unavoidable long struggle with international violent religious extremism that threatens the United States and its worldwide interests), the United States is in a situation reminiscent of that under the Eisenhower administration as it considers grand strategy. It seems to us likely that, in broad terms, grand strategy will need to evolve with an emphasis on rejuvenating and sustaining the country’s economic vitality while relying increasingly on credible forms of deterrence (rather than clear-cut superiority) in certain balance-of-power issues; and on alliances, improvement of allied capabilities, and use of international organizations.³ By analogy as well with the Nixon doctrine, the emphasis will increasingly be on others (e.g., friends or allies), rather than U.S. ground forces, doing the bulk of protracted fighting. This is sometimes called external bal-

ancing. This emerging consensus is already being reflected, e.g., in the Quadrennial Defense Review's emphasis on building partnership capacity. All of this might suggest a new "New Look" (the term used for Eisenhower's strategy). However, some aspects of Eisenhower's original strategy were simplistically dependent on a crude threat of massive nuclear use. The strategy was adjusted shortly to maintain excellent and highly flexible military forces able to deal with a range of challenges. We see the need for a national security strategy of comprehensive balancing, which would include pragmatic grand strategy as well as flexible military capabilities suitable for the world that is, rather than the world that some might prefer.

Endnotes

Chapter One: Introduction

¹ See Gates, 2009, 2010, and background in Rumsfeld, 2006. Binnendijk and Cronin, 2009, discuss the definition of *complex operations*. The term is unfortunate because traditional wars are obviously complex as well, in the sense of orchestrating political, economic, and military activities, often across numerous actors. No better terminology has yet been found.

² See Flournoy and Brimley, 2008; Krepinevich, 2009; and Arquilla, 2008.

³ For example, Secretary of Defense Robert Gates has said,

We simply cannot afford to perpetuate the status quo that heaps more and more expensive technologies onto fewer and fewer platforms—thereby risking a situation where some of our greatest capital expenditures go toward weapons and ships that could potentially become wasting assets. (Tiron, 2010)

Chapter Two: Diagnosis: An Environment with New Demands

¹ Technological advantages do not necessarily equal functional advantages. In the Vietnam War, for example, the United States enjoyed technical superiority, but the North Vietnamese were often better able to support the information needs of their strategy and tactics than was the United States.

² See Matthews, 2008.

³ See Wood, 2008.

⁴ See Defense Science Board, 2005.

⁵ The term *competitive strategies* is often associated with Michael Porter of the Harvard Business School (Porter, 1998), but it has a long history also with the Office of the Secretary of Defense's Office of Net Assessment and Andrew Marshall's earlier work at RAND (Marshall, 1972). It includes the concept of looking for ways in which minor or moderate investments would play to one's own strengths while seriously undercutting the expensive investments of the adversary. U.S. investment in stealth technology rendered obsolete massive Soviet investments in air defense. The measure-countermeasure race did not end there, however. Today, stealth aircraft are very expensive to build and maintain, but modern air-defense systems have evolved with antistealth features.

⁶ Discussion is adapted from Wilson, 2009.

⁷ The term comes from a well-known book (Weigley, 1977), which argued that the United States has generally thought about war in terms of attrition and annihilation of the enemy—and has mobilized its industrial strength correspondingly to produce mass capabilities. The Weigley thesis has been critiqued and modified significantly, with approving comments by Weigley (Linn and Weigley, 2002).

⁸ Consider also experiences from the Boer War and Philippines insurgency. For total-war aspects, consider the national liberation movements after World War II; the Vietnamese and Algerian eras of popular resistance; the contemporary use of print, radio, and television; and al Qaeda's successful use of television and

the Internet. The term *revolutionary warfare* (RMA II) emerged during France's protracted attempt to keep Algeria a part of France.

⁹ The history of transformation has been reviewed recently with a cross-administration perspective (Davis, 2010).

¹⁰ Many examples are possible. For example, the North Atlantic Treaty Organization fielded tactical nuclear weapons (RMA III) to help deter perceived RMA I superiority of the Red Army during the 1950s. Modern superheavy tanks with advanced passive and active armor are an RMA I response to the proliferation of early antitank guided munitions (an early manifestation of RMA IV). More recently, the RMA IV tools and methods used as part of Task Force ODIN are a response to the methods of insurgents (RMA II).

¹¹ Development of advanced air defenses, a feature of RMA IV, is often seen as part of the same way of war as the emergence of stealth technology, which, in fact, is an RMA I response to create aerial combat vehicles that are less vulnerable than ever-more-robust air defenses. Further, it is common to lump stealth technology with precision fires and the like because of the time at which it was introduced, rather than treat them as competitors.

¹² China also holds some \$840 billion in U.S. government bonds (about 30 percent of total foreign holdings), which might or might not provide troublesome leverage. See U.S. Department of the Treasury, 2010. Foreign debt is included in public debt. China's holdings amount to roughly 5 percent of this year's gross domestic product.

¹³ Several readily available reports describe China's growing military power (U.S. Department of Defense, 2010), its naval capabilities specifically (O'Rourke, 2009), and the changed military balance in the Taiwan straits (Shlapak, 2010).

¹⁴ A recent paper recounting the many shortcomings of the Chinese military has the subtitle "It's Not Time to Panic, Yet" (D. Thompson, 2010).

¹⁵ Early in 2010, a bipartisan group of senators introduced a bill to put pressure on China (and the Treasury Department) related to what they see as China's "currency manipulation" (Congressional Research Service, 2010). For related testimony and discussion, see Ferguson, 2010; Krugman, 2010; Stiglitz, 2010; and Batson, 2010. Krugman favors a temporary surcharge on U.S. imports of Chinese goods, by analogy with actions taken in 1971 that led to Germany and Japan raising the evaluation of their currencies. Stiglitz is more skeptical, especially because, in his opinion, a root problem is U.S. profligacy. Most recently, U.S. officials, including Secretary of the Treasury Timothy Geithner, have increased pressure on China, and the House of Representatives voted overwhelmingly in favor of a bill permitting punitive tariffs (Sanger and Chan, 2010). It is a long way from this to law, but it reflects congressional impatience.

¹⁶ See Office of the Secretary of Defense, 2010, p. 26, or "China Asserts Sea Border Claims," 2009.

¹⁷ See Clinton, 2010.

¹⁸ See Das, 2010.

¹⁹ See J. Lee, 2010, and Pomfret, 2010.

²⁰ See *China's National Defense in 2008, 2009*, which reflects a sanguine view of security developments, saying that "China's security situation has improved steadily" (p. 5).

²¹ See Lynn, 2010.

²² For discussion of the military balance regarding Taiwan, see Shlapak et al., 2009, and Shlapak, 2010.

²³ See Cohen and Dasgupta, 2010.

²⁴ The agreement was highly controversial and remains so (Bajoria and Pan, 2010).

²⁵ These include C-130J medium airlifters, C-17 heavy airlifters, and the advanced P-8 Poseidon maritime patrol aircraft. Relations will be further boosted if the United States wins the fiercely contested competition to sell the FA-18E/F Super Hornet or the advanced version of the F-16 Fighting Falcon. India is demanding a major infusion of advanced aviation and avionics technology into its aerospace sector as part of a package deal.

²⁶ If the strategy became more explicit with formal alliances, political scientists would call such an approach external balancing.

²⁷ See Bracken, 2000.

²⁸ See also Thomas Schelling's musings on the matter (Schelling, 2009).

²⁹ Prospects for this have risen with the apparent dynastic transition of power ongoing in late 2010, which apparently triggered the military brinkmanship by North Korea.

³⁰ Such factors can dominate even when individuals are attempting to behave rationally (Davis, 1989).

³¹ Many such plausible but low-likelihood scenarios have been examined in RAND's "day-after" exercises. These have included not only direct catastrophic damage to participants but also the possibility of global effects on agriculture due to a "nuclear autumn" (Kerr and Nikitin, 2010) and the possibility of a sustained shut-down of Persian Gulf production. Nuclear terrorism has also been examined, including a terrorist attack on Long Beach harbor (by a weapon concealed in a container ship) (Meade and Molander, 2006).

³² Chemical weapons are properly seen in a lesser category than WMD, but they might be a more-likely choice for some terrorist groups.

³³ These issues are discussed in an illuminating book that is sober but much less alarmist than many on the subject (Jenkins, 2008).

³⁴ See the November English-language volume of *Inspire*, the glossy magazine issued by al Qaeda of the Arabian Peninsula. It is available on the Internet, although sometimes with difficulty.

³⁵ It could have been otherwise if the Iraq operation had gone well. The George W. Bush administration talked about an "axis of evil," and the United States sometimes appeared intent on ridding the world of threats during a period in which regime change was considered perhaps feasible. For a related set of perspectives from that era, see Frum and Perle, 2004.

³⁶ See Woodward (2010) for an account of the debates within the Obama administration during the 2009 review of strategy for Afghanistan and Pakistan.

³⁷ For differing perspectives on force structuring as of 2009, see Frank G. Hoffman, 2009. A contrasting set of grand strategies was sketched in a RAND study (Davis, Johnson, et al., 2008), informed in part by conclusions from an earlier study on the implications of preparing comprehensively for counterinsurgencies (Gompert et al., 2008).

³⁸ For an overview, see Jaramillo, 2010.

³⁹ We do not discuss weaponization of space, although that could also occur in any of several forms (Preston et al., 2002). See also Rattray, 2001, and Libicki, 2007.

⁴⁰ Both the United States and China have test-flown satellites at various orbital altitudes to rendezvous with a target satellite (S. Clark, 2010; Berger, 2007). Russia, of course, also has such capabilities, developed during the earlier Soviet era.

⁴¹ See comments by Deputy Secretary of Defense William Lynn (Lynn, 2010).

⁴² For a recent discussion of a sophisticated computer network attack mechanism (the Stuxnet computer worm), see Gjelten, 2010.

⁴³ Krepinevich, 2009, is an insightful paper referring to America's "wasting assets."

⁴⁴ For a mid-1990s description with analytic detail, see Frostic and Bowie, 1994. Various official documents on joint operational concepts have been published over the years, some forward-looking and useful to this paper (U.S. Joint Forces Command, 2010).

Admittedly, less emphasis was often placed on stabilization operations until after the difficulties in Iraq in 2003–2004. Nonetheless, that phase of activity was always recognized as necessary and potentially quite demanding.

⁴⁵ With the glaring exception of the al Qaeda problem, the challenges were anticipated in a 1998 paper referring to the exploitation of RMA IV in terms of era A and era B (Davis, Gompert, et al., 1998). Era A, lasting until about 2012, would yield “good news,” with the United States gaining lopsided advantages and solving past problems. Era B, however, would be another matter, with proliferation of precision weapons, threats to force projection, an emergent China, and threat to the U.S. homeland. Era B is now upon us.

⁴⁶ At low altitudes, transport aircraft carrying airborne forces are vulnerable to light antiaircraft artillery equipped with night vision and man-portable air defense systems or to mobile SAM systems; at higher altitudes, they are vulnerable to medium-range high-performance SAMs. If dropped at a distance from such defenses, foot-mobile light-infantry units attempting to seize a target would have neither the mobility nor the firepower to defeat competent local forces with mechanization and fire support. Recent innovations in medium-altitude precision airdrop technology suggest that U.S. airborne forces could overfly low-altitude air defenses and conduct airborne assaults with light armored vehicles that address their current tactical weaknesses. Future motorized airborne forces could be used against a wide spectrum of threats that were not armed with medium-altitude air defenses. Marine forces are vulnerable to similar threats, as the Marine Corps acknowledged in its most-recent discussion of operating concepts (U.S. Marine Corps, 2010). It remains unclear at what threshold of littoral defenses amphibious options would no longer be viable even with extensive investments in measures to counter the defenses.

⁴⁷ Gates, 2011a.

⁴⁸ See Clark, 2001.

⁴⁹ The less-wealthy regional powers will probably maintain modest traditional navies and air forces for national-defense missions, often with a strong internal security mission. The Colombian armed forces illustrate such a mix.

⁵⁰ The motivations for participation in or support of terrorist activities range enormously (Davis and Cragin, 2009) and are often unrelated to religion. In some cases, however, the linkage is strong, as with committed leaders, such as Osama bin Laden and Ayman al-Zawahiri. Extremist religion also comes to play a strong role with other terrorists, whose original motivations were different. In any case, global jihad is a major concern.

⁵¹ A recent article notes Sun Tzu’s dictum, “tactics without strategy is the noise before defeat” (Hoffman, 2010). It is referring to the constant drumbeat about successes with drone attacks against leadership targets while the appeal of jihad continues to attract recruits in numerous places globally, and even homegrown terrorists in the United States have become a serious basis for worry.

⁵² See U.S. Department of the Army and U.S. Marine Corps, 2007.

⁵³ See Christensen, 1997.

⁵⁴ The first phase of the invasion of Iraq was accomplished with relatively small ground forces, but the stabilization phase demanded far more than had been anticipated by the operation’s planners, despite warnings from senior officers, including the previous U.S. Central Command (CENTCOM) commander Gen. Anthony Zinni (Gordon and Trainor, 2006).

⁵⁵ These points were made by the late VADM Arthur Cebrowski 20 years ago (Office of Force Transformation, 2003). They remain valid, although the changes needed now are different.

⁵⁶ Historical examples include development of the longbow, gunpowder, blitzkrieg, revolutionary warfare as conceived by Mao Tse Tung and others (O’Neill, 2001), and nuclear weapons (Arquilla, 2008; Hundley, 1999; Krepinevich, 2009).

⁵⁷ Huntley, 2010.

⁵⁸ The Congressional Budget Office’s expectation is that the baseline curve (current law) will not apply and that various deficit-raising measures will be enacted, such as extension of the inflation adjustment for the alternative minimum tax and extension of most of the 2001 “Bush tax cuts” (Huntley, 2010). The magnitude of effects of such changes is estimated elsewhere (CBO, 2009).

⁵⁹ CBO, 2010a.

⁶⁰ See CBO, 2010b.

⁶¹ See Gates, 2010.

⁶² A recent analysis of the DoD budget includes both historical comparison and current detail (Harrison, 2010).

⁶³ It has been argued that the way ahead was diagnosed a bit incorrectly, with emphasis placed much more on precision weapons than on exploiting the full potential of networking with small, dispersed forces.

⁶⁴ Davis, 2010, reviews the history of transformation in the 1990s and early 2000s.

⁶⁵ Davis, Kugler, and Hillestad, 1997, p. ix. Although not anticipating a decade of counterinsurgency, that briefing noted the shortcomings of forces with too few ground forces for manpower-intensive operations.

Chapter Three: Future Capability Needs and Possible Future Directions

¹ Such methods include cyberspace operations and what has been called “war in the shadows” using the methods of RMA II, state-sponsored insurgency, and terrorism.

² See George and Smoke, 1974; Huth, 1988; Mearsheimer, 1983; and Davis, 1997.

³ Comprehensive capabilities for COIN are discussed elsewhere (Gompert et al., 2008); the partnership emphasis is one of the options discussed in a comparison of strategic options (Davis, Johnson, et al., 2008).

⁴ See Button et al., 2010.

⁵ Arquilla and others have discussed such options (Arquilla, 2008).

⁶ Preemptive attacks and preventive war are troublesome concepts around which to plan, even if one acknowledges that they might be necessary in certain cases, as postulated by the George W. Bush administration’s improperly named preemptive doctrine. Despite the fact that Iraq proved after the 2003 U.S. invasion not to have had WMD, the considerations motivating the doctrine will not go away and have been noted by both Democratic and Republican administrations (Slocombe, 2003).

⁷ A related discussion focused on future force-structure issues argues for a new division of responsibilities across military services (Hoehn et al., 2007).

⁸ For DoD’s most-recent efforts to address these challenges with the specter of constrained resources, see Gates, 2010.

⁹ Some progress has been made with the military effectiveness of directed-energy weapons based on diode lasers. Breadboard models are becoming available.

¹⁰ The PAC-3 (and modified PAC-2) systems intercepted a number of short-range ballistic missiles during the opening days of Operation Iraqi Freedom (T.-W. Lee, 2009, p. 94).

¹¹ See Duffy, 2010, including critical comments of Secretary of Defense Robert Gates.

¹² See Streetly, 2006, 2007b, for a description of U.S. Navy airborne early warning upgrades. See Streetly, 2007a, for a description of the E-3 Sentry to the E-3G variant. The cruise-missile threat is both broad and serious, as described well in a recent review (Kueter and Kleinberg, 2007).

¹³ C-RAM systems are described in various news accounts. A home page for the Army’s efforts is Counter-Rocket, Artillery, Mortar Program Directorate, undated.

¹⁴ See Wolf, 2010.

¹⁵ See Arquilla, 2008.

¹⁶ See, e.g., Naval Air Systems Command, undated.

¹⁷ A recent study provides information about strike options, including ballistic missiles, hypersonic cruise missiles, and missile options with front ends that would provide a degree of mobile-target capability (National Research Council, 2008).

¹⁸ See Gunzinger, 2010.

¹⁹ Such a missile could have a cluster of kinetic-energy projectiles or a single maneuvering reentry vehicle, possibly of the boost-glide variety.

²⁰ The United States is increasing its military presence on the Mariana Islands, especially Guam. An unanswered question is whether DoD will turn Guam into a 21st-century fortress with robust active defenses, massive shelters, and a capacity to repair runways in the face of persistent ballistic- and cruise-missile attacks. A new generation of “super” composite concrete might provide temporary relief but would hardly solve the problem of air-base survivability under precision attack.

²¹ This will not be solved even with the 15,000-kilogram earth-penetrating bomb to be carried on the B-2. For a description of the massive ordnance penetrator program, see Black, 2009. The lower-payload B-3 sometimes discussed (Gunzinger, 2010) could not carry the 15-ton nonnuclear earth-penetrating warhead. Possibilities include rocket boosting for a smaller bomb, but they do not address the problem of deeply buried tunnel infrastructure.

²² See National Research Council, 2005, which concluded (p. 1),

Many of the more important strategic hard and deeply buried targets are beyond the reach of conventional explosive penetrating weapons and can be held at risk of destruction only with nuclear weapons. Many—but not all—known and/or identified hard and deeply buried targets can be held at risk of destruction by one or a few nuclear weapons.

Even a nuclear earth-penetrating warhead has limited capability. For a tunnel complex in a mountain, multiple weapons might be needed, perhaps causing substantial radioactive fallout. This is a good example of an RMA I-type counter, mechanized tunnel-boring machines, to the evolving threat of nuclear weapons (RMA III) and precision-guided munitions (RMA IV).

²³ See U.S. Department of Defense, 2010.

²⁴ See U.S. Department of the Army and U.S. Marine Corps, 2007.

²⁵ These include recent studies on improving local forces (Jones and Munoz, 2010), as well as making major reforms to the way of doing business within the Air Force (Mesic et al., 2010) and, within the Army and Air Force, in stressing building partner capacity for stability operations (Marquis et al., 2010; Moroney et al., 2010).

²⁶ See Gall, 2010.

²⁷ See Quinlivan, 2003, or his original paper on the subject (Quinlivan, 1995–1996).

²⁸ We refer here to the training effort. In contrast, progress in U.S. military operations in Iraq was rather swift after the change in concept of operations associated with the surge. That included platoon-sized outposts, negotiating with reconcilable insurgents, and other distributed activities.

²⁹ The Goldstone report (UN Human Rights Council, 2009) criticized Israel’s Cast Lead offensive into Gaza in December 2008 and January 2009 (“UN Mission Finds Evidence of War Crimes by Both Sides in Gaza Conflict,” 2009). It reported war crimes on both sides. Israel condemned the report (Israel, 2009), and the United States criticized the report’s original charter (Posner, 2009), but the episode illustrates the challenges. A draft follow-up UN report by independent experts was released in September 2010 (Human Rights Council, 2010).

³⁰ See Arquilla, 2010.

³¹ See Hoehn et al., 2007.

³² Nuclear attacks on U.S. forces or allied states are also conceivable in a crisis with a nuclear-armed “rogue.” Many years’ experience in RAND’s “day-after” strategic-planning exercises suggest that such states could plausibly use one or more nuclear weapons to manipulate the situation in crisis, especially if a regime’s survival were at stake. The result is a related “nuclear shadow” over local friends and allies of the United States. That, in turn,

could cause fearful states to refuse to cooperate in crisis with the United States, which in turn could undercut U.S. ability to extend deterrence through conventional power projection.

³³ This theme is elaborated in a recent book (Arquilla, 2008) and subsequent article (Arquilla, 2010).

³⁴ A recent study illustrates the kinds of profound issues that, in fact, beset all of the services (National Research Council, 2010). See also the recent comments by Secretary Lynn (2010).

Chapter Four: Perceiving the Way Ahead, Darkly

¹ Frank Hoffman has described well the different schools of thought about balancing issues as of 2009 (Hoffman, 2009).

² See Hoehn et al., 2007.

³ The Army is considering a shift back to division-centric structuring because of the cost of maintaining the current brigade structure at full strength (Erwin, 2010). That would fly in the face of trends toward having large numbers of small, independently employable units. The alternative could be maintaining a brigade-sized building block but with fewer active personnel than the Army would prefer. A central rationale for the new Army brigade structure was to provide a rotation base for protracted COIN operations.

⁴ Another difference from the Cold War is that the strategic maneuvers in any such cool war would probably have features analogous to jazz music, with the interplay of geostrategic and geopolitical relationships prompting temporal improvisation.

⁵ A recent article reminds us that, at the time, this was called appeasement and was seen as rational behavior. Subsequently, the term has been inextricably linked with Munich (Kennedy, 2010).

⁶ Germany's intent was more to build a large-enough navy to enhance deterrence than to challenge UK naval superiority. For a time, a 2:3 ratio was suggested (Epkenhans, 2008, p. 46). The episode can be seen as yet another failure of conventional deterrence.

⁷ Parallels between China and pre-World War I Germany are noteworthy. Both were going through dynamic social and economic change, with a growing middle class taking on an increasingly nationalist posture on all matters dealing with foreign policy (Liu, 2010). Several senior U.S. political scientists argue that "proto or emerging democracies" might be one of the most dangerous types of states to emerge on the international scene (Mansfield and Snyder, 2005).

⁸ Another issue is further nuclear arms control and disarmament, including the eventual elimination of nuclear weapons. Some see advantages for the United States if such arms control were feasible. We are highly skeptical for many reasons, but that is outside the scope of this paper.

⁹ The list includes the United States, the European Union, China, Russia, Brazil, Israel, Pakistan, India, Turkey, and South Korea.

The United States is part of the trend as well. Its decision to sell Saudi Arabia large numbers of advanced fighter-bombers and combat helicopters is reminiscent of the 1970s sales to Iran and Saudi Arabia after the post-Vietnam defense cuts. The intent is to increase manufacturing exports and high-technology arms, an area of U.S. manufacturing superiority. European defense industries will be even more desperate in needing export sales because of defense cutbacks following the recent recession that triggered the Greek and Irish sovereign-debt crises.

¹⁰ See Hundley, 1999.

¹¹ The importance of champions is discussed in a short review of great development accomplishments (Davis, Shaver, and Beck, 2008).

¹² The importance of such up-front work has been described elsewhere (National Research Council, 2004, 2005) and highlighted in initiatives of recent years by the Office of the Under Secretary of Defense for Acquisition, Technology and Logistics, which has reorganized with related ideas in mind.

¹³ Secretary of Defense Robert Gates has announced closure of the U.S. Joint Forces Command, although some elements might be preserved and moved; it remains to be seen how its functions will be picked up by the Joint Staff, other commands, and the services (M. Thompson, 2010).

¹⁴ See Lewis, 1994.

¹⁵ See Davis, Johnson, et al., 2008.

¹⁶ See Asch et al., 2008.

Chapter Five: Conclusions

¹ One perspective here is that preventive war and preemptive action will be preferable to dependence on deterrence.

² An example was the uncritical embrace of rapid decisive operations in the period 2000–2003. Many of the ideas had merit, but such operations were clearly vulnerable to adaptive adversary tactics, discussion of which was often avoided and sometimes suppressed, as in the now-infamous Millennium Challenge 2002 exercise (Van Riper, 2004). The Army's ill-fated Future Combat Systems program was motivated by the same enthusiasms for rapid maneuver. It was terminated after experience in Iraq and Afghanistan undermined claims that future Army forces would be able to “see, decide, and shoot first” in all combat circumstances. High costs were another factor.

³ Eisenhower's New Look sought to maintain a security posture in balance with the health of the economy while relying on deterrence (nuclear deterrence at that time) to a significant degree. It also emphasized alliances, strengthening of partners, and use of international organizations. The military aspect was initially flawed by an all-or-nothing threat of general war. By 1955, it had been refined to recognize the limitations of excessive dependence on deterrence by threat of massive retaliation, and to have military capabilities adequate to deal “selectively and flexibly” as necessary to resist aggression. This foreshadowed what came to be called flexible-response options, as well as later improvements in conventional defense capabilities (Craig, 1998). Some critical observers believe that the resulting perception of flexibility was a contributing factor in the United States rationalizing the feasibility and appropriateness of a massive U.S. intervention in Vietnam.

Bibliography

- Arquilla, John, *Worst Enemy: The Reluctant Transformation of the American Military*, Chicago, Ill.: Ivan R. Dee, 2008.
- , “The New Rules of War,” *Foreign Policy*, March–April 2010. As of December 30, 2010:
http://www.foreignpolicy.com/articles/2010/02/22/the_new_rules_of_war
- Asch, Beth J., James Hosek, Michael Mattock, and Christina Panis, *Assessing Compensation Reform: Research in Support of the 10th Quadrennial Review of Military Compensation*, Santa Monica, Calif.: RAND Corporation, MG-764-OSD, 2008. As of December 30, 2010:
<http://www.rand.org/pubs/monographs/MG764.html>
- Bajoria, Jayshree, and Esther Pan, *Backgrounder: The U.S.-India Nuclear Deal*, New York: Council on Foreign Relations, November 5, 2010. As of December 30, 2010:
http://www.cfr.org/publication/9663/usindia_nuclear_deal.html
- Batson, Andrew, “Schumer vs. Bernanke on China’s Yuan,” *Wall Street Journal*, April 15, 2010. As of December 30, 2010:
<http://blogs.wsj.com/chinarealtime/2010/04/15/schumer-vs-bernanke-on-chinas-yuan/>
- Berger, Brian, “Pentagon Pulls Plug on Satellite Refueling Prototypes,” *Space News*, July 25, 2007. As of December 30, 2010:
http://www.space.com/missionlaunches/070725_darpa_orbitalexpress_end.html
- Binnendijk, Hans, and Patrick M. Cronin, “Through the Complex Operations Prism,” *Prism*, Vol. 1, No. 1, 2009, pp. 9–20. As of December 30, 2010:
http://www.ndu.edu/press/lib/images/prism1-1/2_Prism_9-20_BinnendijkCronin.pdf
- Black, Edwin, “Super Bunker-Buster Bombs Fast-Tracked for Possible Use Against Iran and North Korea Nuclear Programs,” *Cutting Edge*, September 21, 2009. As of December 30, 2010:
<http://www.thecuttingedgenews.com/index.php?article=11609>
- Bracken, Paul J., *Fire in the East: The Rise of Asian Military Power and the Second Nuclear Age*, New York: Perennial, 2000.
- Brown, Peter J., “China Ire at Sea Chase Signals Wider Reach,” *Asia Times*, September 16, 2010. As of December 30, 2010:
<http://www.atimes.com/atimes/China/LI16Ad02.html>
- Button, Robert W., John Gordon IV, Dick Hoffmann, Jessie Riposo, and Peter A. Wilson, *Maritime Prepositioning Force (Future) Capability Assessment: Planned and Alternative Structures*, Santa Monica, Calif.: RAND Corporation, MG-943-OSD, 2010. As of December 30, 2010:
<http://www.rand.org/pubs/monographs/MG943.html>
- CBO—See Congressional Budget Office.
- “China Asserts Sea Border Claims,” BBC Mobile, May 13, 2009. As of January 15, 2011:
<http://news.bbc.co.uk/2/hi/asia-pacific/8047206.stm>
- China’s National Defense in 2008*, Beijing: Information Office of the State Council of the People’s Republic of China, January 2009. As of December 30, 2010:
http://www.china.org.cn/government/whitepaper/node_7060059.htm

Christensen, Clayton M., *The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail*, Boston, Mass.: Harvard Business School Press, 1997.

Clark, Stephen, "China Remains Silent on Satellite Rendezvous," *Spaceflight Now*, September 8, 2010. As of December 30, 2010:
<http://spaceflightnow.com/news/n1009/08china/>

Clark, Wesley K., *Waging Modern War: Bosnia, Kosovo, and the Future of Combat*, New York: Public Affairs, 2001.

Clinton, Hillary Rodham, Secretary of State, "Remarks at Press Availability," National Convention Center, Hanoi, Vietnam, July 23, 2010. As of December 30, 2010:
<http://www.state.gov/secretary/rm/2010/07/145095.htm>

Cohen, Stephen P., and Sunil Dasgupta, *Arming Without Aiming: India's Military Modernization*, Washington, D.C.: Brookings Institution Press, 2010.

Congressional Budget Office, *Budget Options*, Vol. 2, Washington, D.C.: U.S. Government Printing Office, Pub. No. 3191, August 2009. As of December 30, 2010:
<http://www.cbo.gov/doc.cfm?index=10294>

———, *Long-Term Implications of the Fiscal Year 2010 Defense Budget*, Washington, D.C., January 2010a. As of December 30, 2010:
<http://www.cbo.gov/ftpdocs/108xx/doc10852/01-25-FYDP.pdf>

———, *An Analysis of the President's Budgetary Proposals for Fiscal Year 2011*, Washington, D.C., March 2010b.

———, *The Long-Term Budget Outlook*, Washington, D.C., Pub. No. 4130, June 2010c.

Congressional Research Service, *Summary: Currency Exchange Rate Oversight Reform Act of 2010, S.3134*, Washington, D.C.: Library of Congress, 2010. As of December 30, 2010:
<http://thomas.loc.gov/cgi-bin/bdquery/z?d111:SN03134:@@D&summ2=m&>

Counter-Rocket, Artillery, Mortar Program Directorate, "C-RAM (Counter Rockets, Artillery, and Mortars)," undated web page. As of January 3, 2011:
<http://peoc3t.monmouth.army.mil/cram/cram.html>

Craig, Campbell, *Destroying the Village: Eisenhower and Thermonuclear War*, New York: Columbia University Press, 1998. As of December 30, 2010:
<http://www.ciaonet.org/book/craig/index.html>

Das, R. N., "Chinese and American Muscle-Flexing in South-China Sea: Implications for India," Institute for Defence Studies and Analyses, August 19, 2010. As of December 30, 2010:
http://www.idsa.in/idsacomments/ChineseandAmericanMuscleflexinginSouthChinaSeaImplicationsforIndia_rndas_190810

Davis, Paul K., *Studying First-Strike Stability with Knowledge-Based Models of Human Decisionmaking*, Santa Monica, Calif.: RAND Corporation, R-3689-CC, 1989. As of December 30, 2010:
<http://www.rand.org/pubs/reports/R3689.html>

———, "Protecting Weak and Medium Strength States: Issues of Deterrence, Stability, and Decision Making," in *Post-Cold War Conflict Deterrence*, Washington, D.C.: National Academy Press, 1997, pp. 153–181.

———, "Military Transformation? Which Transformation, and What Lies Ahead?" in Stephen J. Cimbala, ed., *The George W. Bush Defense Program: Policy, Strategy and War*, Washington, D.C.: Potomac Books, 2010, pp. 11–42.

Davis, Paul K., and Kim Cragin, eds., *Social Science for Counterterrorism: Putting the Pieces Together*, Santa Monica, Calif.: RAND Corporation, MG-849-OSD, 2009. As of December 30, 2010:
<http://www.rand.org/pubs/monographs/MG849.html>

- Davis, Paul K., David C. Gompert, Richard Hillestad, and Stuart E. Johnson, *Transforming U.S. Forces: Suggestions for DoD Strategy*, Santa Monica, Calif.: RAND Corporation, IP-179, 1998. As of February 22, 2011:
http://www.rand.org/pubs/issue_papers/IP179.html
- Davis, Paul K., Stuart E. Johnson, Duncan Long, and David C. Gompert, *Developing Resource-Informed Strategic Assessments and Recommendations*, Santa Monica, Calif.: RAND Corporation, MG-703-JS, 2008. As of December 30, 2010:
<http://www.rand.org/pubs/monographs/MG703.html>
- Davis, Paul K., Richard L. Kugler, and Richard Hillestad, *Strategic Issues and Options for the Quadrennial Defense Review (QDR)*, Santa Monica, Calif.: RAND Corporation, DB-201-OSD, 1997. As of December 30, 2010:
http://www.rand.org/pubs/documented_briefings/DB201.html
- Davis, Paul K., Russell D. Shaver, and Justin Beck, *Portfolio-Analysis Methods for Assessing Capability Options*, Santa Monica, Calif.: RAND Corporation, MG-662-OSD, 2008. As of December 30, 2010:
<http://www.rand.org/pubs/monographs/MG662.html>
- Defense Science Board, *Defense Science Board Task Force on the Future of the Global Positioning System*, Washington, D.C.: U.S. Department of Defense, Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics, October 2005. As of December 30, 2010:
<http://purl.access.gpo.gov/GPO/LPS72254>
- Duffy, Thomas, "What's Next for Airborne Laser," *Air Force Magazine Online*, Vol. 93, No. 4, April 2010. As of January 16, 2010:
<http://www.airforce-magazine.com/MagazineArchive/Documents/2010/April%202010/0410laser.pdf>
- Epkenhans, Michael, *Tirpitz: Architect of the German High Seas Fleet*, Washington, D.C.: Potomac Books, 2008.
- Erwin, Sandra, "Army Vice Chief Gen. Chiarelli: Program Will Be Terminated," *National Defense*, September 22, 2010. As of January 26, 2011:
<http://www.nationaldefensemagazine.org/blog/Lists/Posts/Post.aspx?List=7c996cd7-cbb4-4018-baf8-8825eada7aa2&ID=206>
- Fackler, Martin, and Ian Johnson, "Japan Retreats with Release of Chinese Boat Captain," *New York Times*, p. A1, September 25, 2010
- Ferguson, Niall, Laurence A. Tisch Professor of History at Harvard University and William Ziegler Professor of Business Administration, Harvard Business School, "The End of Chimerica: Amicable Divorce or Currency War?" testimony before the U.S. House of Representatives Committee on Ways and Means, March 24, 2010.
- Flournoy, Michèle A., and Shawn Brimley, "The Defense Inheritance: Challenges and Choices for the Next Pentagon Team," *Washington Quarterly*, Vol. 31, No. 4, Autumn 2008, pp. 59–76. As of December 30, 2010:
<http://www.twq.com/08autumn/index.cfm?id=315>
- Frostic, Fred, and Christopher J. Bowie, "Conventional Campaign Analysis of Major Regional Conflicts," in Paul K. Davis, ed., *New Challenges for Defense Planning: Rethinking How Much Is Enough*, Santa Monica, Calif.: RAND Corporation, MR-400-RC, 1994, pp. 351–392. As of December 30, 2010:
http://www.rand.org/pubs/monograph_reports/MR400.html
- Frum, David, and Richard Norman Perle, *An End to Evil: How to Win the War on Terror*, New York: Ballantine, 2004.
- Gall, Carlotta, "Taliban Hold Sway in Area Taken by U.S., Farmers Say," *New York Times*, May 16, 2010. As of December 30, 2010:
<http://www.nytimes.com/2010/05/17/world/asia/17marja.html>
- Gates, Robert, "A Balanced Strategy: Reprogramming the Pentagon for a New Age," *Foreign Affairs*, January–February, 2009. As of December 30, 2010:
<http://www.foreignaffairs.com/articles/63717/robert-m-gates/a-balanced-strategy>

———, *Quadrennial Defense Review Report*, Washington, D.C.: U.S. Department of Defense, February 2010. As of December 30, 2010:

<http://www.defense.gov/qdr/QDR%20as%20of%202026JAN10%200700.pdf>

———, “Statement on Department Budget and Efficiencies as Delivered by Secretary of Defense Robert M. Gates, the Pentagon, Thursday, January 6, 2011,” Washington, D.C.: U.S. Department of Defense, Office of the Assistant Secretary of Defense (Public Affairs), January 6, 2011a. As of February 7, 2011:

<http://www.defense.gov/speeches/speech.aspx?speechid=1527>

———, speech, U.S. Military Academy, West Point, N.Y., February 25, 2011b. As of March 1, 2011:

<http://www.defense.gov/speeches/speech.aspx?speechid=1539>

George, Alexander L., and Richard Smoke, *Deterrence in American Foreign Policy: Theory and Practice*, New York: Columbia University Press, 1974.

Gjeltén, Tom, “Cyberworm’s Origins Unclear, but Potential Is Not,” *National Public Radio*, September 27, 2010. As of December 30, 2010:

<http://www.npr.org/templates/story/story.php?storyId=130162219>

Gompert, David C., John Gordon IV, Adam Grissom, David R. Frelinger, Seth G. Jones, Martin C. Libicki, Edward O’Connell, Brooke Stearns Lawson, and Robert E. Hunter, *War by Other Means—Building Complete and Balanced Capabilities for Counterinsurgency: RAND Counterinsurgency Study—Final Report*, Santa Monica, Calif.: RAND Corporation, MG-595/2-OSD, 2008. As of December 30, 2010:

<http://www.rand.org/pubs/monographs/MG595z2.html>

Gordon, Michael R., and Bernard E. Trainor, *Cobra II: The Inside Story of the Invasion and Occupation of Iraq*, New York: Pantheon Books, 2006.

Gunzinger, Mark Alan, *Sustaining America’s Strategic Advantage in Long-Range Strike*, Washington, D.C.: Center for Strategic and Budgetary Assessments, 2010. As of December 30, 2010:

http://www.csbaonline.org/4Publications/PubLibrary/R.20100914.Sustaining_America/R.20100914.Sustaining_America.pdf

Harrison, Todd, *Analysis of the FY 2011 Defense Budget*, Washington, D.C.: Center for Strategic and Budgetary Assessments, 2010. As of December 30, 2010:

http://www.csbaonline.org/4Publications/PubLibrary/R.20100629.Analysis_of_the_FY/R.20100629.Analysis_of_the_FY.pdf

Hicks, Kathleen H., *Invigorating Defense Governance: A Beyond Goldwater-Nichols, Phase 4, Report*, Washington, D.C.: Center for Strategic and International Studies Press, 2008.

Hoehn, Andrew R., Adam Grissom, David Ochmanek, David A. Shlapak, and Alan J. Vick, *A New Division of Labor: Meeting America’s Security Challenges Beyond Iraq*, Santa Monica, Calif.: RAND Corporation, MG-499-AF, 2007. As of December 30, 2010:

<http://www.rand.org/pubs/monographs/MG499.html>

Hoffman, Bruce, “American Jihad,” *National Interest*, April 20, 2010. As of December 30, 2010:

<http://nationalinterest.org/article/american-jihad-3441>

Hoffman, Frank G., “Striking a Balance: Posturing the Future Force for COIN and Conventional Warfare,” *Armed Forces Journal*, July–August 2009. As of December 30, 2010:

<http://www.armedforcesjournal.com/2009/07/4099782/>

Human Rights Council, *Report of the Committee of Independent Experts in International Humanitarian and Human Rights Laws to Monitor and Assess Any Domestic, Legal or Other Proceedings Undertaken by Both the Government of Israel and the Palestinian Side*, September 21, 2010. As of December 30, 2010:

http://www2.ohchr.org/english/bodies/hrcouncil/docs/15session/A.HRC.15.50_AEV.pdf

Hundley, Richard, *Past Revolutions, Future Transformations: What Can the History of Revolutions in Military Affairs Tell Us About Transforming the U.S. Military?* Santa Monica, Calif.: RAND Corporation, MR-1029-DARPA, 1999. As of December 30, 2010:

http://www.rand.org/pubs/monograph_reports/MR1029.html

- Huntley, Jonathan, *Federal Debt and the Risk of a Fiscal Crisis*, Washington, D.C.: Congressional Budget Office, July 27, 2010. As of December 30, 2010:
<http://purl.access.gpo.gov/GPO/LPS124972>
- Huth, Paul K., *Extended Deterrence and the Prevention of War*, New Haven, Conn.: Yale University Press, 1988.
- Israel, *Initial Response to Report of the Fact Finding Mission on Gaza Established Pursuant to Resolution S-9/1 of the Human Rights Council*, September 24, 2009. As of December 30, 2010:
<http://www.mfa.gov.il/MFA/Terrorism-+Obstacle+to+Peace/Hamas+war+against+Israel/Initial-response-goldstone-report-24-Sep-2009.htm>
- Jaramillo, Cesar, ed., *Space Security 2010*, Kitchener, Ont.: Spacesecurity.org, 2010. As of December 30, 2010:
<http://www.ploughshares.ca/libraries/Abolish/SS2010.pdf>
- Jenkins, Brian Michael, *Will Terrorists Go Nuclear?* Amherst, N.Y.: Prometheus Books, 2008.
- Jones, Seth G., and Arturo Munoz, *Afghanistan's Local War: Building Local Defense Forces*, Santa Monica, Calif.: RAND Corporation, MG-1002-MCIA, 2010. As of December 30, 2010:
<http://www.rand.org/pubs/monographs/MG1002.html>
- Kennedy, Paul, "A Time to Appear," *National Interest*, July–August 2010. As of December 30, 2010:
<http://nationalinterest.org/article/a-time-to-appear-3539>
- Kerr, Paul K., and Mary Beth Dunham Nikitin, *Pakistan's Nuclear Weapons: Proliferation and Security Issues*, Washington, D.C.: Congressional Research Service, RL32428, February 23, 2010. As of December 30, 2010:
http://assets.opencrs.com/rpts/RL34248_20100223.pdf
- Krepinevich, Andrew F., Jr., "The Pentagon's Wasting Assets: The Eroding Foundations of American Power," *Foreign Affairs*, July–August, 2009, pp. 18–33. As of December 30, 2010:
<http://www.foreignaffairs.com/articles/65150/andrew-f-krepinevich-jr/the-pentagons-wasting-assets>
- Krugman, Paul, "Taking on China," *New York Times*, March 14, 2010, p. A23. As of December 30, 2010:
<http://www.nytimes.com/2010/03/15/opinion/15krugman.html>
- Kueter, Jeff, and Howard Kleinberg, *The Cruise Missile Challenge: Designing a Defense Against Asymmetric Threats*, Washington, D.C.: George C. Marshall Institute, May 2007. As of December 30, 2010:
<http://marshall.org/pdf/materials/522.pdf>
- Lee, John, "The End of Smile Diplomacy?" *National Interest*, September 23, 2010. As of December 30, 2010:
<http://nationalinterest.org/commentary/the-end-smile-diplomacy-4122>
- Lee, Tae-Woo, *Military Technologies of the World, Volume I*, Westport, Conn.: Praeger Security International, 2009.
- Lewis, Kevin, "The Discipline Gap and Other Reasons for Humility and Realism in Defense Planning," in Paul K. Davis, ed., *New Challenges for Defense Planning: Rethinking How Much Is Enough*, Santa Monica, Calif.: RAND Corporation, MR-400-RC, 1994, pp. 101–134. As of December 30, 2010:
http://www.rand.org/pubs/monograph_reports/MR400.html
- Libicki, Martin C., *Conquest in Cyberspace: National Security and Information Warfare*, New York: Cambridge University Press, 2007.
- Linn, Brian M., and Russell F. Weigley, "The American Way of War' Revisited," *Journal of Military History*, Vol. 66, No. 2, April 2002, pp. 501–533. As of December 30, 2010:
<http://www.jstor.org/stable/3093069>
- Liu, Melinda, "U.S. of Who? Why China Is No Longer Interested in Following America's Lead," *Newsweek*, February 5, 2010. As of December 30, 2010:
<http://www.newsweek.com/2010/02/04/u-s-of-who.html>
- Lynn, William J., III, "Defending a New Domain: The Pentagon's Cyberstrategy," *Foreign Affairs*, September–October 2010. As of December 30, 2010:
<http://www.foreignaffairs.com/articles/66552/william-j-lynn-iii/defending-a-new-domain>
- Mansfield, Edward D., and Jack L. Snyder, *Electing to Fight: Why Emerging Democracies Go to War*, Cambridge, Mass.: MIT Press, 2005.

- Marquis, Jefferson P., Jennifer D. P. Moroney, Justin Beck, Derek Eaton, Scott Hiromoto, David R. Howell, Janet Lewis, Charlotte Lynch, Michael J. Neumann, and Cathryn Quantic Thurston, *Developing an Army Strategy for Building Partner Capacity for Stability Operations*, Santa Monica, Calif.: RAND Corporation, MG-942-A, 2010. As of December 30, 2010:
<http://www.rand.org/pubs/monographs/MG942.html>
- Marshall, Andrew W., *Long-Term Competition with the Soviets: A Framework for Strategic Analysis*, Santa Monica, Calif.: RAND Corporation, 1972. Not available to the general public.
- Matthews, Matt, *We Were Caught Unprepared: The 2006 Hezbollah-Israeli War*, Fort Leavenworth, Kan.: U.S. Army Combined Arms Center, Combat Studies Institute Press, Long War Series Occasional Paper 26, 2008. As of December 30, 2010:
<http://purl.access.gpo.gov/GPO/LPS104476>
- Meade, Charles, and Roger C. Molander, *Considering the Effects of a Catastrophic Terrorist Attack*, Santa Monica, Calif.: RAND Corporation, TR-391-CTRMP, 2006. As of December 30, 2010:
http://www.rand.org/pubs/technical_reports/TR391.html
- Mearsheimer, John J., *Conventional Deterrence*, Ithaca, N.Y.: Cornell University Press, 1983.
- Mesic, Richard, David E. Thaler, David Ochmanek, and Leon Goodson, *Courses of Action for Enhancing U.S. Air Force "Irregular Warfare" Capabilities: A Functional Solutions Analysis*, Santa Monica, Calif.: RAND Corporation, MG-913-AF, 2010. As of December 30, 2010:
<http://www.rand.org/pubs/monographs/MG913.html>
- Moroney, Jennifer D. P., Joe Hogler, Jefferson P. Marquis, Christopher Paul, John E. Peters, and Beth Grill, *Developing an Assessment Framework for U.S. Air Force Building Partnerships Programs*, Santa Monica, Calif.: RAND Corporation, MG-868-AF, 2010. As of December 30, 2010:
<http://www.rand.org/pubs/monographs/MG868.html>
- National Research Council, Committee for the Role of Experimentation in Building Future Naval Forces and Naval Studies Board, *The Role of Experimentation in Building Future Naval Forces*, Washington, D.C.: National Academies Press, 2004.
- , Committee on the Effects of Nuclear Earth-Penetrator and Other Weapons, *Effects of Nuclear Earth-Penetrator and Other Weapons*, Washington, D.C.: National Academies Press, 2005. As of December 30, 2010:
http://www.nap.edu/catalog.php?record_id=11282
- , Committee on Conventional Prompt Global Strike Capability, *U.S. Conventional Prompt Global Strike: Issues for 2008 and Beyond*, Washington, D.C.: National Academies Press, 2008.
- , Committee on Information Assurance for Network-Centric Naval Forces, *Information Assurance for Network-Centric Naval Forces*, Washington, D.C.: National Academies Press, 2010. As of December 30, 2010:
http://www.nap.edu/catalog.php?record_id=12609
- Naval Air Systems Command, "Unmanned Combat Air System Demonstration," undated web page. As of January 3, 2011:
<http://www.navair.navy.mil/index.cfm?fuseaction=home.display&key=7468CDCC-8A55-4D30-95E3-761683359B26>
- Office of Force Transformation, *Military Transformation: A Strategic Approach*, Washington, D.C.: Director, Force Transformation, Office of the Secretary of Defense, Fall 2003. As of December 30, 2010:
<http://purl.access.gpo.gov/GPO/LPS40519>
- Office of the Secretary of Defense, *Military and Security Developments Involving the People's Republic of China*, Washington, D.C.: U.S. Department of Defense, 2010. As of December 30, 2010:
http://www.defense.gov/pubs/pdfs/2010_CMPR_Final.pdf
- O'Neill, Bard, *Insurgency and Terrorism: Inside Modern Revolutionary Warfare*, Washington, D.C.: Brassey's, 2001.
- O'Rourke, Ronald, *China Naval Modernization: Implications for U.S. Navy Capabilities—Background and Issues for Congress*, Washington, D.C.: Congressional Research Service, RL33153, November 23, 2009. As of December 30, 2010:
<http://handle.dtic.mil/100.2/ADA511396>

- Pomfret, John, "In China, Officials in Tug of War to Shape Foreign Policy," *Washington Post*, September 24, 2010. As of December 30, 2010:
<http://www.washingtonpost.com/wp-dyn/content/article/2010/09/23/AR2010092306843.html>
- Porter, Michael E., *Competitive Advantage: Creating and Sustaining Superior Performance*, New York: Free Press, 1998.
- Posner, Michael, Assistant Secretary of State for Democracy, Human Rights and Labor, "U.S. Response to the Report of the United Nations Fact-Finding Mission on the Gaza Conflict," statement before the Human Rights Council, U.S. Mission to the United Nations and Other International Organizations in Geneva, September 2009. As of December 30, 2010:
<http://geneva.usmission.gov/2009/09/29/gaza-conflict/>
- Preston, Robert, Dana J. Johnson, Sean J. A. Edwards, Michael D. Miller, and Calvin Shipbaugh, *Space Weapons Earth Wars*, Santa Monica, Calif.: RAND Corporation, MR-1209-AF, 2002. As of December 30, 2010:
http://www.rand.org/pubs/monograph_reports/MR1209.html
- Project on National Security Reform, Center for the Study of the Presidency, *Forging a New Shield*, Arlington, Va., November 2008. As of December 30, 2010:
http://www.pnsr.org/data/files/pnsr_forging_a_new_shield_report.pdf
- Public Law 99-433, Goldwater-Nichols Department of Defense Reorganization Act of 1986, October 1, 1986.
- Quinlivan, James T., "Force Requirements in Stability Operations," *Parameters*, Vol. 25, No. 4, Winter 1995–1996, pp. 59–69.
- , "Burden of Victory: The Painful Arithmetic of Stability Operations," *RAND Review*, Summer 2003. As of December 30, 2010:
<http://www.rand.org/publications/randreview/issues/summer2003/burden.html>
- Rattray, Gregory J., *Strategic Warfare in Cyberspace*, Cambridge, Mass.: MIT Press, 2001.
- Rumsfeld, Donald, *Quadrennial Defense Review Report*, Washington, D.C.: U.S. Department of Defense, February 6, 2006. As of December 30, 2010:
<http://www.defenselink.mil/qdr/report/Report20060203.pdf>
- Sanger, David E., and Sewell Chan, "Eye on China, House Votes for Greater Tariff Powers," *New York Times*, September 29, 2010. As of December 30, 2010:
<http://www.nytimes.com/2010/09/30/business/30currency.html>
- Schelling, Thomas C., "A World Without Nuclear Weapons?" *Daedalus*, Vol. 138, No. 4, Fall 2009, pp. 124–129.
- Shlapak, David A., *The Shifting Cross-Strait Balance and Implications for the U.S.*, testimony presented before the U.S.-China Economic and Security Review Commission, March 18, 2010. As of December 30, 2010:
<http://www.rand.org/pubs/testimonies/CT343.html>
- Shlapak, David A., David T. Orletsky, Toy I. Reid, Murray Scot Tanner, and Barry Wilson, *A Question of Balance: Political Context and Military Aspects of the China-Taiwan Dispute*, Santa Monica, Calif.: RAND Corporation, MG-888-SRF, 2009. As of December 30, 2010:
<http://www.rand.org/pubs/monographs/MG888.html>
- Slocombe, Walter, "Force, Pre-Emption and Legitimacy," *Survival*, Vol. 45, No. 1, January 2003, pp. 117–130.
- Stiglitz, Joseph, "A Trade War with China Isn't Worth It," *Guardian*, April 7, 2010. As of December 30, 2010:
<http://www.guardian.co.uk/commentisfree/cifamerica/2010/apr/07/united-states-china-currency-manipulation>
- Streetly, Martin, "Advanced Hawkeye Promises Quantum Leap in US Navy's AEW Capability," *International Defence Review*, August 1, 2006 (posted July 28, 2006).
- , "Next-Generation AWACS Begins Mission System Flight Tests," *International Defence Review*, April 24, 2007a.
- , "US Navy Rolls Out First E-2D Advanced Hawkeye," *International Defence Review*, May 1, 2007b.

Thompson, Drew, "Think Again: China's Military: It's Not Time to Panic, Yet," *Foreign Policy*, March–April 2010. As of December 30, 2010:

http://www.foreignpolicy.com/articles/2010/02/22/think_again_chinas_military

Thompson, Mark, "Gates Wields the Ax, and a U.S. Command Dies," *Time*, August 10, 2010.

Tiron, Roxana, "Defense Secretary Gates Warns Shipbuilding Budget Unlikely to Grow," *Hill*, May 3, 2010. As of December 30, 2010:

<http://thehill.com/news-by-subject/defense-homeland-security/95675-gates-warns-shipbuilding-budget-unlikely-to-grow->

Treaty Between the United States of America and the Russian Federation on Measures for the Further Reduction and Limitation of Strategic Offensive Arms, Prague, April 2010. As of January 12, 2011:

<http://www.state.gov/t/avc/newstart/c39903.htm>

Treaty on the Non-Proliferation of Nuclear Weapons, Russia–United Kingdom–United States, July 1, 1968.

UN Human Rights Council, *Human Rights in Palestine and Other Occupied Arab Territories: Report of the United Nations Fact Finding Mission on the Gaza Conflict*, Geneva: United Nations, A/HRC/12/48, September 15, 2009. As of January 3, 2011:

http://www2.ohchr.org/english/bodies/hrcouncil/specialsession/9/docs/UNFFMGC_Report.pdf

"UN Mission Finds Evidence of War Crimes by Both Sides in Gaza Conflict," UN News Centre, September 15, 2009. As of December 30, 2010:

<http://www.un.org/apps/news/story.asp?NewsID=32057>

U.S. Department of the Army and U.S. Marine Corps, *The U.S. Army/Marine Corps Counterinsurgency Field Manual: U.S. Army Field Manual No. 3-24, Marine Corps Warfighting Publication No. 3-33.5*, Chicago, Ill.: University of Chicago Press, 2007. As of December 30, 2010:

<http://www.fas.org/irp/doddir/army/fm3-24.pdf>

U.S. Department of Defense, *Nuclear Posture Review Report*, Washington, D.C., 2010. As of January 16, 2011:

<http://www.defense.gov/npr/docs/2010%20nuclear%20posture%20review%20report.pdf>

U.S. Department of the Treasury, Federal Reserve Board, "Major Foreign Holders of Treasury Securities (in billions of dollars): Holdings at End of Period," December 15, 2010. As of January 3, 2011:

<http://www.treasury.gov/resource-center/data-chart-center/tic/Documents/mfh.txt>

U.S. House of Representatives, Committee on Armed Services, Panel on Defense Acquisition Reform, *House Armed Services Committee Panel of Defense Acquisition Reform Findings and Recommendations*, Washington, D.C., 2010.

U.S. Joint Forces Command, *The JOE, Joint Operating Environment, 2010*, Norfolk, Va., 2010. As of December 30, 2010:

<http://doclib.jfsc.ndu.edu/joe2010final.pdf>

U.S. Marine Corps, *Marine Corps Operating Concept*, 3rd ed., Marine Administrative Message 415/10, July 28, 2010. As of December 30, 2010:

<http://www.usmc.mil/news/messages/Pages/MARADMIN415-10.aspx>

Van Riper, Lt. Gen. Paul, former president, Marine Corps University, "The Immutable Nature of War," interview with NOVA for PBS, April 2004. As of December 30, 2010:

<http://www.pbs.org/wgbh/nova/wartech/nature.html>

Weigley, Russell Frank, *The American Way of War: A History of United States Military Strategy and Policy*, Bloomington, Ind.: Indiana University Press, 1977.

Wilson, Peter A., *Revolutions in Military Affairs, 1914 to 2014: Adapting to Discontinuities in U.S. National Security Strategy*, Santa Monica, Calif.: RAND Corporation, unpublished research, 2009. Not available to the general public.

Wolf, Jim, "Obama Gets OK on Boosting Israel Against Rockets," Reuters, May 28, 2010. As of December 30, 2010:

<http://www.reuters.com/article/idUSTRE64R66W20100528>

Wood, Dakota L., *The U.S. Marine Corps: Fleet Marine Forces for the 21st Century*, Washington, D.C.: Center for Strategic and Budgetary Assessments, 2008. As of December 30, 2010:
<http://handle.dtic.mil/100.2/ADA491834>

Woodward, Bob, *Obama's Wars*, New York: Simon and Schuster, 2010.