Back to First Principles

U.S. Strategic Forces in the Emerging Environment

David A. Shlapak, David E. Thaler
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David A. Shlapak, David E. Thaler

A Project AIR FORCE Report prepared for the United States Air Force

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PREFACE

The purpose of this report is to offer a coherent perspective on issues surrounding U.S. long-range nuclear forces in the 1990s, seeking particularly to establish clear linkages between offensive and defensive forces and the national objectives they are intended to underwrite. In the wake of recent changes in the former Soviet Union and the resultant and still ongoing changes in the relationship between its successor republics and the U.S., such a review seems both opportune and timely.

The research for this document was carried out between 1990 and 1992, a time when the strategic landscape was in a state of flux and uncertainty. As a result, the analysis involved playing a game of “catch-up” so that issues relevant to long-range nuclear forces in such a dynamic world would be addressed. However, as is argued in this report, major parts of the paradigm in which long-range nuclear forces have existed still hold, perhaps even more so in this era of uncertainty.

This research was undertaken in the National Security Strategies Program of Project AIR FORCE, a federally funded research and development center. The study and its results should be of interest to a wide range of policymakers and analysts concerned with issues surrounding the future of U.S. nuclear forces, ballistic missile defenses, and related arms control initiatives, as well as to the informed layperson.
SUMMARY

For 40 years, U.S. defense planners had the luxury of confronting a geopolitical environment whose basic nature varied little. Now, however, the momentous events of the last few years have altered this state of affairs as the old order gives way to a post–Cold War world.

The time is therefore ripe to revisit the basic precepts of U.S. national security strategy, i.e., to return to first principles. This report undertakes a part of that task, the part limited to the realm of what are commonly labeled “strategic” forces: long-range nuclear strike weapons—which include intercontinental ballistic missiles (ICBMs), submarine-launched ballistic missiles (SLBMs), and long-range bombers—and the defenses used against them. For example, why does the U.S. need such forces, and what national objectives are they expected to support? How might these objectives, or their relative priorities, change in response to the emerging security environment? How can choices among objectives be rigorously translated into criteria relevant to strategic force planners?

NATIONAL OBJECTIVES SUPPORTED BY STRATEGIC FORCES

Armed with an understanding of the traditional missions of U.S. strategic forces and having carefully reviewed the emerging security environment, we suggest that U.S. strategic forces will play an important role in underwriting the following key national military objectives in the 1990s:

- Deter deliberate, large-scale Russian nuclear attack on the U.S. (central deterrence).
- Reduce pressures for either the U.S. or Russia to launch a nuclear first strike against the other (crisis stability, particularly first-strike stability).
- Should war occur, limit damage, deny enemy war aims to the extent applicable and feasible, and terminate the war promptly.
- Deter nuclear, biological, and chemical (NBC) attack by “nth countries” (smaller, non-Russian nuclear powers) against the U.S., its forces abroad, and its allies.
- Protect the U.S. against accidental or unauthorized Russian ballistic missile attack.
• Protect the U.S. and its forces abroad against deliberate attack by nth countries armed with NBC weapons.
• Protect U.S. allies from NBC attack.

The analysis in this report takes as its starting point a simple proposition: Russia, the "successor state" to inherit control of the bulk of the Soviet Union's central nuclear arsenal, will for the foreseeable future maintain the ineluctable ability to obliterate the U.S. as a functioning, modern society. While Moscow's intentions seem significantly less hostile today than in the past, its interests and values are still not fully consonant with those of the West. It is thus premature to bestow upon Russia the status of a Britain or France. Uncertainty about the outcome of reform in the former Soviet Union will, perforce, remain high for years to come. The likelihood of a major U.S.-Russian nuclear war seems far lower than at any time since the Soviet Union first acquired nuclear weapons. Yet the consequences of any such conflagration are so horrible that maintaining a well-defined central deterrent vis-a-vis Moscow is eminently justified.

Because the U.S. will continue deploying nuclear weapons to deter Russia, crisis stability will remain a top-priority objective in the U.S.-Russian relationship. Stability helps the U.S. manage the strategic environment created by its use of nuclear weapons as a deterrent. Establishing a mutually embraced definition and metric for crisis stability, particularly for first-strike stability, would go a long way toward ensuring that the posture or vulnerability of forces on both sides is not a catalyst to instability in a crisis. Moreover, before the two nuclear superpowers consider reducing their arsenals to levels similar to those of nth countries such as China or Israel, defining "stability" in such a world will be critical. This report does not develop such a definition.

The need for U.S. strategic nuclear forces to "extend" a deterrent umbrella to U.S. allies, especially in Europe, is substantially reduced. The disappearance of an aggressive Soviet Union poised to strike in Europe or elsewhere eliminates extended deterrence (for now) as a major determinant of U.S. force structure. As a result, U.S. strategic forces no longer need to support large-scale first-use options vis-a-vis Moscow. The diminished role of extended deterrence also presents new opportunities, because long-standing tensions between this and other objectives, especially first-strike stability, are now relieved.

If a U.S.-Russian nuclear war were somehow to occur, the only way the U.S. could possibly limit damage is bilaterally, i.e., with the help of the Russian leadership. No unilateral approach to limiting dam-
age—by striking nuclear forces and leadership, defending against incoming warheads, or sheltering intended U.S. targets—can succeed in any meaningful way. Therefore, a premium must be placed on limiting damage by controlling escalation and negotiating a swift end to any U.S.-Russian nuclear war. To this end, options for discriminate attack that promote signaling and coercive bargaining must be made available to the U.S. president.

The U.S. cannot rely solely on deterrence to avoid attack by nth countries armed with weapons of mass destruction. While the U.S. must seek to deter such actors from striking it, its forces abroad, and its allies, deterrence may be insufficient when highly asymmetrical stakes and differing value structures are involved. To maintain its freedom to act in defense of perceived interests, the U.S. must counter this emerging threat to the extent possible. Options include antiproliferation efforts, conventional attack planning, and ballistic missile defenses (BMD).

The goal of defending the U.S. and Russian homelands from small ballistic missile attacks (i.e., those of no more than 200 or so warheads) is in some tension with the peacetime goals of central deterrence and first-strike stability. Any Russian capability that limits damage reduces the U.S. ability to maintain a robust central deterrent. First-strike stability is eroded as well, especially when both Washington and Moscow possess defenses. If the U.S. and Russia seek to protect their territory with defenses against limited ballistic missile attack, a floor for nuclear arms reductions must be established that does not severely undermine the core objectives of central deterrence and first-strike stability. Policies that recognize and address the trade-offs among these objectives are needed.

Ironically, small deployments of Russian homeland BMD can hamper bilateral damage limitation. In the event of war, small, carefully planned attacks against Russia are useful for coercive bargaining only when they are recognized as discriminate by the Russian leadership. Because Russian BMD would mean that the U.S. would have to use larger numbers of attacking warheads to attain a desired effect, an attack intended to be discriminate could appear indiscriminate to the Russians if it must be sized to penetrate defenses. This possibility argues for defenses that are small and ill suited to handling multi-azimuth attacks, since only U.S. and Russian attacks would likely be multi-azimuth.
ACHIEVING U.S. OBJECTIVES IN THE EMERGING SECURITY ENVIRONMENT

Before the U.S. considers further reductions in offensive arms and possible deployments of strategic BMD, it should set forth a "test of adequacy" to assess the ability of its strategic nuclear forces to deter Russian attack (central deterrence).

The U.S. central deterrent force should be composed of three invulnerable components: a secure reserve, an urban withhold, and a flexible-response increment. The secure reserve is a small force whose aim is to deter nth countries from attacking the U.S. in the aftermath of a devastating U.S.-Russian nuclear exchange. The urban withhold deters Russian attacks on U.S. cities by threatening Moscow with the ultimate sanction—destruction of Russian society. The flexible-response increment is an additional pool of survivable forces intended to deter other forms of Russian attack and support other wartime objectives.

The flexible-response increment should be sized to credibly threaten a large portion of the Russian-controlled general-purpose forces (GPF). The Russian GPF represent a large, important set of targets, so threatening them is the best means of achieving both peacetime and wartime objectives. However, sizing against Russian GPF does not preclude the selection of other employment options in the event of nuclear war. In fact, Russian leaders cannot be certain as to how the U.S. would actually employ its forces. The test of adequacy for the U.S. deterrent need not include an additive capability against all four canonical target categories: war-supporting industry, strategic forces, leadership, and GPF.

Reducing arsenals to 4700 actual warheads, as proposed by President Bush in his State of the Union address in January 1992, meets our test of adequacy with a considerable margin for uncertainty. According to our analysis, deeper cuts may be imprudent at this time. It is unclear how the limit of 3000 to 3500 weapons agreed to in June 1992 was derived. The size of the U.S. strategic inventory should be determined by measuring the adequacy of alternative postures for supporting relevant national objectives, which has not been done in the case of the agreed-upon limits.

Posture (alert rate) is one of the most important drivers of deterrent adequacy and has the greatest influence on first-strike stability. Only a portion of any U.S. arsenal should be expected to survive a Russian first strike. This portion, and not the arsenal as a whole, is what must be subjected to the test of adequacy.
The prospective deployment by the U.S. and Russia of new BMD argues for greater caution in reducing offensive forces. Where radical cuts in strategic nuclear arsenals impinge on the U.S. ability to deter and maintain first-strike stability, deploying even limited BMD makes the situation worse. Moreover, any modifications to the Antibalistic Missile (ABM) Treaty should be made with the utmost care so as not to undermine deterrence and stability.

Even the smallest BMD deployment considered in this study (a capability for defeating a 200-warhead attack) has a strong negative effect on the deterrent adequacy of 3000-warhead forces, and the impact on first-strike stability is similar. This analysis indicates, however, that reductions to about 4700 weapons, especially when accompanied by more survivable postures, can be combined with such defense deployments without severely undermining central deterrence and first-strike stability. Additionally, modest asymmetries in defense potential that favor Russia do not seem particularly invidious to U.S. interests.

BMD should not be viewed as the only, or even primary, means for protecting the U.S. against accidental, unauthorized, or nth-country NBC attack. Fears of accidental launches or unauthorized Russian ballistic missile attacks may be well founded, but the more worrisome sources of instability in the former Soviet Union could play themselves out well before a U.S. BMD system is in place. In addition to considering defenses, therefore, the U.S. should act with Moscow to eliminate the least-secure elements of the former Soviet nuclear arsenal, enhance the security of remaining weapons as soon as possible, and investigate near-term means of preventing accidents, such as installing command-destruct or command-enable packages on all missiles.

Moreover, as long as it is possible to smuggle large caches of drugs into American cities, BMD will be only part of any solution to the nth-country NBC threat. It is difficult to imagine why an Iran or Libya would want to telegraph the source of a nuclear attack on U.S. territory when there are avenues that allow plausible deniability. Furthermore, the U.S. may never be able to protect itself from all means of delivering weapons of mass destruction. Therefore, the U.S. must threaten a devastating response against potential attackers, up to and including the use of nuclear weapons.

The U.S. should focus on how its development of effective ways to defend its forces and allies overseas against theater ballistic missile attacks could affect the ABM Treaty. Today and for some years to come, defending deployed forces and allies will be a far more pressing
problem than homeland BMD. Yet even theater BMD systems under development could endanger the ABM Treaty, because they will undoubtedly impart some homeland defense capability. This issue must be addressed with Moscow now; otherwise, the U.S. could encounter a situation in which the Russians attempt to veto a U.S. defense of troops deployed to allied soil by threatening to abrogate the ABM Treaty. Politically, if offered a choice between maintaining the ABM Treaty and protecting U.S. troops abroad, most people in the U.S. would probably choose the latter, despite the possible consequences for deterrence and stability. The U.S. should not knowingly put itself in the position of having to make such a choice.
ACKNOWLEDGMENTS

In creating this report, we incurred debts to many individuals. First and foremost, our thanks go to the former director of Project AIR FORCE's National Security Strategies Program, David Ochmanek, without whose trust and guidance this work could not have been undertaken. Glenn Kent, who served as mentor and inspiration to the younger of the two of us, sparked our interest in pursuing this work. He also provided a useful critique of a prior version of this report, as did David Ochmanek, Ted Warner, and Dean Wilkening. We benefited greatly from presenting an early version of our findings to a gathering of knowledgeable and insightful RAND colleagues led by Paul Davis.

We are also indebted to Roger Molander of RAND and Charles Glaser of the University of Chicago for their thoughtful and detailed technical reviews of the working draft version of this report. Jeri O'Donnell did a splendid job of honing our sometimes-woolly prose.

What is useful in these pages is probably as much a product of this collective as it is of the two of us. What shortcomings remain are, of course, ours alone.
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1. INTRODUCTION

A NEW LOOK AT STRATEGIC FORCES

For 40 years, U.S. strategic planners had the luxury of confronting a geopolitical environment whose basic nature underwent little variation. The debate during those years centered on how best to achieve national security objectives that were largely fixed.

That state of affairs has now been altered by the momentous events occurring in the last few years as the old order gives way to a post–Cold War world. While we cannot yet discern the final configuration of this new environment, we can at least identify some of the changes that will affect U.S. strategic planning in the 1990s and perhaps beyond:

- First and foremost, the collapse of the Soviet Union and the perception of a dramatically reduced threat to the U.S. from former Soviet strategic nuclear forces.
- The breakdown of hegemonic Soviet control over Eastern Europe and the virtual disappearance of the conventional military threat to NATO.
- Growing pressures, both budgetary and political, to restrict the size and modernization of U.S. strategic forces.
- The potential for further proliferation of ballistic missiles and weapons of mass destruction, especially nuclear weapons, and especially within historically unstable regions.
- The potential deployment by the U.S. and possibly Russia of ballistic missile defenses (BMD) that go beyond those permitted in the 1972 Anti-ballistic Missile (ABM) Treaty.

Taken individually, any of these factors could prompt a reevaluation of U.S. national security policies. In toto, however, they represent a geopolitical sea change surpassing anything since the Soviet acquisition of nuclear weapons in 1949. Not only is today shaping up to be very different from yesterday, but the uncertainty in U.S. planning for tomorrow is more prevalent than before. To borrow a line from that sage strategist, Yogi Berra, the future ain’t what it used to be.

The time is therefore ripe to revisit the basic precepts of U.S. national security strategy. This report undertakes a part of that task, the part limited to the realm of what are commonly labeled “strategic” forces:
long-range nuclear strike weapons—such as intercontinental ballistic missiles (ICBMs), submarine-launched ballistic missiles (SLBMs), and bombers—and the defenses used against them. We ask and attempt to answer a few basic questions:

- Why does the U.S. need strategic forces? What national objectives are they expected to support?
- How might these objectives, or their relative priorities, change in response to the emerging security environment?
- How can choices among objectives be rigorously translated into criteria relevant to strategic force planners?

In particular, we address three issues of some importance in current thinking about strategic forces. First, what tests of adequacy should be used to judge alternative U.S. strategic nuclear force postures? Measuring U.S. capabilities against some assessment of U.S. needs is a requisite first step in determining the appropriate size and character of U.S. forces.

Second, the U.S. is currently considering or adopting three important changes in the composition and status of U.S. strategic forces:

- Deployment of homeland BMD.
- “Deep cuts” in offensive arsenals as a result of arms control agreements with Russia and, potentially, other nuclear-armed remnants of the Soviet Union.
- Reductions in peacetime alert rates.

What would be the effects of these changes, both alone and in combination, on the U.S. ability to attain its national objectives?

Third, we believe it is an opportune time to return to a long-standing debate over the emphasis accorded various types of targets in U.S. declaratory policy and operational plans for conducting nuclear war.

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1The attributes of strategic forces are grouped in terms of force structure and force posture. Force structure is defined as the types and numbers of force elements (missiles, bombers, submarines), the characteristics of those forces (inherent reliability of systems, hardening against nuclear effects), and the basing modes (mobility). For the purposes of this study, strategic defenses are considered part of strategic force structure. Force posture refers to the readiness and dispersal of offensive forces. Of particular interest here are the portions of the force postured in such a way that they cannot be targeted. Bombers on strip alert that can escape with adequate warning and nuclear-powered ballistic missile submarines (SSBNs) at sea are examples of such forces.
How many of what kinds of targets need the U.S. hold at risk to have confidence in its deterrent posture? How do these targeting choices affect other U.S. objectives? In light of relative priorities among both peacetime and wartime objectives, what should be the weight of effort across target categories in U.S. strike plans?

STRUCTURE OF THIS REPORT

We sought insight into these and other issues by applying a top-down conceptual framework to formulate and define national objectives relevant to strategic forces in the changing world. We describe this framework, define the national security and military objectives that strategic forces support, discuss the role of these objectives in determining force structure and posture, identify obstacles to their achievement, and suggest priorities among them in Section 2. We then set forth criteria in Section 3 for evaluating strategic forces on the basis of some of these objectives and describe some evaluation approaches. In Section 4, we apply these criteria and methodologies to a sampling of alternative force structures and postures.

In Section 5, we make recommendations with regard to future strategic force structures and postures that will allow the U.S. to attain its objectives into the twenty-first century. Some of these recommendations arise not from the quantitative analysis of Section 4, but from the top-down ends-means assessment that underlies all of our work. Where appropriate, we address some of the confusion characterizing the current national dialogue on strategic issues, especially that connected with strategic defenses. A few closing thoughts appear in Section 6.

This work contains numbers and graphs, but we typically present them as exemplars of a range of possible values. This is not a force-exchange analysis or a targeting study. Instead, it tries to present a coherent approach to thinking about U.S. strategic forces in the 1990s, along with some insights into potentially desirable courses of action. The post-Cold War world is still shaking itself out, and we do not claim to foresee or comprehend its final configuration. It would thus be presumptuous and premature to claim that we have ultimate answers to all the questions we attempt to address. Moreover, we recognize that further, detailed analyses are needed before the recommendations made here can be accepted as fully assessed. The purpose of this work is to provide a sound framework within which those more detailed studies can be undertaken.
PROLOGUE: ENDURING PROBLEMS, NEW PERSPECTIVES

We found ourselves in the somewhat uncomfortable position of playing catch-up throughout the year in which we conducted this study. The geopolitical world, which for four-plus decades seemed a familiar (though dangerous) place, has in the last three years transformed itself at a dizzying pace. Our struggle to keep up with the sweep of events mirrored, we believe, the eye-rubbing incredulity with which many people greeted these days, when history seemed on fast-forward and as close at hand as the television.

In 1989, the Berlin Wall disappeared, symbolically unleashing a flood of change whose ebb is not yet on the horizon and whose refiguring of the strategic landscape cannot yet be fully grasped. The world in which both of us had lived our entire lives—that of eastern and western “blocs,” “containment,” and the “evil empire”—has now all but vanished. What is gone can be accounted for, but the outlines of the world that is taking its place can be no more than dimly perceived.

When we undertook this effort in 1990, we felt we faced a daunting yet tractable challenge. U.S. strategic forces had, since the early 1960s at least, fulfilled a more-or-less fixed set of roles in protecting the security of the U.S. While it was already clear that the 1990s would be different, perhaps vastly different, we expected that certain themes would continue to resound through the new decade.

Today, the dissolution of the Soviet Union\(^2\) into a collection of independent, or at least highly autonomous, entities appears to be complete. Ultimately, the effect this evolution will have on U.S. policy regarding strategic forces is difficult to pinpoint. A prominent question on the minds of U.S. leaders is, How many nuclear powers will the Soviet Union give way to, and what will be their orientation toward Western interests? It is clear that the Republic of Russia, possibly within the context of some centralized, interrepublic defense framework, will continue to be the largest nuclear power next to the U.S. Taken as independent states, however, Kazakhstan and Ukraine today have, respectively, the third- and fourth-largest nuclear arsenals in the world.\(^3\) All of the progeny of the former Soviet

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\(^2\)What does one call an actor that does not know what to call itself? In this report, we refer sometimes to “Moscow” and “Russia” and sometimes to the “former Soviet Union” and the “successor state(s).” Unless otherwise noted, these terms are being used to denote the power or powers that gain or maintain control over the strategic force elements heretofore owned by the Soviet Union.

\(^3\)Both countries seem to fluctuate as to whether they intend to give up their inherited arsenals anytime soon.
Union are undergoing political and economic transformations whose outcomes are far from certain. Obviously, the emergence of new nuclear powers in Eurasia would demand some rethinking of the U.S. posture.

The birth of this new world has also been accompanied by pangs of disorder and danger. When planning for this study began, no one would have guessed that before its publication a half-million Americans would travel around the world and wage war against an Arab dictator to rescue the people of a tiny sheikdom few at home could find on a map. Revelations about Iraq's progress in developing nuclear weapons should give all Americans pause as they ponder how close the U.S. may have come to a cataclysm that could have reshaped for ill much of the dynamism in the world. Likewise, the bloody fate of Yugoslavia is a stern warning to those who believe, or wish to believe, that the classic "isms" of international politics—irredentism, imperialism, and nationalism—have lost their appeal for aggrieved populations around the globe. And finally, the attempted Moscow putsch in August 1991, whose failure continues to be a source of great hope, serves as a reminder of how easily the mainspring of history can come unwound.

So where does the U.S. stand in this new world? Looking around, one thing seems clear: it resides neither on a precipice of imminent peril nor on a level plain of perpetual peace. The strategic environment is surely less dangerous than it was, but hardly safe: threats to core U.S. security interests have dissipated, but not disappeared. The themes expected to echo through the 1990s continue to sound, though perhaps in a muted and somewhat dissonant fashion. As evidenced throughout this report, we are hopeful that the character of the emerging order will be one of peace, yet we remain cautious for the time being.

The analysis in this report takes as its starting point a simple proposition: Russia, and possibly any other ex-Soviet successor state(s) that inherits control of long-range nuclear weapons, will maintain the ineluctable ability to oblitrate the U.S. as a functioning, modern society. While Russian intentions seem significantly less hostile today than Moscow's appeared in the past, Russian interests and values are still not fully consonant with those of the West—i.e., Russia is not yet a stable, democratic, market-oriented society. The U.S. cannot expect this uncertainty about Russia's attitudes and intentions to evaporate instantly, so it must constantly remember that the time scale of years and decades is the appropriate one to be using, regardless of the breakneck pace of current events. Pluralist or mar-
ket tendencies can emerge overnight, but the actual development of open political and economic systems is a far more onerous and time-consuming task. Such systems, like all human institutions, are collections of habits, norms, and expectations that can take years, even generations, to grow deep roots.

The capability for waging nuclear warfare against the U.S. is still in the hands of the Russian government. It is this fact, together with the uncertainty about Moscow's current intentions and future direction, that is the constant underlying our approach to strategic force planning. The principal task of U.S. strategic forces must still be to prevent any world leader, Russian or otherwise, from believing that any nuclear attack of any size on the U.S. represents a possible solution to any problem.

Having made this categorical statement, we now rapidly backpedal from it. We recognize that U.S. strategic forces must suit objectives other than central deterrence (first-strike stability, for one) and are constrained by budgetary and other domestic political considerations. We further understand that U.S. peacetime objectives differ from those to be pursued in the event of war. Finally, we realize that all these objectives and constraints exist in a state of mutual tension and thus cannot all be simultaneously maximized or satisfied.

Later in this report, we address these tensions and trade-offs explicitly. Here, we simply wish to make clear that, above all else, strategic nuclear weapons are needed to deter adversaries from attacking the U.S. This fact is true today and will continue to be true so long as nuclear powers exist and have interests that are not in large measure parallel to those of the U.S. It is with this conviction that our analysis begins, and it is toward a better understanding of its implications that this study is dedicated.
2. STRATEGIC FORCES AND NATIONAL SECURITY

Since the invention of nuclear weapons, strategists have ascribed a wide variety of purposes to them, and politicians, activists, and polemicists have been equally creative. Thus, some confusion over why the U.S. and other nations build and deploy nuclear weapons is excusable, perhaps even inevitable. In this section, we intend to return to first principles in an attempt to answer the question, Why do nations have strategic nuclear weapons in the first place?

Both the U.S. and the Soviet Union decided that large offensive forces would be their primary response to the threat posed by the other side's offensive forces. These decisions resulted in what can be characterized as an offense-dominant environment: the U.S. and, in the demise of the Soviet Union, Russia maintain large offensive nuclear forces that so far have outpaced capabilities for defending against them. As a result, neither the U.S. nor Russia can prevent (as distinct from deter) the other side from devastating it, so each side depends upon the other's restraint and forbearance for its survival.¹ Under these circumstances, the only way to ensure national survival is to avoid engaging in a nuclear exchange.

THE EFFECTS OF NUCLEAR WEAPONS

At this writing, the former Soviet Union and the U.S. each have in excess of 10,000 warheads available for their long-range strike systems—ICBMs, SLBMs, and bombers. The smallest of these has a yield, or explosive power, equivalent to 40,000 tons of high explosive, or 40 kilotons (kt). Most currently deployed weapons are much larger than these; the largest U.S. warhead, for example, is the one on the Minuteman II ICBM, which has a reported yield of 1200 kt, or 1.2

¹This situation, in which neither side can prevent the other from retaliating in a devastating way for any nuclear attack, is often referred to as "mutual assured destruction," or MAD. That MAD is a condition, rather than a doctrine, policy, or "mutual suicide pact," is frequently misunderstood. The unfortunate connotations of the acronym have often obscured this simple point.
megatons (mt). By way of comparison, the “Little Boy” bomb that destroyed central Hiroshima had a yield of only about 12 to 15 kt.\(^3\)

A single 1-mt weapon detonated on a large city could result in a half-million or so “prompt” fatalities (i.e., deaths occurring within a few hours of the attack) and as many or more people seriously injured (burned by the thermal pulse of the explosion, blinded by its brilliant fireball, lacerated by fast-moving shards of glass flying through the air).\(^4\) The U.S. and the former Soviet Union each have the equivalent of thousands of such weapons in their arsenals. And although neither side deliberately targets civilians, any but the most limited use of nuclear weapons against the other side’s homeland would result in millions of fatalities.

How many weapons would it take to “destroy” the U.S. or the former Soviet Union? No single answer can be given, because destroy means different things in different contexts and to different people. Destruction of a single major city (say, Chicago or St. Petersburg) would be the work of only two or three bombs, yet the ramifications would be keenly felt by people living thousands of miles from ground zero. Two hundred or so properly targeted 1-mt detonations would suffice to effectively destroy urban civilization in either country. One recent study suggests that some 35 percent of the population in the former Soviet Union could be exposed in an attack on its 200 largest cities. This percentage represents some 100 million people, a large proportion of whom would die or be wounded in such a strike.\(^5\) A similar dismal calculus holds for the U.S.

Clearly, these weapons are engines of destruction unparalleled in human experience. Why, then, do nations persist in owning them, and in such quantity?

The first reason, of course, is that the genie is out of the bottle. Man knows how to build nuclear weapons and cannot “unlearn” the secret any more than he can forget how to make fire. Given this fact, it follows almost axiomatically that mutually suspicious great powers will

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seek to own some bombs, if only as a hedge against the possibility of others possessing them. Agreeing to forgo deployment of nuclear weapons would work only if each power felt very confident indeed that no other nation was cheating on the deal. In a world where no one was supposed to have nuclear bombs, even a handful of hidden, deliverable weapons could be a powerful, even decisive, trump card.

Another reason for owning nuclear weapons is that, for all their potential horror, they can play an important role in achieving national goals. No one will ever know, for example, whether 45 years of peace in Europe has been a byproduct of the nuclear revolution. We and many other observers believe that the specter of nuclear escalation made conventional war distinctly unpalatable to leaders on both sides of the Iron Curtain. Nuclear weapons are unique in the history of warfare because their value lies almost exclusively in what they help avoid, rather than in what they can accomplish. Recognizing and capitalizing on this uniqueness, both the U.S. and the Soviet Union deployed nuclear weapons to support a small set of key national objectives, a subject to which we now turn.

CLARIFYING THE DEBATE: A HIERARCHY OF OBJECTIVES

To understand how nuclear weapons help the U.S. achieve important national objectives, a framework that links means and ends is required. The framework we propose consists of a straightforward hierarchy of objectives that flows from the nation's broadest and most fundamental goals to the narrowest operational activities assigned to force elements. Figure 2.1 shows the hierarchy, using as an example the national military objective of deterring the Russians from conducting a deliberate nuclear first strike on the U.S.

Fundamental goals appear at the top of the hierarchy. These are basic statements that express the nation's values and define the raisons d'être of its government. They are enshrined in such documents as the U.S. Constitution and are enduring and constant irrespective of the international environment. They include maintaining the survival of the U.S. as a free and independent nation and ensuring the well-being of its citizens.

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6The specific hierarchy described here was developed by RAND colleague Glenn Kent. See Glenn A. Kent and William E. Simons, A Framework for Enhancing Operational Capabilities, R-4043-AF, RAND, 1991.
National security objectives are formulated to protect fundamental national goals from various threats. For example, as depicted in Figure 2.1, deterring aggression against the U.S. is a national security objective that supports the national goal of ensuring the survival and well-being of the U.S. When threats change, so do national security objectives. When the Soviet Union tested its first atomic weapon in 1949, for example, the objective of preventing or deterring attacks on U.S. territory gained in importance.

To attain its objectives, a nation employs a wide range of capabilities, among which are military power, economic strength, and diplomacy. The emphasis that the U.S. places on each of these components shifts from objective to objective and across time in a manner dictated by
the changing nature of U.S. national capabilities and the security environment itself.

The national leadership, including the Secretary of Defense and the Joint Chiefs of Staff, set forth national military objectives that describe how the U.S. could apply military resources to support the attainment of national security objectives. As Figure 2.1 shows, an example of a national military objective is the deterrence of deliberate Russian nuclear attack on the U.S. This objective is one of a number of such objectives derived from the national security objective of deterring aggression against the U.S., which in turn is one of several objectives supporting the goal of ensuring national survival.

Acting according to these national military objectives, military commanders prepare plans for achieving appropriate operational objectives. In the context of deterring a Russian nuclear attack, these could include holding Russia's economic infrastructure at risk, threatening Russia's power-projection capability, and maintaining a survivable system for command and controlling U.S. nuclear retaliatory forces. Force elements perform military tasks to achieve an operational objective. The task of holding Russian army garrisons at risk could be performed by ICBMs, SLBMs, or bombers, for example. The commanders' operational strategy, embodied in specific plans, defines how tasks will be accomplished, what force elements will be used, the weight of effort among tasks for achieving an operational objective, and the weight of effort among operational objectives for attaining the national military objective.

In summary, the suggested framework consists of five levels of objectives: fundamental goals, national security objectives, national military objectives, operational objectives, and tasks. We minimize the number of levels in this hierarchy by not interspersing separate "strategies" between the levels of objectives. Rather, we recognize that a strategy for achieving an objective essentially consists of a statement of supporting objectives at the next lower level. In other words, objectives cascade. What is a strategy at one level appears as an objective from the perspective of the next lower level; hence, the hierarchy of objectives.

This or any such framework is useful only insofar as it helps policymakers address important issues. The framework should help clarify and answer questions of strategic force sizing, deployment, targeting, and doctrine. Procurement of weapons and other systems should in turn be justified by reference to the defined objectives and tasks. The framework should—and we believe our candidate does—establish a clear "audit trail" from the nation's most fundamental and enduring
goals down to specific force elements and the tasks they accomplish to meet the nation's fundamental security objectives. A successful framework also encourages precise use of language in discussions of strategic issues and helps clarify crucial distinctions between means and ends.

NATIONAL SECURITY AND MILITARY OBJECTIVES SUPPORTED BY STRATEGIC NUCLEAR FORCES

Throughout our history, our national security strategy has pursued broad, consistent goals. We have always sought to protect the safety of the nation, its citizens, and its way of life. We have also worked to advance the welfare of our people. . . . These broad goals have guided American foreign and defense policy throughout the life of the Republic.7

Thus begins the Bush administration's 1990 report on the national security strategy of the U.S. These fundamental goals—life, liberty, and prosperity—constitute the essentially unchanging background against which national security policy is formulated and played out. One task of the national leadership is to determine how best to secure these unchanging goals in a changing world; this job is accomplished by deriving a number of national security objectives. Those supported by today's strategic forces formerly focused primarily on countering Soviet threats to U.S. interests. Two of them are especially relevant to any discussion of strategic forces:

- [D]eter any aggression that could threaten [U.S.] security and, should deterrence fail, repel or defeat military attack and end conflict on terms favorable to the United States, its interests, and allies. . . .

- [I]mprove strategic stability. . . .8

From these national security objectives we can derive several, more-precise, national military objectives:

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8Ibid., p. 2.
• Deter deliberate nuclear attack on the U.S. (*central deterrence*).

• Deter large-scale military aggression against important U.S. friends and allies and against U.S. forces abroad (*extended deterrence*).

• Reduce pressures on all powers with a large arsenal (today, the U.S. and various former Soviet republics) to launch a nuclear first strike against each other (*crisis stability*, particularly *first-strike stability*).

• Reduce pressures to engage in an ongoing, competitive buildup of nuclear forces (*arms-race stability*).

If a nuclear conflict with Russia or another nuclear-armed power occurred, U.S. wartime objectives would be to

• Limit damage to the U.S. to the extent feasible.

• Limit damage to American allies to the extent feasible.

• Deny enemy war aims to the extent applicable and feasible.

• Terminate the war on terms acceptable to the U.S.

These objectives have been the primary ones driving U.S. strategic force development, procurement, deployment, and employment. We now discuss each of them in somewhat more detail.

**DETERRENCE**

*The main reason the U.S. deploys strategic nuclear forces is to deter.* Analysts can differ over which variety of deterrence, central or extended, has been the more salient consideration, but the larger point is incontestable.

The U.S. attempts to deter an adversary by threatening him with dire consequences should he undertake some specified action. Central deterrence threatens to rain destruction down on the head of any oppo-

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9Possession of strategic nuclear weapons can serve other purposes as well. For 40 years, for example, the U.S. strategic arsenal may have helped to contain pressures for proliferation by placing U.S. military power partially at the disposal of key allies. In addition, the U.S. has used threats of nuclear employment to coerce others; President Truman, for example, deployed several nuclear-capable B-29 bombers to Great Britain in 1948 when the first Berlin crisis erupted. We do not consider either of these uses to be core objectives for contemporary strategic forces. The political leverage or status conferred on the U.S. by its possession of nuclear weapons is a collateral benefit of that arsenal. This leverage accrues primarily from the existential fact of U.S. nuclear capability and will endure so long as that capability remains unquestioned.
ment foolish enough to directly attack U.S. territory. Whatever benefits the adversary might gain by his actions would be clearly outweighed by the destruction he would inescapably suffer. \textit{Extended} deterrence involves a threatened strike against any adversary who attacks a U.S. ally.

It is, unfortunately, impossible to measure "deterrence," or even to ascertain whether a potential adversary is deterred. When an opponent acts as wished, is deterrence "working"? Most often, there is no definitive answer: one can know that deterrence has \textit{failed} but never that it is succeeding. The U.S. deploys strategic nuclear forces to deter because \textit{it believes that they deter and because opponents tend to behave in a manner consistent with that belief}.

\textbf{Extended Deterrence}

Chronologically, extended deterrence came first. From the late 1940s, when U.S. nuclear power was the shield behind which a war-torn Western Europe rebuilt itself, through the 1980s, the American strategic arsenal was the argument of last resort against any Soviet attack on NATO. Unwilling to match the size of deployed Soviet conventional forces, NATO relied in part on first use of nuclear weapons as a counterweight. As the final link in an escalatory chain that began with direct conventional defense and progressed in stages to large-scale nuclear attacks on the Soviet homeland, U.S. strategic nuclear forces extended their deterrent to U.S. allies by serving as the ultimate sanction against Soviet \textit{aggression}. For many years they played this role, arguably helping prevent Soviet aggression against or intimidation of a Western alliance that, in many respects, was perceived as militarily inferior. Even after the growing Soviet nuclear capability challenged the credibility of U.S. first-use options by ensuring that the U.S. would suffer terribly in return, Moscow could not completely discount the threat of uncontrolled escalation arising from a war in Europe.

Further, NATO's first-use options gave it an ability to deny the Warsaw Pact any meaningful success on the battlefield. Both sides would surely have suffered greatly in a battlefield or theater nuclear exchange. However, the West believed that Soviet incentives to initiate conflict were reduced by Moscow's realization that it could not meaningfully "win" a war in Europe.

Despite measures to shore up extended deterrence, U.S. first-use options supporting it seemed increasingly incredible starting in the mid 1960s, when the Soviets acquired nuclear capabilities sufficient to
guarantee a crushing retaliatory strike against the U.S. Under such circumstances, the U.S. has had the difficult task of convincing allies and adversaries alike that it was prepared to risk destruction at home to rescue its European friends. Nonetheless, until recently, extended deterrence remained key to U.S. nuclear planning and thinking as a declaratory tool, a driver of force posture, and a component of U.S. operational plans.

Central Deterrence

The same expansion of Soviet nuclear power that reduced the credibility of extended deterrence brought central deterrence to the fore as a second key national military objective driving the structure and posture of U.S. strategic forces. Previously, when the U.S. had enjoyed a decided advantage in intercontinental strike capability, its strategy for nuclear war had revolved around prevention (attacking first, prior to any indication of a Soviet attack) and preemption (striking first on warning of an imminent Soviet attack). The logic supporting these options was eventually weakened by the end of U.S. nuclear supremacy. In their place, the U.S. accepted the objective of central deterrence.

STABILITY

The maintenance or improvement of stability is a second thrust of U.S. national policy. To provide some clarification of what is not a precise concept, we disaggregate stability into three parts here. First, however, we consider what kind of objective "stability" is.

In a sense, deterrence is the only true peacetime "objective" served by strategic nuclear weapons. The existence of these weapons in large numbers enables the U.S. to encourage restraint on the part of potential adversaries. Stability, in contrast, has something of a different flavor in that it refers to the U.S. desire to manage the dangerous environment created by nuclear weapons. In the physical sense, a "stable" system is one that tends to return to equilibrium after being disturbed. Similarly, in a stable strategic regime, disruptions (a crisis between two powers, for example) are damped by forces within the system, such as fear of inadvertent or uncontrollable escalation. The U.S. assumes the burden of ensuring stability by choosing to use nuclear weapons as deterrents.

\[10\] Along, perhaps, with coercion and maintenance of influence. See footnote 8, above.
So, the U.S. deploys nuclear forces to deter, worries about stability because nuclear weapons are horrific things, and wishes to minimize the likelihood that they will ever be used. Both considerations, deterrence and stability, have driven decisions regarding strategic force posture. When the two objectives are in tension, as they sometimes are, controversial trade-offs must be made between them.

That said, a question remains: What is stability, and how should it be thought about? We suggest that there are three kinds of stability that matter when discussing strategic forces:

- Crisis stability
- First-strike stability
- Arms-race stability

**Crisis Stability**

Deterrence and crisis stability are obviously interrelated. We use the term *deterrence* to describe the calculus that takes place when leaders are choosing between war and no war, and we use *crisis stability* to describe their concerns when deciding whether to initiate conflict once war appears likely or inevitable.

Crisis stability is robust when neither the U.S. president nor his adversary “feels pressure because of emotion, uncertainty, miscalculation, misperception or the posture of forces to strike first in order to avoid the worse consequence of absorbing a first strike.” Of the five factors mentioned here, one—uncertainty—is an omnipresent fact of life, and three of the others—emotion, miscalculation, and misperception—are characteristic foibles of humans under stress. Thus, some degree of crisis instability may be a fact of life. We cannot avoid uncertainty in any case, and the pressures inherent in crises are likely to increase the risks of improper emotional responses, faulty perceptions, and poor risk-benefit analyses. What can be done to render crises less likely to explode into open hostilities?

We believe that the answer may be hinted at in Dr. Johnson’s famous dictum regarding the highly focused mind of the man who knows he is to be hanged. If the consequences of an aggressive course of action are made obviously dire, devastatingly clear, and absolutely inescapable, there is hope that all the noise associated with a crisis can

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be cut through to ensure that at least the very worst outcome does not come to pass.

Potential sources of crisis instability only matter if nuclear war is already perceived as a possible solution to the problem at hand. Avoiding these destabilizing pressures is primarily a matter of ensuring that “launch a first strike” never appears on a decisionmaker’s menu of options during a crisis.

Measures that help countries manage deep crises between them can work to relieve the pressures of uncertainty, misperception, miscalculation, and psychological stress that drive a leader to think about nuclear options. However, one primary impetus for seriously considering a first strike during a crisis would likely be a perception that one’s opponent is contemplating striking first himself. First-strike stability provides a means of addressing one key element of this fear.

First-Strike Stability

The fifth factor contributing to crisis instability—the degree to which the force postures of the two sides affect first-strike incentives—is more amenable to analysis than are the other four, which means our focus on it may seem a little like looking for one’s keys where the light is best. However, since it flows from the choices each side makes in deploying its nuclear forces, first-strike stability is controllable in a way that emotion, misperception, misjudgment, and uncertainty are not. The U.S. can and should take steps to structure decisionmakers’ environments so as to lessen the impact of these factors on their choices in crisis. To the extent, however, that the U.S. cares about improving crisis stability, it should also pay considerable attention to enhancing first-strike stability, which helps ensure that strategic forces themselves do not act as catalysts to war or escalation in a crisis.

First-strike stability is related to, but different from, central deterrence. As noted earlier, deterrence is the effort to affect a decisionmaker’s thinking when he believes that his choice is between starting a war or having no war. A more complex situation arises if the leader is aware, as he must be in a crisis, that one possible consequence of self-restraint is not “no war,” but rather incurring a first strike himself. Thus, while deterrence rests on a simple appreciation of the punishment one would receive for starting a war, first-strike stability involves a somewhat more difficult calculus: How much better off am I if I go first than if I wait and risk absorbing a first strike?
Unlike central deterrence, first-strike stability is a *two-sided* measure applying equally and simultaneously to both the U.S. and an opponent. The object of deterrence is to ensure only that the enemy’s perceived cost of striking first greatly exceeds his expected benefit. First-strike stability, alternatively, relates the expected cost to each side of striking first to the anticipated cost associated with striking second. When the cost to each side of striking second appears to greatly exceed that of striking first, first-strike *instability* can be said to be acute, and either or both leaders may perceive an advantage in preemption during a deepening crisis. First-strike stability is high when there is little difference between the expected costs of striking first and second.\(^{12}\)

Enhancing first-strike stability thus means narrowing the difference between going first and going second, and the most obvious means to this end is to improve one or both sides’ retaliatory capabilities. Because *survivable* forces (dispersed mobile ICBMs, SSBNs at sea, bombers on alert that can escape with tactical warning) ensure that enough forces will survive a first strike to hit back effectively, they are valuable to maintaining high levels of first-strike stability.

In addition to deploying such inherently survivable forces, leaders can take actions in a crisis to improve the chances that a significant fraction of their forces will survive a first strike. More SSBNs can be dispatched from port, additional bombers put on alert, and so forth. To the extent that such measures do not increase one side’s ability to *conduct* a first strike, they can improve first-strike stability.

For example, some Russian SSBNs apparently can fire their missiles from port and still hit targets in the U.S.\(^{13}\) In preparation for a first strike, then, it would not be necessary for Moscow to put these vessels out to sea. Indeed, it might be counterproductive to do so, because it would provide the U.S. with (admittedly ambiguous) warning. In a crisis, however, dispatching these submarines to deep-water patrol areas could be a reassuring gesture: by enhancing the survivability of these submarines without adding to their available firepower, the Russians would have made themselves more able to absorb a U.S. first strike, reduced their cost differential between going first and waiting, and thus improved first-strike stability. Dispersal of U.S. bombers from their main operating bases would have a similar effect.

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\(^{12}\) For a more detailed discussion of first-strike stability, see Kent and Thaler, op. cit.

Likewise, the Russians have inherited a large number of mobile ICBMs. Flushing these weapons from their casernes could be seen by some as an aggressive or hostile action during a deepening crisis. From a first-strike stability viewpoint, however, the opposite could be true. If the ICBMs could have been fired from their garrisons, dispersing them increases their survivability without adding to their offensive potential. The slightly more sophisticated perspective afforded by an understanding of first-strike stability could be helpful in avoiding crisis mismanagement.

As both the U.S. and former Soviet nuclear arsenals are drawn down in size, leaders in both capitals will have to begin addressing the question of what first-strike stability means vis-a-vis other nuclear-armed powers. If, for example, Washington and Moscow decide to bilaterally reduce their forces to, say, 1000 weapons, they will have put themselves in the same quantitative ballpark as the British, French, and Chinese in terms of arsenal size. What does first-strike stability—indeed, stability in general—mean in such a world? Our work can do little more than raise the question. We suggest, however, that careful thought be given to the issue before the U.S. plunges headlong into such a world.

Arms-Race Stability

Arms-race stability is high when no country's ability to achieve its objectives—including central and extended deterrence and maintenance of a high level of crisis stability—is overly sensitive to changes in another country's forces.\(^{14}\) It is not clear to what extent the size and capabilities of the U.S. strategic forces have influenced those of Russia, and vice versa. It is clear, however, that each country has watched the other with a wary eye and that some "action-reaction" dynamic has ensued. U.S. engineers and scientists rushed to deploy an operational ICBM to match supposed Soviet missile deployments in the late 1950s and early 1960s. Conversely, when the U.S. produced the Minuteman III—the first missile to carry multiple independently targetable reentry vehicles (MIRVs)—in the 1970s, the Soviets took only a few years to follow suit.

Enhancing arms-race stability means breaking, or at least damping, this action-reaction process, and it is important to do so for four reasons. First, arms races can create "windows of danger" in which one

\(^{14}\)Arms races can have many more than two contestants. In this report, we focus on the historic race between the U.S. and the Soviet Union (now Russia).
side, perceiving itself as lagging behind in some key area, may be tempted to push a crisis to the ignition point rather than put off the day of reckoning until it is at a clear disadvantage. Second, arms races are unarguably expensive undertakings. In the last decade alone, Moscow and Washington have each spent tens of billions of dollars developing and deploying new strategic weapon systems. Slowing the pace of development and deployment would, in principle at least, save money for both governments. Third, there is a belief—unproven and perhaps unprovable, yet deeply held and intuitively attractive—that an arms race adds to tensions between the competitors and thus may increase the marginal chance of war. Finally, some argue that quantitative arms races, in which the two sides add more and more weapons to their arsenals, may increase the likelihood of inadvertent war by giving more people potential access to nuclear “triggers.”

Again we emphasize, however, that the point of having these weapons in the first place is to deter. As with crisis instability, the nuclear arms race could be done away with by the simple expedient of unilat- eral nuclear disarmament. The U.S. chooses not to follow this path because it believes, as a society, that the deterrent utility of U.S. nuclear forces outweighs the risks entailed by maintaining them. Thus, the question is not how to minimize arms-race instability, but how to structure and posture U.S. forces in a way that provides a strong deterrent without encouraging a fast-moving spiral of arms competition, and that is robust in the face of the adversary’s potential modernization measures.

**IF THE UNTHINKABLE OCCURS: WAGING NUCLEAR WAR**

Thus far, our discussion has concerned U.S. objectives in peacetime, when the purpose is to deter. What if deterrence should fail, however, and the U.S. should suffer a nuclear first strike? What objectives should the U.S. pursue if, despite all efforts, a nuclear war begins?

The three canonical wartime objectives—limit damage, deny enemy war aims, and terminate the war quickly—are by no means mutually

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exclusive. For example, negotiating a prompt end to the war once it has begun is today the only means of limiting damage to the U.S. homeland in any meaningful way, at least vis-a-vis an arsenal on the scale of that deployed by the former Soviet Union. Similarly, having and perhaps demonstrating the capability to deny an enemy’s war aims could serve as a U.S. bargaining tool for intrawar negotiation. Despite this blurring of lines between these three elements of U.S. nuclear employment, however, they are commonly (and, we believe, rightfully) treated as distinct objectives.

Limiting Damage

The first and most important wartime objective would be to limit damage to the U.S. and its allies. Strategic thinking has typically focused on four means of achieving what we call “unilateral” damage limitation:

- Strikes against nuclear delivery systems
- Strikes against command and control (C2)
- Passive defenses
- Active defenses

None of these, of course, represents a pure alternative. Schemes to limit damage unilaterally have usually involved some combination of these approaches. Today, however, none of these represents a viable option for limiting damage in any meaningful way.

Attacks on Soviet offensive nuclear systems were a key component of virtually every plan for nuclear war since the first operational plans of the early 1950s. Today, nuclear forces in the former Soviet republics likely remain high-priority targets in the event of war, but since the mid to late 1960s, these forces have probably been survivable enough to render this method of damage limitation unworkable. To the extent that crisis stability is important, this is good news: U.S. first-strike incentives are reduced by the survivability of the opponent’s forces. Should the U.S. nonetheless stumble into a nuclear conflict in the future, the effective invulnerability of many of these missiles and bombers will be frustrating. For better or worse, this state of affairs will likely continue, because neither the U.S. nor Russia will be able to disarm the other to any meaningful extent.

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Attacks on sources of control over Moscow’s strategic forces—i.e., the political and military leadership and its means of communicating with the forces—have offered a second possible way to blunt attacks on the U.S. As they did with their forces, however, the Soviets worked hard to protect their C2 system from attack. Since Russia and the other successor republics have now inherited the fruits of these labors, it may be nearly impossible to sever the links between Russian leaders and forces. Through the proliferation of communications links, the hardening of fixed command posts, the deployment of mobile command posts, and the possible predelegation of launch authority to lower command echelons, Russia has denied the U.S. a viable “decapitation” option.

Passive defenses had their heyday in the U.S. in the late 1950s and early 1960s, with private citizens digging bomb shelters in their backyards and school children learning to “duck and cover.” As time went on, though, the public simply ceased to believe that clever civil-defense techniques were all that would be needed to survive a nuclear holocaust. More importantly, concern about the possibility of attack faded as the American people gained confidence in the strength of deterrence. A brief resurgence of interest in civil defense early in the Reagan years faded without a trace.

Finally, the U.S. gave up on active defense against nuclear attack in the early 1970s, when it became apparent that the BMD then under consideration could not be relied on to protect the country effectively. The realization that such costly deployments could be neutralized by deploying less-expensive offensive nuclear forces led to the 1972 ABM Treaty forbidding nationwide BMD.

There has been an upsurge of interest in strategic defenses since the mid 1980s. Even today, however, the idea of affordable, effective defenses against large-scale nuclear attack—thousands of weapons—seems incredible to most observers, in large measure due to the same cost-effectiveness questions that doomed earlier ABM schemes. Active defenses could allow the U.S. to achieve meaningful damage limitation in the face of a large-scale attack if the major nuclear powers chose to head toward a defense-dominant world. In that case, each nation would deploy defenses able to defeat any attack by any adversary. (Defense dominance is discussed separately in Section 5.)

A fifth method of limiting damage, bilaterally through escalation control and prompt war termination, remains. The likelihood of further deep reductions in offensive forces notwithstanding, the U.S. and Russia will continue to be locked in a relationship of mutual vulnerability for the foreseeable future. Avoiding war is the surest way to
limit damage; bounding the number of weapons used, restricting the kinds of targets struck, and negotiating a swift end to a conflict would be the only way to do so once the first bombs had gone off. In this light, we suggest that war termination be elevated from its position as a neglected sibling of the other four damage-limiting methods to a new status as a separate and critical U.S. wartime objective.

Note that we do not contend that bilateral damage limitation is certain to work. Signaling during wartime, especially during a nuclear war, is an uncertain business, much more an art than a science. However, we believe that the bilateral approach is the only one that offers any hope of limiting destruction in the unlikely event of a nuclear conflict. As such, it is the least bad of several dreadful alternatives.

Denying Enemy War Aims

Having an articulated strategy and credible capacity to prevent adversaries from achieving their wartime objectives enhances deterrence by amplifying the opponent's uncertainty that the game would be worth the candle. Of course, the U.S. ability to deny its enemies the fruits of aggression depends not only on the state and capabilities of its forces, but also on the enemies' objectives and how U.S. efforts to frustrate them interact with other U.S. goals. Of particular concern are possible negative consequences for the principal U.S. wartime objective, damage limitation, which could arise from pursuing a vigorous denial campaign against a well-armed enemy.

It seems reasonable to believe that a principal goal of a nonirrational adversary in a war would be to survive as a society; in other words, like the U.S., the adversary would first and foremost strive to limit damage.\textsuperscript{17} Certainly, the U.S. can deny this objective—this is the foundation of its peacetime deterrent posture. Further, the U.S. ability to devastate an enemy’s homeland can function as a powerful intrawar deterrent, providing strong incentives to the adversary to keep the war contained.

However, these incentives exist only so long as the threatened destruction is held in reserve. Once the U.S. begins attacks that threaten the survival of an opponent's society (most obviously through strikes on cities and their immediate environs), the deterrent

\textsuperscript{17}Clearly, the best way to survive a nuclear war is to avoid one in the first place. However, given that somehow a war has begun—perhaps due to unforeseen escalation, simple miscalculation, or inadvertence—survival would seem to be a preeminent goal.
disappears and the U.S. risks bringing down a firestorm of destruction on its own head. The capability to deny this objective, then, is useful for both prewar and intrawar deterrence, while acting to deny is likely to produce results profoundly inimical to the parallel U.S. interest in survival.

Conversely, there may be enemy war aims whose accomplishment cannot be prevented. It seems conceivable, for example, that if an adversary’s leadership were pushed to the wall, it might make destruction of the U.S. an objective (or at least a contingent objective: If we are being destroyed, we will destroy them). As we have already noted, under current conditions, there is nothing the U.S. can do to prevent a well-armed opponent from achieving such a goal if that opponent tends to it—i.e., it is a nondeniable war aim.

There thus are some goals the U.S. may be able to defeat, but only by sacrificing objectives of its own, and there may be aims the U.S. is impotent to frustrate. Therefore, we modify the usual words to say deny the enemy’s war aims to the extent applicable and feasible—applicable so as not to inhibit limiting damage through escalation control and war termination, and feasible to reflect only those aims that are deniable. We can summarize our formulation in three parts:

- A nuclear exchange with the Russians, or another nuclear-armed power, could arise from a conventional clash. Using U.S. strategic forces to prevent the enemy from achieving his goals in such a conflict is a reasonable course once the enemy has attacked the U.S.
- In the event that a nuclear war begins inadvertently or in the absence of a theater war, there may be no deniable enemy “war aims” per se.
- Finally, U.S. actions taken to defeat a well-armed nuclear power, such as extensive attacks on economic infrastructure, could lead both sides up the escalation ladder in violation of the primary U.S. wartime goal of escalation control and damage limitation.

In sum, U.S. strategic forces should be able to retaliate in a militarily or strategically effective and appropriate way for any nuclear attack on the U.S. Planning for such a contingency should not, however, lose sight of the primacy of damage limitation as a wartime objective.
Terminating the War on Acceptable Terms

We have already paid some attention to war termination in our discussion of limiting damage, where it was described as the sole feasible means of doing so vis-a-vis Moscow. Here, it is itself a goal, with the additional requirement that the war must end in a way that the U.S. can, quite literally, live with.

In the event of an enemy nuclear attack on the U.S., the U.S. leadership could choose to capitulate rather than retaliate. We reject this option because of its potentially pernicious effect on deterrence in crisis: if an aggressor knows he might get away scot-free, he may be tempted to attack when other alternatives seem bleak. For the sake of deterrent robustness, then, the U.S. must be credibly prepared to respond to any attack.

The easiest case to address is probably the doomsday nightmare of a large-scale first strike on the U.S. involving several thousand weapons detonating across the country. Under such circumstances (assuming that the worst had occurred, and the bulk of U.S. urban and industrial infrastructure had been destroyed, with tens or hundreds of millions killed), all incentives for restraint in retaliation would vanish. The remnants of the U.S. national command authority (NCA) could choose not to retaliate at all, to retaliate in a limited way, or to launch everything in their possession in revenge. We will not attempt to identify the "proper" course of action here; we wish only to point out that under such dismal circumstances, the precise nature of the NCA's decision is not particularly relevant. With the U.S. effectively destroyed, there is little riding on the decision because the U.S. has nothing left to lose.

Choosing a response to a more limited attack on the U.S.—one involving perhaps tens of, or at most a few hundred, weapons carefully targeted to inflict as little damage as possible on the American socioeconomic infrastructure—would be more difficult. In this case, the aim would be to signal as much as punish, to bargain as much as batter. Achieving war termination per se is as simple as surrendering. Ending the war in a manner consistent with other U.S. goals (such as remaining a secure and independent nation in the aftermath) requires something more: a process of intrawar negotiation conducted via controlled escalation and less-violent means of discourse.

Achieving termination in this way would involve limiting damage to the opponent as a way of giving enemy leaders incentives to stop the war without wreaking additional devastation on the U.S. Said differently, limiting damage to the U.S. homeland could hinge less on
what the U.S. destroys and more on what it does not destroy.\textsuperscript{18} (We discuss this subject in greater depth in Section 5.)

WAR WITH NTH COUNTRIES

In many ways, U.S. objectives with regard to smaller nuclear-armed powers are similar to those long pursued with regard to the Soviet Union. While such nth countries\textsuperscript{19} will not in the near term threaten the survival of the U.S. as the Soviets did and their successors do, the U.S. will want to be postured to minimize the chances of even a single nuclear weapon detonating over a U.S. city or a U.S. installation overseas. The primary U.S. goal will be to deter any such power from using the weapons at its disposal.

However, we fear that the gross disparity in power and status between the U.S. and such adversaries may make relations “unstable” in a general sense. We therefore argue in Section 5 that U.S. security will require more than a simple deterrent posture. The U.S. must have a credible capability to conventionally preempt attacks and will need active defenses for forward-deployed forces.

Further, the U.S. needs to begin exploring the meaning of stability, in its various guises, when the “balance of terror” is multisided rather than bipolar and is perhaps not even particularly balanced. Finally, a new variety of extended deterrence may emerge as a U.S. objective: not using nuclear power to deter conventional attack against an ally, but using conventional or nuclear strength to deter small regional powers from using nuclear weapons against U.S. allies.

\textsuperscript{18}We realize that some people may be stunned to hear talk of damage limitation in any large nuclear exchange. However, we believe that the differences between a war in which 10 million Americans die and one in which 100 million perish are meaningful. Further, we believe that if a nuclear war were to occur, the U.S. government’s principal objective should be to exert pressure to achieve termination at the lower end of the casualty scale on both sides. Again, we discuss ways in which this goal might be pursued without injuring central deterrence or first-strike and crisis stability in Section 5.

\textsuperscript{19}We think of nth countries as nuclear-armed powers against which the U.S. strategic arsenal retains a damage-limiting counter-nuclear attack option. That is, the U.S. could, in a first strike against such an actor, minimize the number of weapons left for the opponent’s retaliation. Because of the survivability of their SSBN fleets, Britain and France are not nth countries by this definition. China may be, India certainly is, and so forth.
UNDERSTANDING THE DIFFERENCES AND TENSIONS AMONG THE OBJECTIVES

A number of tensions exist among some of the traditional objectives described above. As was suggested in the discussion of denying enemy war aims, enhancing the ability to achieve one objective sometimes impinges on the ability to achieve others. It is essential, therefore, that the U.S. understand these tensions before undertaking or forgoing modernization efforts, signing arms control agreements, and pursuing other measures affecting U.S. strategic capabilities.

Central Deterrence and First-Strike Stability

Clearly, central deterrence and first-strike stability are closely related. The key to comprehending the distinction between them is to focus on the different perspectives leaders might take in times of crisis versus from day to day.

Under normal circumstances, initiating a nuclear war is the furthest thing from a U.S. president's mind. We can probably say the same about other leaders without knowing much more about them than that they are human. To the extent that foreign leaders might contemplate attacking the U.S., their calculus would weigh the costs and benefits of such an undertaking against those of remaining at peace. Deterrence is robust when the results are lopsided in favor of the status quo. Crisis stability is robust when neither side perceives itself as having strong incentives to go first in a situation in which it fears its opponent may choose to strike an initial blow. When the force postures of the two sides do not present such incentives, first-strike stability can be said to be high.

In a way, then, first-strike stability can be thought of as a measure of "mutual deterrence" in crisis. It merits separate discussion because it covers an important special case: because we believe war to be most likely as a result of crises, we wish to understand crisis dynamics as completely as possible.

In attempting to explain the close relationship between central deterrence and first-strike stability, one must also take pains to illuminate the differences between them. They are not the same thing, as the following two examples point out.

First, central deterrence is a one-sided objective: the U.S. worries about deterring the opponent, not whether the opponent deters the U.S. First-strike stability, in contrast, is two-sided: the U.S. cannot live in a world of high first-strike stability while its nuclear-armed
adversaries dwell in a less stable one. Schelling wrote in *The Strategy of Conflict*:

The enemy's invulnerability to our own first strike could be to our advantage if it relieved him of a principle concern that might motivate him to strike first. If *he* has to worry about the exposure of *his* strategic forces to an attack by *us*, *we* have to worry about it too.  

Put succinctly, first-strike stability explicitly takes into account the U.S. stake in the survivability of the opponent's forces.

Thus, adherents to the view that credible U.S. threats to destroy Russian nuclear forces are “stabilizing” are simply wrong, at least in the sense of first-strike stability. The strategic relationship is equally stable or unstable for both sides; U.S. silo-busting ten-warhead ICBMs cannot be “stabilizing” if the Russian counterparts are “destabilizing.” One can make the argument that holding Russian strategic forces at risk enhances deterrence; however, the cost in first-strike stability must be understood and accepted.

Second, it is possible to imagine situations in which central deterrence is robust and first-strike stability is not, or vice versa. Figure 2.2 helps illustrate this point. The graph plots the number of Russian weapons available to attack U.S. “value” against the number of U.S. weapons available to attack Russian value. The dotted horizontal line indicates that, in this hypothetical case, the U.S. feels it needs 2000 survivable weapons to maintain a “robust” central deterrent.

The chart also shows three pairs of points labeled case I, II, and III. Each pair illustrates a notional force posture for the two sides. The filled-in dot shows the two sides' remaining nuclear weapons after a Russian first strike on U.S. strategic forces; the empty dot depicts the equivalent situation for a U.S. first strike on Russian forces. For our purposes, the prewar inventory levels of the two sides are irrelevant.

In case I, the two dots are close together and toward the upper right of the chart. In this case, it makes little difference which side strikes first because neither can effectively disarm the other. Thus, first-strike stability is high.  

Also, U.S. forces surviving a Russian first

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21 Here, we take *value* to mean targets not associated with strategic nuclear delivery systems. Section 4 treats these targets in more detail.

22 Actually calculating the index of first-strike stability involves assessing the relative costs to each side of going first or waiting. For purposes of simplicity, in this dis-
strike are well above the 2000-weapon line; hence, the U.S. deterrent posture is solid.

Case II demonstrates that first-strike stability can be eroded without affecting the U.S. ability to deter. A relatively vulnerable Russian force posture leaves Russia with but a handful of retaliatory weapons after absorbing a U.S. first strike (case II, white dot), versus almost 8000 weapons if Russia strikes first (black dot). Under these conditions, a U.S. leader might see a clear advantage in striking first, which means first-strike stability is eroded. However, since the U.S. would retain about 3000 weapons after a Russian first strike, its deterrent posture remains robust.

Finally, case III shows another situation in which force posture does not allow either side to gain a measurable advantage by striking first. In this regard, this case resembles case I in being highly first-strike stable. However, the U.S. posture is left with fewer than 2000 surviving weapons on the side that waits as a surrogate for the costs of the side that strikes first.
weapons after absorbing a first strike, meaning that central deterrence is undermined.

It is possible, then, for first-strike stability to flourish in an environment in which central deterrence is not robust. Likewise, the U.S. could mount a strong deterrent in a situation that was relatively first-strike unstable.23 Ideally, of course, the U.S. should posture its forces to maximize both of these attributes. In practice, in fact, it has sometimes done so, sometimes not. For example, the deployment of the MX ICBM in the 1980s may have enhanced the U.S. deterrent posture (by providing improved capabilities for attacking hardened targets) while eroding first-strike stability. We do not use this example to decry the decision to deploy the MX, nor to imply that MX deployment necessarily made the world a more dangerous place. We merely want to illustrate how trade-offs between objectives get made (consciously or not) every time force structure or posture is adjusted.

First-Strike Stability Versus Extended Deterrence and Unilateral Damage Limitation

Extended deterrence implies a willingness to initiate the use of nuclear weapons, including strategic ones. To credibly threaten first use, the U.S. must at least suggest that it has the ability to substantially limit damage to itself by striking first. Such a U.S. capacity could grievously erode first-strike stability. During the Cold War, it might have helped to dissuade the Soviets from attacking U.S. allies, but the U.S. might have regretted having it if a crisis or theater war had occurred, since it could have heightened Moscow's fears of a U.S. attack.

The ability to avoid severe damage through offensive action—a "splendid" first-strike capability24—would cause acute first-strike instability. In a deepening crisis, the U.S. leader, knowing that his nation could avoid severe damage only by striking first, would feel intense pressure to preempt if he perceived that the Russian leader was also contemplating an attack. Knowing this, the Russian leader might himself be pressed to preempt the U.S. preemption. The worst of all possible worlds would result if both sides had a splendid first-strike option, in which case a crisis would force them both into a hair-trigger posture. Fortunately, despite the earnest efforts of both sides,

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23 Indeed, this may have been the case during the period of unquestioned U.S. nuclear dominance in the mid to late 1950s.

24 This is Herman Kahn's term for a situation in which one side can dramatically reduce damage to itself if, and only if, it strikes first.
neither is likely ever again to be able to genuinely limit damage through attacks on the other's nuclear forces.

Limiting Damage by “Decapitation” Versus Terminating the War

If the U.S. sought to limit damage through attacks against the Russian political leadership and military C2, a conflict would arise between limiting damage and terminating the war. “Decapitation” attacks, as they are called, would tend to eliminate the very decisionmakers in Moscow who could maintain the control required to order the cessation of Russian attacks and negotiate an end to hostilities. Without this leadership and control, attacks could continue indefinitely, executed by lower-echelon commands unable to communicate with each other or with the outside world. In the event of a partially successful decapitation attack (the most likely outcome, given past Soviet efforts to protect their leadership and C2), the U.S. could find itself unable to terminate the war at all, at least until the Russian arsenal was spent.

WHAT IS CHANGING?

The New Face of Europe

With the collapse of both the Warsaw Pact and the Soviet Union, the potential ascendancy of Western democratic values in Russian society, and Moscow's preoccupation with multiple internal crises, the importance of extending deterrence to U.S. allies in Europe has decreased dramatically. Fears of an attack on NATO are lower today than at any time since 1945, and prospects for a surprise attack, always the alliance's worst nightmare, have virtually vanished.

With the passing of extended deterrence as a highly demanding requirement, the need for maintaining an extensive counter-nuclear capability is considerably reduced. Threats of massive nuclear first use against Russia, long incredible in any case because of the survivability of Russian forces, have become unnecessary. Thus, an important tension between first-strike stability and extended deterrence has been rendered moot.

Two other benefits arise from the changes in the world that have reduced the saliency of extended deterrence. First, dampened fears of a

\[25\] We prefer this term to the more common, but less precise, counterforce.
surprise attack on Western Europe should enhance crisis stability as a whole; no longer will NATO feel a need to have its finger so close to the nuclear trigger. Second, the incongruity between the U.S. commitment to use nuclear weapons in response to Soviet aggression and the probable costs of following through on that commitment (would an American president trade New York for Bonn?) has been a long-standing source of friction and some mistrust between Washington and its European partners. By moving the question largely into the realm of the irrelevant, the disappearing threat to Western Europe eliminates this gap.\textsuperscript{26}

With all these changes, a fundamental question must be asked: Why should anyone still be concerned about deterring a Russian nuclear attack on the U.S.?

First, there is the ineluctable fact that Russia has the ability to destroy the U.S. The Strategic Arms Reduction Talks (START) Treaty and follow-on agreements will not themselves meaningfully reduce this capability: the 3000 or so Russian warheads that would remain if agreed-to reductions are fully implemented would still suffice to utterly devastate the U.S. Perhaps in the future, the U.S. and the former Soviet Union can redefine their relationship, replacing "assured destruction" with "assured survival." If such an event is ever to happen, however, it will probably not be in this decade.

In the current climate of East-West reconciliation, the U.S. would do well to remember those three fateful days in August 1991 when an abortive Kremlin coup threatened a return to the bad old days. In geopolitics, things can change more rapidly than can ever be anticipated. The unpredictability of the future and the severe economic hardships and disruptions still to come make the ultimate fate of the former Soviet Union not at all clear. Hence, it seems profoundly imprudent at this juncture for the U.S. to lower its guard totally against the reemergence of a hostile "Russian" state. A variety of scenarios can be spun out in which relations between the U.S. and heavily armed former Soviet states turn sour, leading to crises in which the nuclear arsenals of the various sides would figure prominently.

\textsuperscript{26}Of course, the willingness of the U.S. to put its military power, including its strategic arsenal, at the disposal of its allies was the strongest force binding the alliance together. The virtual disappearance of the threat that created the obvious need for a trans-Atlantic military partnership will make NATO more difficult to sustain. See Robert A. Levine, \textit{What If the Russians Aren't Coming and the Americans Aren't Staying?} N-3331-CC, RAND, 1991.
For now, Russia is likely to remain the preeminent military power in Eurasia, able if it chooses to make mischief along its borders. The end of the Cold War notwithstanding, the survival of the U.S.—that most fundamental of national goals—remains dependent on Russian restraint. The U.S. should continue to encourage that restraint by maintaining a strong deterrent posture.

We believe the logic of deterrence continues to hold today. It is certainly harder to conjure up a believable scenario for a U.S.-Russian nuclear war today than it was ten, or even five, years ago. However, it has always been difficult to draw a credible path between here and there, precisely because both sides have taken strong measures to ensure that even a marginally rational opponent would back off rather than cross the brink. The price of being wrong is simply too high. Maintaining central deterrence should be, now more than ever, the primary objective of U.S. strategic forces.

And because the U.S. wishes to continue to deter through the use of its nuclear arsenal, it will remain obliged to manage the dangers of these weapons as best as possible. Enhancing stability of all types, but particularly first-strike stability, thus should remain a primary goal.

Finally, the disintegration of the Soviet empire raises difficult questions about the control of the former Soviet nuclear arsenal. Many people in the U.S. fear that the dissolution of central authority has increased the likelihood of a limited, inadvertent nuclear attack on U.S. territory. One scenario foresees the accidental launch of a ballistic missile; another envisions a rogue ICBM regiment commander or SSBN captain launching, for whatever reason, the missiles under his control. Reports that the leaders of the August putsch purloined President Mikhail Gorbachev's "football" (the "go codes" for unsheathing the Soviet nuclear sword) sent chills down many a spine. Obviously, none of these scenarios can be deterred, at least in the sense in which we have been discussing deterrence. To prevent any of them from playing out, or to avoid damage should one of them occur, the U.S. could assist the former Soviet republics in enhancing the security of their nuclear weapons, be part of a joint deployment of command-destroy systems for the two sides' missiles, and/or deploy a "thin" nationwide BMD.

What About Nth Countries?

Concern is also growing over the spread of weapons of mass destruction and the means for delivering them. In particular, nuclear
weapons mated to long-range ballistic missiles would represent a potentially revolutionary capability in the hands of non-status quo powers, particularly those in the third world. The danger presented by such weapons must be addressed by the U.S. as it formulates its national security objectives for the years to come. The U.S. needs to explore various ways of deterring or preventing attacks on its homeland, its forces abroad, and its allies. Successful deterrence will require that all the elements of national power—military, political, and economic—be employed in a coordinated fashion to both discourage proliferation and prepare to deal with it when it occurs, as it inevitably will.

SUMMARY: THE OBJECTIVES OF STRATEGIC FORCES IN THE 1990s

We believe the following national military objectives should be supported by U.S. strategic nuclear forces in the 1990s:

• Deter deliberate, large-scale Russian nuclear attack on the U.S. (*central deterrence*).

• Reduce pressures for either the U.S. or Russia to launch a nuclear first strike against the other (*crisis stability, particularly first-strike stability*).

• Should war occur, limit damage, deny enemy war aims to the extent applicable and feasible, and terminate the war promptly.

• Deter NBC attack by nth countries (smaller, non-Russian nuclear powers) against the U.S., its forces abroad, and its allies.

Though the jury is still out, the U.S. might want to underwrite three other objectives with strategic defenses:

• Protect the U.S. against accidental or unauthorized Russian ballistic missile attack.

• Protect the U.S. and its forces abroad against deliberate attack by nth countries armed with NBC weapons.

• Protect U.S. allies from NBC attack.

We will relate our views on these latter objectives after applying the methodologies that are introduced next, in Section 3.
3. AN ANALYTIC APPROACH TO ASSESSING STRATEGIC FORCES

This section describes an approach to assessing how well strategic forces attain the objectives defined in the preceding section, particularly central deterrence and first-strike stability. This description is meant to be readily understandable to the informed layperson, so we hope that more-sophisticated readers will bear with any perceived simplicity in the explanations. We believe that the assessment tools offered here are both sound and easy to use. In Section 4, we apply them to evaluate the effects of various posture changes on the ability of U.S. forces to do what they are tasked to do. The purpose of this section is not to underscore our treatment of objectives in Section 2 (e.g., to show that neither the U.S. nor Russia can today meaningfully limit damage in a nuclear war), but to develop tools and probe their bounds.

ASSESSING THE EFFECTIVENESS OF MILITARY FORCES

Much analysis of military forces is undertaken with the help of complex models and data bases. These tools help analysts assess the influence of posture adjustments, new weapon systems, and a host of other factors on simulated war outcomes. The results of such exercises are then related back to fundamental objectives by applying various evaluation criteria.

It is this last step that fuels much of the debate in the national security field. Conclusions about whether certain forces, measures, or actions support a given objective can depend on the evaluation criteria adopted. The relevancy of the chosen benchmarks to the objectives under scrutiny should, of course, be readily apparent, but such is not always the case in actual practice. Criteria can be selected that appear connected to a given objective but are really intended to demonstrate the merits of a desired program or policy.

So, for example, proponents of a new weapon system might demonstrate that its deployment increases the expected damage to Russian missile silos in a U.S. strike, leaving implicit the link between this added capability and U.S. objectives. As we have already seen, however, the ability to credibly threaten a disarming attack on the enemy may work against some objectives. Thus, increasing the threat to Russian retaliatory forces could in fact be a "bad" thing to do so far as
these goals are concerned. Understanding these trade-offs requires a proper derivation of evaluation measures, beginning with the objectives they are intended to describe, which is why we discussed framework and treatment of objectives in the preceding section.

EXCHANGE CALCULATIONS FOR DETERRENCE AND STABILITY

Our quantitative assessment of the effectiveness of nuclear attack forces in supporting deterrence and stability begins with exchange calculations that yield the inputs needed to apply our methodologies. These calculations allow an approximation of how forces perform when attacking opposing strategic nuclear forces, striking the opponent's value structure, and absorbing counter-nuclear strikes by the opponent's forces.

As an illustration of the thought process behind the exchange calculation, consider the simple portrayal of a two-sided strategic nuclear exchange in Figure 3.1. Side A—either the U.S. or its adversary (say, Russia)—strikes first with its available strategic offensive forces and attempts to reduce side B's retaliatory potential while inflicting damage on things side B might value. Side B then retaliates with its surviving strategic offensive forces against things A values. We assume that side A has launched a large attack and that any of its strategic nuclear forces not used in its first strike are either in survivable basing modes or are launchable under attack, and hence cannot be targeted in side B's retaliation.

If side B has BMD and/or air defenses, they subtract some weapons from A's attack. When B retaliates, its weapons may also be required to penetrate side A's defenses. In this study, we employed BMDs that subtract reentry vehicles (RVs) randomly out of an attack. Defending interceptors do not differentiate the types of RVs they are intercepting, nor do they defend particular targets. The attacker is assumed to have knowledge about the strength of the foe's defenses and fashions his attack accordingly.

In the context of this exchange, the leader of each side is assumed to care most about avoiding damage to his own country, and to care to a lesser extent about inflicting damage on his opponent. We combine the elements of limiting damage to oneself and inflicting damage on the foe into a side's "cost." Here, the use of cost is consistent with our belief that there can be no "benefit" to a nuclear war.
Damage to oneself thus dominates one's cost. For example, if one side could conduct a highly successful first strike on the adversary's nuclear forces, it might considerably reduce the damage it suffers, thereby minimizing its cost. In addition, success in damaging things the adversary values further reduces one's cost. However, because inflicting damage is not as important as avoiding damage, the former is discounted compared with the latter.

For the purposes of the methodologies described later in this section, each side is assumed to use its forces to minimize its cost. Deciding how best to employ weapons involves identifying the optimal trade-off between meting out damage to the adversary and limiting damage to oneself. Essentially, the first-striker must determine whether each marginal weapon is better used against the opponent's strategic retaliatory forces or against something else.\(^1\) We assume further that costs are minimized unilaterally through offensive and, to some extent, defensive military actions. Cost measures how well one side can "throw the kitchen sink" at the other, whether in a first strike or in retaliation.

How the exchange calculation illustrated in Figure 3.1 is used depends on whether forces are being assessed on the basis of central de-

\(^1\)The assumption here is that every weapon is as effective against targets associated with strategic forces (such as hardened silos) as against other targets. In the calculations conducted for this study, not all weapon systems were postulated as having the ability to destroy "hard" targets.
terrence or first-strike stability. Since deterrence is a one-sided calculus, "side A" always refers to the U.S. adversary, which is Russia in this case. Though Russia's first strike is always executed in a way that minimizes its cost, the dominant part of Russia's cost, damage to Russian value, is the result that captures our attention. If a well-executed Russian first strike cannot prevent the U.S. from delivering "unacceptable damage" to Russian value in retaliation, central deterrence is said to be robust.²

In the case of first-strike stability, a separate exchange calculation is made for a Russian first strike and a U.S. first strike, so "side A" can refer to either Russia or the U.S. Here, in addition to Russian value destroyed in a U.S. retaliation, we calculate U.S. value destroyed in Russia's first strike, that destroyed in a Russian retaliation, and Russian value destroyed in a U.S. first strike. We translate these four terms into cost. If Russia's cost of striking first is not much different from its cost if the U.S. strikes first, and the same can be said of U.S. costs, neither side should feel much pressure to strike, and first-strike stability is said to be relatively high.

In summary, the exchange calculations we have described are central to clearly and explicitly evaluating the "success" of strategic forces in supporting central deterrence and first-strike stability. We have also taken a first step in relating the objectives to measures of evaluation (damage and cost), thus providing a logical point at which to introduce the methodologies.

A METHODOLOGY FOR DETERMINING AN ADEQUATE DETERRENT

To determine whether U.S. strategic nuclear forces provide an adequate central deterrent, the following questions must be answered:

1. What Russian attacks does the U.S. need to deter?
2. How? What capabilities highly valued by Moscow should the U.S. threaten as a deterrent?
3. How many aim points (designated ground zeroes [DGZs]) contain the assets that provide the targeted capability, and how is the worth of these assets distributed among the DGZs?³

²For the moment, we subsume the deterrence of deliberate but limited strikes under this paradigm.
³DGZs are not necessarily the same as targets. A target can be a physical entity with homogeneous characteristics, such as an SSBN port or a hydroelectric plant. Each target may contain one or more DGZs depending on its level of dispersion, or one
4. What proportion of these assets must be destroyed to deny Moscow the targeted capability?

5. How many weapons would be needed to achieve this level of destruction?

The first and second questions are highly contentious, and answering them is outside the scope of an introduction to the methodology. In fact, the methodology should allow for varying answers. The third and fourth questions are more methodological in nature and can be addressed (though not accurately depicted) without answering the first two. Since our focus here is on describing tools for assessment, we therefore postpone to Section 4 the question of what to threaten, instead describing how potential answers might be represented.

To help depict what is being threatened, the analyst develops a “target base,” which is akin to a data base containing the targets to be held at risk in order to deter. A common method for representing a target base (and, by implication, capabilities inherent in that target base—e.g., economic performance, power projection capability) is the use of column or bar charts. As exemplified by Figure 3.2, analysts often display columns representing the targets (or DGZs) in each of four canonical target categories, or target sets:

- Strategic offensive and defensive forces
- General-purpose forces (GPF), which are sometimes called “other military targets” (OMT)
- Leadership
- War-supporting industry

The height of each column (corresponding to the number of targets to be threatened) is usually set on the basis of what the analyst considers the most important potential targets in a category.\footnote{DGZs may contain several targets. For example, because an SSBN port normally occupies a large area containing some hardened facilities, the targeteer may identify multiple DGZs that must be hit in order to destroy the whole port. Alternatively, a hydroelectric plant represents only one DGZ. At times, only one DGZ is required to destroy two targets that are near each other (e.g., two closely situated factories).}

Each column is partially or totally filled to demonstrate the destructive potential of a particular U.S. nuclear force posture. Columns not filled to the top
are said to show that some deficiency exists. Such an approach suffers from three problems: (1) it does not reflect the reality of unequal worth of targets within each category, (2) the priorities among the four categories (and often why the category is even being threatened) are not usually clear, and (3) the relationship between assets destroyed and capability denied is not explicit. Hence, "deficiencies" cannot be identified accurately.

Our approach to assessing strategic nuclear forces addresses each of these problems. It involves the depiction of targets and capabilities in the form of curves rather than columns. It also explicitly relates assets to capability. In Section 4, we prioritize the categories on the basis of top-down thinking.

Figure 3.3 shows alternative DGZ curves, each relating the number of DGZs associated with a particular target category to the percentage of total assets in that category. The steeper the DGZ curve, the more physically concentrated the assets; thus, the assets in category L are more concentrated than those in categories M and N. As one moves from L to N for the same percentage of total assets (the broken hori-
horizontal line), the number of attendant DGZs increases (the three broken vertical lines). Hence, more DGZs must be attacked to achieve the same percentage of assets destroyed.

Note that the curvature allows the idea of unequal worth among DGZs to be expressed. Taking the automotive industry as an example, the “value” of a Ford plant in Detroit is much greater than that of a used-car dealership in Manzanola, Colorado. The plant, therefore, appears on the steeply sloping part of a DGZ curve: it represents a relatively larger portion of total assets in the U.S. automotive industry. In contrast, the dealership is much less valuable and thus resides on the flatter segment of a curve.

The DGZ curve for a specific target set tells how the relative worth is distributed among the assets within the set. A competent targeteer would aim his weapons first at the most-valuable DGZs to get the highest return, i.e., the highest percentage of assets destroyed. Yet he is not simply attempting to destroy things, but rather to deny some capability. Thus, he needs a second step in the process, one which relates the percentage of assets destroyed to the portion of capability denied through attacks on those assets.
There are a number of assets-to-capability relationships that can be identified. We express three as curves in Figure 3.4, which maps the percentage of total assets associated with a targeted capability (simply the y-axis in Figure 3.3 rotated 90 degrees to the right) against the percentage of total capability. For example, it is possible that the assets in a particular target set have a one-to-one relationship with the capability inherent in that set—i.e., that eliminating 40 percent of the assets would reduce the “capability” by a like amount. This relationship is depicted as a 45-degree “viability curve” (line A) in Figure 3.4. This curve could describe 100 light bulbs of equal wattage composing total “assets” and giving off 100 percent of light in a room. If 25 bulbs were extinguished, the light would dim by 25 percent; if 50 bulbs, by 50 percent. In our vernacular, we would have reduced by half the “viability” of the room’s illumination.

The capability in another target set could be highly sensitive to even small attacks, as represented by the sharply rising line B in Figure 3.4. For instance, assume that a combat unit of new draftees is thrown onto the battlefield the day after the recruits are forcibly re-

![Figure 3.4—Sample Viability Curves](image-url)
moved from their homes and inducted into the Army. The unit’s viability as a cohesive, effective fighting force would probably diminish precipitously in the first seconds of an engagement with a well-trained, determined enemy even if actual casualties were relatively light.\textsuperscript{5} In this case, very little damage to the unit’s assets would be needed to seriously imperil its viability as a fighting force.

Alternatively, the relatively demanding S-curve (line C) is akin to “the straw that broke the camel’s back.” The weight of the first several bales of straw does not appreciably impair the camel’s ability to function. The next bale slows the animal’s walking speed, and the one after causes it to stop. When the final straw is loaded, however, the camel’s ability even to stand drops markedly. Such a target set can absorb some damage with virtually no reduction in effectiveness. Past a certain threshold, however, it responds dramatically to further attacks.

**APPLYING THE METHODOLOGY OF DETERRENCE: AN EXAMPLE**

We now have one tool for relating the number of DGZs attacked to the percentage of total assets in a target set destroyed, and a second for expressing the relationship between the percentage of total assets destroyed and the percent reduction in the targeted capability, or viability of the target set. The tasks of prioritizing among target sets and establishing a test of adequacy remain. Afterwards, we use a notional force posture to show how the calculations attendant upon the methodology work.

How might the target sets be prioritized, even to the point of excluding complete categories of targets? A reasonably exhaustive set of scenarios detailing alternative paths to a nuclear conflict with an adversary could be developed. For each scenario, U.S. wartime objectives would be ranked based on the demands of the specific circumstances. This ranking informs judgments regarding which target types are of the highest value—i.e., which targets have the highest payoff in terms of achieving the most important wartime objectives. Then, the scenarios are subjectively ranked by their relative likelihood and the target sets prioritized accordingly. The force needed to threaten them can then be defined according to some agreed-upon

\textsuperscript{5}Recall the amazing video footage of Iraqi conscripts surrendering to an unarmed U.S. unmanned aerial vehicle in the latter stages of the Persian Gulf War.
rule of adequacy—for instance, holding at risk 75 percent of the capabilities relevant to the most probable 95 percent of the scenarios.

Here, let us assume that one wishes only to hold target category L at risk, where 90 percent of the total assets are contained in 700 DGZs (see Figure 3.3). Let us also assume that category L’s viability “responds” to attacks on associated assets according to line B in Figure 3.4, and that our test of adequacy is met if U.S. forces, after absorbing a first strike, can threaten at least 75 percent of the capability engendered in category L. Reading from the 75 percent point on the y-axis in Figure 3.4, over to line B, and then down to the x-axis, one finds that at least 10 percent of the total assets in L must be destroyed. Going from 10 percent on the y-axis in Figure 3.3, across to L’s DGZ curve, and then down to the x-axis, one finds that only about 35 DGZs need to be held at risk to meet our test of adequacy. This requirement is akin to 35 arriving, detonating weapons.

To translate this result into the number of actual weapons required, one must account for the survivability of the weapons, their probability of penetrating defenses (if applicable), and the probability that they will destroy their intended targets (P_k). Postulating no defenses and a P_k of 0.80 yields a requirement for about 44 surviving weapons (35/0.80). If one assumes that 50 percent of the retaliatory weapons are in survivable basing modes (e.g., are dispersed and difficult to find), the deployment of 88 weapons will suffice to pass this notional test of adequacy.

Figure 3.5 demonstrates how changes in DGZ curves (target sets) and viability curves (responses to attack) affect the ability of a notional force structure to meet the test of adequacy (the horizontal line placed at 75 percent). The x-axis is labeled according to the DGZ curve/target base being used (L, M, or N from Figure 3.3) and the viability curve that demonstrates a target set’s response to attack (A, B, or C from Figure 3.4). The force structure comprises 1000 weapons, each of which has a P_k of 0.80, and half of which are in a survivable basing mode when the first strike arrives. Therefore, 500 surviving weapons can destroy 400 DGZs (500 × 0.80) in a retaliatory strike.

Generally, Figure 3.5 shows the obvious trend associated with larger target bases (flatter DGZ curves): they are more demanding to hold at risk. Moreover, the effects of the shape of the viability curves can

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6Otherwise termed “probability of kill,” this quantity is derived by multiplying the reliability of the delivery vehicle and weapon by the “single-shot kill probability,” a measure of accuracy, yield, and target characteristics.
be seen. Using line A (the straight line) in Figure 3.4 yields a relatively even drop in the percentage of targeted capability reduced (from L,A to M,A to N,A), and the retaliatory force never meets the test of adequacy. Line B (the steeply concave line) changes only marginally, because the percentage of targeted assets destroyed always yields results on the flat portion of the curve. The retaliatory force meets the test in all cases involving line B. Lastly, line C (the S-curve) displays a precipitous drop because of the steep portion in the middle of that curve; small reductions in the percentage of assets destroyed result in large drops in the percentage of capability reduced.

We now have a tool by which to assess the ability of U.S. forces to underwrite the objective of central deterrence. In Section 4, we develop a realistic test of adequacy and evaluate actual force structures—current, planned, and proposed.

MEASURING FIRST-STRIKE STABILITY

We now turn from a methodology of central deterrence to an evaluation of how well the U.S. manages the environment created by nuclear weapons. The methodology of first-strike stability that we
offer is well documented elsewhere.7 Here we provide a brief description.

The methodology provides an index of first-strike stability for ranking alternative force postures on the basis of whether they enhance or erode first-strike stability. The index is a number between 0 and 1.0, with 0 being the most first-strike unstable and 1.0 the most first-strike stable. The numbers are used only as ordinal rankings—i.e., a force posture with an index of 0.25 can be said to be less first-strike stable than one with 0.50, but cannot be said to be 50 percent less stable. Moreover, we do not relate the index to the likelihood of nuclear war. First-strike stability is only one component of a launch decision and ignores the human factors critical to such a decision.

How do we arrive at an index? The index relates the cost to each side of striking first to its cost of striking second. Thus, one index value represents a combination of four costs: (1) the cost to Russia of striking first (C_{1}^{\text{Rus}}), (2) the cost to the U.S. of incurring that attack and striking second (C_{2}^{\text{US}}), (3) the cost to the U.S. of striking first (C_{1}^{\text{US}}), and (4) the cost to Russia of incurring that attack and striking second (C_{2}^{\text{Rus}}). Assuming that one side’s cost of going first can never exceed that of going second, we multiply the ratio of Russian costs (C_{1}^{\text{Rus}}/C_{2}^{\text{Rus}}) by the ratio of U.S. costs (C_{1}^{\text{US}}/C_{2}^{\text{US}}) to get an index between 0 and 1.0. If the costs of going first and second are nearly identical for each side, the index approaches 1.0. It nears 0 when the cost to either side of going first is small compared with that of striking second.

Cost, described toward the beginning of this section, is a function of the percentage of one’s own assets damaged and, to a lesser extent, the percentage of the enemy’s assets one fails to damage. Thus,

\[ C^{\text{US}} = D^{\text{US}} + \lambda(1 - D^{\text{Rus}}), \]

where \( D \) is the portion of valued assets damaged and \( \lambda \) is the discount factor that the U.S. leader ascribes to the damage to Russian assets, set at 0.3.8 Cost is hence bounded by 0 and 1.3. If the U.S.

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8Thus, the cost to side A of engaging in a nuclear exchange with side B is the damage to side A plus the damage not inflicted on side B discounted by some factor. If one loses twice as much about the damage one suffers than the damage that the adversary
receives no damage and completely devastates Russia, the right side of the equation reads $0 + 0.3(1 - 1)$, which equals 0. Alternatively, if both the U.S. and Russia are devastated, the U.S. cost is 1.0. However, failing to damage the other side at all while being devastated in return results in the highest cost, 1.3.

Because first-strike stability is a two-sided measure, the posture of Russian nuclear retaliatory forces is as important as that of U.S. forces. Let us assume now that U.S. and Russian inventories total 1000 weapons each. The first-striker can destroy two of the adversary's weapons for every one he uses in his counter-nuclear attack. If Russia strikes first, it uses 250 weapons to destroy 500 U.S. weapons, leaving 750 weapons to attack U.S. value. Five hundred U.S. weapons survive to retaliate against Russian value. In the case of a U.S. first strike, 300 U.S. weapons destroy 600 Russian weapons, leaving 700 and 400 weapons, respectively, for striking value.

Let us further postulate that both the U.S. and Russian target bases are represented by DGZ curve L in Figure 3.3. After Russia's counter-nuclear first strike, its remaining weapons could destroy 600 U.S. DGZs ($750 \times 0.80$), corresponding to about 86 percent of U.S. assets. The U.S. retaliation could destroy 400 Russian DGZs ($500 \times 0.80$), or 73 percent of Russian value. The Russian cost of striking first is therefore $0.77 (0.73 + 0.3[1 - 0.86])$. The U.S. cost of striking second is $0.94 (0.86 + 0.3[1 - 0.73])$. In a U.S. first strike, damage to U.S. value would approximate 65 percent, and Russia would incur 84 percent damage to value. The result is thus $C_{US}^{1} = 0.70$ and $C_{RUSS}^{2} = 0.95$, and the index of first-strike stability is $0.60 (0.77/0.95 \times 0.70/0.94)$.

With this index, we can rank alternative force structures and postures on the basis of first-strike stability. In Section 4, we assess whether planned or proposed measures related to strategic nuclear forces enhance or erode first-strike stability.

incurs, the discount factor attached to the latter term would equate to 0.5. Alternatively, if one cares only about damage to oneself, then the factor is 0, thereby cancelling out this term. Our choice of 0.3 is somewhat arbitrary; notably, conclusions about stability are relatively insensitive to variations in the discount factor. For a sensitivity analysis, see Glenn A. Kent and David E. Thaler, First-Strike Stability: A Methodology for Evaluating Strategic Forces, R-3755-AF, RAND, August 1989, pp. 62–67.

9For the purposes of the methodology of first-strike stability, the viability curve is assumed to be a straight line (line A in Figure 3.4).
EFFECTS OF STRATEGIC DEFENSES

Until now, we have provided tools for assessing the ability of alternative U.S. strategic nuclear forces to achieve two core U.S. objectives—central deterrence and first-strike stability. Other national objectives, especially defending the nation against small ballistic missile attacks, have gained increasing prominence in the public dialogue on strategic forces. A number of researchers have provided analyses of the requirements for a defensive system that would provide high confidence in achieving this latter objective.\footnote{For an excellent analysis, see Michael D. Miller et al., \textit{Arms Control Regimes and Ballistic Missile Defense}, R-4071-A, RAND, 1991.} For the purposes of this report, we merely apply the methodologies heretofore discussed to provide insights into the effects BMD might have on central deterrence and first-strike stability (see Section 4).

Our measure for expressing the capability of a given BMD deployment is “defense potential,” which refers to the number of RVs the defense can subtract from a ballistic missile attack. Thus, a defense potential of 1000 means that defense is capable of intercepting up to 1000 RVs. It does not signify the number of interceptors in a defense system, which could require 2000, 5000, or 10,000 interceptors, for example, to achieve 1000 interceptions. The defense system is assumed to operate in a “random subtractive” mode—i.e., it subtracts RVs from an attack irrespective of their type or intended target.

Generally, defenses blunt the effectiveness of an attack by reducing the probability of penetration (Pp) of incoming warheads (or bombers). For example, if a BMD system has a potential of 200, and 1000 RVs are arrayed against it, each of the RVs has a Pp of 0.80 (1 – (200/1000)). If the Pk of an RV is 0.80 absent defenses, it now becomes 0.64 (0.80 × 0.80). An attacker can counter the effect of the opponent’s defenses by striking the defenses themselves and/or by raising the number of RVs he lays down on each target or DGZ. Two RVs, each with a Pk of 0.64, have a joint Pk of 0.87 (1 – [1 – 0.64]^2) when striking the same target.

We now return to the example we offered when describing the deterrence methodology, with the further stipulation that each side has deployed BMD with a defense potential of 200. Let us assume that U.S. defenses have disrupted the Russian first strike such that 100 additional weapons (totaling 600) survive. Against Russian defenses, these RVs have a Pp of 0.66 (1 – [200/600]); combined with reliability and other factors yielding 0.80, the Pk of each retaliating weapon is
0.53 (0.66 × 0.80). Thus, the U.S. retaliation can destroy 318 DGZs (600 × 0.53), as opposed to 400 before defenses are introduced. Though a greater number of U.S. weapons survive the Russian first strike, fewer DGZs are destroyed in the presence of defenses.

LOOKING AHEAD

We now have appropriate tools for assessing alternative strategic nuclear force structures and postures on the basis of central deterrence and first-strike stability. The next section applies these tools to forces currently deployed, those likely to be deployed under the START accords, and those proposed for "deep cut" regimes.
4. RELATING MEANS TO ENDS: APPLYING THE METHODOLOGIES

In this section, we apply the top-down thinking and methodological tools described in the preceding pages to make a few points about the role of the U.S. strategic force posture in the coming decade. Along the way, we provide our own thoughts about some of the key questions raised but left unanswered in Section 3. We then offer recommendations for U.S. forces that flow from the analysis.

EVALUATING STRATEGIC NUCLEAR FORCES: CENTRAL DETERRENCE

To measure how well U.S. strategic forces do in deterring a deliberate Russian nuclear attack on the U.S., we set forth a criterion, or test of adequacy. This test is a sizing tool and, as such, is not necessarily meant to suggest how the U.S. should actually employ its forces in the event of war. We propose this test of adequacy with full cognizance of the profound uncertainty surrounding the future capabilities and intentions of Russia and the other successor states of the Soviet Union.

Components of an Adequate Deterrent

As displayed in Figure 4.1, an adequate deterrent should incorporate three survivable components: a secure reserve, an urban withhld, and an additional force that we call the flexible-response increment. The numbers we provide here are intended to indicate an order of magnitude. Whether a number is 200 or 250 is not important; we contend only that it is neither 2000 nor 0.

The secure reserve is a survivable force dedicated to ensuring U.S. military power in the aftermath of a nuclear war, regardless of how strenuous that war turns out to be. This force should at least be large enough to provide a highly destructive capability against the societies of non-Russian nuclear powers. Its purpose is to avoid situations in which the U.S., having been engaged with Moscow in a devastating nuclear exchange, is susceptible to coercion by whatever small nuclear power(s) remains able and willing. The secure reserve force
(SRF) probably need not exceed 200 or so weapons,\(^1\) which should be enough to deter a coalition of such nth countries.

The secure reserve is not intended as a force with which the U.S. might conduct prolonged duels with nth countries in the aftermath of a devastating U.S.-Russia exchange. One might think of the U.S. at this point as a wounded animal prepared to pounce at the jugular with no thought to limiting its attack. Other nuclear powers interested in exploiting this situation would be deterred by the perception of a U.S. having little reason to respond in a limited or discriminating manner. Thus, the purpose of the secure reserve is to threaten the societal destruction of a coalition of non-Russian nuclear powers, not to engage in signaling or negotiation, as might be the case with Russia.

The urban withhold, a second survivable force, is intended to provide what is commonly referred to as an "assured destruction" capability vis-à-vis Russia. The bedrock of central deterrence, this capability threatens the ultimate sanction against Russia: its destruction as a functioning society through strikes against large urban-industrial areas.

\(^1\)These are deliverable weapons—i.e., ones that survive a massive nuclear exchange. Thus, somewhat more than 200 inventory weapons are almost certainly needed to meet this requirement.
At the same time, we believe that in the event deterrence fails and nuclear war ensues, unleashing this capability should be an option only of last resort if carried out at all—hence the withhold portion of the term. In a nuclear conflict, the U.S. would refrain from using this force unless Moscow conducted a concerted attack against U.S. cities or, possibly, attacks against nonurban targets that unintentionally lay waste to cities nearby. Knowing the societal destruction they could bring upon themselves from such attacks, however, the Russians should be deterred from conducting them in the first place. The hope is that in the event the U.S. stumbles into a nuclear conflagration with Russia, it could be terminated before there was widespread devastation to population centers. We put about 500 deliverable weapons in the urban withhold, which correlates to approximately 200 equivalent megatons (EMTs) if an average warhead yield of about 300 kt is assumed.²

Most U.S. policymakers and analysts agree that prudence dictates that the U.S. maintain a survivable assured destruction capability to deter a hostile Russian leadership from seriously contemplating a deliberate nuclear attack on the U.S. homeland. Where there is disagreement is over the issue of whether such a capability is, in and of itself, sufficient. We argue that a “minimum deterrent” force is a necessary but insufficient posture given U.S. objectives. Specifically, the U.S. needs to deter more than just a “kitchen sink” attack. Until the prospect of serious conflict with the former Soviet Union disappears, the U.S. would be well-advised to posture its forces to deter smaller attacks as well. Therefore, for some years to come, U.S. presidents will need to be able to wage nuclear war without attacking Russian cities.

In other words, we contend that holding Russian cities at risk deters a Russian strike against U.S. cities, but the urban-withhold element of the deterrent may not deter other types of Russian attack. For example, in the face of a Russian attack limited to the destruction of some U.S. strategic nuclear systems, a U.S. president with only an urban withhold at his disposal might be perceived as having only two options: respond with weapons designated as part of this urban with-

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²Equivalent megatonnage is a surrogate for a given warhead's destructive capacity against such area targets as cities. See Bruce W. Bennett, Assessing the Capabilities of Strategic Nuclear Forces: The Limits of Current Methods, N-1441-NA, RAND, June 1980. When he was Secretary of Defense in the mid-1960s, Robert McNamara proposed 400 deliverable EMTs as his test of adequacy for the destruction of a large portion of Russian cities, industry, and politico-military controls. We use “half a McNamara” in our test, or an average of 1 EMT on each of the 200 largest Russian cities.
hold or respond not at all. A U.S. retaliation against cities could bring nuclear weapons raining down on U.S. cities in retaliation. If the president were to respond, therefore, it would be against nonurban targets; yet by so doing, he would be cutting into the force making up the U.S. assured destruction capability.

Fundamentally, the U.S. seeks to deter all deliberate nuclear attacks on the U.S. homeland. Such attacks could range from relatively small strikes against selected U.S. targets to a large-scale attack on a combination of U.S. strategic forces, GPF, leadership, and war-supporting industry. This range of possibilities argues for U.S. nuclear forces that offer the president a wide range of executable retaliatory options. Thus, we suggest that an additional bundle of forces is needed for the coercive bargaining process (of which the threat of societal devastation is a part) that could lead to war termination without counter-city attacks.

Sizing the Flexible-Response Increment

What remains is to propose a target set or sets against which to size the flexible-response increment of the U.S. deterrent. That is, we return to a question left unanswered in Section 3: What capability, or set of assets, should the U.S. size its forces against in order to deter less-than-all-out attacks? Put more succinctly, what is the test of adequacy for the U.S. deterrent? Our main purpose here is to offer a first-order estimate to bound the problem on the higher end.

Of the four canonical target categories, our surrogate for sizing the flexible-response increment is Russian GPF. We choose this category because it simultaneously meets three criteria: (1) it encourages us to be conservative, (2) it bolsters deterrence without undermining other peacetime and wartime objectives, and (3) it would likely constitute a critical target set in the event deterrence failed.

First, recognizing our inherently limited ability to foresee future scenarios, we prefer to err on the conservative side in the face of uncertainty. Russian GPF are probably the largest single target set and one of the most difficult to destroy, especially if they disperse to widely scattered locations, as is likely in a deep crisis. A force sized for this task could probably handle most others, either singly or simultaneously. By using GPF as a surrogate, we are thus proposing an "upper bound" to the size of the flexible-response increment.

Second, of the four target categories, only the GPF provide a target set that both supports deterrence and does not negatively affect other peacetime and wartime objectives. Threats or attacks against the
other three categories (strategic forces, leadership, and war-supporting industry) run contrary to the ability to achieve one or more objectives.³ Threats to retaliate against GPF in nonurban areas are credible under a variety of circumstances, and convincing Russian leaders of the credibility of U.S. threats against valuable assets strengthens central deterrence. Moreover, holding Russian GPF at risk is not first-strike destabilizing. In the event of war, conducting metered counter-GPF strikes supports the U.S. wartime objectives of bilaterally limiting damage and denying a number of plausible enemy war aims.

Finally, we contend that the results of an exhaustive scenario analysis (such as that suggested in Section 3) would lead to a focus on GPF. That is, Russian GPF would appear as a high-value target set for achieving U.S. wartime objectives in many of the most likely scenarios. Holding these forces at risk threatens important aspects of Moscow's power: the ability to project power across its borders, to maintain control within its borders, and to sustain something of a superpower image based on its military capability. Further, attacks on GPF can, in theory at least, be meted out according to the signals the U.S. president wishes to send his Russian counterpart. Measured attacks on these assets would allow negotiations to proceed in an effort to terminate the war before levels of destruction became truly apocalyptic.

Note that choosing Russian GPF as the target set for sizing the flexible-response increment of the U.S. deterrent in no way precludes the selection of alternative employment options in the event of war. U.S. retaliatory forces can be used to attack targets across all target categories, so Russian leaders cannot be sure which ones the U.S. would actually strike. Though sized against GPF targets, therefore, the U.S. force would not necessarily be dedicated to them; indeed, the ability to respond flexibly to the unexpected is an important characteristic of an adequate deterrent posture.⁴

In summary, we contend that central deterrence does not require that U.S. retaliatory forces be able to additively cover all four canonical target categories: strategic forces, GPF, leadership, and war-supporting industry. Our suggested test of adequacy allows the U.S. to target some subset of each category, but is sized to allow comprehensive attacks on Russian GPF and Russian cities and economic in-

³A detailed discussion of targeting can be found in Section 5.

⁴Our argument that sizing against Russian GPF will allow employment flexibility recognizes the fact that, even with arms reductions, many weapons in the U.S. arsenal will continue to be effective against both hard and soft targets.
fractional structure while retaining an assured-destruction capability for use against any other potential antagonist. A force capable of undertaking these missions should provide a very robust deterrent for the U.S. At the same time, we encourage the creation of a range of limited options to aid in escalation control should deterrence fail.

A Proposed Test of Adequacy for Central Deterrence

To set our test of adequacy, we must establish the size of the Russian GPF target base. A preliminary survey of unclassified sources indicates a broad range of views. Numbers of targets range from a low of 765 to a high of 1560.\textsuperscript{5} For the purpose of defining our target base, we take several factors into consideration. First, we assume that many Russian GPF targets occupy substantial acreage, which means some will require multiple DGZs. Second, Russian GPF will likely be dispersed during a crisis situation, increasing the number of DGZs. Finally, of course, all DGZs are not of equal value.

Our approach involves using two DGZ curves, one steep and one relatively flat. The steeper DGZ curve is used when we assess day-to-day U.S. nuclear force postures. In these cases, Russian nuclear forces are assumed to strike from a highly generated posture, but only some of Russia's GPF are out of garrison (e.g., those engaged in the conflict that fosters the escalation to nuclear weapons). We use the flatter curve when evaluating generated U.S. postures, assuming that a crisis deep enough to spark generation of U.S. strategic nuclear forces would also involve the dispersal of all Russian GPF units. The two DGZ curves appear in the left-hand graph of Figure 4.2. The steeper one (M) assumes a target base in which 90 percent of Russian GPF assets are contained in 1200 DGZs, whereas the flatter one (N) assumes 2000 DGZs. Their exact curvatures are notional; we used a simple mathematical function to trace reasonable-looking curves through the point where 1200 and 2000 DGZs equal 90 percent. Their crucial characteristic is that they meet our requirement of unequal worth among GPF assets.\textsuperscript{6}


\textsuperscript{6}The important question that arises is how to define GPF assets as a homogenous pool, since comparing armored maneuver regiments with ammunition depots is like comparing apples with oranges. We believe that such a definition can be reached by
We now determine how the capability attendant upon this pool of assets (e.g., the ability to project power across borders, to bring a cantankerous republic in line) might respond to attacks on it, which will lead us to a viability curve. We choose the more demanding S-curve, shown in the right-hand graph in Figure 4.2, to represent the viability of the Russian GPF.

Using the S-curve indicates our judgment that the Russian power-projection capability would remain a useful and powerful tool even if a large chunk of military equipment (say, even 40 percent) was destroyed. This is not a deeply reasoned or well-analyzed conclusion on our part. It does, however, reflect a frequently cited heuristic damage criterion that says a division-size combat unit becomes combat ineffectual the utility of a target to a standard measure of effectiveness, akin to the "armored division equivalent" used by analysts to rate the relative strength of ground force units.

Assume that our basis for comparison is a crack, battle-ready tank regiment with top-of-the-line equipment. As the base case, this regiment gets a rating of 1.0. A similar regiment with second-rate equipment would be less effective on the battlefield, so it receives a rating of, say, 0.8 and is therefore a less valuable target. And a regiment composed of reservists with second-rate equipment would get a 0.5 rating and be less valuable still.

Now assume that a given ammunition depot serves seven regiments in its vicinity. Further, assume that if all of its stores are distributed to the regiments, it adds 0.2 points to the rating of each regiment. Thus, when well stocked, the depot receives a rating of \(0.2 \times 7 = 1.4\), meaning that it is a more valuable target than the crack, well-equipped armored regiment. We contend that this approach can be used to roughly rank the relative value of diverse GPF targets according to a single unit of account.
fective when reduced to 50 percent of its nominal strength.\textsuperscript{7} We have simply scaled this measure up from the divisional level to that of an entire army, which is why the S-curve in Figure 4.2 steepens dramatically after 50 percent of Russian GPF assets are destroyed.

Now that the relationship between GPF assets and their capabilities has been postulated, we assume that 50 percent is the required reduction in Russian GPF viability. This percentage translates into about 60 percent damage to Russian GPF assets. To attain this level of damage (with weapons that have, on average, a \( Pk \) of 0.80), a U.S. retaliatory attack from a day-to-day posture must be able to hold at risk at least 700 DGZs (dividing 60 percent by 80 percent yields 75 percent on DGZ curve \( M \) in Figure 4.2, which corresponds to about 700 DGZs on the \( x \)-axis). Alternatively, the U.S. response from a generated posture must threaten about 1200 DGZs when DGZ curve \( N \) is used.\textsuperscript{8}

Thus, under our assumptions about the size and character of GPF assets in Russia, the flexible-response increment should comprise at least 700 survivable weapons on a day-to-day basis and at least 1200 survivable weapons when generated. Adding these to the 500 urban-withhold weapons and 200 weapons for the SRF yields totals of 1400 and 1900 weapons, respectively, that should be available to retaliate for a Russian first strike. \textit{This is our test of adequacy for the U.S. strategic offensive forces needed to constitute a robust deterrence.\textsuperscript{7} It provides an estimate of an upper bound on the size of the U.S. nuclear retaliatory capability.}

\textbf{Evaluating Alternative U.S. Strategic Offensive Forces}

We now apply our test of adequacy to evaluate the ability of alternative U.S. nuclear force structures and postures to underwrite central deterrence. We assess seven structures (details are in Appendix A):

- Structure II: START-reduced U.S. and Russian forces, no U.S. modernization.

\textsuperscript{7}Recall the "mother of all briefings" delivered by General Schwartzkopf on the last day of Operation Desert Storm. Iraqi divisions on his map were color coded to describe the level of damage they had suffered. According to Schwartzkopf, divisions incurring 50 percent damage were considered combat ineffective.

\textsuperscript{8}Our assumption that surviving U.S. weapons have an 80 percent \( Pk \) is notional. Again, recall that these are deliverable, not inventory, weapons.
• Structure III: START-reduced U.S. and Russian forces, U.S. modernization.
• Structure IV: U.S. and Russian forces reduced to 4700 actual inventory weapons (President Bush's 1992 proposal).
• Structure V: U.S. and Russian forces reduced to 4000 actual inventory weapons, U.S. modernization.
• Structure VI: U.S. and Russian forces reduced to 3000 actual inventory weapons, no U.S. modernization.
• Structure VII: U.S. and Russian forces reduced to 3000, U.S. modernization.

Russian forces are held constant regardless of whether the U.S. structure is modernized. Structures II and III refer to the recently completed accord to limit arsenals to 6000 accountable weapons (actual inventory levels will be higher due to counting rules). Structure IV is derived from President Bush's State of the Union address in January 1992. Structures V, VI, and VII exemplify further options for reduction that have been suggested.

For the purposes of assessing central deterrence, U.S. forces are assumed to retaliate from one of three alternative postures within each structure, and Russian forces are assumed to always strike first from a highly generated posture in which most of their available weapons are used. (The three U.S. retaliatory postures and Russian first-strike posture are detailed in Appendix B.) U.S. posture A for each of the seven structures resembles the day-to-day alert rates in force before President Bush's September 1991 speech in which he ordered the "stand-down" of U.S. bombers. Posture B refers to the alert rates in effect since that speech; enhanced alert rates characterize posture C. The evaluations of postures A and B assume a steeper DGZ curve than is assumed in evaluating posture C.

Some readers will question whether a Russian first strike could catch U.S. strategic nuclear forces operating in a day-to-day posture (presently posture B). In light of warming U.S. relations with the Russians and the opening of their society, it may be expected that the U.S. would receive "strategic warning" and generate its forces to deny Russian success in delivering a nuclear "bolt from the blue." Strategic warning refers to the detection of preparations for an attack, sometimes long before the attack takes place. A bolt from the blue is synonymous with a surprise attack, meaning that the victim perceives the first strike as coming out of nowhere.
We believe that these terms of art, long a part of the strategic vernacular, miss the point. National authorities may not act upon indications of enemy preparations for attack because they are subject to the same human factors that drive crisis instability. Further, an attacker will always strive to catch the victim in as vulnerable a posture as possible. The interaction of an attacker’s intent to deceive and the victim’s possible slow and confused response to ambiguous warning indicators makes writing off “surprise” a dangerous step. Because the generation of forces depends on human actions, the analysis of peacetime postures remains relevant.

Figure 4.3 applies the test of adequacy to the seven U.S. strategic force structures. The y-axis measures the percent reduction in the viability of the Russian GPF, with the heavy horizontal “line of adequacy” representing the required 50 percent reduction. The x-axis depicts three postures for each of the seven structures. After incurring a determined Russian first strike, surviving U.S. forces not dedicated to the urban withhold or secure reserve retaliate against Russian GPF targets. Those postures with results above the line of adequacy (the heavy horizontal line) can reduce the viability of the Russian GPF by more than 50 percent and thus pass the test.

According to our measure, results for structure I corroborate the Bush administration’s assessment that the stand-down of U.S. bombers from alert still leaves the U.S. with a robust deterrent. With former day-to-day alert rates, currently deployed U.S. forces could reduce Russian GPF capability in a retaliatory strike by 97 percent while maintaining sufficient unused weapons to fulfill our requirements for a secure reserve and an urban withhold. Removing bombers from strip alert status (posture B) hardly affects U.S. retaliatory capabilities, although they are now almost entirely reliant on some 3000 weapons aboard survivable SSBNs at sea.9

Additionally, the U.S. will maintain an adequate deterrent even after the reductions planned under the START accord. Even under posture B, U.S. forces can reduce the Russian GPF capability by more than 90 percent. Moreover, U.S. forces in structure II are so capable that the modernization imbedded in structure III seems almost irrelevant.

Structure IV (4700 actual weapons) fares less well than structures I, II, and III, although even the least adequate posture, B, still technically passes the test. However, Figure 4.2 shows that a reduction in

9Relying solely on the retaliatory capability of SSBNs would have dire consequences if Moscow developed an ability to track U.S. submarines at sea.
viability of 68 percent is on the steep portion of the S-curve, where relatively small perturbations in the survivability of U.S. forces could render them "inadequate" by our measure. In this case, the U.S. retaliatory punch is approaching the edge of adequacy. Returning some bombers to an alert status would help cushion the effects of this force structure on deterrence.

With an arsenal of 4000 actual weapons (structure V), U.S. forces in posture B do not meet our test of adequacy. Our calculations show that, in this case, only 1100 weapons are expected to survive. With 400 dedicated to the flexible-response increment (and 700 weapons tied up in the reserve and urban withhold), Russian GPF viability could be reduced by only 21 percent according to Figure 4.3. Placing bombers on alert and/or dispersing mobile ICBMs on a daily basis (posture A) would recover a robust deterrent. Thus, according to our first-order findings, arms reductions to a level of 4000 on each side should be accompanied by a more survivable day-to-day posture than is now the case.

Figure 4.3—Applying the Test of Adequacy to Alternative Force Structures
Structures VI and VII are in the main inadequate deterrents according to our test. With about 750 weapons available for the flexible-response increment, the modernized case VII/A is the only one at inventories of 3000 to reach the line of adequacy, and it barely does so. Notably, despite the higher number of surviving U.S. retaliatory weapons in case VII/C, the reduction in GPF capability is less than in case VII/A. This outcome is due to a more demanding DGZ curve in the generated posture. The increased numbers do not suffice to meet the higher demands levied on the force when Russian GPF are dispersed to improve their chances of survival in a U.S. nuclear response.

Obviously, all structures and postures would fare better if the size of the Russian target base declined significantly. For example, if we steepen DGZ curve M in Figure 4.2 so that 90 percent of the total Russian GPF assets reside in only 700 DGZs, postures A and C in structure VI meet the test of adequacy, although B remains inadequate. Not surprisingly, as we said earlier, the job to be accomplished drives the metrics of “adequacy.”

EVALUATING STRATEGIC NUCLEAR FORCES: FIRST-STRIKE STABILITY

We now turn our attention to assessing alternative U.S. and Russian force structures and postures on the basis of first-strike stability. The index of first-strike stability associated with the currently deployed forces is used as a yardstick to evaluate the effectiveness of the alternative structures.

In contrast to the procedure used above, here we use only one DGZ curve for each country, regardless of the force posture. Our intent is to relate trends in first-strike stability to the reader, and we believe that this intent is best served by employing one set of DGZ curves. The Russian DGZ curve has 90 percent of value in 2000 DGZs; the U.S. DGZ curve is assumed to be steeper, with 90 percent of U.S. value contained in 1500 DGZs. To keep the focus on first-strike stability, neither side is assumed to dedicate forces to an urban withhold or a secure reserve.10

10Were we to use two DGZ curves for each country, the resulting trends would be no different, just less pronounced.

The first-striker—be it the U.S. or Russia—is always assumed to strike from a fully generated posture (i.e., all on-line weapons are ready for launch). Postures A, B, and C therefore refer to the alert rates of the side incurring the first strike. Thus, for example, posture C reflects a relatively survivable posture adopted by U.S. retaliatory forces before a Russian first strike or, conversely, by Russian retaliatory forces before a U.S. first strike. (The alert rates connected with each posture are provided in Appendix B.)

Figure 4.4 depicts the effects of arms reductions and posture on U.S. and Russian nuclear-exchange costs using the current and START structures. Each structure is represented by six columns, three for Russian costs and three for U.S. costs. Each column shows the costs of striking first and second.

Under current circumstances, the costs to each side of going first and second hover around 1.0 because of the high damage levels both sides would sustain in a nuclear exchange. Even in posture B, in which bombers and mobile ICBMs are removed from alert status, there is little difference between going first and second and hence little posture-induced incentive to strike first in a crisis. This situation is reflected in the relatively high index of 0.72 \((0.91/1.04) \times (0.84/1.02)\).

START-mandated arms reductions widen the gap between the costs of going first and second, and this effect is magnified in moving to the less survivable postures. In case II/B, the U.S. cost of striking first diminishes appreciably from its structure I level (from 0.84 to 0.57), while the U.S. cost of going second remains essentially the same. This result primarily stems from the fact that the substantial nuclear capability afforded by Russia’s land-based missiles and bombers is available if the Russians strike first, but is destroyed if they incur a U.S. first strike. Since the damage that the U.S. suffers is appreciably reduced, its cost is lower here than under structure I. As expected, the stability index diminishes, to 0.44.

Figure 4.5 displays the values of the first-strike stability index across all seven force structures. The heavy horizontal line represents today’s level of first-strike stability, an index of 0.72.

One cannot help but notice the importance of posture in maintaining first-strike stability as forces are reduced. Enhanced alert rates allow deep cuts in U.S. and Russian offensive forces without eroding first-strike stability, regardless of modernization. The results shown for cases VI/C and VII/C are good examples of situations in which central deterrence is not robust (Figure 4.3) but first-strike stability is
Figure 4.4—Costs to Each Side of Going First and Second Under Current and Nonmodernized START Structures

relatively high. However, if the U.S. and Russia undertake reductions without improving the survivability of their forces, the stability index could diminish to between 0.30 and 0.50 from today's 0.72.

INCORPORATING HOMELAND BMD INTO ASSESSMENTS OF STRATEGIC NUCLEAR FORCES

We now explore the effects of various levels of homeland BMD on central deterrence and first-strike stability. For each posture combined with each of the seven nuclear force structures, we examine four homeland BMD deployments.

A U.S./Russian defense potential of 0/0 represents the current state of affairs in which neither side possesses BMD. The second case, potentials of 200/200 (i.e., each side can subtract 200 RVs from an at-

12We disregard the existing Russian BMD deployment around Moscow because it defends Moscow only.
Figure 4.5—Values of First-Strike Stability Index for Alternative Force Structures

tack), exemplifies U.S.-Russian agreement on defending against limited ballistic missile attacks, the driving factor being the number of SLBM RVs aboard a single SSBN. The 200/500 case represents a demand by the Russians for asymmetry because threats to their homeland from potential adversaries on their periphery make their situation more stressful than the U.S. situation. Finally, we consider a 1000/1000 case because it represents a number of possible scenarios:

- The two sides break out from the smaller deployments.
- Deployed defense systems have a defense potential of 200 against single-azimuth attacks (nth-country attack or unauthorized launch), but have a much higher potential against a multi-azimuth attack (deliberate, large-scale attacks).
- The U.S. decides to deploy fairly robust defenses and Russia follows suit.
Figure 4.6 demonstrates the deterrent adequacy of alternative U.S. offensive force structures in the presence of these different defense deployments. As a limiting case, we hold constant the number of weapons needed for the urban withhold and secure reserve.

According to the figure, current forces meet our test of adequacy under all considered defense conditions. Under START, however, the U.S. must not be complacent about the level of defense potential on each side. If posture B is maintained, the U.S. may not wish to allow Russian defenses to reach a potential of 500. With more survivable postures, asymmetric U.S./Russian defense potentials of 200/500 are not worrisome with regard to central deterrence.

The force structure proposed by President Bush in 1992 (structure IV) would provide a robust deterrent in the face of low levels of BMD, but only in postures A and C. The U.S. should thus consider placing bombers on alert and/or putting more SSBNs to sea on a day-to-day basis to compensate for any future Russian BMD deployments.

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*Figure 4.6—Deterrent Adequacy of Alternative U.S. Strategic Nuclear Forces in the Presence of Homeland BMD*
Structure V (4000-weapon inventories, modernized U.S. force) provides little margin for error even when U.S. forces are rendered more survivable. Neither case VA nor case VC provides much deterrent cushion even in the presence of rather modest defenses.

In regimes comprising more ambitious cuts to 3000 actual warheads on each side (i.e., those represented by structures VI and VII), our proposed deterrent criterion would never be satisfied if BMD deployments were permitted. As mentioned before, the test of adequacy is not met even in the absence of BMD, except in case VII/A. With BMD, the U.S. ability to maintain an adequate flexible-response increment is almost nonexistent in some cases, even if the urban withhold is not altered (e.g., even if weapons are not added to the withheld force to guarantee that enough weapons would penetrate to their targets). Thus, when arms reductions and less-survivable postures undercut the U.S. deterrent, Russian defenses worsen the situation.

Figure 4.7 shows that the same can be said about the effects of BMD on relative levels of first-strike stability. Within each of the figure's columns, homeland BMD deployments always lower the index. As one moves from left to right, the tension between arms reductions (sans posture enhancements) and defenses is readily apparent: defenses magnify the erosion of first-strike stability. However, Figure 4.7 also shows that the more survivable posture C cancels out these effects in every force structure so long as defense potentials are minimal.

Behind the results in Figure 4.7 is the fact that BMD tend to reduce the cost each side incurs in a nuclear exchange, regardless of which side delivers the first blow. However, the cost to each side is reduced to a greater extent when it strikes first than when it retaliates. As a result, the gap between the costs of striking first and second is widened, and the index of first-strike stability drops.

**METHODOLOGY-BASED RECOMMENDATIONS FOR FUTURE U.S. STRATEGIC FORCES**

We have shown how the analytic tools developed in Section 3 allow changes in force posture, modernization efforts, and arms control to be related to the core U.S. national military objectives of central deterrence and first-strike stability. The criteria selected are solidly anchored in top-down analysis. We now offer a number of recommendations for future U.S. strategic forces that flow from the application of our methodologies.
Maintaining an Adequate Deterrent

Our recommendations for maintaining an adequate deterrent are based on the premise that the primary role of strategic offensive forces is to deter a deliberate Russian nuclear attack on the U.S. This mission will remain the primary determinant of U.S. strategic nuclear force posture in the 1990s. The simplicity of these statements conceals some important ramifications.

First, the national security community in the U.S. needs to develop agreed-upon measures of adequacy for evaluating the U.S. central deterrent. In this section, we provided our judgment as to what this test of adequacy should comprise. Further work needs to be done to allow the community to gain consensus on the proper inputs and measures. This consensus should be achieved before the U.S. defines its agenda for any further nuclear arms reductions vis-a-vis Russia.
Until then, we believe that adjustments to U.S. force posture should err on the side of caution. Experience with the measures and methods described in this study suggests that, pending a more careful and wide-ranging analysis, and given plausible assumptions regarding force structure and posture alternatives, the U.S. could field an adequate deterrent with the 4700 warheads proposed by President Bush, but no fewer. A force of this size meets our test of adequacy (based on targeting GPF) with a comfortable margin for error. According to our criteria, smaller force structures may prove inadequate as deterrents. Put differently, we see no compelling reason that the U.S. arsenal should contain more than about 4700 strategic nuclear weapons.\textsuperscript{13}

As large as it is compared to some numbers being discussed for a "START II" treaty, 4700 actual warheads represents a substantially smaller inventory than that sanctioned by the START accord. By one estimate, the U.S. could conceivably deploy up to 9480 "real" warheads while remaining within all START constraints.\textsuperscript{14} Thus, a 4700-warhead force would allow for sizable additional reductions in U.S. inventory levels while still meeting stringent deterrent criteria.

Note that our recommendation is largely independent of the size of any other power's nuclear force in recognition of the fact that central deterrence rests on the ability of U.S. forces to meet criteria that the U.S. sets for them. Therefore, the size of the U.S. offensive force need respond only to changes in that force's own character and survivability and to the size of the "tasks" assigned to it.

For instance, postulate that our test requires the U.S. to have at least 2000 deliverable weapons surviving after a well-executed Russian counter-nuclear strike. So long as the U.S. posture can reliably meet this requirement, whether an opponent has 2000 or 20,000 inventory weapons is irrelevant, as are his enhancements in hard-target kill capability. Such improvements or additions to an adversary's forces would affect the size of the U.S. force only if they reduced the survivability of U.S. missiles, bombers, and C2. Parity in numbers, missile size, and hard-target kill capability—"the balance"—is relevant only inasmuch as it has important psychological implications. Decoupling the U.S. posture from the Russian posture in American minds should help dampen arms-race pressures, possibly more so than any arms control agreement could.

\textsuperscript{13}This number holds so long as there are no significant BMD deployments. Creation of anything but the thinnest antimissile shield over Russia would drive this number upward.

Finally, those who support deployment of more than the most-limited nationwide BMD have claimed that an "optimal mix" of strategic defenses and defenses would enhance central deterrence by injecting uncertainty into Russian planning. Such uncertainty, it is argued, would augment central deterrence "by diminishing the [Russian] decisionmaker's confidence in the ability of his forces to execute an effective attack." This formulation has caused considerable confusion.

Leaving Russian leaders uncertain as to whether they would be destroyed if they launched a nuclear attack on the U.S. is hardly a goal for the U.S. to pursue. To the contrary, the U.S. strives for a Russian perception of certainty that U.S. retaliation would be fierce and inescapable. This certainty surely would be eroded if Moscow was permitted unconstrained deployment of strategic nationwide BMD. As evidenced in Figure 4.6, such defenses would inhibit the ability of U.S. retaliatory weapons to reach their targets in Russia. It must be remembered that deterrence rests on denying the adversary the possibility of avoiding a devastating U.S. retaliation, not on some reduced ability on his part to achieve a high damage expectancy with regard to some U.S. targets or to gain an advantage in the "correlation of forces" after a nuclear war.

**Underwriting First-Strike Stability**

So long as the U.S. fields nuclear weapons to deter, stability concerns should continue to drive force posture considerations. In particular, we believe that maintenance or enhancement of first-strike stability should remain a top priority.

For the purposes of both first-strike stability and central deterrence, it is much more profitable to improve the survivability of the U.S. posture than to threaten the survivability of an adversary's forces. The ability of U.S. forces to fulfill their central deterrent role hinges first and foremost on their ability to survive a well-planned, well-executed Russian first strike. Importantly, highly survivable forces on both sides enhance first-strike stability by reducing both U.S. and Russian first-strike incentives.

More-survivable postures on both sides will help avoid an erosion in first-strike stability. The preferred posture is one in which force survivability does not depend on decisions by leaders in crisis; such postures emphasize "inherently" survivable forces, such as SSBNs at sea.

A decisionmaker may not order the generation of forces if he does not believe the opponent is preparing to attack, despite indications to the contrary. He may also fear that alerting forces could invite an enemy attack that might not otherwise be launched. To alleviate instabilities arising from forces that are not inherently survivable in peacetime, such as SSBNs in port, leaders should be convinced of the stabilizing effects that generation can have during a crisis. However, hoping that forces will be generated in crisis is not recommended as a way of guaranteeing the adequacy of the U.S. deterrent or the robustness of first-strike stability.

In the interest of first-strike stability, efforts to target Russia's mobile ICBMs when dispersed should be halted. Moreover, calls to ban mobile ICBMs or limit their dispersal areas, motivated at least in part by fears that such missiles would be untargetable, are profoundly misguided. Mobility should be encouraged, not legislated away. One way to clarify this issue is to compare mobile ICBMs with SLBMs. For years, the U.S. encouraged the Soviets to move more of their nuclear forces "out to sea" onto "stabilizing" submarines. The primary reason SSBNs are perceived as "good things" is that they are highly survivable, so thinking about mobile ICBMs as land-based SLBMs should clarify their attractiveness. The apparent inability of the U.S. to deploy its own mobile ICBMs should not prompt a resistance to Russian mobility. The political problems of mobility in the U.S. in no way diminish mobility's stabilizing effect overall. Increasing the survivability of Russian retaliatory forces increases stability for both sides.

Similarly, the U.S. should curtail its investment in antisubmarine warfare (ASW) efforts aimed at finding and destroying Russian SSBNs. The capability for counter-nuclear attacks is no less destabilizing just because it can be achieved with conventional weaponry, away from the Russian homeland, and before nuclear attacks have commenced. Moscow would still face a "use or lose" situation with a key element of their nuclear triad. Determining how far the Russians could be pushed before they would launch nuclear weapons is a test we hope will never be run.

We realize that decoupling the strategic ASW mission from routine wartime ASW operations may be difficult. However, the deployment patterns of Russian SSBNs may simplify matters somewhat. Since the early 1980s, fewer and fewer Russian ballistic missile submarines have been forward deployed; most today are kept in well-defended bastions in or near Russian home waters. These bastions should be keep-out zones for U.S. attack submarines (SSNs) and other ASW forces. SSBNs that venture out from these protected waters in
wartime would be fair game, since ASW platforms cannot always distinguish between "boomers" and other submarines.

Finally, enhancing first-strike stability cannot be a reason for deploying nationwide BMD as currently conceived. Defenses dedicated to defending only one's nuclear retaliatory forces can indeed enhance first-strike stability, but today's focus is on protecting the nation. Thus, those who argue that more-robust nationwide defenses improve first-strike stability are incorrect.

**Future U.S.-Russian Arms Reduction Initiatives**

Our analysis leads us to conclude that President Bush's proposed reduction to about 4700 actual warheads in the U.S. and Russian inventories would leave the U.S. with an adequate deterrent. We believe that it is not in the interest of the U.S. to reduce its strategic arsenal beyond this number in the near future. This level of forces should be viewed as a point at which the U.S. can catch its breath and see how developments in the former Soviet Union, as well as the rest of the world, play themselves out. If events progress positively by the end of the decade, there may indeed be reason to consider further, even drastic, cuts in nuclear arms. Should developments take a nasty turn, however, the U.S. will still be in a position to maintain a robust deterrent.

The results of our analysis suggest that the posture of forces is one of the most important drivers of deterrent adequacy and has the greatest influence on first-strike stability. This outcome is not surprising, since deterrence and stability are both enhanced by increased survivability, and higher alert rates imply lower vulnerability to a first strike. Therefore, we believe that future arms control negotiations with Russia should concentrate as much on force posture as force size.

Posture is an issue missing from many debates about arms control. When some commentators attach a number to their vision of deep cuts, they ignore the crucial difference between inventory weapons (structure) and survivable weapons (posture), or at best seem vaguely aware of it. It must be remembered that when a number is bandied about as a goal for reductions in inventory weapons, only a portion of that number should be expected to survive a Russian first strike. This portion, and not the arsenal as a whole, is what must be subjected to the test of adequacy.

Our analysis of central deterrence and first-strike stability may lead to injunctions of the following sort to arms control negotiators:
• *Do not* ban mobile ICBMs. Their increased survivability makes them highly desirable from a stability standpoint.

• *Do* prohibit silo-based multiple-warhead missiles. SS-18s, fixed SS-24s, and MX ICBMs are valuable, vulnerable weapons. Their presence adds to first-strike incentives.

• *Do* negotiate restrictions on both sides' ASW activities in order to create "safe zones" for SSBN deployments.

• *Do* create protocols or reach understandings on the dispersal of forces in crisis. As long as dispersal does not increase the offensive capability of the force, its use to increase a force element's survivability during a crisis can be interpreted as a confidence-building measure rather than a threat.

As demonstrated in Figures 4.6 and 4.7, radical reductions in arsenal size may be in some tension even with so-called "thin" homeland BMD. When we assumed no increase in alert rates, even the smallest BMD deployment considered (the capability to defeat a 200-warhead attack) had a strong negative effect on the deterrent adequacy of both 4000- and 3000-warhead forces. A similar effect on first-strike stability was visible.

Homeland BMD deployment should put a floor on the extent to which offensive forces can safely be reduced—thin defenses are more acceptable at higher offensive force levels. Any decision to proceed with BMD should be made in full cognizance of the effect they will have on deterrent adequacy and stability. It may be that the benefits of BMD will be adjudged to outweigh these costs. The U.S. must, however, understand and accept that costs are involved.

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16That is, in a first strike, the systems in question (mobile ICBMs, SSBNs, and bombers) can be employed no more effectively from their dispersed sites than they can from their undispersed locations.
5. KEY ISSUES AFFECTING U.S. STRATEGIC FORCES IN THE 1990s

In this section, we discuss key issues involving the achievement of national military objectives in the 1990s. Ever mindful of the interrelationships among objectives, we attempt to highlight them as we proceed. This discussion is not derived from in-depth quantitative analysis; it instead uses top-down thinking and Section 2's treatment of objectives to help frame the debate.

BACK TO FIRST PRINCIPLES: CORE OBJECTIVES

In an offense-dominant environment, avoiding nuclear war is the key to national survival. It is the guiding light and must take precedence over virtually all other objectives. In choosing force posture and planning options, the U.S. faces a fundamental choice: Does it err on the side of avoiding war or of minimizing the consequences should war come? We believe that, in most circumstances, trade-offs must favor the former. Fortunately, there are measures that, while maintaining or enhancing deterrence and stability, can also help to avoid the worst possible outcomes should deterrence fail. We believe that the opportunities presented by the changing world order allow much greater harmony between U.S. peacetime and wartime objectives than ever before. Many tensions among those objectives should become relics of the Cold War.

Central Deterrence and First-Strike Stability: A Cold War Mentality?

In this study, we place great importance on the national military objectives of central deterrence and first-strike stability, enough so to devote two full sections to measuring strategic nuclear forces against them. Why, with all the fast-paced changes happening in the world, should we not be accused of clinging to a Cold War mentality?

Indeed, the arguments we make about tests of adequacy and the costs of war could—and, we contend, should—have been applied at the height of the U.S.’s adversarial relationship with the Soviet Union. But they apply equally well today. When we look about us, we do not see a world on the verge of reaching a new end-state to replace the Cold War paradigm for the next 40 years. Rather, we see a turbulence in relations among states that will not be resolved for years to
come. Our recommendations are based on this perspective, and not on a view of where we would like the world to be many years from now. Still, why should central deterrence and first-strike stability remain the primary drivers of the U.S. strategic force posture vis-a-vis Russia?

One way to begin making sense out of such a world is to think about three groups of powers with which the U.S. will have to deal:

- **Group 1**: friends and allies the U.S. simply does not have to worry about as attackers. Examples include Canada and Great Britain.
- **Group 2**: countries with which U.S. relations are proper but lukewarm. Attack by these countries is seen as unlikely in the near term, though long-term prospects are more ambiguous. China arguably fits into this category.
- **Group 3**: hostile powers that might at any time attack the U.S. or its interests. Until recently, the Soviet Union was the star of this group and had been since the end of World War II. Today's "demons" could include North Korea, Libya, and Iraq.

In the last few years, the Soviet Union and its successors have migrated from the third group toward the second one. Some would say Russia has already arrived there; others might claim that it is still en route. Whichever the case may be, we believe that the recommendations in this report will apply so long as Russia—whose nuclear arsenal will remain on a par with that of the U.S. for the foreseeable future—retains this neither-fish-nor-fowl status. Deterrence and stability will remain important goals unless the U.S. manages to engineer the joint evolution to defense-dominance described later in this section.

What, however, if our fondest hopes are realized, and the former Soviet Union transforms itself into a collection of states that belong to the first group? Essentially, the U.S. will once again be in control of its own survival by virtue of the disappearance of its principal adversary. Clearly, such a world would demand a radical restructuring of the U.S. strategic posture. A much smaller offensive force structure, perhaps numbering only a few hundred low-yield, accurate, survivable weapons, would suffice to provide a flexible deterrent against any coalition of small, nuclear-armed adversaries. Should Russia cease to be a worry for U.S. planners, the U.S. could even undertake deployments of highly-capable defenses unilaterally, since fears of undermining deterrence and stability will have been rendered moot.
Though the current pace of events seems a blur, such a fundamental change in the U.S.-Russia relationship will not happen overnight. At the risk of being pedantic, we wish to reiterate that a shift of such magnitude will be the work of many years. Until then, our approach is conservative and, we believe, rightly so, because the potential costs of a deterrent failure are too immense to be gambled with. Today the world is an especially uncertain place, and any nuclear war between the U.S. and Russia would be a tragedy of unparalleled proportions. The U.S. must not slacken in its efforts to avoid such a catastrophe.

**Extending Deterrence over Key Allies**

One opportunity that should be exploited now is the fact that the emphasis on extended deterrence vis-a-vis Russia can be greatly reduced. For the U.S. and its principal allies, the greatest single change in the global security environment has been the collapse of the Warsaw Pact and the end of the imminent threat of Soviet aggression against Western Europe. That change is also the one that stands the least risk of rapid reversal.

Given this state of affairs, the need for tight linkage between the U.S. strategic arsenal and deterrence of conventional aggression against NATO is substantially reduced. There is no longer any compelling need to brandish U.S. strategic nuclear weapons as an ultimate sanction against potential Russian misbehavior in Europe.

Note that we do not assert that the need for a nuclear backup to NATO's posture has vanished. Some theater nuclear capability is still needed to make clear the escalatory potential of any conflict between NATO and a nuclear-armed foe. Further, the continued deployment of a relatively large, highly capable strategic nuclear arsenal controlled by a U.S. still committed to the security of Western Europe poses an existential deterrent to aggression and remains important. We believe, however, that fulfilling this role imposes no special requirements on the U.S. strategic arsenal.

The diminished extended deterrent role is correctly viewed as an opportunity, not as a "loss of mission." It means that U.S. strategic forces no longer need to support first-strike options against the former Soviet Union. The decline of extended deterrence thereby relieves a long-standing tension with other objectives, especially first-strike stability.
Limiting Damage

It would be difficult to overemphasize this point: Today, and for the near future, there is no way to meaningfully limit the damage from a U.S.-Russian nuclear war except by limiting the scope of the war and seeking to end the conflict as swiftly as possible (bilateral damage limitation). Two key points flow from this statement.

First, limiting damage to the U.S. probably means limiting damage to Russia. The U.S. cannot hope to escape destruction unless it spares its adversary. Incentives for restraint will rapidly disappear if either side finds itself face to face with what appears to be its devastation, regardless of the other side's intent.¹

For these purposes, appearances may be as important as reality. Striking military or economic concentrations on the fringes of Russian cities, for example, will not communicate restraint if Moscow's attack assessment capability cannot discriminate finely enough to see that downtown areas are not under attack. Likewise, weapons that produce enormous damage to unintended targets will restrict U.S. attack options if the NCA wishes to avoid inadvertent destruction of Russian cities, industries, and people.

Accordingly, U.S. attack planning should take into account the limitations of Russian warning and attack assessment capabilities. It does no good to build a host of "limited" options that Moscow will be unable to perceive as such. Attacks should be sized and targeted in ways that allow the Russian leadership to understand the true purpose and extent of the strike (such attacks might be sized in the tens rather than hundreds of weapons). Implementation of this strategy will impose certain restrictions on U.S. force planning and operations, but it is a necessary step toward achieving damage limitation in a world where neither side can effectively disarm the other.

In addition, the U.S. should enhance its ability to carry out discriminate attacks. That is, the U.S. should deploy forces that can be used in small numbers against small targets without blowing up a lot of other things "accidentally." This requirement calls for low-yield, very accurate warheads on single-warhead launchers or launchers with only a few warheads. We realize that such weapons are currently not in the U.S. inventory, and that it will be many years before any such

¹The issue of limiting damage once deterrence fails is separate from that of sizing nuclear forces to underwrite central deterrence. Again, sizing against the bulk of Russian GPF assets does not mean that forces are dedicated to destroying them should war occur. Rather, these forces in wartime should support a wide range of options that help achieve bilateral damage limitation.
systems are deployed. There may be options available in the nearer term, however, that could begin moving the U.S. toward a more finely tuned retaliatory capability.\textsuperscript{2}

Second, bilateral damage limitation through war termination requires the U.S. president to engage in coercive bargaining. To this end, he must make complex, well thought-out decisions on nuclear weapons employment during a war. The quality of human decision-making tends to suffer, however, as time pressures build. Thomas Schelling wrote:

To compress a catastrophic war within the span of time that a man can stay awake drastically changes the politics of war, the process of decision, the possibility of central control and restraint, the motivations of the people in charge, and the capacity to think and reflect while war is in progress.\textsuperscript{3}

We could not agree more. In fact, slowing the expected tempo of any nuclear exchange could help ease pressures on decisionmakers both before and during a war.

Americans have long been conditioned to believe that a nuclear war will be a spasmodic affair. It is said that the president will have less than 30 minutes to make decisions, that both countries will be utterly destroyed in a matter of a very few hours, and so on. These truisms are not, however, facts of nature; they are instead predictions of human behavior. The NCA can in fact have as much time as it likes to make a choice, provided its members can survive and communicate with the forces to pass the word along, and the forces themselves survive. Giving leaders on both sides the chance to pause, think, and only then act is a vital element of any practical scheme for limiting damage.

Both the U.S. and Russia have postured their forces so as to make a large number of their weapons invulnerable to attack by the other side. Despite much effort directed at improvement over the years, however, the command, control, and communication (C3) capabilities needed to employ these forces appear to be less robust. We believe

\textsuperscript{2}Depending on technical feasibility, these might include retrofitting some later Trident D-5 SLBMs with the W-88 physics packages from retired Poseidon C-3 missiles; equipping some bombers and cruise missiles with lower-yield weapons, perhaps reusing the nuclear packages from retired nuclear artillery projectiles and tactical missiles to achieve yields in the 10-kt range; and retrofitting some Minuteman III ICBMs with smaller warheads, such as the W-88.

that this state of affairs exists at least in part because C3 improvements may have been somewhat misdirected, focusing on the perceived need to propagate the “go code” through an enormously hostile environment during or immediately after a massive nuclear attack on the U.S. Such “heroically survivable” C3 systems (i.e., those that can remain functional during an attack) are expensive, complex, and less than perfectly reliable.

Lengthening the NCA’s decision timeline from minutes to hours or even days relaxes the need for such measures. We suggest that in addition to survivable C3, attention be paid to what might be called regenerable systems—i.e., links that can be restored within hours to days after an attack. One way to implement such a scheme might involve simple proliferation of links that consist of dedicated land lines with multiple, dispersed entry nodes, numerous radio transmitters in a number of frequency bands, long-endurance drone aircraft with radio repeater payloads, and so on. We believe that although no one specific pathway could be relied on to be available during an attack, a system could be designed to provide high confidence that a link could be isolated and identified with some dispatch in the attack’s aftermath. Experience shows that decisions made in the greatest haste are often the ones most regretted. It thus seems only reasonable that the U.S. take all possible steps to “buy time” for the national leadership to reflect on the most momentous decisions any American could ever make.

In parallel with improvements to its own C3 systems, the U.S. should pursue upgrades to various links with the Russian leadership to provide enduring channels of communication in crisis and wartime. Highly selective attacks that spare Russian leaders are necessary to, but insufficient for, prompt war termination. The leaders of the two sides must have reliable communications with one another so that the coercive bargaining of attack and counterattack can be supplemented—and, it is hoped, ended—by more-direct negotiations.

The U.S. and Russia should also create an ongoing forum for peacetime consultations on crisis management issues. These discussions should involve high-level military and political figures from both sides, not only academics and low- to mid-level functionaries. Such groups could discuss Russian and American perspectives on past crises, attempt to identify new or emerging sources of friction, and play through joint “What if...?” exercises.

An argument might be put forward that implementing our recommendations for prompt conflict termination would make conflict more palatable and hence more likely. We would argue that, so long as an
adequate deterrent posture is maintained, an opponent contemplating a first strike cannot be certain that attacking the U.S. would not result in the flattening of his country: the U.S. ability to obliterate any enemy will remain unquestionable regardless of declared U.S. intent. An adversary must base his decision on what he perceives his opponent can do, not on how the adversary would like the war to play out once it is under way. Thus, we believe that the support of options for prompt war termination in no way affects the U.S. ability to deter.

**Targeting in Nuclear War**

In addition to our belief in the diminished need for extensive first-strike counter-nuclear attack options, we believe that the U.S. should de-emphasize second-strike counter-nuclear targeting. We propose this approach for three reasons. First, building up a capability to exhaustively attack Russian strategic offensive forces could reduce first-strike stability by undermining Moscow’s confidence in its ability to retaliate effectively after a U.S. attack. Given that a core U.S. objective is to maintain or enhance first-strike stability, emphasizing counter-nuclear options appears contrary to American interests.

Second, a truly credible counter-nuclear option would require the ability to destroy Russia’s mobile strategic forces, both land and sea based. Technically, this nut is difficult to crack, and any solution is bound to be expensive. Given that Russian forces are becoming increasingly mobile, a smaller and smaller fraction of their forces will over time be vulnerable to prompt attack. What would be the point of destroying these few weapons, principally silo-based ICBMs, when their destruction can neither meaningfully limit damage to the U.S. nor significantly limit the attack options available to the Russians?

Finally, most of the weapons that could be attacked can also be launched out from under attack. To the extent that the Russians can discriminate a large-scale counter-nuclear attack from any other variety, such a strike would seem likely to increase rather than decrease the number of nuclear weapons landing on U.S. territory, since the Russians could launch their silo-based weapons prior to the arrival of U.S. RVs. Adding incentives for the Russians to use these warheads,

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4The difficulty coalition forces had in tracking down Saddam Hussein’s Scud launchers in a relatively small country without effective air defenses should shed some light on the challenge U.S. forces would face if attempting to locate road-mobile SS-25s deep inside Russia. ASW technology apparently still awaits the breakthrough that will render SSBNs genuinely vulnerable to timely and systematic destruction.
regardless of their targets, certainly goes against the principal U.S. wartime aim of limiting damage.

We are aware that many of the weapons in the U.S. strategic arsenal have some counter-silo capability. The U.S. thus holds these targets at risk and thereby perhaps reaps some deterrent benefit in Russian eyes. Nonetheless, should the U.S. ever decide to replace these weapons, it should consider doing so with smaller-yield devices that pose less of a threat to Russian ICBMs. In the meantime, U.S. targeting doctrine and declaratory policy should de-emphasize second-strike counter-nuclear targeting.

The U.S. might incorporate small counter-nuclear strikes in its war plans to shore up options for coercive bargaining. It is possible (if, in our view, highly unlikely) that the actual circumstances of any nuclear war could make strikes on some Russian strategic forces desirable. However, targets should be limited to those that cannot immediately launch nuclear strikes against the U.S.—e.g., weapon storage facilities, empty mobile missile garrisons, and SSBN ports known to be devoid of launchable SLBMs. Again, the purpose of these attacks is not to limit damage to the U.S. homeland, for no second-strike counter-nuclear options can accomplish that. Instead, their purpose is to aid in signaling U.S. intentions to Russia and negotiating an end to the war.

We likewise feel that the U.S. should eschew attacks on the Russian leadership in other than a final, massive retaliatory strike launched in response to an all-out Russian attack on the U.S. Two arguments are commonly made in support of counter-leadership targeting. First, there is a desire to “decapitate” Russian C2 in the hope that strikes on the U.S. can thus be prevented or greatly reduced in magnitude. Second, some believe that Russian leaders are more strongly deterred by a U.S. force posture that puts their lives at risk.

The decapitation argument is valid, so far as it goes. Unfortunately, its principal unspoken assumption, that an attack on Russian leaders would in fact blunt retaliation, is a weak reed. Even if the U.S. acquired the weaponry needed to effectively target the full spectrum of Russian leadership targets (including earth-penetrating warheads to destroy deep underground command posts), uncertainty over the location of key leaders, as well as the redundancy presumably built into Russian C2, makes it highly unlikely that even a well-executed U.S. strike could sever the link between the opponent’s leadership and his strategic forces. Eliminating the very people with whom war termination might be arranged in a probably futile attempt to prevent a devastating Russian counterblow would be a very poor gamble.
We concede that threatening to kill Russian leaders probably adds to central deterrence. The question is, how much? The most basic deterrent threat is destruction of their nation, their economy, their way of life—in essence, their world. This threat alone is sufficiently awesome to influence most mortals, so spending money and risking marginal decreases in stability\(^5\) in order to enhance the threat seems to us to be gilding the lily.

Related to counter-leadership targeting are strikes against the opponent's early warning and attack assessment capabilities—his eyes and ears. Rendering the Russian leaders blind and deaf runs counter to terminating the war if it leads them to misread U.S. attacks intended to be discriminate.

One final note about targeting is that the U.S. should stop pretending that the target category called "war-supporting industry" is anything but a euphemism for Russian cities. A substantial portion of the Russian industrial base is, quite naturally, located in and on the outskirts of big cities. Any effort to attack a sizable portion of these targets must lead to severe damage in urban areas. The fact that the U.S. may be aiming at factories in the outskirts rather than at the downtown area is largely irrelevant, given the yield of existing and planned U.S. weapons. Further, the ability of the Russians to discriminate attacks on urban fringes from strikes on cities proper is probably very limited. "Collaterally" blowing up Russian cities, or even appearing to attack them, is a recipe for bringing societal destruction upon the U.S. The U.S. can destroy Moscow and other large Russian cities only once, so it had better mean it or not do it at all.

U.S. planners will still be left with a number of economic assets to hold at risk that are located away from heavily populated areas. Under some circumstances, striking remote hydroelectric plants, rail hubs, and petroleum storage sites (to name but a few) may be highly useful as a way of signaling intent during a nuclear war without creating massive casualties.

Clearly, the targeting of U.S. strategic offensive forces must be in harmony with changes in the composition of the former Soviet empire. Republic withholds should be implemented and highlighted within U.S. operational plans. Some areas, such as the Baltic re-

\(^5\)The same mechanism operates here as in the earlier discussion of counter-nuclear targeting: a credible U.S. threat to decapitate Russian strategic forces would increase Moscow's first-strike incentives in any crisis in which the use of nuclear weapons seemed a real possibility.
publics, might even be removed from target lists altogether as Russian military forces withdraw.

Arms Control and National Objectives

The U.S.-Russian summit agreement of June 1992 calls for unprecedented reductions in the strategic nuclear arsenals of the U.S. and the former Soviet Union. It would require strategic arsenals to be drawn down by approximately 70 percent, to levels of 3000 to 3500 actual inventory weapons. At the time of this writing, neither party had yet ratified the less ambitious START Treaty, a process which has not kept up with the flurry of proposals for deeper cuts during the first half of 1992.

Reductions in nuclear arms are almost universally seen as good by the public at large. The belief is widespread that arms reductions will enhance "stability" between the U.S. and Russia without eroding the robustness of the U.S. deterrent, and will foster savings in the defense budget. Taking these assertions for granted promotes uninteresting and somewhat irrelevant debates on how to structure strategic forces within the constraints of a given treaty.

*Arms control may be a means to an end, but it is not an end in and of itself.* It is merely one way of helping manage the nuclear environment. Arms control proposals and agreements should bear a clear relationship to important U.S. security objectives, such as avoiding inadvertent war or reducing arms-race pressures.

For example, though the drawdown to 3000 to 3500 weapons is now almost a given, nowhere have we seen persuasive analytic arguments that justify this number versus, say, 5000, 1000, or 50. The number appears to have been derived by halving the START Treaty's limit of 6000 accountable warheads, which itself was arrived at by cutting the superpowers' nominal 12,000-weapon inventories in half. Such decisions are too important to be made by choosing round numbers. *The size of the U.S. strategic inventory should be determined by measuring the adequacy of alternative postures for supporting relevant national objectives.* We have not seen any such assessments made in connection with the new reduction pact. They should be undertaken and the results well understood before an agreement is reached.

Finally, in considering potential reductions beyond those of the START Treaty, analysts have been asking, *How much is enough?* This question is valid, and we devote a good part of our methodological work to addressing it. Once the answer is determined, however, *achieving it should not be a goal of our arms reduction proposals.* It is
not in the U.S. interest to sit on a precipice below which the Russian temptation to strike first may dramatically increase, or to put Russia in a parallel predicament. Some cushion should be built into both sides' force structures, the idea being to put some space between that cliff and where the U.S. and Russia are standing. This is particularly true in light of the comparatively modest cost of maintaining currently deployed strategic nuclear forces. Reductions per se are of little value.

In light of our analysis, we cannot vouch for “deep cuts” below the 4700 or so inventory weapons proposed by President Bush in January 1992. In our view, such cuts potentially endanger the U.S. ability to achieve its core objectives and should be avoided at this time. We are not arguing against a reduction to 3000 to 3500 in the near future, but merely advising that analysis of U.S. requirements in the presence of world developments be given time to catch up. Perhaps focusing for now on defining the proper niche for BMD, rather than further reductions in offensive arms, would be a more fruitful track to follow in arms control talks with Moscow. The need to protect U.S. troops and allies abroad from ballistic missile attack should provide a sufficient impetus.

The combined effects of reduced arsenals and lower alert rates on deterrence and stability argue for great caution in how the U.S. treats the ABM Treaty. The U.S. certainly should not abandon it. Moreover, if the U.S. is to continue on the road to deeper offensive force reductions, any potential amendments to the ABM Treaty must be carefully crafted to ensure tight limits on defense deployments.

**STRATEGIC DEFENSES IN AN OFFENSE-DOMINANT WORLD**

The issue of deploying strategic (homeland) defenses, particularly those against ballistic missiles, has grown in prominence in recent years and shows no sign of diminishing in importance in the near future. The articulated purpose of such a defense has ranged from increasing the survivability of strategic nuclear forces to protecting the entire nation against a large-scale attack. Most recently, the focus has been on protecting the nation against small ballistic missile attacks—i.e., unauthorized Russian attacks, accidental launches, and attacks by nth countries.
Deploying Defenses to Limit Damage in a Large-Scale Nuclear War

What of deploying robust strategic defenses in order to limit damage should war with Russia occur? To support the case for a robust, damage-limiting defense, some observers point to the lessons of the Persian Gulf War, in which the Patriot missile purportedly rendered Iraq's Scud missiles ineffective militarily, psychologically, and politically.

However, knocking down a handful of Scuds with Patriot missiles is a far cry from defeating an attack of hundreds or thousands of ICBM and SLBM warheads, both technically and strategically. It must be borne in mind that the capabilities the U.S. acquires for pursuing its wartime objectives can adversely affect the attainment of peacetime goals. In an offense-dominant world, avoiding nuclear conflict with Russia is the key to ensuring U.S. survival. Fielding defenses for damage limitation in such an environment undercuts central deterrence and first-strike stability, the two pillars on which war avoidance rests.

Defending Against Unauthorized or Accidental Ballistic Missile Attack by Russia

Instability in Russia has given rise to fears of Russian accidental launches or unauthorized ballistic missile attacks. Many observers view limited homeland BMD—i.e., BMD that can reliably defeat an attack of up to a couple hundred warheads—as the most logical solution to this problem. While these observers could turn out to be right, the timing may be wrong. An adequate nationwide defense against limited attacks could not be in place before the late 1990s at the earliest. What if the more extreme sources of instability in Russia play themselves out in the next two or three years?

In addition to considering defenses, therefore, the U.S. should act with Moscow to eliminate the least-secure elements of the Russian nuclear arsenal and enhance the security of remaining weapons as soon as possible. Doing so could mean sharing operational-safety technology (such as permissive-action links) and security techniques and procedures, decoupling nuclear from conventional forces, assisting in the development of reliable C3 systems, and so forth.

Further, the two sides should investigate new means of preventing accidents, such as installing command-destruct packages on all missiles. Such systems could probably be installed quickly (some Russian missiles may already possess this feature) and cheaply. If
the U.S. is truly concerned about accidental or unauthorized use of nuclear weapons, it should take steps designed to enhance their security.

**Defending Against Deliberate Ballistic Missile Attack by Nth Countries**

Proliferation of weapons of mass destruction and the means of delivering them worries the U.S. for two primary reasons. First, of course, the U.S. ultimately wants to avoid the devastation that even one nuclear weapon could wreak on a U.S. city or U.S. ally. Second, and related, the U.S. president wants to be free to act as necessary in defense of U.S. interests abroad—i.e., he does not want to be deterred from intervening in regional conflicts. The U.S. has three complementary options for dealing with proliferation: prevention, deterrence, and defense.

Preventing the spread of nuclear weapons and technology has long been a centerpiece of U.S. policy. While not uniformly successful, technology-control regimes, export restrictions, and support for international atomic energy control agencies are all worthwhile undertakings. The U.S. government should continue to oppose nuclear proliferation, but it must also accept that some growth in the “nuclear club” is probably inevitable. It should therefore be prepared to manage the dangers of a proliferated world just as it once endeavored to deal with the pitfalls of the U.S.-Soviet deterrent standoff.

So long as it is possible to smuggle a bale of marijuana into New York City, the U.S. will not be able to protect itself against all means of delivering nuclear weapons. Therefore, it must threaten a devastating response against potential attackers, up to and including the use of nuclear weapons. Deterrence with nuclear weapons must remain an important component in U.S. relations with all potential nuclear-armed adversaries.

Although the U.S. will always want to deter anyone from attacking it, deterrence may not suffice in a crisis with an nth country. To be deterred, an actor must feel he has something left to lose. Leaders of a small power may well believe that their survival, and that of their nation, is at stake as soon as they choose to confront the U.S., even if Washington’s nuclear arsenal is left out of the equation. Thus, they may perceive that there is little else to lose, and perhaps much to gain, by threatening to use nuclear weapons against either the U.S., its allies, or its expeditionary forces. Indeed, precisely because they
feel they have little left to lose, they may attempt to deter the U.S. from intervening by brandishing nuclear weapons.

The U.S. should cope with this dilemma on at least two fronts. First, it should acquire and attempt to legitimize, both domestically and internationally, a policy of preventive attack with conventional weapons against a smaller opponent’s nuclear capability in the event of a crisis. It is clearly foolish to allow a small foe the first shot if it is likely to be a nuclear one and he is indifferent to the kinds of calculations that have allowed the two superpowers to maintain a peaceful coexistence over the years. If a crisis with a small nuclear power should appear to be in imminent danger of turning into war, and particularly if the adversary’s weapons threaten U.S. forces or allies, the U.S. president should have at his disposal conventional options to eliminate, or at least blunt, the enemy’s nuclear arrows. A combination of surveillance systems and long-range—perhaps stealthy—bombers armed with accurate conventional weapons would be ideal for this mission.

In the event that preventive attack is either politically infeasible or fails to totally eradicate the enemy’s nuclear arsenal, however, the U.S. should have effective means of defending its forces and allies overseas against theater ballistic missile and cruise missile attacks. As demonstrated in the Gulf War, missiles are already a weapon of choice against U.S. allies and expeditionary forces. Defense against these weapons, particularly those carrying nuclear, biological, and chemical (NBC) payloads—is needed to protect allied populations and facilities and to ensure the survival of U.S. forces. Theater BMD will allow the U.S. to continue acting decisively in defense of its overseas interests even if an opponent is armed with NBC weapons and ballistic missiles. Such flexibility is the hallmark of a superpower.

Today and for some years to come, this ballistic missile threat will be a far more pressing problem than the nth-country threat to the U.S. homeland. Deploying BMD now to protect the U.S. against this threat is premature and suggests a one-dimensional view of the problem. Nth-country ballistic missiles that could reach U.S. territory are many years away, and they will likely be highly vulnerable to conventional attack. The more immediate ballistic missile threat is to U.S. forces abroad and allies, and even to Russia. Moreover, easier, less conspicuous methods of delivering weapons of mass destruction may make the ballistic missile the least likely form of NBC delivery. Ultimately, the treatment of this problem will revolve not only around defense, but also around deterrence and prevention.

The nth-country ballistic missile threat to various parts of Russia exists today and is likely to grow far faster than the still-theoretical one
to the U.S. This Russian vulnerability, along with the greater territorial expanse of Russia and its associated (or disassociated) republics compared to that of the U.S., means that any renegotiation of the ABM Treaty to allow for thin BMD may well involve a demand by the Russians for asymmetric deployment levels in their favor. Our work suggests that modest asymmetries (a defense potential of 200 for the U.S., 500 for the Russians) do not seem particularly invidious to U.S. interests. That is, there appear to be few cases in which a posture that meets the test of deterrent adequacy at the 200/200 level is inadequate at 200/500. The effects of such asymmetries on first-strike stability also seem less than dangerous.

Obviously, we have only begun exploring the implications of such unbalanced deployments. Our current assessment, however, is that Russian demands for modest advantages in BMD capability should at least be negotiable.

TO A DEFENSE-DOMINANT WORLD?

We have demonstrated that there is no “optimal mix” of U.S.-Russian offenses and defenses that involves large strategic nuclear forces combined with relatively robust BMD. Only two situations are optimal for U.S. interests and objectives: offense dominance (i.e., powerful offenses numbering, at a minimum, several thousand strategic nuclear weapons with defenses constrained to low potentials) and the inverse, defense dominance. This report focuses on living more securely in an offense-dominant world. With the rapidly changing face of the former Soviet Union and the push for deeper reductions, however, two questions arise: Why keep whittling away at the offense-dominant world through deeper and deeper reductions? Why not foster a fundamental change in the strategic landscape and get rid of offensive nuclear weapons altogether?

Defense Versus Offense

In his famous Star Wars speech of 1983, then President Reagan asked the rhetorical question, “Wouldn't it be better to save lives than to avenge them?” At that time, he framed the challenge in terms of national security objectives:

My predecessors in the Oval Office have appeared before you on other occasions to describe the threat posed by Soviet power and have proposed steps to address that threat. But since the advent of nuclear weapons, those steps have been increasingly directed toward deterrence of aggression through the promise of retaliation. ... What if free people
could live secure in the knowledge that their security did not rest upon
the threat of instant retaliation to deter a Soviet attack, that we could
intercept and destroy strategic ballistic missiles before they reached our
own soil or that of our allies?  

The former president suggested that deterrence be replaced with pro-
tection. The idea was to deny an opponent the ability to destroy the
U.S. by preventing his nuclear weapons from reaching their U.S. tar-
gets. In a strategic sense, Reagan's goal was to transfer control of
U.S. national survival from Russian hands to American ones—i.e., to
achieve assured survival, especially with regard to ballistic missiles,
by moving to a world in which the defense would dominate the off-
ense.

In retrospect, the offense-dominant world has been relatively safe.
Attaining defense dominance against limited attacks (unauthorized
attacks, accidental launches, and deliberate nth-country strikes) does
not preclude a continued offense-dominant relationship overall vis-a-
vis Russia. However, the prospect of bringing U.S. survival under
U.S. control without waiting for a totally benign U.S.-Russian relation-
ship to emerge is powerfully attractive. If there indeed exists a
choice between continuing to live with the Russians in an offense-
dominant world and building a new foundation for the strategic relation-
ship on the basis of defense dominance, which is preferable?

We believe that this debate is worth having in light of changes in the
security environment. Rather than offering a definitive answer, we
pose a number of relevant questions in an effort to frame the debate:

• Once the U.S. has achieved dominance over ballistic missiles, will
it want to do the same with regard to bombers and other "air
breathers?" True defense dominance requires an affirmative an-
swer, yet the U.S. ability to use air breathers for conventional
power projection could be jeopardized. Also, 50 years of experience
suggests that mounting an effective defense against manned
bombers is a daunting challenge: despite great efforts, such a de-

• How can the U.S. suppress instabilities that might arise in a de-
fense-dominant world? The potential utility of antisatellite attacks
against space-based components of a strategic defense architecture
and concentrated strikes against single-point failure nodes on the

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6Ronald Reagan, "Address by the President to the Nation," March 23, 1983, Office of
the Press Secretary, The White House, pp. 7–8.
ground could spur an arms race in defense-suppression capabilities.

- Must other countries be included in any U.S.-Russian scheme for defense dominance? The interests of such close U.S. allies as Britain and France, which possess their own strategic nuclear forces, will be at stake.

Possible Path to a Defense-Dominant World

If the debate comes down on the side of defense dominance, a cooperative transition to that state with regard to ballistic missiles can be envisioned without contradicting the main goals of maintaining central deterrence and first-strike stability. One possible path can be summed up as follows:7

1. Implement the START Treaty but go no further. Favor survivable postures.
2. Modify the ABM Treaty to allow U.S. and Russian deployments of strategic nationwide BMD not to exceed a defense potential of around 200 to 500. Agree to keep air defenses at the level required to maintain sovereignty against nth-country or unauthorized attacks with air breathers.8 Ban nuclear-armed sea-launched cruise missiles (SLCMs).
3. Deploy U.S. and Russian BMD to the level allowed under the amended ABM Treaty.
4. Quickly and reliably dismantle U.S. and Russian offensive ballistic missiles to zero or near zero.

Because thin homeland BMD and reductions that go deeper than START constraints may be largely incompatible, it is extremely important to maintain highly survivable retaliatory postures during the early phases of the transition to defense dominance. Central deterrence and first-strike stability will remain potentially crucial to avoiding war. Since this scenario already assumes U.S.-Russian accord on

7The agenda for achieving defense dominance is based on one proposed by former President Reagan in his National Security Strategy of the United States, The White House, January 1987, p. 25. His agenda was to reduce arsenals by 50 percent, reduce ballistic missiles to zero, and deploy strategic defenses. Reagan’s proposal has merit and deserves debate, but has largely been ignored in the national dialogue over strategic defenses.

8This stipulation would require substantial unilateral cuts on the part of the Russians.
attaining defense dominance, there would be no reason to cut offensive arms below START levels until the two sides have installed their complete BMD systems.

In step 2, the two nations would amend the ABM Treaty to permit deployment of low levels of BMD. Why choose defense potentials of 200 to 500? So long as there is U.S. and Russian adherence to the recommendations in step 1, such defenses would protect each nation from limited attacks without seriously reducing central deterrence and first-strike stability. Moreover, these levels of defense potential would serve as a hedge against cheating after zeroing ballistic missiles.9

To ensure a minimal effect on the core objectives, the U.S. and Russia should agree not to enhance their air defense capabilities during the transition from offense to defense dominance. Bombers would play a significant role in ensuring the retaliatory capability of each side and thereby would help maintain first-strike stability in this world of zero ballistic missiles. Nuclear-armed SLCMs (especially the stealthy variants) should be banned so as not to threaten the survivability of bombers on strip alert. An alternative to such a ban, enhancing ASW capabilities, is more costly and may hurt first-strike stability by increasing the threat to SSBNs during the first part of the transition.

Upon ratification and implementation of the accords, the superpowers could begin deploying homeland BMD as agreed. Once each side was satisfied that an agreed level of defenses was in place on both sides, offensive ballistic missiles could be dismantled quickly. As long as bomber survivability and penetrability are maintained at high levels, serious erosion in the ability to achieve core objectives can be avoided.

Implementing this agenda would eliminate the threat of ballistic missiles and could constitute the first phase in an attempt to gain assured survival. Transferring complete control of U.S. survival to U.S. hands would involve a similar transition for cruise missiles and bombers. As we noted earlier, however, defense against such systems is a more difficult job than defeating ballistic missiles. In fact, given the inherent potential of conventional bombers, military airlift aircraft, and even civil airliners to be converted into long-range bombers, comprehensive controls on air-delivered nuclear weapons may be unachievable.

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9Owing to the existence, and potential existence, of other, smaller nuclear powers, the U.S. and Russia may choose to reduce their nuclear ballistic missile arsenals to very small but still nonzero levels rather than eliminate them altogether.
6. CONCLUDING REMARKS

The emerging security environment presents both challenges and opportunities for planners and decisionmakers in the realm of strategic forces. The "prime directive" of U.S. strategic policy—to provide a robust deterrent while managing the environment that nuclear weapons create—should now be easier to meet than it was in the Cold War era. Moreover, a top-down review of wartime objectives that seeks to strengthen first-strike stability at the expense of credible first-use options and that emphasizes damage limitation through escalation control and prompt war termination can lead to greater harmony between peacetime and wartime goals.

Our numerical estimates may seem absurdly high to some people. It should be recognized, however, that we are proposing an upper limit of sorts on force size. We are not claiming that reductions beyond this level would lead to war or be otherwise disastrous; our analysis simply will not allow us to vouch for the adequacy of a smaller force. Further work may establish that fewer, perhaps many fewer, weapons will suffice. Again, we would view such an outcome with equanimity, provided that it emerges from a serious intellectual effort that relates means and ends in a logical and coherent way. This report surely will not be the last word in this regard.

As was noted in Section 3, much strategic analysis is done in a highly quantitative way, using sophisticated computer models, detailed target bases, and precise weapons characteristics. Such analysis cannot be done in a vacuum. To be useful, it must be tied clearly and logically to the appropriate national objectives.

At bottom, the problem is fuzzy. Much if not most of what goes into understanding and achieving objectives such as central deterrence and crisis stability lies in the realm of psychology, not operational analysis or engineering. In the final analysis, the problem being addressed is how to affect the thinking and choices of decisionmakers about whom rather little is known. If much of the analysis of strategic concepts is then no more precise than psychoanalysis, should that be surprising? Indeed, much of the inspiration for this work arose from a suspicion that a cult of spurious precision had arisen in the analytic community. Problems that can hardly be cogently articulated are being answered to three decimal places. Techniques for manipulating numbers advance at dizzying speeds, leaving in the dust the strategic thinking upon which they should depend.
Detailed analyses are tremendously useful and powerful tools, provided they are clearly linked to a meaningful question or set of questions. We set out to define such an agenda—i.e., to postulate a way of thinking about strategic forces in the post–Cold War world. Without such a framework, more detailed studies would be lacking the context needed to render them meaningful. We have no wish to denigrate such undertakings; we wish only to remind the community that truth does not always lie to the right-hand side of the decimal point.

Times such as these require a return to first principles, and this necessity has guided our analysis. Of course, it is entirely possible that in a few years, U.S. relations with the former Soviet Union and the rest of the world will have evolved to a point from which our thinking, in retrospect, will appear short sighted and anachronistic. So be it. We will welcome this day if and when it comes.

For now, if asked to summarize our position in a sentence, it would probably be, Keep your powder dry, and stay tuned for further developments. This is a time of great change in the world, resulting in great confusion. The most profound interest of the U.S. is that the unacceptability of nuclear war remain the single least ambiguous element in the rapidly changing geopolitical landscape.
Appendix A

U.S. AND RUSSIAN STRATEGIC OFFENSIVE FORCE STRUCTURES

This appendix details the force structures evaluated in the body of this report. In each of the 12 tables provided, specific delivery systems—divided into ICBMs (MM stands for Minuteman and SICBM stands for small ICBM), SLBMs, and bombers (ALCM stands for air-launched cruise missile)—are listed in the left-most column. Numbers of launchers, weapons per launcher, and total weapons in the inventory appear for each delivery system. Numbers of on-line weapons (those not under repair or in overhaul) are also provided. We assume that 90 percent of all missile submarines, bombers, and mobile ICBMs are available as on-line systems, and that all silo-based ICBMs are on line.

Tables A.3, A.4, and A.5 detail structures relating to the START accords (structures II and III). These tables contain an additional column, “START weapons,” that provides numbers of weapons accountable under the treaty. The difference between the numbers in this column and those in the “inventory weapons” column is due to the counting rules for bombers. For example, penetrating bombers (those with short-range bombs that must penetrate the opponent’s air defenses) are counted as one weapon even though they can deliver a payload of 10 to 20 weapons.
### Table A.1

<table>
<thead>
<tr>
<th>System</th>
<th>Launchers</th>
<th>Weapons/Launcher</th>
<th>Inventory Weapons</th>
<th>On-Line Weapons</th>
</tr>
</thead>
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<td></td>
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<td>1,500</td>
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<tr>
<td>MX</td>
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<td>10</td>
<td>500</td>
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<td>SLBM</td>
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<td>C3</td>
<td>176</td>
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<td>1,760</td>
<td>1,600</td>
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<td>3,072</td>
<td>2,752</td>
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<td>D5</td>
<td>48</td>
<td>8</td>
<td>384</td>
<td>384</td>
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<td><strong>Total missiles</strong></td>
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<td><strong>7,186</strong></td>
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<tr>
<td>Bombers</td>
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<td></td>
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<td>B-52G/ALCM</td>
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<td>1,200</td>
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<tr>
<td>B-52H/ALCM</td>
<td>95</td>
<td>16</td>
<td>1,520</td>
<td>1,376</td>
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<tr>
<td>B-1B</td>
<td>97</td>
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<td>1,392</td>
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<td><strong>Total bombers</strong></td>
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<td>Totals</td>
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Table A.2

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<th>On-Line Weapons</th>
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<td>3,080</td>
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<td>1,620</td>
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<tr>
<td>SS24/silo</td>
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<td>10</td>
<td>600</td>
<td>600</td>
</tr>
<tr>
<td>SS24/rail</td>
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<td>10</td>
<td>360</td>
<td>320</td>
</tr>
<tr>
<td>SS25/road</td>
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<td>300</td>
<td>270</td>
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<td>SLBMs</td>
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<td>448</td>
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<td>Bombers</td>
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<td>720</td>
<td>648</td>
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### Table A.3

**Structure II: Unmodernized U.S. Force Structure Under START**

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<th>Launchers</th>
<th>Weapons/Launcher</th>
<th>Inventory Weapons</th>
<th>On-Line Weapons</th>
<th>START Weapons</th>
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<td>ICBMs</td>
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<tr>
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<td>SLBMs</td>
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<td></td>
<td></td>
</tr>
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<td>1,344</td>
<td>1,536</td>
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<tr>
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<td>1,728</td>
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<td>95</td>
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<td>224</td>
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### Table A.4

**Structure III: Modernized U.S. Force Structure Under START**

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<th>On-Line Weapons</th>
<th>START Weapons</th>
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<tr>
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<td>194</td>
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<td>500</td>
<td>450</td>
<td>500</td>
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<tr>
<td>SLBMs</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td>1,344</td>
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<td>Bombers</td>
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<td></td>
</tr>
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<td>Weapons/ Launcher</td>
<td>Inventory Weapons</td>
<td>On-Line Weapons</td>
<td>START Weapons</td>
</tr>
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<td>-----------</td>
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<td>-----------------</td>
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</tr>
<tr>
<td>ICBMs</td>
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<td>1,540</td>
<td>1,540</td>
</tr>
<tr>
<td>SS24/silo</td>
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<td>600</td>
<td>600</td>
<td>600</td>
</tr>
<tr>
<td>SS24/rail</td>
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<td>360</td>
<td>320</td>
<td>360</td>
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<tr>
<td>SS25/road</td>
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<td>662</td>
<td>736</td>
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<td>800</td>
<td>960</td>
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### Table A.6
**Structure IV: U.S. Force Structure, 4700**
**Actual Weapons**

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<th>Weapons/Launcher</th>
<th>Inventory Weapons</th>
<th>On-Line Weapons</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICBMs</td>
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<td></td>
</tr>
<tr>
<td>MM3</td>
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<td>500</td>
</tr>
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<td>SLBMs(^b)</td>
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<td></td>
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<td>768</td>
<td>672</td>
</tr>
<tr>
<td>D5</td>
<td>96</td>
<td>4</td>
<td>384</td>
<td>384</td>
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<tr>
<td>D5</td>
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<td>1,152</td>
<td>960</td>
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<td>Total missiles</td>
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<td>2,516</td>
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<td>Bombers</td>
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</tr>
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<td>1,400</td>
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<td>4,684</td>
<td>4,204</td>
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</table>

\(^a\)President Bush's 1992 proposal.

\(^b\)Assumes 12 C4 or D5 SLBMs per boat, 18 boats total.

### Table A.7
**Structure IV: Russian Force Structure, 4700**
**Actual Weapons**

<table>
<thead>
<tr>
<th>System</th>
<th>Launchers</th>
<th>Weapons/Launcher</th>
<th>Inventory Weapons</th>
<th>On-Line Weapons</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICBMs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SS25/silo</td>
<td>300</td>
<td>1</td>
<td>300</td>
<td>300</td>
</tr>
<tr>
<td>SS25/road</td>
<td>600</td>
<td>1</td>
<td>600</td>
<td>540</td>
</tr>
<tr>
<td>SLBMs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SSN20</td>
<td>200</td>
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<td>800</td>
<td>720</td>
</tr>
<tr>
<td>SSN23</td>
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</tr>
<tr>
<td>Bear-H/ALCM</td>
<td>60</td>
<td>16</td>
<td>960</td>
<td>864</td>
</tr>
<tr>
<td>Blackjack</td>
<td>20</td>
<td>16</td>
<td>320</td>
<td>288</td>
</tr>
<tr>
<td>Total bombers</td>
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<td>1,280</td>
<td>1,152</td>
</tr>
<tr>
<td>Totals</td>
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<td></td>
<td>4,068</td>
<td>3,672</td>
</tr>
</tbody>
</table>
### Table A.8
Structure V: Modernized U.S. Force Structure, 4000
Actual Weapons

<table>
<thead>
<tr>
<th>System</th>
<th>Launchers</th>
<th>Weapons/ Launcher</th>
<th>Inventory Weapons</th>
<th>On-Line Weapons</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICBMs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MM4</td>
<td>212</td>
<td>1</td>
<td>212</td>
<td>212</td>
</tr>
<tr>
<td>SICBM/road</td>
<td>300</td>
<td>1</td>
<td>300</td>
<td>270</td>
</tr>
<tr>
<td>SLBMs*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C4</td>
<td>72</td>
<td>8</td>
<td>576</td>
<td>480</td>
</tr>
<tr>
<td>D5</td>
<td>144</td>
<td>8</td>
<td>1,152</td>
<td>1,056</td>
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<tr>
<td>Total missiles</td>
<td>728</td>
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<td>2,240</td>
<td>2,018</td>
</tr>
<tr>
<td>Bombers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B-1B</td>
<td>60</td>
<td>16</td>
<td>960</td>
<td>864</td>
</tr>
<tr>
<td>B-2A</td>
<td>50</td>
<td>16</td>
<td>800</td>
<td>720</td>
</tr>
<tr>
<td>Total bombers</td>
<td>110</td>
<td></td>
<td>1,760</td>
<td>1,584</td>
</tr>
<tr>
<td>Totals</td>
<td>838</td>
<td></td>
<td>4,000</td>
<td>3,602</td>
</tr>
</tbody>
</table>

*Assumes 12 C4 or D5 SLBMs per boat, 18 boats total.

### Table A.9
Structure V: Russian Force Structure, 4000
Actual Weapons

<table>
<thead>
<tr>
<th>System</th>
<th>Launchers</th>
<th>Weapons/ Launcher</th>
<th>Inventory Weapons</th>
<th>On-Line Weapons</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICBMs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SS24/silo</td>
<td>120</td>
<td>5</td>
<td>600</td>
<td>600</td>
</tr>
<tr>
<td>SS24/rail</td>
<td>100</td>
<td>5</td>
<td>500</td>
<td>450</td>
</tr>
<tr>
<td>SS25/road</td>
<td>668</td>
<td>1</td>
<td>668</td>
<td>601</td>
</tr>
<tr>
<td>SLBMs*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SSN20</td>
<td>60</td>
<td>6</td>
<td>360</td>
<td>300</td>
</tr>
<tr>
<td>SSN23</td>
<td>208</td>
<td>4</td>
<td>832</td>
<td>768</td>
</tr>
<tr>
<td>Total missiles</td>
<td>1,156</td>
<td></td>
<td>2,960</td>
<td>2,719</td>
</tr>
<tr>
<td>Bombers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bear-H/ALCM</td>
<td>24</td>
<td>16</td>
<td>384</td>
<td>352</td>
</tr>
<tr>
<td>Blackjack</td>
<td>41</td>
<td>16</td>
<td>656</td>
<td>592</td>
</tr>
<tr>
<td>Total bombers</td>
<td>65</td>
<td></td>
<td>1,040</td>
<td>944</td>
</tr>
<tr>
<td>Totals</td>
<td>1,221</td>
<td></td>
<td>4,000</td>
<td>3,663</td>
</tr>
</tbody>
</table>

*Assumes 10 SSN20 SLBMs per Typhoon boat.
### Table A.10

**Structure VI: Unmodernized U.S. Force Structure, 3000 Actual Weapons**

<table>
<thead>
<tr>
<th>System</th>
<th>Launchers</th>
<th>Weapons/ Launcher</th>
<th>Inventory Weapons</th>
<th>On-Line Weapons</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICBMs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MM3</td>
<td>70</td>
<td>3</td>
<td>210</td>
<td>210</td>
</tr>
<tr>
<td>MM4</td>
<td>186</td>
<td>1</td>
<td>186</td>
<td>186</td>
</tr>
<tr>
<td>SLBMs*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C4</td>
<td>36</td>
<td>8</td>
<td>288</td>
<td>288</td>
</tr>
<tr>
<td>D5</td>
<td>132</td>
<td>8</td>
<td>1,056</td>
<td>960</td>
</tr>
<tr>
<td>Total missiles</td>
<td>424</td>
<td></td>
<td>1,740</td>
<td>1,644</td>
</tr>
<tr>
<td>Bombers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B-52H/ALCM</td>
<td>19</td>
<td>20</td>
<td>380</td>
<td>340</td>
</tr>
<tr>
<td>B-1B</td>
<td>40</td>
<td>16</td>
<td>640</td>
<td>576</td>
</tr>
<tr>
<td>B-2A</td>
<td>15</td>
<td>16</td>
<td>240</td>
<td>224</td>
</tr>
<tr>
<td>Total bombers</td>
<td>74</td>
<td></td>
<td>1,250</td>
<td>1,140</td>
</tr>
<tr>
<td>Totals</td>
<td>498</td>
<td></td>
<td>3,000</td>
<td>2,784</td>
</tr>
</tbody>
</table>

*aAssumes 12 C4 or D5 SLBMs per boat, 18 boats total.*

### Table A.11

**Structure VII: Modernized U.S. Force Structure, 3000 Actual Weapons**

<table>
<thead>
<tr>
<th>System</th>
<th>Launchers</th>
<th>Weapons/ Launcher</th>
<th>Inventory Weapons</th>
<th>On-Line Weapons</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICBMs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MM4</td>
<td>162</td>
<td>1</td>
<td>162</td>
<td>162</td>
</tr>
<tr>
<td>MCBM/road</td>
<td>230</td>
<td>1</td>
<td>230</td>
<td>207</td>
</tr>
<tr>
<td>SLBMs*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C4</td>
<td>36</td>
<td>8</td>
<td>288</td>
<td>288</td>
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<tr>
<td>D5</td>
<td>132</td>
<td>8</td>
<td>1,056</td>
<td>960</td>
</tr>
<tr>
<td>Total missiles</td>
<td>560</td>
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<td>1,736</td>
<td>1,617</td>
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<tr>
<td>Bombers</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B-1B</td>
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<td>16</td>
<td>464</td>
<td>416</td>
</tr>
<tr>
<td>B-2A</td>
<td>50</td>
<td>16</td>
<td>800</td>
<td>720</td>
</tr>
<tr>
<td>Total bombers</td>
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<td></td>
<td>1,264</td>
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<tr>
<td>Totals</td>
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<td>3,000</td>
<td>2,763</td>
</tr>
</tbody>
</table>

*aAssumes 12 C4 or D5 SLBMs per boat, 18 boats total.*
### Table A.12

**Structures VI and VII: Russian Force Structure, 3000**

**Actual Weapons**

<table>
<thead>
<tr>
<th>System</th>
<th>Launchers</th>
<th>Weapons/ Launcher</th>
<th>Inventory Weapons</th>
<th>On-Line Weapons</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICBMs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SS24/silo</td>
<td>30</td>
<td>5</td>
<td>150</td>
<td>150</td>
</tr>
<tr>
<td>SS24/rail</td>
<td>60</td>
<td>5</td>
<td>300</td>
<td>270</td>
</tr>
<tr>
<td>SS25/road</td>
<td>606</td>
<td>1</td>
<td>606</td>
<td>545</td>
</tr>
<tr>
<td>SLBMsa</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SSN20</td>
<td>60</td>
<td>6</td>
<td>360</td>
<td>300</td>
</tr>
<tr>
<td>SSN23</td>
<td>176</td>
<td>4</td>
<td>704</td>
<td>640</td>
</tr>
<tr>
<td>Total missiles</td>
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<td>2,120</td>
<td>1,905</td>
<td></td>
</tr>
<tr>
<td>Bombers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bear-H/ALCM</td>
<td>20</td>
<td>16</td>
<td>320</td>
<td>288</td>
</tr>
<tr>
<td>Blackjack</td>
<td>35</td>
<td>16</td>
<td>560</td>
<td>512</td>
</tr>
<tr>
<td>Total bombers</td>
<td>55</td>
<td>880</td>
<td>800</td>
<td></td>
</tr>
<tr>
<td>Totals</td>
<td>987</td>
<td>3,000</td>
<td>2,705</td>
<td></td>
</tr>
</tbody>
</table>

*aAssumes 10 SSN20 SLBMs per Typhoon boat.*
Appendix B
U.S. AND RUSSIAN STRATEGIC OFFENSIVE FORCE POSTURES

Tables B.1 and B.2 provide notional postures of forces for first strike and second strike. The values for postures A, B, and C represent the “nontargetable,” survivable portions of force elements deployed when incurring a first strike. The values for the first-strike posture represent the portions of forces used when launching a first strike.

Silo-based ICBMs are assumed to be fully alert and to be completely used in a first strike. In a second strike, however, they are targetable and vulnerable.

Table B.1
U.S. Strategic Offensive Force Postures

<table>
<thead>
<tr>
<th>Force</th>
<th>Percent Available (on Alert)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Posture A</td>
</tr>
<tr>
<td>Mobile ICBMs</td>
<td>90</td>
</tr>
<tr>
<td>SLBMs</td>
<td>66</td>
</tr>
<tr>
<td>Bombers</td>
<td>33</td>
</tr>
</tbody>
</table>

Table B.2
Russian Strategic Offensive Force Postures

<table>
<thead>
<tr>
<th>Force</th>
<th>Percent Available (on Alert)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Posture A</td>
</tr>
<tr>
<td>Mobile ICBMs</td>
<td>25</td>
</tr>
<tr>
<td>SLBMs</td>
<td>30</td>
</tr>
<tr>
<td>Bombers</td>
<td>0</td>
</tr>
</tbody>
</table>