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From Counterforce to Minimal Deterrence:

A New Nuclear Policy on the Path Toward Eliminating Nuclear Weapons

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Cover image: As a pure counterforce weapon, the B61-11 nuclear earth-penetrating gravity bomb would be retired under the minimal nuclear deterrence policy proposed by this report.

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CEP	Circular Error Probable
CJCS	Chairman of the Joint Chiefs of Staff
CONPLAN	Contingency Plan
DE	Damage Expectancy
DOD	U.S. Department of Defense
DGZ	Desired Ground Zero
GEF	Guidance for the Employment of the Force
HOB	Height of Burst
HPAC	Hazard Prediction Assessment Capability
ICBM	Intercontinental Ballistic Missile
JCS	Joint Chiefs of Staff
JSCP	Joint Strategic Capabilities Plan
JSCP-N	Nuclear Supplement to JSCP
kt	Kiloton
MIRV	Multiple Independently-Targetable Reentry Vehicle
MT	Megaton
NPR	Nuclear Posture Review
NUWEP	Nuclear Weapons Employment Policy
OPLAN	Operations Plan
PPD	Presidential Policy Directive
SIOP	Single Integrated Operational Plan
SLBM	Sea-Launched Ballistic Missile
SSBN	Nuclear-Powered Ballistic Missile Submarine
START	Strategic Arms Reduction Treaty
STRATCOM	U.S. Strategic Command
WMD	Weapon of Mass Destruction

Executive Summary

To realize President Barack Obama's vision of "dramatic reductions" in the number of nuclear weapons, stopping development of new nuclear weapons, taking nuclear weapons off alert, and pursuing the goal of a world without nuclear weapons, radical changes are needed in the four types of U.S. policies that govern nuclear weapons: declaratory, acquisition, deployment, and employment. This report largely concerns itself with employment policy, that is, how the United States actually plans for the use of nuclear weapons, and argues that there should be fundamental changes to the current war plans and the process of how these are formulated and implemented. The logic, content, and procedures of the current employment policy are relics of the Cold War and, if not changed, will hinder the hoped-for deep cuts to the nuclear stockpile and the longer term goal of elimination.

The counterforce mission, and all that goes with it, must be abandoned and replaced with a much less ambitious and qualitatively different doctrine.

This report argues that, as long as the United States continues these nuclear missions unjustifiably held over from the Cold War, nuclear weapons will contribute more to the nation's and the world's insecurity than they contribute to their security. And without those Cold War justifications, there is only one job left for nuclear weapons: to deter the use of nuclear weapons. For much of the Cold War — at least from the early 1960s — the dominant mission for U.S. strategic weapons has been counterforce, that is, the attack of military, mostly nuclear, targets and the enemy's leadership. The requirements for the counterforce mission perpetuate the most dangerous characteristics of nuclear forces, with weapons kept at high levels of alert, ready to launch upon warning of an enemy attack, and able to preemptively attack enemy forces. This mission is no longer needed but it still exists because the current core policy guidance and

directives that are issued to the combatant commanders are little different from their Cold War predecessors. General Kevin Chilton, head of U.S. Strategic Command (STRATCOM), recently took issue with President Obama's characterization of U.S. nuclear weapons being on "hair-trigger alert" but made our case for us by saying, "The alert postures that we are in today are appropriate, *given our strategy and guidance and policy*." [Emphasis added.] That is exactly right and, therefore, if President Obama wants General Chilton to do something different, he will have to provide the commander of U.S. nuclear forces with different guidance and directives.

The counterforce mission, and all that goes with it, should be explicitly and publicly abandoned and replaced with a much less ambitious and qualitatively different doctrine. A new "minimal deterrence" mission will make retaliation after nuclear attack the sole mission for nuclear weapons. We believe that adopting this doctrine is an important step on the path to nuclear abolition because nuclear retaliation is the one mission for nuclear weapons that reduces the salience of nuclear weapons; it is the self-canceling mission. With just this one mission, the United States can have far fewer nuclear forces to use against a different set of targets. Almost all of the "requirements" for nuclear weapons' performance were established during the Cold War and derive from the counterforce mission. Under a minimal deterrence doctrine, appropriate needs for reliability, accuracy, response time, and all other performance characteristics, can be reevaluated and loosened.

In this analysis, we consider in detail an attack on a representative set of targets that might be appropriate under a minimal deterrence doctrine, including power plants and oil and metal refineries. We find that, even when carefully choosing targets to avoid cities, attack with a dozen typical nuclear weapons can result in more than a million casualties, although using far less powerful weapons can substantially reduce that number. Nuclear weapons are so destructive that much smaller forces, of initially 1,000 warheads, and later a few hundred warheads, are more than adequate to serve as a deterrent against anyone unwise enough to attack the United States with nuclear weapons.

The president will need to maintain keen oversight to insure that the new guidance is being carried out faithfully. We describe the many layers of bureaucracy between the president and those who develop the nuts-and-bolts plans for nuclear weapons employment to show how easily a president's intentions can be co-opted and diffused. We finally offer examples of what a presidential directive might look like.

Introduction

The global elimination of nuclear weapons has recently regained public attention and is being seriously discussed by policy elites within the political mainstream.[1] Several proposals have been made for immediate initial steps toward this goal. These include ratification of the Comprehensive Test Ban Treaty and negotiating a follow-on to the soon-to-expire START Treaty and the Moscow Treaty strategic arms reduction agreements with Russia. Other early steps include taking nuclear weapons off alert, retirement and verified elimination of non-deployed reserve stockpile weapons, verified declarations of existing stocks of fissile materials, and negotiation of a global agreement barring production of fissile material for weapons.

Proposals for unilateral or parallel reciprocal reductions typically cite some round number as a target for reduction. This can appear arbitrary but does, in fact, make sense. Nuclear weapons might have some transitional missions on the way toward zero, but the number needed to fulfill basic nuclear deterrence is not large and excess weapons increase the nuclear danger without contributing to national or the world's security. Even absent a detailed accounting of nuclear requirements indicating whether the United States needs tens or hundreds of nuclear weapons for deterrence, quick assessment can provide confidence that the number will not exceed one thousand. Therefore, immediate calls to reduce to a thousand weapons, pending further analysis of when and how to go below a thousand, are valid.

Going forward, nuclear weapons should not be assigned any mission for which they are less than indispensable.

This report examines in greater detail the next steps toward zero: how to reduce down to levels where the numbers of weapons might start to make a difference in meeting the core nuclear deterrent mission that will apply during the (possibly extended) transition to a nuclear weapons-free world. Our approach is somewhat different from most other studies. We do not start with

a discussion of numerical goals for nuclear weapon arsenals. Advocates of a more robust nuclear posture argue that, with dramatically reduced nuclear arsenals, the United States military will not be able to fulfill this or that mission assigned to nuclear weapons. That is precisely the point; to move with any sincerity and effectiveness toward a nuclear weapons-free world, nuclear weapons must shed almost all of their current missions. Going forward, nuclear weapons should not be assigned any mission for which they are less than indispensable. That is why we believe that the focus ought to *begin* with a discussion of nuclear missions. As missions for nuclear weapons are, one-by-one, stripped away, the logic of reducing their numbers will be inescapable.

Figure 1:
Davy Crockett Nuclear Projectile

Most U.S. tactical nuclear weapons, including the Davy Crockett nuclear projectile, were retired when presidential guidance removed the requirement to fight nuclear battles. Now the president must end counterforce planning.

Nuclear weapons have many potential missions. The first ballistic missile defense system was nuclear. Both the United States and the Soviet Union once had nuclear torpedoes, nuclear air defense missiles, and nuclear artillery, even nuclear landmines. It is important to recognize that the enormous reductions in the numbers of nuclear weapons since their Cold War peak has been because nuclear missions were abandoned as they were proven infeasible or were displaced by militarily superior conventional alternatives. This ongoing process of nuclear obsolescence continues today.

Both advocates of a robust nuclear posture and nuclear disarmers would probably agree that the last mission of nuclear weapons should be to survive a nuclear attack in order to threaten retaliation against a nuclear aggressor, with the aim of deterring such an attack in the first place. We call this the "minimal deterrence" mission. This mission could be fulfilled by conventional alter-

natives but, even so, this mission is significant for this study because it is the only potential mission that can be assigned to nuclear weapons that actually reduces the salience of nuclear weapons; it is the self-canceling mission of nuclear weapons. We further assume that on the glide path down to zero, the United States and the rest of the world may pause at a certain point for some extended period of time to allow the world's nuclear powers to establish a stable equilibrium while they develop the international institutions and political confidence necessary for moving toward complete global nuclear disarmament. We hope that this transition period might be short, perhaps on the order of one or two decades.

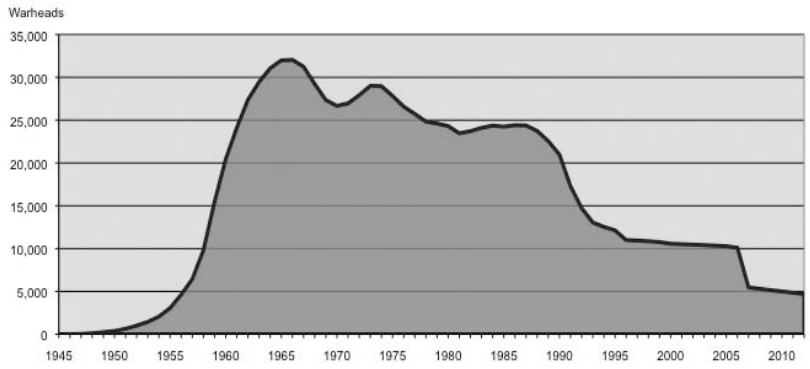
The report focuses on some essential penultimate steps that must be taken to get to the stage of global elimination, sketching out one possible path. First, we review current U.S. nuclear doctrine, both what it is and how it is developed and implemented. Next, we describe how restricting the missions for nuclear weapons much more severely would enhance the security of the United States, and then show how these new limited missions would be implemented. From that position, a transition to nuclear elimination would be easier and safer.

Current U.S. Nuclear War Planning and Posture

Twenty years after the end of the Cold War, many Americans would be surprised—possibly even alarmed—to learn the full extent of the continuing U.S. engagement with nuclear weapons, as measured by the size and cost of its nuclear forces, the pace of its nuclear force deployments, and the extent of its detailed planning to employ nuclear weapons in a wide range of conflict contingencies.

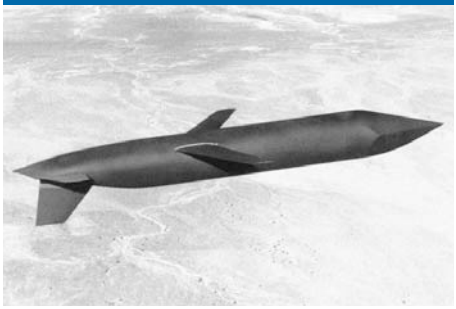
The current U.S. nuclear stockpile includes approximately 5,200 nuclear warheads, of which about 2,700 are "operational;" of those, about 2,200 are "strategic" warheads, simply meaning they are very powerful and mounted on intercontinental-range weapons, and 500 are non-strategic or "tactical."[2] Another 2,500 warheads are in an active reserve status, meaning they can be returned to service over a period of weeks and months. The strategic weapons are deployed on a "triad" of delivery systems: submarine- and land-based

Figure 2:
U.S. Nuclear Weapons Stockpile 1945-2012



The Department of Defense nuclear stockpile has fluctuated considerably over the years with changes in security and weapons.

Figure 3:
Advanced Cruise Missile



The Advanced Cruise Missile was retired in 2007 despite its long range and stealth capabilities.

ballistic missiles and long-range bombers. The non-strategic weapons include bombs for dual-capable fighter aircraft, and warheads for cruise missiles launched from selected attack submarines.

Since the end of the Cold War, the United States has eliminated entire classes of nuclear weapons, for example, the Army's nuclear artillery and tactical missiles, and the Navy's tactical nuclear weapons on surface ships. Yet the heart of U.S. nuclear forces, the strategic nuclear arsenal, operates in essentially the same way and has the same overall structure as it did during the Cold War, although with fewer warheads and delivery vehicles. The reason is simple: the basic planning principles for what constitutes a "credible" nuclear war fighting force have not changed.

The size of the U.S. force has fluctuated considerably over the years because of changes in the perceived threat and technological advancements in weapon systems (see Figure 2). After a dramatic build-up to more than 32,000 warheads by 1966, the trend since then has been, with a few bumps and plateaus, consistently downward. While the numbers declined by only one-quarter over the next twenty years, the types of warheads in the stockpile changed dramatically, with strategic warheads increasing and tactical warheads decreasing. Of the 32,000 in 1967, approximately one-third were strategic and the balance tactical. Of the 23,500 in 1987, almost two-thirds were strategic and the balance tactical. Between 1987 and 1996, more than 13,300 weapons were retired leaving approximately 10,500 warheads in the stockpile. Although it is little commented upon, President George H.W. Bush cut the stockpile in half (to the 10-11,000 level, by treaty agreements and unilateral actions) as the Cold War ended and President George W. Bush cut it in half again in the 2002-2008 period.

Reductions implemented by the George W. Bush administration were not directly comparable to previous reductions. The recent downsizing has focused on moving excess weapons, already in the military's inactive reserve stockpile, into the dismantlement phase, and dismantling the backlog of weapons previously retired from the active stockpile. Bush's actions were primarily implementing stockpile and force structure decisions made as far back as the mid-

1990s, but also by more recent decisions as well. The result is a smaller total stockpile but mainly because of reduction in warheads that were already inactive.

Requirements

Throughout the two terms of the Bush administration, the size of the arsenal was justified by appealing to requirements: to strike a large number of targets in half a dozen countries; to maintain several different war plans with numerous strike options, including large strikes against Russia and China and smaller ones against regional states; and to ensure that counterforce targets be destroyed with high confidence. In addition, a "hedging" policy that dated to the Clinton administration required the military to keep thousands of warheads in reserve to safeguard against strategic surprises or some hypothetical unforeseeable technical failure of deployed weapons. It is now up to the Obama administration to reassess the validity of these claims and articulate new requirements that match a policy designed to take clear steps away from Cold War planning assumptions toward the elimination of nuclear weapons.

With the end of the Cold War almost twenty years ago, followed by the denuclearization of all the Former Soviet Union (FSU) successor states save Russia, and Russia's own unilateral and bilateral nuclear force reductions, the formal U.S. requirements for hitting nuclear targets on the former Soviet landmass decreased, while the United States increased the role and reach of nuclear weapons against China and elsewhere. Under Clinton and later Bush administration guidance, the United States asserted that nuclear weapons can legitimately be used against "weapons of mass destruction" (WMD), even chemical weapons, anywhere in the world, even against non-nuclear nations.[3] The inclusion of all forms of weapons of mass destruction as potential targets for U.S. nuclear war planners significantly broadened the geographical reach and number of potential scenarios for U.S. nuclear strike options.

Attack Plans

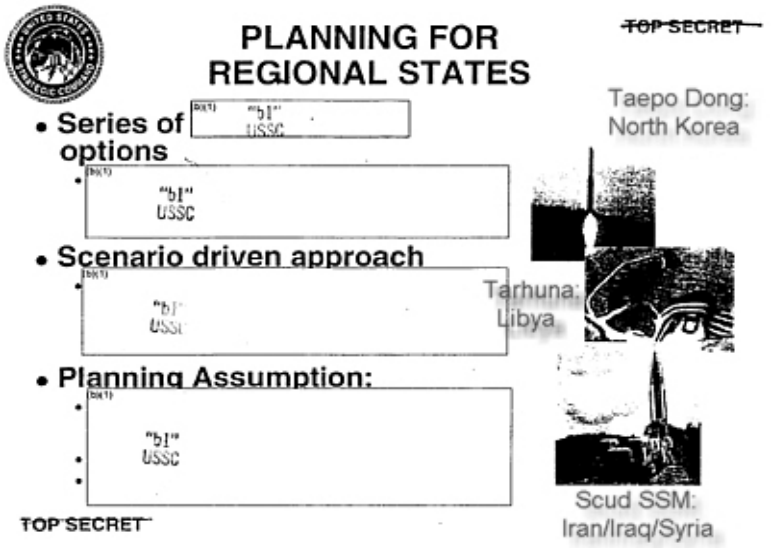
During preparations for the Single Integrated Operational Plan (SIOP) that was to enter into effect in March 2003, the head of the Strategic Command (STRATCOM), Admiral James Ellis, said the word "single" in SIOP no longer accurately described the new plan. "STRATCOM is changing the nation's nuclear war plan from a single, large, integrated plan to a family of plans applicable in a wider range of scenarios." The SIOP name, he said, was a Cold War artifact. STRATCOM changed the name to OPLAN, or Operations Plan 8044, to reflect the creation of STRATCOM's "new family of plans."[4]

The first plan that had the new name was OPLAN 8044 Revision 03, meaning it came into effect in Fiscal Year 2003.

OPLAN 8044 Revision 03 was a "transitional step toward the New Triad and future war plans" and included several new strike options for attack against regional states armed with WMD (see Figure 4). General Richard Myers told Congress that the Revision 05 update from October 2004 "provides more flexible options to assure allies, and dissuade, deter, and if necessary, defeat adversaries in a wider range of contingencies."[5]

OPLAN 8044 Revision 05 was replaced by OPLAN 8010 in February 2008, to signal a break with previous concepts and the arrival of a "New Triad" war plan with mixed nuclear and conventional employment options. OPLAN 8010, which first entered into effect on February 1, 2008, and was updated on December 1, 2008, includes strike options against six potential adversaries. Like OPLAN 8044 (and to a large extent the SIOP), the target categories for OPLAN 8010 include critical war-making and war-supporting assets such as WMD forces and supporting facilities, command and control facilities, and the military and political leadership.[6] The new plan also includes conventional

Figure 4:
Nuclear Strike Planning Against Regional States



Nuclear strike options against regional WMD proliferators were added to the strategic war plan OPLAN 8044 Revision 03 that entered into effect in March 2003. Country names added to original.

strike options. By expanding the targets to include "WMD" very broadly defined and by including four regional powers in addition to Russia and China, the number of potential scenarios and targets has actually increased since the early-1990s. Despite this geographic expansion, the overall target categories have remained surprisingly constant over the years (see Figure 5).

The Planning Process

This evolution of the strategic war plan has come about in response to specific guidance issued by the President, the Secretary of Defense, and the Chairman of the Joint Chiefs of Staff. However, language in declassified or leaked documents indicates that, although the number of nuclear weapons has decreased significantly and the strike plans trimmed and made more flexible, the core objective of the war planning has not changed much since the 1970s. The guidance still directs the military to deploy forces that can credibly threaten to destroy the weapons, war-making, and leadership targets of potential adversaries.

STRATCOM's role is to "translate" the guidance from the White House, the Secretary of Defense, and Chairman of the Joint Chiefs of Staff (see Appendix A) into weapon requirements and employment plans. This is a tedious one-year process (see Figure 6) where planners begin with identifying the myriad facilities that fall under the category "leadership and military capabilities, particularly WMD, military command facilities and other centers of control and infrastructure that support military forces." These facilities are pulled from the Integrated Database (IDB), which is the core database of the Military Intelligence Integrated Data System (MIIDS). IDB describes units, personnel, equipment, facilities, and installations and is integrated to allow assessment of the military capabilities and vulnerabilities of countries worldwide. The targets selected from IDB for potential use in the strategic war plan make up the National Target Base (NTB), from which STRATCOM planners select and build the National Desired Ground Zero List (NDL), the actual target list for the strategic war plan.

Once the targets are selected, the planners begin the process of force allocation, which involves calculating the blast and thermal effects needed to ensure destruction of the target, assigning boundaries among groups of targets, validating information about targets, adding geographical targeting information, determining whether the attack is appropriate to the political and military objectives, and systematically analyzing how the attack might fail.[7]

After each target has been allocated a warhead, strike planning follows to select the delivery vehicle needed to deliver each warhead to target under the various strike options. Weapon sorties are carefully designed to

Figure 5:
U.S. Nuclear War Planning Targeting Objectives

SIOP-5 (1976)

"In order to "preclude domination" in the "post-war period," U.S. "political, economic and military power" must be "maximized" through "destruction of those political, economic and military resources critical to the enemy's post-war power and influence and national and military recovery."

NUWEP-74, April 3, 1974

OPLAN 8044 Revision 05 (2004)

"U.S. nuclear forces must be capable of, and be seen to be capable of, destroying those critical war-making and war-supporting assets and capabilities that a potential enemy leadership values most and that it would rely on to achieve its own objectives in a post-war world."

NUWEP-04, April 19, 2004

"Constrain an adversary's WMD employment through US counterforce strikes aimed at destroying adversary escalatory options."
"Reestablish deterrence of further adversary WMD employment"

Deterrence JOC, Vol. 2, Dec 2006

OPLAN 8010 (2008)

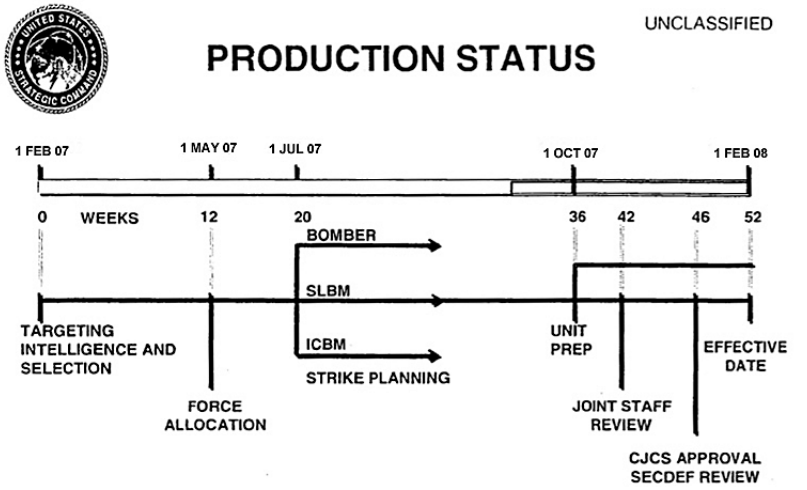
"Based on current projections, an operationally deployed force of 1700-2200 strategic nuclear warheads by 2012...will support U.S. deterrence policy to hold at risk what opponents value, including their instruments of political control and military power, and to deny opponents their war aims. The types of targets to be held at risk for deterrence purposes include leadership and military capabilities, particularly WMD, military command facilities and other centers of control and infrastructure that support military forces."

Nuclear Posture Review, 2001

avoid blast and fallout from other detonations and other delivery vehicles involved in the same or a nearby attack.

Once the draft tasking to the individual missile, submarine, bomber, and tanker units has been worked out, the plan is briefed to the Joint Staff and Secretary of Defense for final reviews, and finally approved by the Chairman of

Figure 6:
OPLAN 8010 Plan Production Schedule (Estimate)



This estimated production schedule for OPLAN 8010-08 from February 1, 2008, is based on the schedule for OPLAN 8044 Revision 03 from 2003. An update was made on December 1, 2008.

the Joint Chiefs of Staff. Production of individual plan documents follows with the final plan entering into effect one year after production began.

Since 1992, when STRATCOM was established, a total of 16 major updates to the main strategic war plan have been published. The updates occurred in response to changes in the targets in putative threat nations, retirement and introduction of U.S. weapon systems, and new guidance issued by the White House, the Secretary of Defense, and the Chairman of the Joint Chiefs of Staff. The most recent updated was published on December 1, 2008 (see Figure 7).

Available Forces

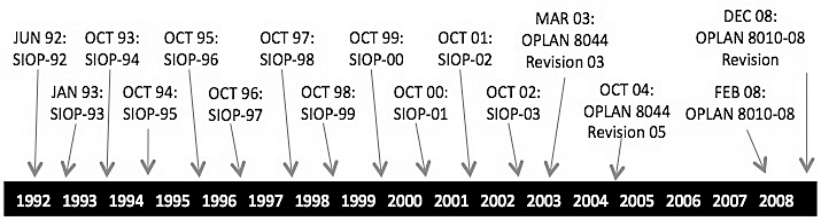
To meet the objectives set for OPLAN 8010, the Pentagon, maintains, as of early 2009, some 2,200 "operational deployed strategic warheads" as counted by the SORT Agreement,[8] and approximately 500 operational non-strategic warheads. Of the operationally deployed strategic warheads, an estimated 900 were on alert and immediately available on a day-to-day basis to "provide a spectrum of targeting options for consideration during rapidly developing, high-stakes contingencies." This alert force "serves immediate deterrence and defeat goals," according to the government.[9] General Kevin Chilton, head of

Strategic Command, recently defended keeping current alert levels where they are. He also made the central point of this report when he said: "The alert postures that we are in today are appropriate, given our strategy and guidance and policy."[10] General Chilton is doing the job the guidance directs him to do. If we want him to do something else, e.g., lower the alert levels or abandon counterforce targeting, then the president must change his guidance.

Another 2,500 warheads are kept in reserve that could in a few weeks to months be uploaded onto missiles and bombers to increase the force "should unexpected developments pose a more immediate threat," or in case of "the emergence of a new WMD-armed adversary, or severe deterioration in a U.S. near-peer relationship resulting in a return to hostile confrontation and nuclear threats."[11] The reserve warheads for these contingencies are retained in what the Bush administration called the Responsive Force, a pool of active but non-deployed weapons.

Combined, these different categories of warheads make up the DOD stockpile of approximately 5,200 warheads, an inventory that under current plans will decrease to an estimated 4,600 warheads by 2012. This is the stockpile size that the Obama administration will have to reassess as it goes about its own posture review.

Figure 7:
U.S. Strategic War Plans 1992-2008



STRATCOM has made at least 16 major updates of the strategic war plan since 1992.

Deterrence Use and Misuse

Few terms in discussions of nuclear weapon are more misused, misunderstood, or distorted than "deterrence." The Department of Defense's (DoD) 2009 Quadrennial Roles and Missions Review defines deterrence operations as "integrated, systematic efforts to exercise decisive influence over adversaries' decision-making calculus in peacetime, crisis, and war."[12] Without mentioning whom or what is being deterred, the word can refer to either nuclear deterrence or conventional deterrence, and to either retaliatory or first strike attacks. Throughout the Cold War — and even today — nuclear "deterrence" had many definitions and many roles.

Figure 8:
Minuteman III Test Launch

Virtually all of 450 U.S. Minuteman III ICBMs are on alert, ready to launch in a few minutes after receiving the launch order.

Cold War Deterrence

For example, during the Cold War, nuclear forces based in the continental United States were intended to deter, among other things, Soviet conventional attacks on NATO Europe, Japan, and South Korea, by threatening nuclear damage to the Soviet Union as the likely response. But the threat of Soviet nuclear retaliation – whether counterforce or countervalue – tended to weaken the plausibility of any American nuclear threat. That is, Soviet nuclear forces deterred the U.S. deterrent, thus, the ability to execute a "first strike" to destroy Soviet nuclear systems on the ground was ironically viewed as a valuable part of the U.S. nuclear "deterrent" mission, and enormous resources were devoted to that goal.

Similar intentions were ascribed to the Soviet defense establishment, which, some believed, might be tempted to alter the balance of power by launching a disarming first strike against U.S. central strategic nuclear forces. As a result, in the strange logic of the Cold War, both sides felt that threats of surprise nuclear first strikes were counted as "deterrence." While this might have contributed to deterring a conventional attack, it created a dangerously unstable nuclear competition because both sides knew or suspected the other of preparing to execute a first strike. The logical way to avoid being struck first is to plan for your forces to strike first, creating an extremely dangerous and unstable situation. Only slightly less dangerous is to configure your forces to be launched the moment that an enemy's nuclear attack is detected. Either way, forces are placed on a hair-trigger and prone to mistakes that could result in catastrophe. The practice of keeping U.S. and Russian nuclear forces on alert continues today, albeit at lower numbers than during the Cold War (see Figure 8).

"Deterrence" has become to be defined as whatever it is that nuclear weapons do.

In part, the overuse and misuse of the term "deterrence" is the result of believing one's own euphemisms. Nuclear weapons are horrific things and nuclear war would be an unimaginable disaster. Political and military leaders avoid direct, public discussion of the real consequences of planning for such a global catastrophe by arguing that nuclear weapons are not really intended to be used, but are meant only to deter, and therefore detailed war plans and alert forces increase the "credibility" of the deterrent and make an attack less likely. From such a limited claim the argument evolved to regard all nuclear missions as contributing to deterrence. "Deterrence" has become to be *defined* as whatever it is that nuclear weapons do. Indeed, U.S. ICBMs and SLBMs are often called the "land-based deterrent" and the "sea-based deterrent," respectively. And nuclear bombs deployed in Europe are called the "extended deterrent." Nuclear weapons have simply *become* deterrence no matter what mission they have.

Deterrence Today

Current White House, Pentagon, and State Department documents describe "nuclear deterrence" as the fundamental component of U.S. national security policy.

The U.S. Nuclear Weapons Employment Policy (NUWEP) that entered into effect in 2004 stated in part:

> "U.S. nuclear forces must be capable of, and be seen to be capable of, destroying those critical war-making and war-supporting assets

> and capabilities that a potential enemy leadership values most and that it would rely on to achieve its own objectives in a post-war world."[13]

The National Security Strategy of the United States of America, published by the White House in 2006, states in part:

> "Safe, credible, and reliable nuclear forces continue to play a critical role. We are strengthening deterrence by developing a New Triad composed of offensive strike systems (both nuclear and improved conventional capabilities); active and passive defenses, including missile defenses; and a responsive infrastructure, all bound together by enhanced command and control, planning, and intelligence systems. These capabilities will better deter some of the new threats we face, while also bolstering our security commitments to allies. Such security commitments have played a crucial role in convincing some countries to forgo their own nuclear weapons programs, thereby aiding our nonproliferation objectives."[14]

The National Defense Strategic published by the Office of the Secretary of Defense in June 2008 pledges that:

> "Our ability to deter attack credibly also reassures the American people and our allies of our commitment to defend them. For this reason, deterrence must remain grounded in demonstrated military capabilities that can respond to a broad array of challenges to international security. For example, the United States will maintain its nuclear arsenal as a primary deterrent to nuclear attack, and the New Triad remains a cornerstone of strategic deterrence. We must also continue to field conventional capabilities to augment or even replace nuclear weapons in order to provide our leaders a greater range of credible responses."[15]

The challenge for nuclear advocates had been to illustrate just how the nuclear deterrent actively contributes to post-Cold War national security challenges. One recent attempt to illustrate this, and one which is being widely used, is the reports of the *Secretary of Defense Task Force on DoD Nuclear Weapons Management*, more commonly called, the *Schlesinger Task Force Report*, initially established to examine and correct the deficiencies that led to the 2007 Minot incident where the Air Force lost track of six nuclear warheads for 36 hours, but which also has taken on a role of promoting the

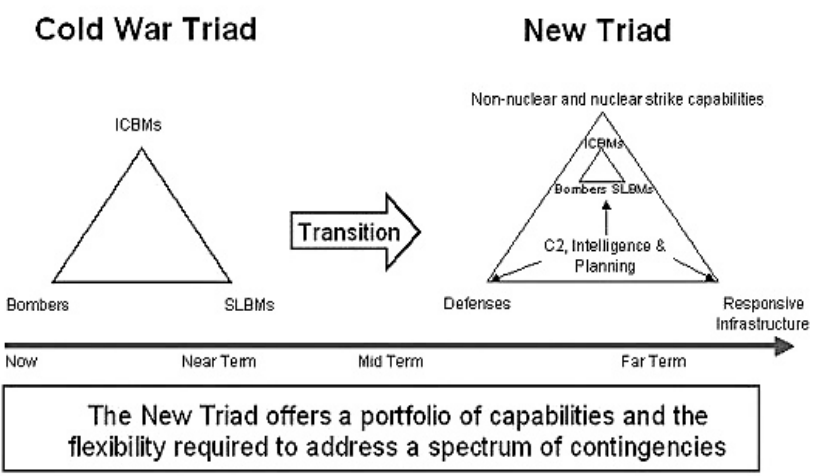
nuclear mission:

> "Though our consistent goal has been to avoid actual weapons use, the nuclear deterrent is 'used' every day by assuring friends and allies, dissuading opponents from seeking peer capabilities to the United States, deterring attacks on the United States and its allies from potential adversaries, and providing the potential to defeat adversaries if deterrence fails."[16]

This on-going appeal to nuclear deterrence was repeated in the Air Force's 2008 nuclear roadmap report as a justification to "reinvigorate" the nuclear mission.[17]

With such sweeping rationales for why nuclear weapons are needed, it is little wonder that extensive requirements are generated that, in turn, require many kinds of nuclear weapons in large numbers. This results in multiple strike options making it difficult, if not impossible, to change the *status quo*. One

Figure 9:
Deterrence Capabilities of the "New Triad"



The "New Triad" constructed by the Bush administration blurred the distinction between nuclear and non-nuclear missions and included missile defense and nuclear industry as means to "deter aggressors."

place to start changing this self-generating justification is to constrict the numbers and kinds of *missions* for nuclear weapons, eventually down to one.

Theory and Logic of Deterrence

The deterrence challenge of today is quite different from that of the Cold War, partly because of differences in who is being deterred, but primarily because of differences in what is being deterred. Efforts during the Bush administration to create a new strategic forces command that included nuclear, conventional, and defensive capabilities acknowledged this dilemma to some extent, although this has failed to reduce the missions of nuclear weapons and instead blurred the separation of nuclear and non-nuclear forces and missions, ironically making it harder for nuclear deterrence to work when it needs to (see Figure 9). Simply carrying forward the deterrence logic and assumptions based on the *who* and the *what* of the Cold War thinking results in profound and dangerous fallacies in today's radically different world.

It is quite remarkable that discussions about deterrence and what may be needed for it often avoid mentioning any actions that are supposed to be deterred. Indeed, the new strategy intentionally leaves that unclear. Uncertainty about what the U.S. response will be and when it will be triggered, so the argument goes, helps make deterrence work. The presumption is that the United States wants to deter an attack, which is true, but without asking the more basic question of *why* anyone would be attacking the country, especially with nuclear weapons, in the first place. This is a throwback to the Cold War worst-case thinking when the stakes were widely perceived as absolute. For decades, two hostile and mutually incompatible systems competed for the allegiance of the rest of the world. If the world is the prize then two strange things happen to the deterrence equation.

First, deterrence is about threatening to inflict pain to make the seizing of some prize seem like a bad idea. If the prize is everything, then the pain that must be threatened must be total. Cold War deterrence theory considered limited nuclear strikes for limited goals but always held in reserve marching up the escalation ladder to unrestricted nation-crushing attacks. For more limited stakes, absolute destruction is never needed and never justified.

Second, in a bipolar, global struggle, there is no out-of-bounds and no absolute measure of success; the only measure of success is power *relative* to the power of the one other global foe. In such a contest, inflicting damage on one's foe makes one *relatively* stronger; indeed, receiving damage is not so important as long as substantially more damage is inflicted on the enemy, advancing one's *relative* power and hence "strengthening deterrence." This bizarre characteristic of the Cold War nuclear balance allowed the nuclear part

of the contest to be abstracted out of any larger context; it allowed nuclear exchanges to be treated by game theory and other mathematical abstractions that seemed to make sense to some at the time. It made nuclear weapons and nuclear attack self-referential to the extent that models of nuclear war sometimes assumed that Soviet nuclear attack would occur inevitably and automatically unless it were deterred by the threat of a comparable U.S. nuclear attack, without reference to an outside geopolitical context or triggering event.

Today, the question is not whether nuclear weapons can be considered without reference to an outside context but quite the opposite: is there *any* outside context that can justify use of nuclear weapons? During the Cold War, not only did nuclear weapons dominate the context, they created their own context. Today, the context of conflict should dominate any discussion of nuclear weapons and nuclear weapons will—in all but a few highly improbable cases—not be relevant. Yet nuclear "logic" is also evident in the Obama administration's nuclear policy to "always maintain a strong [nuclear] deterrent as long as nuclear weapons exist,"[18] a phrase that STRATCOM is already making use of to justify the current nuclear posture.[19]

Figure 10:
Sea-Based First-Strike Nuclear Capability

Widely considered merely a secure second-strike capability, modern SSBNs actually play a key role in the earliest phases of nuclear strike contingencies.

Nuclear "Requirements"

The Cold War deterrence legacy continues to affect not just the grand strategic vision but also many of the more technical assumptions about nuclear weapons. After decades of the Cold War, many of the extraordinary demands on nuclear weapon performance — created by conditions peculiar to the Cold War — are simply assumed to be necessary universal characteristics of nuclear weapons in general, not open to choice. It has been said, for example, in arguing for a new generation of "Reliable Replacement Warheads," that nuclear weapons must be highly reliable. What is lacking in the debate has been any definition of a reliability goal; for example why is 99 percent reliability required but 95 or 90 percent reliability considered not acceptable?

Similarly, we rarely find any questioning of the need to keep nuclear weapons forward deployed on submarines within range of Russia or China ready to launch on a moment's notice. Yet this kind of operational deployment is an artifact of the Cold War where the mission was to ride out a large Soviet attack on the United States or destroy Soviet forces on the ground before their missiles and bombers could be launched against the United States. Indeed, SSBNs are typically portrayed as merely secure retaliatory forces when, in fact, today's SLBMs are highly capable offensive weapons designed to play a key role in the earliest phases of a nuclear war.

Highly capable missiles on deployed SSBNs drive defensive and offensive planning in Russia and China that, according to the U.S. intelligence community, undercut efforts to reduce the role and numbers of nuclear weapons or to move toward their elimination. We must also consider that the United States keeps its land-based missiles on alert, ready to launch at a moment's notice, to insure that they would survive by being launched before incoming Russian missiles arrive, even though Russia is said to no longer be an enemy and no other nuclear power has the ability to threaten U.S. ICBM silos. Similarly, current "requirements" for explosive yield, accuracy, flight times and all other nuclear weapon characteristics can be traced back to the very different conditions of the Cold War.

Rational judgments about what performance is really required of nuclear weapons are possible only with a careful, explicit statement about what missions the country assigns to the nuclear weapons. With an explicit mission of surviving a nuclear attack and retaliating, to deter the nuclear attack in the first place, nuclear planners can develop not just a list of possible targets but also determine how nuclear weapons could be deployed, their required number, the explosive power of the weapons, the reliability of the warheads and delivery vehicles, the response time of the weapon systems, and flight speed of the delivery vehicles.

Minimal Deterrence: A New Nuclear Doctrine

The missions assigned to nuclear weapons during the Cold War might or might not have made sense during the Cold War but there is no reason to think they would have any relevance at all to the radically different conditions of today. By keeping nuclear weapons on alert, the United States and Russia are running minute-by-minute risks of cataclysm for reasons that disappeared two decades ago. Assigning missions to nuclear weapons beyond the very minimum creates more risks than security for the nation and the world. Without assumptions left over from the Cold War, nuclear weapons would be given the minimal task possible, nuclear deterrence. The question then becomes: how can nuclear weapons be used to impose costs such that an enemy will never calculate that initiating the use of nuclear weapons is advantageous?

If the role for nuclear weapons is to be minimized, a set of targets must be identified that can only be attacked with nuclear weapons.

Minimal deterrence would reserve for nuclear weapons just one mission: To deter the use of nuclear weapons. We believe that a doctrine based upon minimal deterrence would lessen the legitimacy of nuclear weapons and allow for significant reductions in global stockpiles. A minimal deterrence doctrine is, almost by definition, one of no-first-use with constrained second-use. Adopting this approach could end aggressive nuclear planning, curtail the drive for endless modernization, and provide a stable interim regime along the path toward nuclear disarmament. A minimal deterrence doctrine requires only that nuclear weapons be able to impose sufficient costs on a potential attacker to make the initial nuclear attack appear too costly. The United States would have great leeway in deciding how to impose an appropriate cost on the unwise attacker. Because a putative enemy's nuclear forces would not be targeted by U.S. nuclear forces, the size of the U.S. arsenal would not be dependent upon the number and technical characteristics of enemy weapons,

effectively eliminating arms race incentives. If adopted, over time and in concert, all of the nuclear powers could reach a stable equilibrium essentially leveling their forces in some way before taking further steps toward nuclear abolition.

A true minimal deterrence mission has no need for a capability to attack enemy nuclear forces, hardened facilities, or underground structures, and certainly not to do it promptly. The objective is no longer to destroy enemy nuclear forces so as to achieve an advantage in a nuclear exchange or limit damage against the United States or to "win" a nuclear war. Nor is it to deter use of chemical or biological weapons or to deter conventional wars. The only objective is to deter nuclear use in the first place. It may be that no prompt retaliatory response is required unless it can be demonstrated that retaliating in an hour somehow deters more effectively than retaliating in a day or a week.

The next step is to identify a set of potential targets. The target sets for OPLAN 8010 include "WMD production, storage, and delivery systems, adversary, decision-makers, critical command and control facilities, and adversary leadership power bases."[20] But, if the role for nuclear weapons is to be minimized, a set of targets must be identified that can only be attacked with nuclear weapons. As we will show below, with this mission as the only mission for nuclear weapons, the required nuclear forces are extremely limited; indeed, the need for nuclear weapons eventually vanishes.

The essence of deterring an action is to threaten punishment sufficient to make that action appear undesirable. In this case, the action in question is the use of nuclear weapons, particularly against the United States or its allies. The extent of the threatened punishment depends on the context and what is being contested. This minimal deterrence mission is not to deter, for example, a conventional attack by an enemy. Such an attack by itself should be deterred by conventional forces. Yet NATO's nuclear policy says that the role of its nuclear weapons is "to preserve peace and prevent coercion and *any kind* of war,"[21] a meaningless bluff that has been called against nuclear powers many times: China's entry into the Korean War, the Vietnam War, the Falkland War, the Soviet war in Afghanistan, Iraq's Scud attacks against Israel, or even the conflict in Northern Ireland. During a conventional war, an enemy may be tempted to introduce nuclear weapons into the conflict because he believes it will give him some advantage. It is only this incremental advantage that U.S. use of nuclear weapons must offset.

Reducing Nuclear Missions

To reduce the nuclear threat it faces, the United States should seek to curtail the role of nuclear weapons, achieve major reductions, and prepare the ground for the final phase of the nuclear era. This requires shifting the focus to eliminating nuclear *missions*. Nuclear weapons have lost many of the missions they once held because they have been superseded by technologically and militarily superior non-nuclear alternatives. In every case where a mission has both a nuclear and non-nuclear solution, the non-nuclear option is clearly preferred on military, technical, cost, and political grounds. Only very few missions remain for which nuclear weapons are the technically best, or only, solution. One of those is the rapid and thorough destruction of cities with massive destruction of life. Some practitioners of minimal-type deterrence, the Chinese for example, apparently have this kind of attack as their core mission since its forces are too small and inadequate for counterforce. Moreover, this is such a straightforward mission for nuclear weapons that simply having any long-range delivery system means that nuclear weapons will be able to carry out the mission. In fact, it would be difficult for the United States to possess nuclear weapons at all and still deny itself this capability, regardless of its intentions or actual doctrine.

There are two other missions often advanced for nuclear weapons that are difficult or impossible to replace with conventional alternatives. One is the attack of deeply buried or super hard targets and the other, often considered separately but actually a subset of the first, is a disarming surprise first strike against enemy nuclear forces.

Hard and Deeply Buried Targets

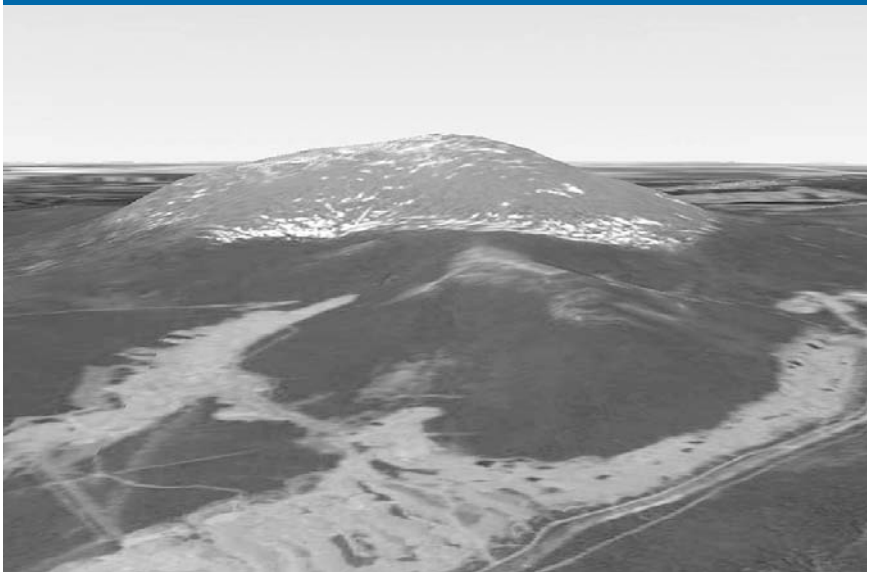
Attack of hardened and deeply buried targets is a contrived mission tailor-made to justify nuclear weapons in the face of their impending obsolescence. Recognizing the irreversible decline in the military significance of nuclear weapons and noting that many potential adversaries had buried important assets in response to the development of highly accurate *conventional* munitions, nuclear advocates pushed for a new warhead or the modification of an

existing warhead, called the Robust Nuclear Earth Penetrator, or RNEP. The RNEP would penetrate a meter or two into hard earth and rock and explode, causing the bomb's powerful shock wave to crush nearby underground bunkers or tunnels. An unfortunate consequence of such attacks is that the bombs would create huge craters and an extensive cloud of radioactive debris.

From the outset, advocates of the RNEP needed enemy targets to be precisely at the right depth. They had to be just out of reach of conventional weapons but not so deep that they were invulnerable even to a nuclear weapon. Another problem is the intelligence that would be required about the target. To find the target and be assured of what it contained would be extremely demanding. A real world example demonstrating these difficulties was the opening move of the 2003 Iraqi war, the conventional bombing of an underground bunker where Saddam was thought to be hiding. Not only was Saddam not there but also it turned out there was no bunker at that location either.

Supporters argued for the RNEP using novel distortions of deterrence theory. These included statements claiming that deterrence involved, not simply being able to impose *sufficient* cost on an enemy, but required being able

Figure 11:
Russian Kosvinsky Mountain



One of the targeting requirements that resulted in the B61-11 nuclear earth-penetrator apparently was the Russian underground nuclear command center built under Kosvinsky Mountain. *Source: Google Earth*

to impose essentially unlimited costs. All valued assets must be destroyed; if even one were invulnerable, then deterrence was undermined according to this bizarre logic.[22] After the Republican Congress twice stopped funding for the RNEP, the Bush administration withdrew its support and the program ended.

Counterforce and First Strike

The second nuclear-only mission is a first strike against an enemy's nuclear forces. Existing nuclear weapons are immensely powerful and have considerable capabilities against even very hard targets. In particular, they are the only weapons currently available that can plausibly attack ballistic missiles stored in underground concrete launchers, or silos, or that can barrage the deployment areas for land-based mobile missiles. Thus, nuclear weapons are the only weapons that would be even potentially effective in a disarming first strike against an enemy. In a crisis they could be used to strike the other side's nuclear weapons first to reduce the damage that might be inflicted on the United States.[23]

Figure 12:
Russian Mobile SS-27 Launch

The alert postures of Russia and the United States drive requirements in both countries for keeping nuclear forces on alert. A minimal deterrence posture would remove this incentive. *Source: Web.*

Adopting a minimal deterrence doctrine along with the appropriate physical changes in weapons, delivery systems, and deployments, would mean abandoning the capability to carry out a surprise disarming first strike on an adversary's weapons of mass destruction forces. Giving up this one mission will be particularly difficult politically because it will appear to be a choice to deliberately leave the nation vulnerable yet it will also remove the incentive for maintaining the most dangerous deployments of nuclear weapons.

While vulnerability could increase in the unlikely near-term case of a near-inevitable nuclear war, the net effect of eliminating the counterforce mission will enhance the nation's security in the long run. Justifying a first strike

depends upon knowing with near certainty when the enemy is about to strike, so that you can go first. The president might be faced with choosing between an estimated high probability of being struck first in a looming nuclear war or accepting the certainty of a nuclear war—certain because he would start the war—in exchange for the reduced damage that would occur by being the first to strike the enemy. Since the damage from a nuclear attack, even from a reduced Russian attack made with what was left after a U.S. first strike, would be horrendous, this would be an extraordinarily difficult choice. The decision to strike first would require near-perfect confidence in intelligence about the intentions of the enemy during a crisis and that is unlikely.

"China feels [its nuclear] deterrent is at risk over the next decade because of U.S. targeting capabilities, missile accuracy, and potential ballistic missile defenses. Beijing is, therefore, modernizing and expanding its missile force to restore its deterrent value."

On the other side of the balance, the United States' ability to attack and destroy Russian nuclear forces is not without cost. The Russians and Chinese are all too aware of their vulnerability and try to compensate through operational measures. In the case of Russia, these may include launching their weapons on warning of an incoming American attack. This tactic will get many of the Russian missiles into the air before they can be destroyed on the ground but would have catastrophic consequences if Russian early warning was actually a false alarm. The Russians may take other risky measures during a crisis if they perceived their forces to be vulnerable, such as pre-delegating launch authority to lower echelons for fear of a decapitating strike on national leaders. Moreover, dispersing weapons to improve survivability increases the possibility of accident and theft by or diversion to terrorists.

The counterforce capabilities of the United States also affect Russian and Chinese force structure decisions. Because a large fraction of U.S. forces is on invulnerable submarines, the Russians have no hope of a disarming first strike against the United States. The Russians must be resigned to a retaliatory attack (or at best a very limited counterforce attack) so part of the Russian calculation of an adequate force structure is to have enough weapons *after* an American first strike to still retaliate with forces adequate to deter. Thus, if the

Russians judge that some minimum number of weapons is adequate for retaliation and further calculate that a U.S. first strike attack would be, say, 90 percent effective, then they must maintain ten times more weapons than they would judge would be needed for effective retaliation. While the United States may benefit in one case by blunting the effectiveness of the Russian attack on the United States, precisely that capability is part of what motivates the Russian force that needs to be destroyed; that is, maintaining a counterforce capability for the rare possibility that it might reduce damage to the United States creates an ongoing, day-by-day increase in the threat to the United States.

Figure 13:
Chinese DF-31 Launch

The Chinese development of long-range nuclear missiles was, according to the U.S. intelligence community, at least in part triggered by U.S. nuclear counterforce capabilities.

Source: Web

The U.S. Intelligence Community has repeatedly stated that U.S. counterforce capabilities have triggered Chinese nuclear modernizations, developments that are now seen as strategic challenges to U.S. national security and constraining its options in the Pacific. The U.S. Defense Intelligence Agency concluded in 1999 that, "China feels [its nuclear] deterrent is at risk over the next decade because of U.S. targeting capabilities, missile accuracy, and potential ballistic missile defenses. Beijing is, therefore, modernizing and expanding its missile force to restore its deterrent value."[24] CIA's Robert Walpole echoed this assessment in 2002 when he told the Senate Armed Services Committee that the Chinese effort to deploy mobile long-range missiles as an alternative to silo-based missiles got underway because "China became concerned about the survivability of its silos when the U.S. deployed the Trident II-D5 because you could hit those silos."[25] Most recently, in March 2009, the

Director of U.S. National Intelligence, Dennis Blair, stated before the Senate Armed Services Committee that China is modernizing its "strategic forces in order to address concerns about the survivability of those systems in the face of foreign, particularly U.S., advances in strategic reconnaissance, precision strike, and missile defenses."[26]

A calculation of U.S. security must compare the long term, on-going risks that are triggered by maintaining U.S. counterforce capabilities with the possible, but highly unlikely, advantage of launching a first strike counterforce attack. We believe that the *net* security benefit of maintaining a counterforce first strike capability is uncertain at best and is more than likely strongly negative.

If the United States abandons its counterforce capability under a minimal deterrence policy, changes in Russian and Chinese arsenal size and deployment could result. The Russians could make some immediate changes in response. For example, since they are as worried about responding disastrously to a false warning of attack as the United States is, they could adjust their threshold for launch to reflect their altered perception of the threat. China, likewise, might, if the United States and Russia relaxed their postures, be less inclined to modify its nuclear doctrine, a concern stated repeatedly by the Pentagon.[27]

Changes in the Russian and Chinese nuclear forces would not be automatic, of course. We believe, however, that moving away from counterforce will more importantly open opportunities for negotiated symmetric reductions in the forces of all sides. By abandoning counterforce capability against Russia, the United States might be able to negotiate reductions in Russian forces down to the levels that they would have after a U.S. counterforce first strike, to the clear security advantage of both. There is no question that bringing the next tier of nuclear powers, probably China, Britain, and France, into arms reduction negotiations will be complex and challenging, but management of the Chinese threat in particular will be easier without their fearing a disarming first strike. The Chinese are in the difficult position of currently seeing such a threat from both the United States and the Russians, and all sides have clear benefits from curtailing the nuclear mission. An American focus on retaliation alone will allow negotiation of changes in the Russian force structure and, with both nuclear superpower arsenals being less offensively-oriented, Chinese constraint on missile numbers, payload, and MIRVing will be easier.

Abandoning Counterforce Targeting

Under our proposal for a minimal deterrence policy, the United States would break with Cold War nuclear planning and explicitly abandon counterforce targeting. Targets for nuclear weapons have historically been divided into two broad categories: countervalue and counterforce. Countervalue targets included industry, civilian infrastructure, and other assets valued by a society including, obviously, the lives of its citizens. At the beginning of the nuclear era when nuclear weapons were few, cities were the targets of strategic bombers. This was a straightforward progression of the strategic bombing practices of World War II that included saturation bombing and fire-bombing of German and Japanese cities. When early, inaccurate ballistic missiles could not hit targets smaller than a city, cities became the primary targets of nuclear-armed missiles by default. As technologies and missile accuracies improved, the targeting of the enemy's nuclear forces, such as ICBM silos and command, control and communication facilities, came to predominate. A key turning point was Secretary of Defense Robert McNamara's speech at the University of Michigan in February 1962 where he said:

In practice, counterforce targeting would have killed many tens of millions of people.

> "The U.S. has come to the conclusion that to the extent feasible, basic military strategy in a general nuclear war should be approached in much the same way that the more conventional military operations have been regarded in the past. That is to say, principal military objectives, in the event of a nuclear war stemming from a major attack on the Alliance, should be the destruction of the enemy's military force, not of his civilian population."

This shift to attacking the Soviets' ability to use their own military power, called counterforce targeting, did not result in any meaningful reduction in

civilian casualties, but it did lead to an expensive and dangerous arms race between the United States and the Soviet Union. In the aftermath of PD-59 and NSDD-13,[28] what constituted "deterrence" had reached grotesque proportions, with the apparent definition being the ability to destroy a heavily protected Soviet leadership, to effectively target Soviet nuclear forces, and retain command and control of U.S. nuclear forces during a "protracted" nuclear war. While the new war goals seemed to focus on military targets instead of population, in fact, the war plans included attack on political leadership, command centers, transportation hubs, defense industry, and other targets that were in the heart of all major cities. Technically, hitting the Kremlin—or for that matter, the White House—would be considered counterforce targeting (because it is a national leadership center) but when the weapon is a nuclear bomb with a force of several hundred thousand tons of TNT and many such bombs would be directed against key targets, the surrounding population is killed just as certainly as if it were the primary target. In practice, counterforce targeting would have killed many tens of millions of people. "Counterforce" versus "countervalue" was a distinction without a practical difference as far as the civilian populations were concerned.

With the Cold War over, the ideological battle with the Soviet Union has ended, this targeting philosophy and the forces needed to carry it out are clearly out of proportion to the stakes in play. Yet, through momentum and the lack of clear-cut contrary directives by the president, the core counterforce elements continue to guide the purpose, operational deployment, doctrine, and targeting plans of U.S. nuclear forces. And because of the requirement to deter not just nuclear but all forms of WMD use in all hostile WMD-quipped countries, counterforce targeting has been mirrored onto a handful of regional states in addition to Russia and China. Counterforce, though reduced in size, still largely determines the types of targets in the war plan, how nuclear weapons are deployed, how quickly they can be launched, how accurate they have to be, what yield they should have, and how reliable they should be. Counterforce means that the number and character of other nations' nuclear forces dictate U.S. target planning and locks nuclear planning into a capability race that works against deep cuts and reducing the salience and role of nuclear weapons. It is time for something new.

Infrastructure Targeting

We believe that there are no targets for nuclear weapons that simultaneously meet the criteria of being militarily essential and morally defensible. Nuclear weapons are extremely efficient against certain types of targets, such as leveling cities and killing millions of civilians, but such attacks are neither morally defensible nor legal under international law. Nuclear weapons are extremely powerful explosives so, obviously, any target that can be destroyed by conventional weapons could also be destroyed by a nuclear weapon. Yet, even in those cases in which nuclear weapons are more efficient and effective, non-nuclear alternatives are preferred because of the cost of introducing nuclear weapons into any conflict.

…huge fatalities will occur in any nuclear attack but many fewer in a minimal deterrence posture than would occur with today's…

The targeting scheme offered here is for the transitional minimal deterrence mission on the path toward zero. The targets proposed are neither counterforce nor simply countervalue, but a tightly constrained subset of countervalue targets. A new targeting category and policy that we term ***infrastructure targeting*** would focus on a series of targets that are crucial to a nation's modern economy, for example, electrical, oil, and energy nodes, transportation hubs.[29] Conventional military facilities that are not collocated with population centers might also be included although we do not examine examples in our target sets. Customary laws of war prohibit attack of purely civilian targets so the infrastructure targets should be further limited to those that support war industries. The goal of such constrained targeting would be to have the ability to inflict sufficient damage, that is, impose costs and pain on a nation, which will outweigh any potential benefit that a future enemy might expect from a nuclear attack on the United States.

Proponents of counterforce targeting often claim that it is the only moral-

ly justifiable nuclear targeting because anything else means "city busting" and targeting of civilians. But that argument ignores that existing counterforce targeting accepts tens of millions of civilian casualties. We believe that nuclear targeting decisions should place a very high value on avoiding collateral threat to populations, and explicitly prohibit city attacks, keeping in mind that important military targets in cities can always be attacked, simply not with nuclear weapons. Of course, huge fatalities will occur in any nuclear attack but many fewer in a minimal deterrence posture than would occur with today's targeting choices. Note that this approach actually restricts the mission of nuclear weapons to just deterrence, which is what most discussions of nuclear weapons claim the mission to be. This is not war fighting, it is not preemption to limit damage, it is not vengeance. It is only deterrence in its simplest form: guaranteed pain if an adversary unwisely attacks the United States or its allies with nuclear weapons.

As previously noted, today's nuclear counterforce employment plans are composed of a "family" of individual strike options organized under an operational plan known as OPLAN 8010. The choice of which member of the family is selected would depend upon the size and nature of the adversary's attack, and the size and nature of the counter-plan that would be decided by the president and his advisers. The actual strike plans probably range from using just a few weapons to using more than 1,000. The more flexible nature of the current war plans suggests that new plans could be generated relatively quickly, using targets and weapons already embedded in existing plans.

The actual strike plans probably range from using just a few weapons to using more than 1,000.

Because the Bush administration's Nuclear Posture Review ordered the military to integrate nuclear and conventional weapons into the strike plans, some of these "New Triad" targeting strategies began to look more like countervalue than counterforce targeting. Since many military law attorneys consider countervalue targeting illegal under the Law of Armed Conflict (LOAC), STRATCOM proposed during the revision of the *Joint Pub 3-12 Doctrine for Joint Nuclear Operations* in 2003-2004 renaming "countervalue targeting" as "critical infrastructure targeting." Other Commands objected to the renaming, however, arguing that countervalue "has an institutional and broadly understood meaning in the academic literature," and could not be substituted anyway because critical infrastructure targets actually are a subset of countervalue targets. Rather than resolving the controver-

sial targeting trend, however, Joint Staff instead decided to delete the entire countervalue section from the final draft.[30] Unlike the critical infrastructure targeting proposed by STRATCOM, the minimal deterrence posture proposed by this report would have clear separation of nuclear and conventional forces in relaxed strike plans directed against a sharply curtailed target set.

A minimal nuclear deterrence policy and posture with infrastructure targeting does not require nuclear forces to be on alert, to be configured for preemption, or to even retaliate quickly

The practice of maintaining highly ambitious active, operational nuclear war plans, whether they were the Cold War SIOP or the post-Cold War OPLAN, is a recipe for unceasing arms requirements. A minimal nuclear deterrence policy and posture with infrastructure targeting does not require nuclear forces to be on alert, to be configured for preemption, or to even retaliate quickly. Planning should shift from having nuclear forces in a ready-to-go OPLAN to a contingency war planning capability able to assemble an attack plan in the event of an attack by another nuclear state, but focused on a new set of infrastructure targets. This new process and paradigm would alleviate the pressures that the current plans impose and lead to relaxing alert rates and reducing the number of weapons.[31]

Damage and Casualty Analysis for a Notional Infrastructure Target Set[32]

Even a very limited nuclear strike directed against industrial targets is capable of inflicting considerable damage to an adversary. The *Effects of Nuclear War* published by the Office of Technology Assessment (OTA) in 1979[33] used seven Poseidon missiles with 64 40-kt warheads and three Minuteman III ICBMs with nine 170-kt warheads to attack 24 Soviet oil refineries and 34 petroleum storage sites. All were air-bursts and were detonated at an altitude optimal for target destruction. The 73 weapons destroyed 73 percent of the Soviet petroleum refining capacity and 16 percent of Soviet storage capacity. Many of the refineries were in or near cities and thus between 836,000 and 1,458,000 people were killed, depending upon whether the people were in single or multistory buildings. Injuries would total an additional 2.6 to 3.6 million people. While it did not seek to kill people, it did not seek to avoid doing so either. If that had been the intent, much larger casualties would have resulted. Other kinds of collateral damage would result, such as to railroads, pipelines, nearby petrochemical plants. Depending upon the proximity of the refinery to the city, electric plants, airfields, and highways might also be damaged or destroyed as well. OTA concluded that, "Destroying 73 percent of refining capacity would force the economy onto a crisis footing, curtailing choices and consumer goods, dropping the standard of living from austere to grim and setting back Soviet economic progress by many years."

The notional infrastructure target set considered here for a minimal deterrence posture consists of twelve large industrial targets in Russia: three oil refinery targets; three iron and steel works; two aluminum plants; one nickel plant; and three thermal electric power plants. Most of these targets were visible in high-resolution commercial satellite imagery hosted by Google Earth. (To view nominal target set, open the following file in Google Earth: http://www.fas.org/nuke/guide/usa/doctrine/MinimalDeterrence Targets.kmz). This analysis estimates the damage and casualties caused by

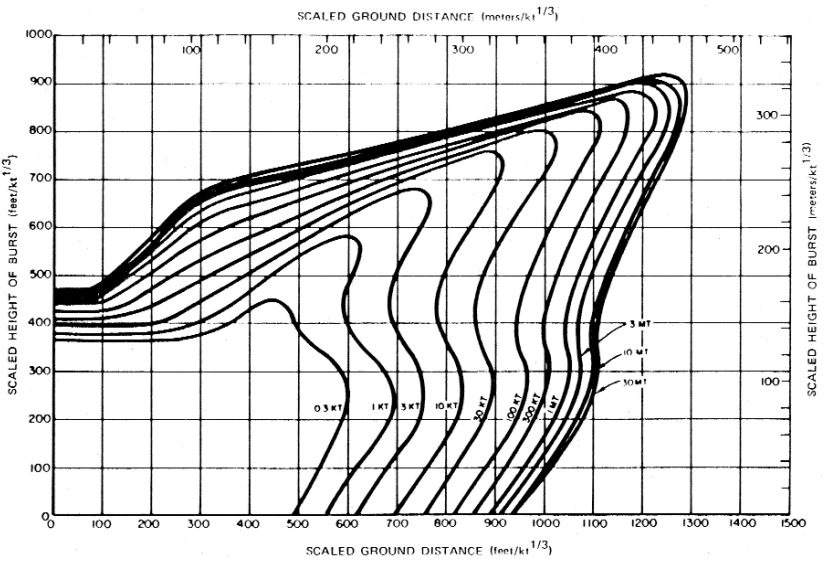
targeting these large facilities with nuclear weapons of varying yields. While only twelve targets are considered, we believe that these results could be scaled up to include several times as many similar targets.

To begin, we assessed the vulnerability of these targets to nuclear attack using data in U.S. documents dating from the Cold War obtained by NRDC under the Freedom of Information Act. Then, having constructed heights of burst (HOB) and aim points for a given attacking nuclear weapon yield, we used the U.S. Department of Defense computer code Hazard Prediction and Assessment Capability (HPAC) to estimate casualties from these nuclear strikes in nearby population centers. To minimize civilian casualties to the

Table 1:
Damage Criteria Against Minimal Deterrence Target Categories

Target Category	**Description of Severe Damage**
Installations for the refining of crude oil and/or intermediate petroleum products	Severe damage to the installation consisting of overturning the distillation, fractionation, and/or cracking columns and associated damage generally as follows: severe structural damage to buildings; blast and debris damage in the principal processing area to control equipment, overhead piping, pipe furnaces, and furnace stacks; severe damage to electrical switches and circuit breakers; collapse of overhead gas mains; and interruption of water supply due to electric power loss. [NTDIH, pg. 98]
Single-story, reinforced concrete (industrial) building structures with heavy cranes	Severe Structural Damage [NTDIH, pp. 14-15]
Thermal and hydroelectric power plants, electric substations and electric power control centers	Severe structural damage to aboveground turbine houses (generator hall), which will prevent the operation of traveling cranes essential for major repairs to turbines and generators, severe damage to transformers and associated damage generally as follows: collapse of switchyard frames, severe damage to switches and circuit breakers, and interior electrical control panels overturned. [NTDIH, pg. 201]

Figure 14:
Isodamage Damage Curves For Minimal Deterrence Targets



"Isodamage" curves (i.e., curves of identical damage) for heavy, steel-frame industrial buildings (single story), with 60-ton to 100-ton crane capacity, described as having lightweight, low strength walls which fail quickly.

extent possible, we chose the optimum HOB and lowest possible yield to destroy each facility.

Among the broad categories of targets for nuclear weapons described in documents on estimating damage from nuclear attacks, we are focusing on three categories listed in Table 1. Also given in the table are descriptions of what qualifies as severe damage to these categories of targets from a nuclear strike for oil refineries and power plants.

To calculate damage to these three target categories from nuclear strikes, we use data for the nuclear explosive damage to heavy, steel-frame industrial buildings (single story), with 60-ton to 100-ton crane capacity, described as having lightweight, low strength walls that fail quickly. The damage "requirements" in terms of nuclear blast wave dynamic pressure for refineries and components of a thermal power plant are similar but slightly lower than for this industrial building type. Figure 14 above shows "isodamage" curves (i.e., curves of identical damage) for this type of industrial building.

The curves are read as follows: each curve is drawn for the specified yield. At a point along the curve for that yield and at the scaled HOB, industrial

structure targets within the scaled ground distance are severely damaged fifty percent of the time. The scaled HOB is the HOB in feet multiplied by the cube root of the yield in kilotons. The scaled ground distance is the distance from the ground zero in feet multiplied by the cube root of the yield in kilotons. So, for example, for a one-kiloton air burst at about 500 feet HOB, industrial structures would be severely damaged out to a range of 600 feet with a fifty percent probability. For a 50-megaton (MT) explosion at 33,156 feet HOB, industrial structures would be severely damaged out to a ground distance of 44,209 feet with a fifty percent probability. The optimum HOB, or the HOB for which the ground distance over which targets are damaged is a maximum, is found by following the curve for a given weapon yield to the point where the scaled ground range is a maximum, and then reading off the corresponding scaled HOB. For the target categories considered here, the optimum HOB is sufficiently high that no local fallout would be predicted (the rule of thumb is that if the HOB in feet is greater than $180 \times \text{Yield}^{1/4}$ where the yield is in kilotons, then no local fallout occurs).

To assess effects, we are also interested in the distances from the ground zero to which at least moderate and light damage would be expected and the distances from the ground zero out to which fires would be predicted to occur, for a given yield and HOB. A table in the source document for the isodamage figure above provides scaling factors by which we multiply the severe damage scaled ground distances to calculate the moderate damage scaled ground distances. According to the document, the distance at which the nuclear explosion produces one pound-per-square-inch (1 psi) overpressure can be taken as the distance out to which at least light damage occurs for a given nuclear explosion. The area vulnerable to fire is that area exposed to 10 calories per square centimeter (10 cal/cm^2) thermal flux, above the ignition point of many flammable substances. Table 2 below lists these distances for various nuclear explosive yields.

From this table of ground distances it can be seen that the area of fires exceeds the areas of severe and moderate damage from the nuclear blast wave. However, in Cold War U.S. targeting practices, only the damage expectancy from blast effects was considered in the weapon allocation process.[34]

The footprints of these industrial and infrastructure targets are large, as seen in Google Earth imagery. If the required level of damage for deterrence is severe damage from blast effects over most of the target footprint, multiple low-yield weapons or higher yield weapons would be required. If the required level of damage for deterrence is severe and moderate damage to the central footprint of the target, and fires and light damage across the target footprint, then a single lower yield weapon would be required.[35]

Table 2:
Damage and Fire Distance for Various Nuclear Explosive Yields

Yield (kilotons)	HOB (feet)	Ground Distance for Severe Damage (feet)	Ground Distance for Moderate Damage (feet)	Ground Distance for Fires (feet) or Light Damage	Ground Distance Light Damage (feet)
3	343	1,004	1,506	2,900	7,200
10	1,579	1,971	2,760	5,000	13,000
30	2,402	3,207	4,169	8,500	18,000
100	3,774	5,161	6,194	15,000	30,000
300	5,603	7,819	9,383	25,000	40,000

Fatalities and casualties calculated from HPAC for each of the targets and yields examined in this report are given in Table 3 below: The code estimates fatalities and injuries separately using an extrapolation of the Hiroshima and Nagasaki data, for both people out in the open during the nuclear explosion or in building structures. The table below shows the casualty predictions (fatalities plus injuries) for these targets and yields for people in building structures, with fatalities identified.

The nuclear explosion casualty estimates vary a great deal by target due to the proximity of a given target to nearby population centers. Among these dozen targets, the Omsk Refinery presented the most casualties and the Berezovskoye Thermal Power Plant presented the fewest casualties; the difference was about two orders of magnitude. This speaks to the possibility that targets in a revised nuclear strike plan could be first selected for their significance, but then targets with high civilian casualties eliminated from the list. Among the three types of industrial targets considered here, the refineries and metal plants had a higher number of casualties on average than the power plants, presumably because they employed more people and these employees lived close to the facility.

(Below is detail regarding Table 3 on facing page.) The code HPAC estimates fatalities and injuries from a nuclear explosion based in part on an extrapolation from what occurred at Hiroshima and Nagasaki to lower or higher nuclear explosive yields. These calculations assume that victims of the nuclear strikes are in building structures at the time of the attack, and so would be subject to injuries from collapsing structures but less vulnerable than people out in the open to blast, initial radiation (the burst of gamma rays and neutrons emitted by the fireball within the first minute after the explosion) and thermal (heat) radiation. These calculations predict that the overall percentages of fatalities within the casualties range from 70 percent at 3 kilotons to between 20 and 33 percent at the higher yields – this arises in part because of the increasing areas subject to mid- or low-levels of blast effects with increasing yields.

Table 3:
Fatality and Casualty Predictions for People in Industrial Building Structures

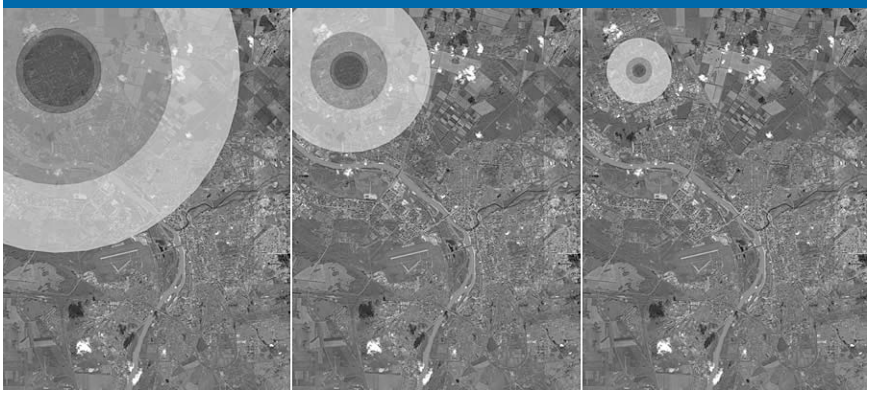
Target	Fatalities 3 kt (343′ HOB)	Casualties 3 kt (343′ HOB)	Fatalities 10 kt (1,579′ HOB)	Casualties 10 kt (1,579′ HOB)	Fatalities 30 kt (2,402′ HOB)	Casualties 30 kt (2,402′ HOB)	Fatalities 100 kt (3,774′ HOB)	Casualties 100 kt (3,774′ HOB)	Fatalities 300 kt (5,603′ HOB)	Casualties 300 kt (5,603′ HOB)
Omsk Refinery	6,775	9,575	8,512	23,830	14,448	73,408	32,022	182,291	86,086	336,602
Angarsk Refinery	1,223	2,166	1,980	13,004	4,861	67,366	19,430	173,264	81,699	281,255
Kirishi Oil Refinery	739	1,185	1,112	3,971	2,598	11,783	6,398	25,089	16,014	36,548
Magnitogorsk Iron and Steel Works (MMK)	5,894	8,421	7,681	20,793	12,714	67,175	27,676	167,065	78,835	273,555
Nizhny Tagil Iron and Steel Works (NTMK)	5,420	8,703	7,919	31,560	15,310	97,680	40,455	207,782	112,712	316,994
Severstal-Cherepovets Iron and Steel Works	6,851	10,368	9,532	31,899	17,152	64,418	40,625	108,419	99,144	150,719
Norilsk Nickel Mining and Metals Plant	13,794	18,259	16,767	36,251	25,872	87,358	44,992	176,772	99,144	249,657
Bratsk Aluminum Works (BrAZ)	1,341	2,045	1,864	8,277	4,315	30,333	12,952	68,799	37,825	104,067
Novokuznetsk Aluminum Plant	100	177	154	679	424	2,876	1,238	12,538	4,020	49,859
Berezovskoye Thermal Power Plant	104	175	171	640	430	2,473	1,127	9,621	3,345	28,139
Sredneuralskaya Thermal Power Plant	3,030	4,087	4,018	9,026	6,375	15,222	11,207	31,455	18,142	83,121
Surgut Thermal Power Plant	1,443	2,303	2,150	7,185	5,052	17,068	10,878	42,372	22,065	85,964
Total All Targets	**46,714**	**67,464**	**61,860**	**187,115**	**109,551**	**537,160**	**249,000**	**1,205,467**	**659,031**	**1,996,480**

Fatalities and casualties increase with increasing nuclear explosive yield. For the total casualties to be kept under one million people, yields less than about 30-kt would have to be used – less than the W76 for example. But again, in a revised war plan, targets could be assigned weapons based on casualty estimates as well as damage expectancies for deterrence. For example, the Sredneuralskaya Thermal Power Plant could be struck by a 100-kiloton weapon with the same degree of threat to nearby population centers as striking the Nizhny Tagil Iron and Steel Works with a 10 kiloton weapon.

Power plants, however, represent a particularly sensitive group of targets because they provide electricity used by the civilian population for heating and sanitation. Destruction of power plants can therefore lead to significant numbers of indirect civilian casualties due to lack of heating, water purification, and sewage treatment. We recommend that minimal deterrence targets include those power plants that explicitly produce electricity for key military industrial facilities, not power plants generally.

These results are sobering. We have gone out of our way to find remote targets of importance that, while near their own workforce, are not part of a

Figure 15:
Nuclear Weapons Effects Circles for Different Yields Against Omsk Refinery



The nuclear weapons effects of a 300-kt, 30-kt and 3-kt explosion (left to right) with a ground zero at the Omsk Refinery in southwestern Siberia. The city of Omsk, along the Om River, lies 15 kilometers southeast of the ground zero. In the figures, the dark, inner circle represents the area over which industrial structures with heavy cranes would be severely damaged. The next zone represents the slightly larger area over which such building structures would be at least moderately damaged. The intermediate zone and within represents the areas in which fires would be predicted to occur from ignition of flammable substances due to the heat radiation produced by the nuclear fireball. Finally, the outer areas represent zones of light damage to such industrial buildings. *Image: GeoEye via Google Earth*

city. Even so, with weapons equivalent to the W76, the most common U.S. warhead, over a million people would be killed or injured by an attack of just one dozen warheads. This suggests to us that the current U.S. arsenal is vastly more powerful than needed. There is no need for two stage thermonuclear warheads of a hundred kiloton and more yield to produce extensive damage on a scale sufficient to deter – to the extent that anything can – potential adversaries from attacking the United States and its allies with nuclear weapons (see Figure 15 above). Under a minimal deterrence posture, existing warheads should carry inert secondaries, limiting their yields to ten or so kilotons and, when possible, the primary should be unboosted, limiting their yield to a few kilotons.

The current U.S. arsenal is vastly more powerful than needed. There is no need for two stage thermonuclear warheads of a hundred kiloton and more yield to produce extensive damage on a scale sufficient to deter – to the extent that anything can – potential adversaries from attacking the United States and its allies with nuclear weapons.

The current target base probably already contains many types of infrastructure targets that could suffice for a minimal deterrence posture. There are hundreds of these types of targets, many of which could be included in retaliatory attack options of various sizes to avoid an all-or-nothing posture.

Keep in mind that the goal of the attacks analyzed above is to deter nuclear use, not defeat nuclear weapons or win nuclear wars. So we must speculate on the stakes involved such that the incremental benefit to the Russians or Chinese of turning a conflict nuclear is worth destruction of their critical infrastructure and potentially a million casualties. Nothing presents itself. Given the complex interconnectedness of modern societies such as Russia and the United States and a rapidly changing China, we believe that the destruction of key targets meeting our criteria would have a profound effect upon the national infrastructure and economy and would negate any conceivable advantage an enemy might calculate it could gain by attacking the United States or its allies with nuclear weapons.

The Minimal Deterrence Stockpile

The power of nuclear weapons is so immense that our descriptions of them have become skewed. We refer to nuclear weapons like those that destroyed Hiroshima and Nagasaki as "small" weapons that, if detonated in a city with high population density, could kill many hundreds of thousands or millions of people. The U.S arsenal is predominantly made up of nuclear weapons that are between five and seventy-five times as powerful. For the missions laid out here, no weapon of such power is needed; and, because we want to minimize collateral damage to a civilian population, including radioactive fallout, such weapons cannot be justified. While this study does not attempt to develop an ideal modern stockpile, simple adjustments to the legacy stockpile will be more than adequate to carry out the new targeting policy.

A common argument in favor of new warheads is that the so-called "legacy" nuclear arsenal, the one left from the Cold War, is not the arsenal we need today. The main complaint is that the warheads are too powerful, designed to destroy "hardened" Soviet targets such as buried, reinforced missile launchers and that they were designed with a very tight performance margin to minimize weight in order to allow deployment of large number of warheads on each missile. Our analysis reinforces these objections but, even so, approximately one-third of the warheads in the current arsenal have low-yield options, and others could get it by disabling the thermonuclear secondary stage so that the weapons and warheads that are currently in the stockpile are more than sufficient to meet the requirements of a minimal deterrence policy. No new warheads need to be developed, produced, or deployed, and performance requirements can be relaxed.

Refurbishment and modernization, under the Stockpile Stewardship Program (SSP), are already taking place and, while there was much concern about the feasibility of the SSP at its beginning, subsequent experience has shown that the understanding and maintenance of nuclear warheads has improved significantly with time. The land-based intercontinental-range missiles are undergoing an extensive series of upgrades that will extend their service through 2030. The life of the ballistic missile submarines has been

extended through 2040. Reductions in the number of nuclear weapons are being made by retiring the oldest weapons first and retaining the newer ones so the *average* age of the arsenal is growing by less than one year per year. The SSP has been successful in maintaining U.S. warheads for the past decade and should be able to continue well into the future. In certain cases there can be funding for "life extension" programs to replace critical non-nuclear parts.

Current nuclear weapons are so-called two stage thermonuclear weapons. The first stage, or primary, is a fission device powered by plutonium that alone would create a yield of a few kilotons. The first stage in current weapons is "boosted," that is, the yield of the fission primary is enhanced by the addition of a mixture of heavy isotopes of hydrogen, deuterium and tritium, that produces copious neutrons that induce additional plutonium fissions, thereby substantially increasing the yield. The energy of the boosted primary is used to compress and heat the second stage, or secondary, igniting it and releasing the vast majority of the overall energy of the weapon. Most modern U.S. nuclear weapons can, therefore, easily be given a selectable explosive yield: a yield of a few hundred tons from the unboosted primary, a greater yield of several kilotons from the boosted primary but with the secondary turned off, and finally a yield of up to hundreds or thousands of kilotons from the complete weapon. For the missions envisioned here, the main adjustment will be to disable the secondary stage of the thermonuclear weapon leaving it with either a boosted fission or pure fission option. Instead of warheads with 300 kt (W87/MX), 335kt (W78/MM III), 450 kt (W88/Trident II) or 100 kt (W76/Trident II,) by disabling the second stage one ends up with yields in the low kiloton range, more than enough to obliterate the infrastructure targets described above.

Figure 16:
W87/Mk21 SERV Reentry Vehicle

A U.S. Air Force technician inspects the fuze section on an Mk21 SERV reentry vehicle for the W87 warhead. Under a minimal deterrence posture, the secondary on this 300-kt warhead is not needed.

The composition of the nuclear force structure intended to meet the minimal deterrence posture proposed in this study would gradually transition from today's Cold War Triad to a Dyad of ICBMs and bombers. The posture would consist of approximately 500 warheads, including 200 single-warhead ICBMs (all with W87 warheads with reduced yield) and about 250 gravity bombs for

aircraft (B61/B83) also with reduced yield.

Unlike the ICBMs, the nuclear bombers would not be routinely operational with nuclear weapons but could quickly be rolled back into operational nuclear capability when necessary. De-alerting is sometimes said to be dangerous for crisis stability because adversaries might detect readying of the bombers and therefore decide to strike first. This is true only for a counterforce posture where nuclear forces are held at risk and a sudden increase of the alert status might trigger escalation. Keep in mind that, by hypothesis, the aircraft will be nuclear armed only after nuclear attack; a crisis cannot get much more serious than that and there will be no mystery that the United States will be preparing to do something. The U.S. bomber force was de-alerted in October 1991 without adverse effect and the B-1 bomber maintained in a nuclear re-role posture for several years until this arrangement was finally terminated in 2003.

Due to their offensive and overt nature, we consider nuclear-armed SSBNs to be incompatible with a minimal deterrence posture and an obstacle to transparency and verification. Under our scenario, the SSBN force would gradually be reduced and retired by 2025, which would also greatly simplify the nuclear command and control system.

The transition from Cold War triad to a minimal deterrence posture could look like this:

Table 4:
U.S. Nuclear Posture Options on a Path Towards Zero

Platform	Warheads 2009	Warheads 2015	Warheads 2020	Warheads 2025
SSBNs	14/1,152	12/960	8/576	0
ICBMs	450/550	300/300	200/200	200/200
Bombers*	44/500	16/256	16/256	16/256
Non-strategic	500	0	0	0
Subtotal	**~2,200**	**~1,500**	**~1,000**	**~500**
Reserve	2,500	1,000	500	0
Total	**5,200**	**2,500**	**1,500**	**500**

* Only a portion of the Primary Aircraft Inventory bombers has a nuclear mission.

Conclusion and Recommendations

Whatever the utility of nuclear weapons during the Cold War, nuclear weapons today threaten the security of the United States and the world more than they enhance it. The United States should publically announce a goal of eliminating nuclear weapons and establish a series of policies and action to achieve that goal. Current nuclear doctrine is an artifact of the Cold War that needs to be fundamentally altered. "Counterforce" targeting should be explicitly and publicly abandoned. While the ultimate goal is nuclear abolition, a minimal deterrence doctrine creates a stable resting spot that minimizes the salience and danger of remaining nuclear weapons and allows all of the world's disparate nuclear powers to come into a stable equilibrium before moving to the last step or denuclearization. Thus, minimal deterrence should be adopted as a transitional step on a path to zero nuclear weapons.

The president must be continuously engaged in this transformation with specific and direct instructions to the national security bureaucracies. Once formulated, the president should publicly announce the changed role for nuclear weapons and the new types of targets. Under American leadership, the process should lead to engagement with the other nuclear powers towards a global goal of negotiating verifiable nuclear abolition, which will enhance the security of the United States. The new strategy can be carried out with weapons in the current arsenal. No new weapons need be built.

Appendix A

Nuclear Doctrine and Policy Guidance Hierarchy

The president and his advisors develop the overall policy that guides how the military should plan for nuclear use and employ nuclear weapons. The policy is promulgated in a series of guidance documents that direct the Secretary of Defense (SecDef) and the Chairman of the Joint Chiefs of Staff (CJCS) to structure the nuclear forces and develop detailed strike plans to achieve a set of objectives against specific adversaries in support of national and alliance security policy.

The Office of the Secretary of Defense (OSD) and the CJCS "translate" the presidential guidance into detailed force requirements, deployments, and requirements for strike plans that the Services, Unified Commands, and individual Combatant Commanders implement. As such, the nuclear guidance process extends from overall policy concepts emanating from the president's pen to the highly detailed and carefully orchestrated strike plan that instructs an individual war fighter how and when to attack a specific target.

At each step in the process of "translating" the presidential guidance, civilian and military officials add nuances and interpretations to the president's stated policy and objectives. In the case of the presidential guidance for Change Two to the Unified Command Plan from January 2003, for example, former STRATCOM commander Admiral James Ellis recalls: "[the] president's direction to me was less than two pages; the Joint Staff's explanation of what the president really meant to say was twenty-six pages."[36]

White House Guidance

The process begins with the White House publishing the National Security Strategy (NSS), which lays out the overall national security objectives of the United States. The 2006 NSS states that "safe, credible, reliable nuclear forces continue to play a critical role" in U.S. deterrence strategy and "We are strengthening deterrence by developing a New Triad composed of offensive strike systems (both nuclear and improved conventional capabilities); active and passive defenses, including missile defenses; and a responsive infrastructure, all bound together by enhanced command and control, planning, and intelligence systems. These capabilities will better deter some of the new threats we face, while also bolstering our security commitments to allies. Such security commitments have played a crucial role in convincing some countries to forgo

their own nuclear weapons programs, thereby aiding our nonproliferation objectives."[37]

A series of classified Presidential Policy Directives (PPDs) provide more detailed guidance on specific policy and force structure issues. The Nuclear Weapons Stockpile Memorandum or Plan, for example, instructs the Pentagon on how many and of what types of nuclear weapons it should have in the nuclear stockpile for the next five years. Another example is the Nuclear Weapons Deployment Authorization, which authorizes the Pentagon to deploy a certain number of nuclear weapons at facilities outside the United States.

Yet another example is "Nuclear Weapons Planning Guidance" (NSPD-14) issued on June 28, 2002, which laid out the newly elected president's nuclear weapons planning guidance and provided broad overarching directions to the agencies and commands for nuclear weapon planning. The directive led to the creation of OPLAN 8044 Revision 03, a modified nuclear strike plan with executable strike options against regional states.[38]

Appendix B includes an example of a Presidential Policy Directive that would direct the necessary changes to achieve a minimal nuclear deterrence posture. Following this directive, the president would publish a new NSS.

The Office of the Secretary of Defense

The Office of the Secretary of Defense (OSD) translates the NSS into the National Defense Strategy (NDS), which describes the role of the military forces in U.S. national and foreign policy. Other OSD instructions include Defense Planning Guidance (PDG) and Contingency Planning Guidance (GPG), which provide annual policy guidance to CJCS for defense and contingency planning.

The most important nuclear guidance from the OSD is the Guidance for the Employment of the Force (GEF) – previously known as Nuclear Weapons Employment Policy, or NUWEP), which lists the strike options and war objectives the military must plan for against specific adversaries. The 2004 NUWEP stated in part that "U.S. nuclear forces must be capable of, and be seen to be capable of, destroying those critical war-making and war-supporting assets and capabilities that a potential enemy leadership values most and that it would rely on to achieve its own objectives in a post-war world."[39]

OSD also directs a series of periodic reviews that influence nuclear policy. Since the end of the Cold War, the most important has been the Nuclear Posture Review (NPR), which describes – with input from the Services – the nuclear policy, programs, and potential scenarios. Since the late 1990s, OSD has also conducted the Quadrennial Defense Review (QDR), which lays out the overall defense posture, including nuclear forces.

The Chairman of the Joint Chiefs of Staff

The Chairman of the Joint Chiefs of Staff publishes the National Military Strategy (NMS), which – based on the NSS – provides the CJCS's advice on national military objectives, force structure, and support requirement to the National Command Authority (NCA).

Based on this, and more directly the GEF, the CJCS produces the Joint Strategic Capabilities Plan (JSCP), which provides strategic guidance to Combatant Commanders, Service chiefs, and agencies, and apportions forces for near-term planning. The JSCP, which is formally known as CJCS Instruction 3110.01, has 14 supplements with instructions for specific aspects of military planning. One of the supplements is the Nuclear Annex previously known as Annex C but now CJCSI 3110.04 or JSCP-N. The current JSCP-N, which was published on December 31, 2004, with Change 1 on March 18, 2005, was updated on January 5, 2007.

JSCP-N is where the nuclear "rubber hits the road." The document assigns planning tasks to the individual combatant commanders, apportioning major combat forces and resources, and issues planning guidance to integrate joint operation planning activities. JSCP-N establishes parameters and constraints that are the basis for the nuclear target development for the individual strike plans. It also defines the probability of damage (PD) that is to be achieved by the strike plans against individual targets and groups of installations. For non-strategic nuclear forces, JCSP-N "describes situations which could lead to a request for the selective release of nuclear weapons."[40]

Command-Level Planning

Based on the NUWEP and JSCP-N, the combatant commanders construct a series of nuclear strike plans to meet the guidance. For U.S. Strategic Command (STRATCOM) the primary product is Operations Plan (OPLAN) 8010 Strategic Deterrence and Global Strike, formerly known as OPLAN 8044, and, before that, the Single Integrated Operational Plan (SIOP), which now consists of a "family" of strike plans against six potential WMD adversaries. Based on guidance from the STRATCOM Commander, the responsibility for building, maintaining, and executing the strike plans rests with Joint Forces Component Command for Global Strike (JFCC-GS) at Offutt Air Force Base in Nebraska. The operational forces that are needed to execute the plans are made available to JFCC-GS by the Air Force and Navy, which produce their own OPLAN 8010 support plans. STRATCOM also provides planning "cells" to assist Central Command, European Command, and Pacific Command with designing regional nuclear strike plans as needed.

Appendix B

A Draft Presidential Policy Directive (PPD)

To change military planning from counterforce to minimal deterrence, President Obama will have to sign a Presidential Policy Directive (PPD) that clearly articulates the altered role of nuclear weapons in overall security policy and discuss details such as targeting, force size, and the circumstances under which nuclear weapons might be used. After signing, the PDD would go through a series of stages to be implemented. Taking direction from the PPD, the Secretary of Defense would draft the Guidance for the Employment of the Force (GEF). The GEF provides more detail about how nuclear weapons are to be employed and instructs the Joint Chiefs of Staff (JCS) on guidelines on how to create the Nuclear Supplement to the Joint Strategic Capabilities Plan (JSCP-N), the document that assigns the nuclear forces to commanders of unified commands.

Below is a draft PPD that uses the kind of language that will be necessary to reorient the U.S. nuclear posture in the direction of dramatic reductions and eventual elimination of nuclear weapons.

Presidential Policy Directive X

To: Secretary of Defense
Chairman, Joint Chiefs of Staff
Secretary of State
Director National Intelligence

Subject: Presidential Guidance for Planning the Employment of Nuclear Weapons

Based upon a vastly altered geopolitical situation, in which the United States no longer faces thousands of Soviet nuclear weapons, I have reached a series of decisions about United States nuclear weapons employment policy. The decisions depart from current policy in major ways: by limiting the role of nuclear weapons in our security policy, by going to smaller and smaller numbers through a series of stages, and by truly supporting our pledge to honor Article

VI of the Nuclear Non-Proliferation Treaty, which calls for the eventual elimination of nuclear weapons.

This PPD provides the criteria for how U.S. nuclear weapons would be employed, and establishes the process by which to implement the changes.

The Reason for Possessing Nuclear Weapons

The sole reason for possessing nuclear weapons, I have determined, is to deter the use of a nuclear weapon against the United States and our allies thus keeping intact prior security commitments. In years past much more expansive reasons were given for the utility of nuclear weapons. Their many roles led to enormous stockpiles and elaborate war plans. The new plans I am ordering to be implemented will focus on ensuring that there are assured retaliation options available to the president if anyone were so unwise as to attack the United States with nuclear weapons.

Abandoning Counterforce Nuclear Targeting

The most dramatic shift that I intend to implement is to abandon "counterforce," the ruling paradigm for U.S. war plans and forces for more than four decades. We are no longer going to demand that, "U.S. nuclear forces must be capable of, and be seen to be capable of, destroying those critical war-making and war-supporting assets and capabilities that a potential enemy leadership values most and that it would rely on to achieve its own objectives in a post-war world" as the former administration stated in 2004. The purpose of nuclear strike planning is no longer to achieve an advantage over an adversary's nuclear forces or limit damage to the United States, but entirely to provide a secure retaliatory strike capability to deter nuclear attack. Dramatic reductions of the stockpile, limiting the role of nuclear weapons, and relaxing the requirements for weapon cannot take place unless the current targeting policy changes. The essential steps are to withdraw target coverage of an adversary's nuclear forces and relax the alert rates that currently keep U.S. forces poised to strike.

New Targets for Minimal Deterrence

The shift I am ordering is not from counterforce to "countervalue" (the targeting of population centers) but rather to a new set of targets we characterize as "infrastructure" targets. Infrastructure targets are facilities such as oil refineries, iron and steel works, aluminum plants, nickel plants, thermal electric power plants, and transportation hubs that can be destroyed while minimizing collateral civilian casualties. In short they are the essential components

that constitute the sinews of modern societies. Their destruction would decimate the economic and industrial foundation of any country.

Knowing that the attack on infrastructure would follow if any nation were unwise enough to attack the United States or its allies with nuclear weapons should be enough of a deterrent – to the extent anything is - to prevent an attack in the first place.

Upon signing I will make this Directive public to ensure that our declaratory and employment policies are in concert and to warn anyone harboring any thoughts of attack to understand what would happen.

Next Steps and Reviews

Based upon this PPD, the Secretary of Defense shall prepare the Guidance for the Employment of the Force to instruct the Joint Chiefs of Staff in their preparation of the Nuclear Supplement to the Joint Strategic Capabilities Plan. I am to be kept informed of the preparation of these documents through my National Security Adviser and must approve the final versions.

_____,
[signed President Barack H. Obama], April 2009

Endnotes

1 George P. Shultz, William J. Perry, Henry A. Kissinger and Sam Nunn, "A World Free of Nuclear Weapons," *Wall Street Journal,* January 4, 2007, p. A15; Mikhail Gorbachev, "The Nuclear Threat," *Wall Street Journal*, January 31, 2007, p. A13; George P. Shultz, William J. Perry, Henry A. Kissinger and Sam Nunn, "Toward a Nuclear Free World, *Wall Street Journal*, January 15, 2008; Ivo Daalder and Jan Lodal, "The Logic of Zero," *Foreign Affairs*, November/December 2007; George Perkovich and James M. Acton, et al., *Abolishing Nuclear Weapons, A Debate*, Washington, DC: Carnegie Endowment, February 2009; Sidney Drell and James Goodby, "The Reality: A Goal of a World Without Nuclear Weapons is Essential," *Washington Quarterly*, Summer 2008, pp.23-32.

2 In addition to the active weapons, an additional 4,200 retired warheads remain from the 5,500 or so that were withdrawn from the DOD stockpile between 2004 and 2007 and are still intact but awaiting dismantlement. The backlog of retired warheads is scheduled to be dismantled by 2022. See Robert S. Norris and Hans M. Kristensen, "Nuclear Notebook: U.S. Nuclear Forces, 2009," *Bulletin of the Atomic Scientists*, March/April 2009. Available online at http://thebulletin.metapress.com/content/f64x2k3716wq9613/fulltext.pdf

3 For information about the Clinton administration's Nuclear Posture Review, see: *The 1994 Nuclear Posture Review*, July 8, 2005, http://www.nukestrat.com/us/reviews/npr1994.htm; Excerpts from the Bush administration's Nuclear Posture Review are at http://www.globalsecurity.org/wmd/library/policy/dod/npr.htm

4 Memorandum, Adm. J.O. Ellis, U.S. Navy, Commander, U.S. Strategic Command, to the chairman of the Joint Chiefs of Staff, "USSTRATCOM Request to Change the Name of the Single Integrated Operational Plan (SIOP) to Operations Plan 8044," January 3, 2003. Declassified and released under FOIA. Available online at http://www.fas.org/blog/ssp/2007/11/white_house_guidance_led_to_ne.php

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Security Blog, November 5, 2008; Memorandum, Gen. Richard B. Myers, Chairman of the Joint Chiefs of Staff, to STRATCOM commander, "USSTRATCOM Request to Change the Name of the Single Integrated Operational Plan (SIOP) to Operations Plan (OPLAN) 8044," CM-757-03, February 8, 2003. Declassified and released under FOIA. Both documents available online at http://www.fas.org/blog/ssp/2007/11/white_house_guidance_led_to_ne.php

6 It is noteworthy that the report on the role of nuclear weapons in the 21st century published by the Defense and Energy departments in September 2008 confirms that SIOP was replaced in 2003 but did not indicate that CONPLAN 8010 represents a shift compared with OPLAN 8044 Revision 05. See: U.S. Department of Defense/U.S. Department of Energy, *National Security and the Role of Nuclear Weapons in the 21st Century*, September 2008, p. 17.

7 For a glossary of nuclear war planning terms and programs, see: William M. Arkin and Hans M. Kristensen, *The Post Cold War SIOP and Nuclear Warfare Planning: A Glossary, Abbreviations, and Acronyms*, Natural Resources Defense Council, Washington, DC, January 1999. Available online at http://www.nukestrat.com/pubs/SIOP%20Glossary%201999.pdf

8 "The number of U.S. operationally deployed strategic nuclear warheads was 2871 as of December 31, 2007." U.S. Department of State, *Annual Report on the Implementation of the Moscow Treaty*, 2008, p. 2

9 U.S. Department of Defense/U.S. Department of Energy, *National Security and the Role of Nuclear Weapons in the 21st Century*, September 2008, p. 17.

10 Elaine M. Grossman, "Top U.S. General Spurns Obama Pledge to Reduce Nuclear Alert Posture, *Global Security Newswire*, February 27, 2009.

11 U.S. Department of Defense/U.S. Department of Energy, *National Security and the Role of Nuclear Weapons in the 21st Century*, September 2008, p. 17.

12 U.S. Department of Defense, Office of the Secretary of Defense, *Quadrennial Roles and Missions Review Report*, January 2009, p. 5. Available online at http://www.defenselink.mil/news/Jan2009/QRMFinalReport_v26Jan.pdf

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In 2008, the NUWEP was replaced with a new document entitled Guidance for the Employment of the Force (GEF).

14 The White House, *The National Security Strategy of the United States of America*, March 2006, p. 22.

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16 U.S. Department of Defense, *Report of the Secretary of Defense Task Force on DOD Nuclear Weapons Management, Phase I: The Air Force's Nuclear Mission*, September 2008, p. 1.

17 Headquarters, U.S Air Force, *Reinvigorating the Air Force Nuclear Enterprise*, October 24, 2008, p. 17.

18 The White House, *Foreign Policy*, n.d. [accessed March 18, 2009]. Available online at http://www.whitehouse.gov/agenda/foreign_policy/

Note that the White House policy statement doesn't specify that it is a *nuclear* deterrent but assumes that "a strong deterrent" in this context means nuclear. However, the word "nuclear" was included in the Obama Campaign's fact sheet *Confronting 21st Century Threats* from July 16, 2008. Available online at http://www.barackobama.com/pdf/issues/foreign_policy/Fact_Sheet_21st_Century_Threats.pdf

19 General Chilton's paraphrasing of the Obama Administration's policy is: "As long as other states maintain nuclear arsenals, we must maintain a reliable, safe, and secure nuclear deterrent." General Kevin P. Chilton, Commander, U.S. Strategic Command, Statement Before the Strategic Forces Subcommittee, House Committee on Armed Services, on the United States Strategic Command, March 17, 2009, p. 6. Available online at http://armedservices.house.gov/pdfs/SF031709/Chilton_Testimony031709.pdf

20 U.S. Department of Defense, *Deterrence Operations Joint Operating Concept*, December 2006, p. 39.

21 North Atlantic Treaty Organization, Final Communiqué, Ministerial meetings of the Defence Planning Committee and the Nuclear Planning Group, Brussels, June 15, 2007, item 6. Emphasis added. Available at http://www.nato.int/docu/pr/2007/p07-070e.html

22 Stephen M. Younger, *Nuclear Weapons in the Twenty First Century*, Los Alamos National Laboratory, LAUR-00-2850, June 27, 2000. Also available at http://www.wslfweb.org/docs/SteveYounger.pdf

23 "First strike" not only refers to an out-of-the-blue surprise attack but also to a capability to strike first against certain target groups once hostilities have broken out in order to win a nuclear exchange. To prepare for such scenarios, U.S. war planners designed the Red Integrated Strategic Offensive Plan (RISOP) to war-game against Soviet and later Russian nuclear forces. RISOP was canceled in 2005 after Russia was removed as "an immediate contingency" for U.S. nuclear planning, but STRATCOM is still required to do RISOP-like strike analysis. See: Hans M. Kristensen, "The RISOP is Dead: Long Live RISOP-Like Nuclear Planning," *FAS Strategic Security Blog*, July 21, 2008. Available online at http://www.fas.org/blog/ssp/2008/07/risop.php

24 Defense Intelligence Agency, *The Decades Ahead: 1999-2020*, A Primer on the Future Threat, July 1999, p. 38.

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26 Dennis C. Blair, Director, U.S. National Intelligence, *Annual Threat Assessment of the Intelligence Community for the Senate Armed Services Committee*, March 10, 2009, p. 24.

27 Department of Defense reports on Chinese Military Power are available here: http://www.fas.org/nuke/guide/china/dodreports.html

28 Presidential Directive-59 was signed by President Jimmy Carter on 25 July 1980. National Security Decision Directive-13 was signed by President Ronald Reagan in October 1981. See Desmond Ball, "The Development of

the SIOP, 1960-1983," in Desmond Ball and Jeffrey Richelson, ed.s, *Strategic Nuclear Targeting* (Ithaca: Cornell University Press, 1986), pp. 57-83.

29 Infrastructure targeting under a minimal deterrence posture must comply with international law. The Hague Convention (IV) states that it is "explicitly forbidden" to "destroy or seize the enemy's property, unless such destruction or seizure be imperatively demanded by the necessities of war" (Annex, Article 23(g), http://www.au.af.mil/au/awc/awcgate/law/hague-iv-1907.txt).

30 For a description of the revision of Doctrine for Joint Nuclear Operations and STRATCOM's proposal to substitute countervalue with critical infrastructure targeting, see: Hans M. Kristensen, "Doctrine for Joint Nuclear Operations," February 2, 2006. Available online at http://www.nukestrat.com/us/jcs/jp3-12_05.htm

31 Modern strategic war planning to some extent already uses contingency planning via improved adaptive planning capabilities optimized for crisis scenarios and regional strike options. Yet these contingencies are still based on larger preplanned options developed for the OPLAN.

32 This section is by Matthew McKinzie of the Natural Resources Defense Council.

33 See: U.S. Congress, Office of Technology Assessment, *The Effects of Nuclear War*, May 1979. Available online at http://www.fas.org/nuke/intro/nuke/7906/

34 Lynn Eden, *Whole World on Fire: Organizations, Knowledge, and Nuclear Weapons Devastation* (Ithaca: Cornell University Press, 2004)

35 To examine the damage calculations for all targets and yields considered in this report, please open the following file in Google Earth: http://www.fas.org/nuke/guide/usa/doctrine/MinimalDeterrenceTargets.kmz

36 U.S. Strategic Command, Commander U.S. Strategic Command End of Tour Interview for Admiral James O. Ellis, Jt., June 18, 2004 (last updated January 17, 2006), p. 5. Released under FOIA.

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38 Hans M. Kristensen, "White House Guidance Led to New Nuclear Strike Plans Against Proliferators, Document Shows," *FAS Strategic Security Blog*, November 5, 2007, http://www.fas.org/blog/ssp/2007/11/white_house_guidance_led_to_ne.php

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