

GLOBAL ZERO U.S. NUCLEAR POLICY COMMISSION REPORT

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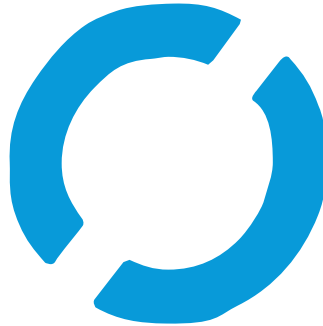
*Modernizing U.S. Nuclear Strategy,
Force Structure and Posture*



GLOBAL
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**GLOBAL
ZERO**

A WORLD WITHOUT
NUCLEAR WEAPONS

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GLOBAL ZERO is the international movement for the elimination of all nuclear weapons. It has grown to 300 leaders and more than 450,000 citizens worldwide, developed a step-by-step plan to eliminate nuclear weapons, built an international student movement with 100 campus chapters in ten countries, and produced an acclaimed documentary film, *Countdown to Zero*. President Barack Obama, President Dmitry Medvedev, Prime Minister David Cameron, Prime Minister Manmohan Singh, Prime Minister Yoshihiko Noda and UN Secretary-General Ban Ki-moon have endorsed Global Zero, with Obama declaring, “Global Zero will always have a partner in me and my administration.” Leading newspapers have backed Global Zero’s plan, the *Financial Times* concluding that, “Global Zero’s plan has shown the direction to be travelled; the world’s leaders must now start moving.”

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GLOBAL ZERO U.S. NUCLEAR POLICY COMMISSION REPORT

Modernizing U.S. Nuclear Strategy, Force Structure and Posture

Introduction: An Illustrative Future U.S. Nuclear Policy and Architecture

This report defines an illustrative U.S. nuclear force structure, strategy and posture that reflect an alternative deterrence construct for the 21st century. The 20th century world of bipolar power and U.S.-Soviet confrontation has rather suddenly changed into a multipolar world with numerous emerging bases of geopolitical, economic and military power. For the United States, deterring and defeating aggression in today's world depends a great deal less on projecting nuclear offensive threat and a great deal more on the skilled exercise of all the instruments of power, both "soft" and "hard." Security, previously organized around bilateral confrontation, increasingly depends upon multilateral cooperation.

As a part of this profound shift, the United States will reduce its reliance on nuclear weapons and consequently will seek to negotiate further reductions in the U.S. and Russian nuclear arsenals following the ratification of the New START Treaty of 2011. In our illustrative plan, the United States over the next ten (10) years reduces its arsenal to

a maximum of 900 total nuclear weapons¹ and increases the warning and decision time over its smaller arsenal.² These steps could be taken with Russia in unison through reciprocal presidential directives, negotiated in another round of bilateral arms reduction talks, or implemented unilaterally. In parallel, these two powers possessing the lion's share of the world's nuclear weapons would also work together to bring all the nuclear weapons countries to the negotiating table for the first in history multilateral negotiations to limit nuclear arms.

These illustrative next steps are possible and desirable for five basic reasons. First, mutual nuclear deterrence based on the threat of nuclear retaliation to attack is no longer a cornerstone of the U.S.-Russian security relationship. Security is mainly a state of mind, not a physical condition, and mutual assured destruction (MAD) no longer occupies a central psychological or political space in the U.S.-Russian relationship. To be sure, there remains a physical-technical side of MAD in

¹ By "total" we mean all categories of weapons in the active inventory – strategic and non-strategic ("tactical"), and deployed and reserve.

² See also *Global Zero Action Plan*, Feb. 2010.

our relations, but it is increasingly peripheral. Nuclear planning for Cold War-style nuclear conflict between our countries, driven largely by inertia and vested interests left over from the Cold War, functions on the margins using outdated scenarios that are implausible today. There is no conceivable situation in the contemporary world in which it would be in either country's national security interest to initiate a nuclear attack against the other side. Their current stockpiles (roughly 5,000 nuclear weapons each in their active deployed and reserve arsenals) vastly exceed what is needed to satisfy reasonable requirements of deterrence between the two countries as well as vis-à-vis third countries whose nuclear arsenals pale in comparison quantitatively.

Second, the actual existing threats to our two countries (and the globe) cannot be resolved by using our nuclear arsenals. No sensible argument has been put forward for using nuclear weapons to solve any of the major 21st century problems we face – threats posed by rogue states, failed states, proliferation, regional conflicts, terrorism, cyber warfare, organized crime, drug trafficking, conflict-driven mass migration of refugees, epidemics or climate change. A large standing Cold War-like nuclear arsenal cannot productively address any of these dangers – for instance, it is unable to reliably deter or defeat terrorists with no return address, and its impact on proliferation may be largely counterproductive. In fact, nuclear weapons have on balance arguably become more a part of the problem than any solution. For instance, our large nuclear stockpiles and infrastructures run risks of theft by non-state

actors. Minimizing these risks costs billions of dollars each year and still they remain of deep concern; heads of state meet annually to muster stronger efforts to secure nuclear materials.

While our nuclear arsenals may be perceived by some as playing a role in deterring a nuclear-armed state like North Korea from attacking us or our allies, oversized arsenals are unnecessary for this purpose. We surely do not need thousands of modern nuclear weapons to play this role vis-à-vis a country with a handful of primitive nuclear devices. In fact, strong conventional forces and missile defenses may offer a far superior option for deterring and defeating a regional aggressor. Non-nuclear forces are also far more credible instruments for providing 21st century reassurance to allies whose comfort zone in the 20th century resided under the U.S. nuclear umbrella. Precision-guided conventional munitions hold at risk nearly the entire spectrum of potential targets, and they are useable.³

The dramatic shift in the threat environment from the 20th to the 21st century is underscored by last year's survey of several hundred experts by the Council on Foreign Relations.⁴ Russia is not even mentioned among the top twenty (20) contingencies that in their

³ For a rigorous analytical assessment of the capabilities of modern conventional weapons to perform missions once assigned to nuclear forces, see *Conventional Forces for Extended Deterrence*, Global Zero Technical Report, forthcoming.

⁴ *Preventative Priorities Survey: 2012*, Council on Foreign Relations, Dec. 8, 2011.

view directly threaten the U.S. homeland or countries of strategic importance to the United States. Far more worrisome to them are such specters as a massive cyber attack on U.S. electric power grids, severe internal instability in Pakistan shaking loose nuclear weapons that fall into terrorist hands, drug-trafficking violence in Mexico spilling over the border, political instability in Saudi Arabia threatening global oil supplies and a collapse of the euro that plunges the U.S. economy into deep recession.

Another compelling way to illustrate this tectonic shift is to describe the threat context of the last three times that the United States put its nuclear forces on high alert during a crisis that threatened U.S. national security. These alerts involved taking serious steps to increase U.S. readiness to undertake nuclear operations – steps like strategic missile crews retrieving launch keys and launch authentication codes from safes in their underground firing posts and strapping into their chairs to brace themselves against anticipated nuclear blasts from incoming warheads. The first time this happened was the Cuban Missile Crisis in 1962. The second time was the Yom Kippur War of 1973. Both cases featured 20th century nuclear brinksmanship between the United States and the Soviet Union – Cold War-style nuclear escalation, coercion and risk manipulation. But the third and last case was totally different. It happened on September 11, 2001. A powerful nuclear arsenal proved utterly powerless. It failed to deter the 9-11 terrorism and proved completely useless in responding to the multi-pronged attack.

In fact, the Minuteman missile launch crews feared they themselves might be terrorist targets. The eventual U.S. response of course took an entirely conventional course – routing the Taliban and occupying Afghanistan.

9-11 exposed the lack of efficacy – indeed, the irrelevance – of nuclear forces in dealing with 21st century threats. The last episode of nuclear brinksmanship between Americans and Russians took place nearly forty (40) years ago. Since then their nuclear weapons have increasingly become liabilities, not assets.

Third, the recommendation to make nuclear arms reductions a multilateral enterprise would remedy a basic deficiency in the framework of ongoing nuclear arms talks: the exclusion of everyone except for Americans and Russians. Many of the most serious nuclear risks in the world today thus lie outside the scope of redress through the extant forum for negotiated regulation. By limiting participation to the United States and Russia in a bilateral forum, a long and growing list of emerging nuclear dangers – such as Pakistan's unconstrained effort to produce fissile materials and expand its nuclear arsenal at a breakneck pace that may well propel it into third place in the pecking order of arsenal size – gets short shrift. A 21st century fraught with new nuclear threats like this one calls for comprehensive nuclear dialogue and negotiations involving all of the world's nuclear-armed states as well as key non-nuclear nations. The goal should be to cap, freeze, proportionately reduce or otherwise rein in nuclear weapons programs

across the board, not just the U.S. and Russian programs.

It will be challenging to get everyone to the table at the very beginning. The effort will probably only succeed by starting with a dialogue with China and others on matters of transparency and verification in particular. Sharing information on numbers, types and locations of nuclear stocks is a critical first step in laying the groundwork for formal arms control talks.⁵ A concerted effort by the United States and Russia could gradually transform such a dialogue into formal negotiations involving the non-NPT nuclear-armed countries (India, Pakistan, Israel) as well as China and the rest of the P-5 states (United States, United Kingdom, France, Russia). U.S. and Russian leadership in this arena would be bolstered by further deep cuts in their arsenals down to a maximum of 1,000 total weapons. Stockpiles of 500-1,000 total weapons on each side are roughly the level at which China could be drawn into the process. As more countries join, it will become harder for the rest to remain on the sidelines. It is essential to begin this effort right away in order to make nuclear arms control universal and relevant to 21st century nuclear dangers.

⁵ The monitoring and verification challenges of the proposals in this report include further strengthening of on-site inspections and developing new technical methods for monitoring individual warheads without revealing sensitive information about their design. We judge the current and expected increases in monitoring capabilities to be sufficient to ensure the parties' ability to verify compliance with the multilateral reductions and de-alerting proposals herein.

The fourth reason for undertaking these illustrative next steps of bilateral and multilateral arms control is that the world is spending vast sums on producing and maintaining nuclear arms and on mitigating their environmental and health consequences. In Global Zero's estimation, this sum will exceed \$1 trillion over the next decade.⁶ At a time of global economic stagnation and acute budgetary pressure on governments, the world can ill afford to lavish scarce resources on nuclear forces. The United States and Russia annually spend about \$60 billion and \$15 billion, respectively on them, inclusive of costs (actual or deferred) for health and environmental remediation of radioactive contaminated sites (or \$30 and \$10 billion, respectively, for their core operations). Furthermore, both are embarking on expensive modernization programs to replace their aging forces and infrastructure. Stimulated largely by each other's strategic programs, the cost to Russia is estimated to run upwards of \$70 billion over the next decade and to the United States upwards of \$200 billion over the next twenty years. These huge investments are being driven by outmoded logic – the Cold War logic of the 20th century. They are dubious investments in excessive numbers of unusable weapons at the expense of needed and useable conventional weapons. For example, the replacement of the

⁶ Bruce G. Blair and Matthew A. Brown, *Nuclear Weapons Cost Study*, Global Zero Technical Report, June 2011.

current U.S. Trident submarine fleet would consume three-fourths of the U.S. Navy's ship-building budget for many years. Similar extreme trade-offs confront many other countries, such as the U.K., which are facing replacement decisions for their geriatric nuclear forces.

The fifth and last reason for pursuing the illustrative steps is that the launch-ready nuclear postures of Russia and the United States present unnecessary risk. The technical situation today is a dangerous throwback to the Cold War, with warning and decision time in commanding and controlling hundreds of nuclear-armed missiles measured in minutes and seconds. The timelines and deadlines for existential decisions on both sides can be exceedingly short. U.S. teams in early warning centers responsible for assessing whether missile attack indications are real or false, a situation that happens daily, may be allowed only three (3) minutes to report their findings. In an emergency, senior U.S. nuclear commanders convened by phone to brief the President on his nuclear strike options and their consequences may be allowed as little as thirty (30) seconds to give the briefing. The President, if led to believe the attack indications are real, would have at most twelve (12) minutes to decide whether and how to respond with nuclear weapons or else risk nuclear command-control decapitation and the decimation of U.S. retaliatory forces. Upon receipt of a launch order sent without prior warning and preparation, U.S. missile launch crews in underground command posts and submarines would be allowed only

two (2) and twelve (12) minutes, respectively, to get their missiles out of their silos and tubes on their thirty (30) minute or shorter flights to targets on the other side of the planet. The missiles in peacetime are always ready to fly – silo-based missiles are armed, fueled, targeted and will launch instantly upon receipt of a short stream of computer signals from their launch crews. Submarine-based missiles are nearly as ready. Russia's alert posture is comparably poised for equally rapid operations.

The risks, while low, still exist for missiles to be fired by accident, miscalculation, mistake, false warning, bad judgment or unauthorized action.⁷ The results would be catastrophic. Given the end of the Cold War, it makes sense to end the Cold War practice of preparing to fight a large-scale nuclear war on a moment's notice. The launch-ready postures would be stood down and aligned with the current political realities of the U.S.-Russian relationship. Warning and decision time would be increased to days instead of minutes for strategic forces, and to days and weeks instead of hours for tactical forces.

⁷ We judge unauthorized launch to be the least likely of these risks. It is extremely improbable given existing safeguards on U.S. and Russian forces, although the risk would grow in the event of a crisis dispersion of nuclear weapons, particularly Russian tactical nuclear weapons. Unauthorized use is also a major concern for scenarios involving terrorist capture of nuclear weapons, and for scenarios involving third countries such as Pakistan whose organizational and technical safeguards may be inadequate.

A 21st Century Nuclear Strategy and Force Posture

U.S. security requires a strategy that deals with the changing nature of global threats and the new security priorities that are emerging as a consequence. The risk of nuclear confrontation between the United States and either Russia or China belongs to the past, not the future, while nuclear proliferation and nuclear terrorism present real and growing risks whose prevention or defeat demands global cooperation among the former adversaries.

Making the shift to a new strategy requires basic change along a multitude of vectors – shifting emphasis from nuclear deterrence to general deterrence of the array of tools at the disposal of hostile governments; from nuclear to conventional; from offense to defense (active and passive); from global to theater, regional and even local; from small to deep nuclear stockpile reductions; from high to low nuclear launch readiness; from an institutionalized threat-based relationship with Russia and China to a pattern of systematic cooperation and even operational coordination; from individual to collective approaches to dealing with emerging regional and local threats; from projecting a global threat of sudden nuclear strike that compresses decision-making, to removing this threat and increasing warning and decision time; from positive control enabling rapid nuclear release to negative control working to prevent the accidental or unauthorized release of nuclear weapons and prevent their seizure or capture by terrorists.

A U.S. nuclear force that satisfies the evolving requirements of this transition and that helps thwart nuclear proliferation and terrorism would have several characteristic features: (1) a substantially decreased stockpile of nuclear weapons and delivery vehicles on a path of reductions that lead in verifiable stages with an objective of their total elimination (“Global Zero”), (2) a de-alerted operational posture requiring 24-72 hours to generate the capacity for offensive nuclear strikes, thereby relieving the intense pressure on nuclear decision-making that currently exists, (3) a more secure, consolidated and “locked down” nuclear weapons stockpile that reduces the day-to-day risks of theft or unintended use, (4) a stood-up alert missile defense and conventional force capability that is prompt and global, and that can function sufficiently well for 24-72 hours that a regional adversary would be deterred or defeated during an initial period of conflict prior to the generation of nuclear offensive forces and (5) a command, control, communications and early warning system that could endure and maintain coherence for a protracted time period and manage an effective transition from negative to positive control over nuclear forces during the initial stage of conflict.

An Illustrative U.S. Nuclear Force Structure and Posture

An illustrative nuclear force that possesses these characteristics would consist of an arsenal of 900 total strategic nuclear weapons on modified alert that could be put in place within ten (10) years (2022). One-half of this

force would be deployed, with the remainder kept in reserve.⁸ The deployed forces of 450 warheads would be de-alerted and require a small number of days (24-72 hours) to become launch ready. Most of the 450 reserve warheads could be taken from storage and loaded on delivery vehicles within weeks to months.

Trident SSBNs and B-2 Bombers

This notional force would consist of ten (10) Trident ballistic missile submarines armed with 720 strategic missile warheads (360 deployed; 360 reserve) and eighteen (18) B-2 bombers armed with 180 gravity bombs (90 deployed; 90 reserve). The submarine force would offer a high degree of survivability for many decades – no peer competitor currently has any effective anti-submarine warfare capability against U.S. SSBNs at sea and technological breakthroughs that could threaten this survivability are several decades away.⁹ Both submarines and bombers would offer a high degree of flexibility for reasons explained below.

⁸ The current ratio of deployed to reserve warheads is approximately 1 to 2.25. We estimate that by 2022 it will be possible to achieve a 1:1 ratio. Further progress in increasing warhead interoperability in the out-years would further reduce the need for reserve warheads to back up the deployed arsenal and hedge against a systemic defect in any warhead types.

⁹ There are potential threats on the distant horizon (30-50 years in future) that could dramatically alter this prognosis. Foremost among them is the prospect that sophisticated sensors coupled to supercomputing with advanced data filtering could strip away enough of the ocean's masking characteristics to expose the submerged boats.

Nuclear ICBMs and Tactical Weapons Eliminated

The Minuteman land-based ICBM force would be eliminated. ICBMs can only support nuclear wartime operations against Russia because current-generation ICBMs fired from the existing three (3) bases (shown on the map below) on their minimum energy trajectories have to overfly Russia and China to reach targets in potentially adversarial third countries (e.g., Iran, North Korea), and fly dangerously close to Russia to reach Syria. U.S. ICBMs would also have to overfly Russia to reach targets in China.



So the latitude for U.S. ICBM wartime operations is extremely circumscribed by orbital constraints. (Basic orbital mechanics are unclassified.) Since direct wartime nuclear operations against Russia alone, or Russia-China in combination, were Cold War scenarios that are no longer plausible, and since overflying Russia en route to more southerly targets (in China, North Korea, Iran)

risks confusing Russia with ambiguous attack indications and triggering nuclear retaliation, the U.S. ICBM force has lost its central utility. By contrast, U.S. Trident submarines and B-2 strategic bombers can deliver nuclear weapons to virtually any point on the earth on flight paths that avoid undesirable territorial incursions that violate national sovereignty and risk inducing nuclear responses.

Also, ICBMs in fixed silos are inherently targetable and depend heavily upon launch on warning for survival under some scenarios of enemy attack. Warning and decision time, as described earlier, is measured in minutes and seconds. While providing for “prompt” launch, they are too “prompt” and exacerbate risks of launch on false warning. Since only Russian nuclear missiles could physically decimate the U.S. ICBM force, and since the Cold War is over, this is largely a technical risk divorced from political realities. Nevertheless, the U.S. ICBM rapid reaction posture remains in operation and runs a real risk of accidental or mistaken launch.

By contrast, U.S. SSBNs at sea do not depend on rapid firing for their survival and thus work to increase decision time in a nuclear crisis. Although their communications links to higher authority are not as resilient and reliable as ICBM communications, the SSBNs on alert patrol normally maintain continuous VLF (very low frequency) communications and they may be promptly launched at the direction of the national command

authorities.¹⁰ SSBNs on launch patrol can be fired in twelve (12) minutes compared to two (2) minutes for the ICBMs. There are no effective defenses against submarine launched ballistic missile warheads.

Strategic bombers fall between these stools. Although they would need to be loaded with nuclear bombs and generated to strip alert status in a crisis (a 24-48 hour generation timeline) and then flushed quickly on warning of incoming strikes in order to survive, strategic bombers are highly flexible in their flight paths to targets anywhere around the globe. They are also recallable in many scenarios involving third countries and they may also carry lethal conventional weapons along with nuclear weapons to provide greater flexibility and usability. However, they have disadvantages. They are slow to reach their targets (many hours at minimum), require refueling for long-range missions and may have difficulty penetrating defenses compared to SLBM or ICBM warheads.

All U.S. tactical nuclear weapons would be eliminated over the next ten years. Their military utility is practically nil.¹¹ They do

¹⁰ Rapid advances in new higher-frequency communications modes involving special buoys dispersed on the surface of the oceans to link submerged SSBNs to higher authority are greatly increasing the reliability of launch order transmissions to SSBNs in all environments. The past clear-cut superiority of ICBM over SSBN communications for wartime dissemination of emergency action messages no longer exists.

¹¹ See *Global Zero NATO-Russia Commission Report*, Feb. 2012.

not have assigned missions as part of any war plan and remained deployed today only for political reasons within the NATO alliance. The obligation to assure U.S. allies in Europe and Asia of American commitment to their defense and to extend deterrence to them would fall to U.S. strategic nuclear and conventional forces, which are amply capable of fulfilling it.

Operational Posture and Nuclear Deterrence

A 10-boat fleet of Trident SSBNs would assign seven (7) to the Pacific and three (3) to the Atlantic basins. Assuming two (2) boats are normally in overhaul and the U.S. Navy maintains its historical at-sea rate of seventy (70) percent for the remainder, there would normally be four (4) and two (2) SSBNs at sea in the Pacific and Atlantic, respectively, carrying a total of 270 warheads. This day-to-day force would be survivable under worst-case conditions and versatile in providing prodigious target coverage of all prospective nuclear-armed aggressors. But a 270-warhead force would not pose a first-strike threat to Russia.¹² Also, this force would operate on modified alert outside the normal launch stations and require 24-72 hours to generate immediate offensive strike capability, in order to increase the amount of time available to leaders on all sides. This would prevent a

rushed launch decision by one's own leaders and remove the threat of sudden surprise attack that could otherwise trigger a rapid mistaken launch by an opposing force.

In an emergency, an additional two (2) Pacific boats in port armed with ninety (90) additional warheads could be flushed to sea within hours and the fleet of eighteen (18) B-2 bombers could be loaded with ninety (90) warheads and put on strip alert status within 24-48 hours. After 24-72 hours of force generation, the total number of survivable U.S. warheads would thus grow to 450.

A protracted nuclear crisis or severe deterioration of geostrategic relations between the United States and either Russia or China – both remote possibilities at this time – lasting for weeks or months would allow time for a large fraction of the U.S. arsenal of reserve warheads to be uploaded on SSBNs and B-2 bombers over the course of that period. By six (6) months into this period, the U.S. strategic arsenal could grow to upwards of 900 deliverable warheads.

The capacity to deliver 900 warheads would project a threat of draconian dimensions at any prospective aggressor country. A force of this size could support extensive counterforce against opposing nuclear forces, countervalue against war-supporting industries and operations against command centers of the opponent's top political and military leadership.

¹² According to Russian professional military sources in private communications with this Commission in Feb. 2011, their calculated threshold for the United States posing a decapitation first-strike threat against Russia is 300 U.S. warheads.

Russia and China are not enemies of the United States. If they were, and nuclear planners allocated this 900-weapon arsenal according to Cold War targeting principles, the following (strictly) illustrative categories of targets and warhead assignments would be possible:

Russia: WMD (325 warheads including 2-on-1 strikes against every missile silo), leadership command posts (110 warheads), war-supporting industry (136 warheads). Moscow alone would be covered by eighty (80) warheads.

China: WMD (85 warheads including 2-on-1 strikes against every missile silo), leadership command posts (33 warheads), war-supporting industry (136 warheads).

North Korea, Iran, Syria: Each country would be covered by forty (40) warheads.

The capability in peacetime or crisis circumstances to deliver many hundreds of nuclear warheads to targets in any prospective aggressor country in retaliation to a nuclear attack satisfy reasonable requirements of nuclear deterrence even under worst-case Cold War-like conditions. These numbers substantially exceed the self-reported number of nuclear explosions on urban centers and high-level command posts that would effectively deter the only nations (Russia and China) possessing nuclear arsenals that

technically pose existential threats to the United States. According to a former senior general in the Russian strategic forces, U.S. nuclear retaliation against only a handful of Russian cities would cross the threshold of unacceptable damage in the view of Russia's top political and military leadership.¹³ U.S. retaliatory capability would be orders of magnitude greater than this. Also, an arsenal of 900 U.S. weapons would vastly exceed the size of the nuclear arsenals fielded by America's actual contemporary adversaries (namely, North Korea with less than 12 weapons; Iran with zero; Syria with zero). In short, although an arsenal of 900 total weapons would represent a whopping eighty (80) percent reduction from today's level, it would still possess enormous destructive power, far more than necessary to impress any potential rational foe. For the irrational foe, such as fanatical terrorists, the level of American nuclear armaments would make no difference at all.

Missile Defense and Conventional Force Augmentation

To mitigate the putative risk incurred by this sizable downsizing of the U.S. strategic arsenal, to partially offset the decrease in target coverage and to provide a cushion during an initial 24-72 hours of conflict when U.S. offensive nuclear forces are being generated to combat alert status, the United States and its allies would seek protection from vigilant

¹³ Col. Gen. (Ret.) Victor Esin (personal communication, Dec. 16, 2011).

missile defenses and conventional forces kept on constant alert.

Missile defenses augmented by passive defenses (e.g., hardening, sheltering) could provide especially effective tools in deterring or defeating a regional adversary such as Iran or North Korea, and terrorists, for a 24-72 hour period. Such a time-limited requirement would ease the burden on missile defenses to intercepting the maximum number of offensive missiles that an adversary could launch during this period – defined as the total number of launchers times the number of reloads per launcher during a 24-72 hour period. Missile defenses would not have to handle every missile in the adversary’s stockpile – only those that could be fired during this initial phase of conflict.

This reduced burden would allow a theater missile defense program such as the adaptive system for protecting Europe from Iran to be scaled down by ten (10) to fifty (50) percent. This downsizing, coupled with U.S.-Russian cooperation in this arena and confidence-building measures, such as establishing 100-mile exclusion zones for U.S. missile defense deployments adjacent to Russian territory, would reassure Russia that its strategic missile force would not be put in jeopardy. To provide further reassurance, the operational status of U.S. missile defenses would be tailored to the actual threat in the region. These defenses would only stand up on full alert if and when a commensurate Iranian or North Korean threat materialized. Russia and China would receive full notification if the alert status of

U.S. missile defenses were raised.

This theater strategy would be bolstered by advanced U.S. conventional arms whose accuracy of delivery allows them to reduce the role of nuclear weapons in covering the target base. The rapid increase in the lethality of conventional forces achieved in recent years allows conventional forces to threaten the destruction of very hard targets (including missile silos protected up to 1,000 pounds per square inch (p.s.i.). This technological progress translates into the capability of using conventional forces to cover practically one-hundred (100) percent of the North Korean, Iranian and Syrian target bases previously covered by nuclear forces.¹⁴ A prompt conventional pounding of an adversary’s missile installations (e.g., in Iran or North Korea) could severely degrade its capacity and ease the work of U.S. missile defenses. For many such scenarios, U.S. conventional forces may well suffice to defeat a regional adversary without needing to generate any U.S. nuclear forces at all.

¹⁴ Regarding Russia and China, large-scale conflict with the United States is implausible. Theoretically, however, we estimate that U.S. conventional forces could cover between ten (10) and thirty (30) percent of an expansive Russian target base previously covered by U.S. nuclear forces. If Russia’s planned \$150 billion investment in “air-space defense” over the next ten (10) years is productive then the target coverage figure would be lean toward the lower end of the range. Concerning China, we estimate that U.S. conventional forces could cover between thirty (30) and fifty (50) percent of the Chinese target base previously covered by U.S. nuclear forces. The Chinese target set is roughly one-half the size of the Russian target set.

Key Implications and 10-Year Implementing Strategy

This 10-year illustrative agenda aimed at reducing the number of U.S. nuclear weapons to 900 total warheads has basic implications for the nuclear complex, force structure and posture development and nuclear arms negotiations. If adopted, this agenda would reduce U.S. spending on nuclear weapons programs by as much as \$100 billion over the next decade.

Downsized Nuclear Complex

The illustrative nuclear force would deploy only four types of nuclear weapons – W-76 and W-88 on Trident SSBNs, and the B61 (mods 7 and 11) and B83 on B-2 bombers. The need for warhead refurbishment would be vastly decreased. The B61-11 recently completed a Life Extension Program (LEP); the W-76 LEP has already completed a sufficient number of these warheads to meet future requirements under this plan; and the W-88 and B83 are relatively new weapons whose LEP needs are far into the future. Only the B61-7 needs LEP work in the near future (to convert it to a B61-12), and the number of them needed for the bomber force is relatively small.

As a consequence, thousands of warheads in the LEP pipeline could be retired instead of refurbished. Also, the costly modernization of the nuclear complex currently underway – particularly the PF-4 and the CMRR-NF plutonium facilities at Los Alamos and the UPF uranium facility at Y-12 Oak Ridge – can

be restructured and downsized, depending on the balance of warhead refurbishment, reuse and/or replacement that emerges from a future review by the National Nuclear Security Agency (NNSA) and the U.S. Strategic Command.¹⁵ These agencies would need to consider eighty (80) percent cuts in the stockpile and determine an optimal strategy for improving surety, reliability, adaptability and maintenance at greatly reduced numbers of weapons.

Nuclear Force Structure and Posture

The follow-on nuclear ICBM program on the drawing boards would be cancelled, the plans for a fleet of next-generation bombers altered¹⁶ and the Trident follow-on program

¹⁵ In February 2012, President Obama deferred construction for five years on the \$6 billion CMRR facility. The need for such a facility would decrease substantially if the active U.S. stockpile shrinks to 500-900 total warheads as we recommend. Its primary purpose is to manufacture plutonium pits. Given the 50-year minimum normal lifespan of a plutonium pit, only two (2) percent of the stockpile would normally need new plutonium pits on an annual basis – 10-18 pits for 500-900 weapons. The current pit capacity of Los Alamos is roughly twenty (20) pits per year. In the event of a systemic defect in a warhead type that required a crash re-building of the warheads, the manufacturing rate might need to be several times greater than the current capacity if rapidly replenishing the stockpile was deemed critical to deterrence.

¹⁶ The U.S. Air Force currently plans to design and build 100-150 advanced bombers to replace the current fleet of B-52s and B-2s at a rough cost estimated to be \$550 million per plane. These current and future aircraft may perform long-range strategic missions and they are also interchangeable with tactical carriers on the battlefield and thus are replacing the older category of dual-purpose (nuclear-conventional) tactical platforms such as U.S. fighter-bombers stationed with B-61 nuclear arms in NATO Europe. Under our illustrative plan, the number of next-generation bombers configured to perform strategic or

delayed. All existing ICBM facilities and delivery vehicles, and all B-52 bombers, would be dismantled or converted to carry only conventional munitions over the course of the next decade.

Conventional ICBM. A conventional-armed extended-range ICBM – some variant of the Hypersonic Technology Vehicle-2 (HTV-2) – should be designed and developed to provide a 1-hour global strike capability by 2022.¹⁷ With a total of twelve (12) to twenty (20) such vehicles based in California, the Great Lakes region and/or Alaska (co-located with missile defense bases), this ICBM would have the down- and cross-range agility and reach to span continents flying within the stratosphere and promptly hit virtually any target around the world (such as North Korean or Iranian missile installations) without overflying Russia or China.¹⁸

This program would not be designed or deployed against Russia, and although it would possess an ability to destroy very hard

tactical nuclear missions would be limited to 30-50 aircraft. The B-2 fleet would retire as the new bombers are fielded. 30-50 planes would allow for deployment and crew training to more than one physical location. (The current B-52 fleet is based at two locations, and the B-2s at a third base.)

¹⁷ Russia started developing an HTV before the United States initiated its program, and President Putin attaches high priority to the program. Both programs are making progress, and both face major challenges – achieving aerodynamic stability in the Russian case, and overcoming heat shielding problems in the U.S. case. Russia recently experienced its second test failure of the developmental system.

¹⁸ Such a capability would require a downrange of 9,000 miles and a cross range of 3,000 miles.

targets including missile silos, the small number of vehicles built and deployed would allay Russian concern about their impact on Russia's nuclear deterrent capability.¹⁹

A conventional and versatile long-range ICBM would overcome the drawbacks of other conventional delivery means – for instance, the range and speed constraints of Tomahawk IV missiles on ships and submarines, and the strategic conventional (dual nuclear and conventional capable) bomber's lack of timeliness and in some cases difficulty of penetrating air defenses. Combined with other conventional forces and alert missile defenses keyed to 24-72 hour effective operations, a versatile non-nuclear ICBM force would provide a timely strike option to buy time for nuclear force generation and leadership deliberation if the conventional phase of the conflict did not end decisively in favor of the United States. It would also provide a means of promptly hitting terrorist targets anywhere on the globe, greatly augmenting existing Predator drones and other tools.

A Phased, Consultative Approach to Increasing Warning and Decision Time. The strategy, force structure and posture outlined in this report work to create additional warning and decision time as they are implemented over

¹⁹ It appears realistic to achieve an accuracy of 3 meters with a payload of 1,000 lbs. We calculate that this performance translates into roughly a fifty (50) percent chance of destroying a missile silo hardened to 1,000 lbs. per square inch (p.s.i.). Twenty (20) single-warhead HTVs would technically possess the capacity to destroy with high confidence only about six (6) missile silos.

the 10-year period. During the initial phase of a rebalancing of offense and defense, and of nuclear and conventional components, defensive systems would be put on higher alert as growing numbers of nuclear offensive forces were taken off of launch-ready alert (“de-alerted”). As the burden of deterrence shifted from MAD based on nuclear offensive operations to flexible response based on conventional forces (air, sea and land) with a prompt global strike component and on defensive operations (notably early warning, missile defense and cyber security), new opportunities will emerge for cooperation with allies and other countries with common security interests.

We envision cooperation progressing through stages beginning with heightened transparency and monitoring on a global basis. The United States and Russia would lead in providing to the rest of the world a comprehensive data stream on the status of maritime and airspace traffic and space objects. Augmenting this heightened global awareness of the earth and heavens, information would be provided on the status of U.S. and Russian (and eventually other nations’) missile defenses as well as all offensive nuclear and conventional forces. Cyber security centers would provide near real-time information on the global cyber threat and cooperate in mitigating it.

In a second stage, early warning information would be shared in near real-time with all participating countries. This would

strengthen global cooperation in monitoring missile and other weapons tests, assessing proliferation threats and tracking military operations including hostile air-, sea- and space-actions during peacetime and conflict.

By the end of the 10-year period, international cooperation in the missile defense arena could be achieved. Active missile defense cooperation would complete the transition from MAD to mutual awareness, warning and defense. And the full transition would increase warning and decision time by hours, days, weeks and months.

De-Alerting to Increase Warning and Decision Time. De-alerting is a key element in achieving this goal. Any follow-on strategic nuclear forces including a Trident replacement submarine should be designed to enable the delivery systems and the warheads to be kept separated during normal peacetime operations and easily re-mated during an emergency. Existing forces were not designed for such a de-mated configuration. They were optimized for rapid reaction; de-mating warheads and missiles and re-mating them in an emergency are cumbersome, suboptimal operations. The goal of a new force posture is to keep all warheads and means of delivery separated in peacetime, in order to increase decision time, strengthen safety and security and prevent mistaken or unauthorized launches.

During the next ten (10) years, de-alerting can still be instituted with existing forces, however. We should close the books on the

Cold War and immediately put the nuclear arsenals into strategic reserve status on “modified alert.” This single stroke would greatly reduce nuclear risks while deepening U.S.-Russian cooperation and strengthening mutual stability. It would also have salutary effects on their relations with China and other countries currently threatened by the hyper-vigilant launch-ready postures of the nuclear superpowers.

Under this illustrative “modified alert” posture, SSBNs at sea would no longer patrol at their Cold War launch stations ready to fire within fifteen (15) minutes of receiving the order. The current strict requirements of speed, depth, navigation and communications would be relaxed. For example, the Cold War requirement for alert submarines to maintain continuous receive communications and readiness to fire almost instantly (within 12 minutes of receiving the order to fire) would be relaxed to 24-72 hours – providing greater freedom to train and exercise at sea as an additional benefit. Other measures, such as the removal of “inverters” on submarine missile tubes, would help ensure that 24-72 hours would be needed to fully re-alert the weapons onboard.

Similarly, land-based ICBMs would no longer be poised for full-scale launches on a moment’s notice. Instead, they would be “pinned and safed” in their silos, an existing safety measure (the reversal of which requires maintenance crews to re-enter the silos and remove the pins), thus precluding their launch during normal peacetime conditions

and requiring many hours to reverse. (The Chinese nuclear forces reportedly already meet this standard; indeed, they are in an even less threatening posture with warheads kept off their means of delivery.) As an interim measure during a transition to a wholesale strategic reserve status, a portion of the ICBM force – perhaps one of the nine current 50-missile squadrons – could be kept on launch-ready status on a monthly rotational basis. Eventually, however, all of the ICBMs would be dismantled according to the 10-year plan outlined here and their alert status would become moot.

Additional related measures should also be considered as part of this mutual, coordinated shift away from Cold War postures, to include removing all of the existing wartime targets from the ballistic missile submarine (SSBN) databases and the land-based missile (ICBM) computers. Fully restoring this data would take a number of days, thus building in a larger firebreak – 24-72 hours – between the onset of a crisis or conflict and the capacity to initiate nuclear strike operations.

Rigorous analyses have proven that de-alerting, if done properly and verifiably, would remove the threat of a sudden first-strike or decapitation strike and thus remove the incentive to maintain strategic forces poised to launch out from under a surprise enemy attack. Both sides could relax their postures while eliminating any incentives for re-alerting and launching a preemptive attack during a crisis. A well-designed posture can

eliminate any advantage to re-alerting, bolster the survivability of second-strike forces, substantially increase decision and warning time and stabilize mutual deterrence.²⁰

This new posture would represent a large improvement over the current one. The United States and Russia currently maintain about one-third of their forces on high alert; the other two-thirds require 24-72 hours to generate to launch-ready status. Their current postures are ill-designed for stability. They are actually quite unstable – prone to competitively rapid force generation and to launch on warning – and need to be re-designed to remove the re-alerting incentives behind this instability. Studies have shown that, if properly configured, all the strategic nuclear forces on both sides could be stood down from high alert and still achieve a much greater degree of stability than presently exists.²¹ Force survivability can be ensured even in the face of re-alerting by an adversary, and the key de-alerting measures such as separating warheads from delivery vehicles

can be adequately verified.²²

Regarding tactical nuclear weapons, the recommendations of the Global Zero NATO-Russia Commission Report put forward by American, European and Russian security leaders and experts make sense. They call for the United States and Russia to remove their tactical weapons from European combat bases and relocate them to national storage sites. We envision that this relocation would happen in the context of broader negotiations aimed at cutting their nuclear stockpiles down to 1,000 total weapons on each side.

This simple redeployment would increase warning and decision times for employing hundreds of these non-strategic weapons on each side from the current “hours” to a period of “days to weeks.” The absence of nuclear warheads at combat bases could be reliably confirmed by on-site inspections, and any large-scale covert effort to move warheads from national storage sites back to the combat bases would be readily detectable by space surveillance and other national technical means.

Bilateral Nuclear Arms Negotiations

The reductions and de-alerting proposed under this illustrative plan could be carried out in unison by the United States and Russia through reciprocal presidential directives, negotiated in another round of bilateral arms reduction talks, or implemented unilaterally.

²⁰ The leading studies that validate this assessment include Bruce Blair, Victor Esin, Matthew McKinzie, Valery Yarynich and Pavel Zolotarev, (1) “Smaller and Safer,” *Foreign Affairs*, Vol. 89, No. 5, September/October 2010; pp. 9-16 and (2) “One Hundred Nuclear Wars: Stable Deterrence between the United States and Russia at Reduced Nuclear Force Levels Off Alert in the Presence of Limited Missile Defenses,” *Science and Global Security*, Vol.19, 2011, pp. 167-194; Bruce G. Blair, “De-Alerting Strategic Forces,” in George P. Shultz et. al., *Reykjavik Revisited: Steps Toward a World Free of Nuclear Weapons*, Hoover Institution, 2008, pp. 47-105.

²¹ *Ibid.*

²² Blair, “De-alerting Strategic Forces,” *op.cit.*

In any case, these cuts would lead to yet another round of talks that would reduce the nuclear arsenals on each side to 500 total weapons.²³ These cuts to 500-900 total weapons apiece should be sufficient to bring China and other nuclear weapons countries to the table to begin multilateral negotiations for further cuts on the path to global zero.²⁴

²³ The consensus of former Russian senior military officers in Global Zero, led by Col. Gen. (Ret.) Victor Esin who once served as Chief of Staff of the Strategic Rocket Forces and now consults to the SRF Commander, is that a 900-warhead Russian arsenal should consist of: 450 deployed strategic warheads; 150 reserve strategic warheads, and 300 reserve tactical warheads. The strategic warheads would be deployed in either of these configurations: (a) 150 single-warhead ICBMs (50 silo-based and 100 mobile) and 8 “Borey” class SSBNs with 300 total warheads; OR (b) 300 single-warhead ICBMs (100 silo-based and 200 mobile) and 4 “Borey” class SSBNs with 150 total warheads. Dr. Bruce Blair and Col. Gen. Victor Esin (personal communications, February 2012).

²⁴ Some observers argue that deep cuts by the United States and Russia would tempt China to ramp up its nuclear weapons production to exploit the opportunity to achieve parity or even supremacy. This “race to parity or supremacy” argument is not based on any solid evidence. All the publicly available evidence supports the opposite view that deep cuts would draw the Chinese into a multilateral arms control regime that would lead to phased reductions. China has historically stayed out of the U.S.-Russian nuclear arms race, content to deploy a very small nuclear force in the service of “minimum deterrence.” Its program is quite insensitive and detached from the U.S. and Russian programs, though its current modernization program seeks to ensure a minimum survivable deterrent in the face of external threats. China has historically advocated for nuclear disarmament on a universal basis, and in 1982 its Foreign Minister Huang Hua presented a blueprint for disarmament at the United Nations General Assembly meeting in which it committed to join multilateral negotiations if and when the nuclear superpowers cut their arsenals in half, stopped testing and building them, and otherwise exercised restraint. Global Zero discussions with high-level Chinese government officials, military officers and experts indicate strongly that China remains committed to this course. China would not “race to parity or supremacy” and in fact would take the op-

These strategic cuts and de-alerting, coupled with constrained U.S. missile defenses tailored to actual regional missile threats, should also go a long way toward breaking the current bilateral arms talks impasse with Russia, which is hung up on the potential technical capability of the United States to deliver a one-two punch of offensive and defensive operations against Russia’s strategic nuclear missile forces once U.S. phase-four adaptive missile defenses (SM3-2B missile systems) become operational in ten (10) years (2022). Russia has sought a formal guarantee from the United States that its advanced missile defense system in phase four will not be aimed at Russia and will not undermine Russia’s strategic deterrent forces. The United States has not met this demand nor provided other satisfactory assurances. As a result, Russia anticipates a continuing evolution of the U.S. program into increasingly threatening variants (including space-based strike systems in phases five and six) that become more difficult for Russia to offset with inexpensive countermeasures. The bilateral nuclear arms control process and even the broader U.S.-Russian relationship has stalled over this one technical complication.

posite position to join an arms reduction process if the United States and Russia reduce their arsenals to low numbers. See Maj.-Gen. Pan Zhenqiang, “China’s Nuclear Strategy in a Changing World Strategic Situation,” *Unblocking the Road to Zero: China and India*, Dr. Barry Blechman, ed., March 2009, pp. 29-54; 鲁斯·布莱尔博士：“‘全球零核倡议’运动回顾与展望”，载滕建群主编《全球核态势评估报告：2010/2011》，北京：时事出版社，2011年2月，第161页。(Dr. Bruce Blair, “The Global Zero Movement and China,” *Global Nuclear Posture Review 2010/2011*, ed. Teng Jianqun (Beijing, 2011); and Bruce G. Blair, “Chinese Nuclear Preemption,” *China Security*, Autumn 2005, No. 1, pp. 15-22.

The illustrative plan outlined above offers a solution. Under it, Russia (and China) would no longer be targeted in set piece war plans of the kind embodied in the longstanding plans that grew out of the Cold War face-off, and the de-alerting of U.S. strategic forces would preclude a sudden offensive strike. By removing the technical threat of a surprise U.S. nuclear first strike, the United States could no longer theoretically decimate the bulk of Russia's strategic forces, and the specter of U.S. missile defenses mopping up a small number of surviving Russian missiles after the strike would evaporate.

During the 24-72 hour time period needed for the United States technically to generate its offensive strike capability, Russian strategic forces could be flushed to secure locations. Mobile ICBMs and in-port SSBNs could be simultaneously dispersed to hidden locations to reduce their vulnerability and provide for an overwhelming Russian retaliatory capability. (The current Russian modernization program is concentrating on new mobile ICBM and SSBN production.) As a result, U.S. missile defense deployment would not pose nearly as great a technical threat to Russia, improving the prospects for a new round of fruitful U.S.-Russian nuclear arms negotiations.

The less good approach would be to adopt this agenda unilaterally. A strong case can nevertheless be made that unilateral U.S. deep cuts and de-alerting coupled with strengthened missile defenses and conventional capabilities would not weaken deterrence in practical terms vis-à-vis Russia,

China or any of the more plausible nation-state challengers that America may confront in the years ahead. While preserving effective deterrence against all but non-state actors, unilateral steps would lay the groundwork for increasing security cooperation among the former Cold War adversaries and encourage them to consider comparable unilateral actions. If unilateral U.S. de-alerting of its strategic offensive forces would cause Russia to follow suit, it would buy a large margin of safety against the accidental or mistaken launch of Russian missiles on hair-trigger alert aimed at the United States.

More broadly, this illustrative agenda with its deep cuts and de-alerting would strongly validate the Non-Proliferation Treaty and help preserve it in the face of challenges by North Korea, Iran and other prospective proliferators. In strengthening the NPT, inhibiting the spread of nuclear weapons and setting the stage for multilateral negotiations among the nuclear weapons countries to reduce and eventually eliminate their nuclear arsenals, this initiative would go far toward building a new security architecture embodying the vision of Global Zero – a world without nuclear weapons.

Multilateral Security Cooperation

A 21st century security plan meant to reduce reliance on offensive nuclear weapons and shift toward a more global, transparent and defense-oriented architecture designed to address the real threats facing the world today would be greatly strengthened through

broad cooperation along two dimensions. First, in replacing the blunt instrument of nuclear offensive threat with versatile, tunable and integrated power projection using modern high-tech components cutting across the spectrum of offense-defense and conventional-nuclear, there is a growing need for nations in the same security boat to share costs and operational responsibilities. No single nation can afford any longer to shoulder the full burden alone. Great mutual benefit accrues to nations with common interests who cooperate. The phased adaptive approach to missile defense in Europe is only possible through a division of labor and burden sharing within the NATO alliance. Japan is an essential partner of the United States in developing the guidance and warhead for SM₃-2A/B missile defense interceptors that will become the backbone of phased missile defenses for America's Asian allies. Stretching this envelope of cooperation even further, it is a newly deployed radar in Israel supported by U.S. command-control-communications networks that enables Saudi Arabia's Patriot missile batteries to work effectively.

Second, as the last example suggests, the changing world is creating common interests among nations not previously aligned and often at loggerheads, and creating incentives for them to cooperate in the security arena. They often fail to exploit the opportunities – as evidenced by, for instance, the duplicative, inefficient deployment of three separate global space-based navigation systems. But economic forces and mutual security incentives are driving nations haltingly but

surely toward security globalization in the areas of monitoring, early warning and active defenses. Future cooperation will take the form of generating global output on maritime, aircraft and space activities that increase worldwide real-time monitoring of the seas, skies and heavens – an unprecedented level of situational awareness of the earth. It will take the form of shared early warning of missile launches and other potential threats through joint warning centers manned by Russians, Americans, Chinese and many other nationalities, and through joint technological ventures such as U.S.-Russian early warning satellite deployments with the output widely shared with other nations. Over time, this increasingly global cooperation will extend into the area of active missile defenses.

These trends appear to us to be deeply embedded in a globalizing world of growing economic and informational interaction and interdependence. They are not preordained, however, and we must therefore be prepared if our predictions for the next decade or so are wrong and the world becomes more confrontational in nuclear terms. It seems increasingly improbable that U.S. relations with Russia or China would deteriorate so severely during the time frame of this report's plan (2012-2022) that the nuclear balance among them would become a salient factor in their security relationships and cause them to suspend the nuclear arms reductions process and possibly even resume a nuclear arms race. However, this specter cannot be ruled out; if it happens, then the United States, despite possessing a stockpile of 500-900 nuclear

weapons, may feel more secure if it possesses the capacity to build up its nuclear forces in quantitative or qualitative respects.

We believe that the illustrative force structure and posture outlined in this report, augmented by contingency plans to regenerate the U.S. nuclear infrastructure, provide an ample margin of safety in the event of unanticipated developments that increase the nuclear threat to our nation over the next ten years or so. The trends described toward growing global transparency and security integration increase our ability to adapt if all these trends reverse course unexpectedly. But given the long lead times required to re-engineer our nuclear plans and programs in response to a marked increase in nuclear threat, our nuclear infrastructure must be resilient in the face of the unforeseen.

Conclusion

An urgent and transformational change in U.S. nuclear force structure, strategy and posture is needed to squarely address the security threats facing the nation in the 21st century. The strategy inherited from the Cold War which remains in place artificially sustains nuclear stockpiles that are much larger than required for deterrence today and that have scant efficacy in dealing with the main contemporary threats to U.S. and global security – nuclear proliferation, terrorism, cyber warfare and a multitude of other threats stemming from the diffusion of power in the world today. Current U.S. nuclear policy focuses too narrowly on threats rooted in

Cold War thinking, incurring excessive costs to prepare for an implausible contingency of nuclear war with Russia when there is no conceivable circumstance in which either country's interest would be served by deliberately initiating such a conflict. Current U.S. nuclear policy also unnecessarily incurs risks of unintentionally initiating a nuclear conflict. By maintaining launch-ready nuclear postures just as they did during the Cold War, the United States and Russia run risks of nuclear mistakes that could have catastrophic consequences.

The U.S. and Russian arsenals have been steadily shrinking since the end of the Cold War. These reductions should continue. Steep bilateral reductions in all categories of weapons in their stockpiles are warranted and should be pursued in the next round of U.S.-Russian negotiations. An arsenal of 500-900 total weapons on each side would easily meet reasonable requirements of deterrence and would set the stage to initiate multilateral nuclear arms reductions involving all countries with nuclear weapons. The United States should seek to achieve such reductions in ten (10) years and plan to base its arsenal on a dyad of nuclear delivery vehicles. The optimal mix of carriers would consist of ten (10) Trident ballistic missile submarines and eighteen (18) B-2 bombers. Under normal conditions, one-half of the warhead stockpile would be deployed on these carriers; the other half would be kept in reserve except during a national emergency. All land-based intercontinental missiles armed with nuclear payloads would be retired along with the

carriers of non-strategic nuclear warheads, all of which would be eliminated from the stockpile. B-52 heavy bombers would be completely dismantled or converted to carry only conventional weapons.

The United States and Russia should devise ways to increase warning and decision time in the command and control of their smaller arsenals. The current postures of launch-ready nuclear forces that provide minutes and seconds of warning and decision time should be replaced by postures that allow 24-72 hours on which to assess threats and exercise national direction over the employment of nuclear forces. This change would greatly reduce the risks of mistaken, ill-considered and accidental launch. It would also strengthen strategic stability by removing the threat of sudden, surprise first strikes. Any move by one side to massively generate nuclear forces to launch-ready status would provide ample warning for the other side to disperse its nuclear forces to invulnerable positions. By increasing warning time through de-alerting, the new postures would actually increase force survivability and diminish the adverse impact of missile defenses in the equation. Missile defenses would be less threatening to the other side's larger retaliatory force and less undermining of the other side's confidence in its ability to carry out effective retaliation.

In the context of such reduced reliance on offensive nuclear weapons on launch-ready alert, the United States would increase its reliance on missile defenses and advanced

conventional forces in an integrated new strategy. These non-nuclear forces in a real sense would replace nuclear forces. Their role in deterring and defeating a 21st century adversary, and in reassuring U.S. allies of our commitment to their defense, would be especially important during the 24-72 hour period prior to the possible generation of offensive nuclear capability. This time-limited role, however, would reduce the requirements imposed on missile defenses and conventional forces. Missile defense architecture in particular could be scaled down.

It is critical to broaden the agenda of nuclear arms regulation to include all categories of weapons in all nuclear weapons countries. Only a broad multilateral approach can effectively address the multitude of serious nuclear dangers found in other parts of the world. While pursuing bilateral negotiations to reduce the U.S. and Russian stockpiles to much lower levels, the two sides should initiate a multilateral process that would seek to cap, freeze, reduce and otherwise constrain the arsenals of third countries. Nuclear arms regulation must become comprehensive and universal.

This multilateralism should be extended beyond nuclear arms reductions into the realm of multilateral security cooperation. 21st century threats demand heightened cooperation among longstanding friends and former foes alike. No single nation can any longer afford to go it alone in developing and deploying systems that strengthen its security.

Powerful economic forces and mutual security incentives are increasingly driving nations toward security globalization, particularly in the areas of monitoring, early warning and active defenses. Future cooperation will take the form of generating global real-time output that provides for an unprecedented level of situational awareness of the earth. It will take the form of shared early warning of missile launches and other potential threats through joint warning centers manned by Russians, Americans, Chinese and many other nationalities, and through joint technological ventures such as U.S.-Russian early warning satellite deployments with the output widely shared with other nations. Over time, this increasingly global cooperation will extend into the area of active missile defenses.

The illustrative strategy, force structure and posture outlined in this report, augmented by contingency plans to regenerate the U.S. nuclear infrastructure if the trends toward global security cooperation and multilateral arms regulation unexpectedly reverse course, provide a roadmap for strengthening U.S. security in the 21st century. It allows the United States to continue to reduce its reliance on nuclear weapons, to reduce nuclear dangers around the world and to move toward a world without nuclear weapons.

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