2. De-alerting Strategic Forces

Bruce G. Blair

Key Findings and Judgments

The end of the Cold War did not lead the United States and Russia to significantly change their nuclear strategies or the way they operate their nuclear forces. Both sides maintain about one-third of their total strategic arsenals on launch-ready alert. Hundreds of missiles armed with thousands of nuclear warheads—the equivalent of about 100,000 Hiroshima bombs—can be launched within a very few minutes. The command and early warning systems are geared to launch on warning—firing friendly forces *en masse* before the arrival of incoming enemy missiles with flight times of 12–30 minutes.

The Russian early warning system has been decaying since the breakup of the Soviet Union and despite some recent upgrades it is more prone today to cause false alarms than it was during the Cold War. Despite this technical degradation, both the Russian and U.S. postures normally run a somewhat lower risk of launching on *false*

The author is grateful to James Goodby, Sid Drell, David Holloway, Henry Rowen, Gen. (ret.) George Lee Butler, Joan Rohlfing, Steve Andreasen, John Steinbruner, Frank von Hippel, and George Shultz for their keen observations and wise guidance during the preparation of this analysis. This report draws heavily upon previous research conducted by the author with the generous support of the John D. and Catherine T. MacArthur Foundation, the New-Land Foundation, Inc., the Ploughshares Fund, and Margaret R. Spanel. The author's current work on nuclear weapons de-alerting and elimination is generously supported by the Carnegie Corporation, Ploughshares, and Ms. Spanel.

warning due to their improved political relationship and higher propensity to discount tactical warning indications of enemy missile attack. But the *risk remains non-negligible in peacetime, and would spike upward in the unlikely event of a nuclear confrontation between them*.

Although both sides impose very strict safeguards on their strategic nuclear forces to prevent an unauthorized launch, the actual level of protection against unauthorized launch defies precise estimation due to the complexity of the nuclear command-control systems and of the threats to them. Serious deficiencies are routinely discovered. *There is reason to believe that state and non-state actors including terrorists may be able to exploit weaknesses in these systems of control by physical or informational means, heightening the risks of unauthorized or accidental launch.* Cyber-attack is a growing threat in these terms. The traditional two-man rule arguably is no longer an adequate safeguard in an era of information warfare.

The traditional war-fighting postures keep nuclear weapons in constant motion and thereby create opportunities for terrorists to capture or steal them, particularly in Russia where the number of weapons in transit or temporary storage is especially large. In precluding all weapons from being locked down in secure storage, the U.S. and Russian nuclear postures embody unnecessary risk and thwart the efforts of the Nunn-Lugar program.

The U.S. and Russian force postures lend legitimacy to the nuclear ambitions of other nations, and to those nations' adoption of launch-ready nuclear postures. Over time more states are likely to follow in our footsteps, and increase their own forces' combat readiness, resulting in growing worldwide dangers of accidental or unauthorized launch, or theft, of nuclear weapons.

Major benefits would accrue from standing down ("de-alerting") the legacy postures. Keeping thousands of weapons ready to fly upon their receipt of a short sequence of simple computer signals is inherently risky. De-alerting would increase warning and decision time far beyond the short fuse inherent in current command systems, thereby reducing the risk of mistaken launch to negligible proportions. De-alerting would greatly strengthen safeguards against unauthorized launch and terrorist exploitation.

De-alerting could also strengthen crisis stability. Driven by their current war-fighting strategies, a serious crisis today could spark an unstable re-alerting race between the two postures. Whereas de-alerting is often criticized on the grounds that it would contribute to instability during a crisis as forces race to return to launch-ready alert, the actual situation is the polar opposite. The current nuclear postures are prone to breakneck re-alerting during a crisis and would severely undermine crisis stability. De-alerted postures can be designed to alleviate this danger.

Another major benefit of de-alerting is its contribution to curbing proliferation. Standing down the forces would downgrade the role of nuclear weapons, and convey a hopeful and serious message to the world that reliance on them is diminishing. This would strengthen non-proliferation diplomacy, foster progress toward the global elimination of nuclear arsenals, and contain an otherwise growing worldwide risk of accidental or unauthorized use or theft of nuclear weapons.

De-alerting is feasible. Wholesale de-alerting happened once before, in 1991. There are many practical ways to extend the time needed to fire U.S. and Russian nuclear forces—by hours, days, weeks, months, and even years—while preserving stable deterrence during peacetime and in the remote event of a U.S.-Russian nuclear crisis. De-alerting options take the form of procedural or physical modifications, or both.

Implementing such measures would nullify quick-launch options and create an unmistakably second-strike posture geared to riding out an attack before retaliating. The traditional nuclear strategies of both nations would be transformed by this change; *the predominance of nuclear war-fighting would be ended.* Further, the demands on the command system required in this "launch after attack" posture would promote a salutary new focus on enhancing the survivability of present arrangements.

Ideally, both U.S. and Russia would stand down in unison. Reciprocal de-alerting would immediately yield major security and safety benefits to both sides. Because Russia's strategic forces today are vulnerable to a sudden surprise attack, U.S. de-alerting would allay Russian fear of a disarming U.S. first strike and justify Russia removing its own finger from the nuclear button. Reciprocal Russian de-alerting would bolster U.S. force survivability but would be especially welcome for lowering the risks of a mistaken or unauthorized Russian launch.

This beneficial de-alerting dynamic could begin with U.S. unilateral steps that would preserve the survivability of its nuclear forces and give Russia confidence to follow suit. Unilateral U.S. de-alerting would protect the United States if it causes Russia to begin to relax—physically or psychologically—its nuclear hair-trigger. Unilateral steps that jeopardize the survivability of nuclear forces obviously would not satisfy the criterion of maintaining stable deterrence and would thus not be recommended.

The more deeply the postures are de-alerted—for instance, by separating warheads from delivery vehicles and consolidating the nuclear stockpiles in storage depots on land—the easier it becomes to verify their off-alert status, but the more critical this verification process becomes. Strict monitoring becomes essential because the successful covert breakout of a small number of deliverable nuclear weapons could threaten the wholesale destruction of the concentrated stockpiles in depots on the other side.

This report evaluates several of the most promising de-alerting options and finds many of them worthy of support. Recommendations are made with varying degrees of enthusiasm and qualification.

Procedural changes to extend the launch time line by dropping prompt launch and massive attack options from the emergency war *plans.* These changes could lengthen the time line for both decision and execution, and preclude large-scale retaliatory strikes. By taking operationally meaningful, rather than cosmetic, steps to de-target the strategic missile forces, any move to bring them back to launch-ready status would incur significant delays in re-targeting. With some qualifications due to transparency and verification concerns, this report recommends these changes, which could readily be adopted, because they would reduce the risks of mistaken launch on false warning, *require significant time to reverse (many hours to re-target; many days to revert to former procedures),* preserve deterrence under the worst of plausible conditions, and build momentum toward a nuclear-free world. It is a qualified recommendation, however, because the degree of transparency and verifiability is low.

Physical de-alerting measures that could be instituted immediately on the U.S. side by "safing" Minuteman missiles in their silos—flipping a safety switch inside the silos that electronically isolates the missiles from outside launch signals—*and refraining from installing special electronic devices known as "inverters" on the tubes of Trident submarines going on patrol.* These simple, practical measures are stronger in all the respects noted above for the procedural changes, and have the added virtues of *extending the time to re-alert the bulk of the forces by approximately 24 hours* and of lending themselves to a modest degree of verification that would build confidence over time. Analogous or comparable measures can be effected in the Russian posture, resulting in a stable nuclear balance that removes sudden first strike and launch on warning completely from the array of response options available to decisionmakers, and that all but eliminates the prospect of unauthorized actors, including terrorists, exploiting hair-trigger postures to cause a nuclear incident or actual firing.

Physical measures that could be instituted in 1–3 years by creating a reserve strategic nuclear force that entails separating warheads from their delivery vehicles (missiles) but widely dispersing both warheads and missiles in protected positions. For a notional U.S.

strategic force utilizing the existing force of 14 Trident submarines and the planned force of 450 Minuteman silos, this de-alerting scheme calls for storing Minuteman warheads in 225 otherwise empty silos, adjacent to 225 silos housing the unarmed Minuteman missiles; and for storing Trident warheads on 11 boats in 11 otherwise empty tubes on each boat, adjacent to 11 tubes housing the unarmed Trident missiles. Supplemented by 143 bomber warheads in local base storage, this de-alerting scheme preserves a large margin of survivability under worst-case conditions of break-out and attack by opposing forces. Reciprocal Russian measures would produce a resilient 500-warhead reserve force on each side that further *extends the time to re-alert* (by re-mating warheads to adjacent silos/tubes) *by days to weeks*. This option is highly rated in terms of stable deterrence, re-alerting stability, depriving unauthorized actors of any opportunity to induce a launch, and eliminating the risk of mistaken launch on false warning. Furthermore, this option rates highly with respect to transparency and verification. It would both demand and benefit from U.S.-Russian monitoring cooperation that applies to the warheads as well as launchers and promote the creation of an auditable database of warheads that in turn would facilitate progressive disarmament. Most notably, this option would significantly reduce the relative importance of nuclear weapons in national security policies. It would provide a waypoint on the path toward storing the entire U.S. and Russian nuclear arsenals and inspire greater confidence regarding the path toward the long-term goal of total elimination.

Physical measures for the medium-term future (4–6 years) that transfer nuclear warheads from their field deployment into warhead storage depots on land. Such wholesale consolidation of nuclear stockpiles would mark the end of traditional nuclear war-fighting strategies. *Reconstitution times for the bulk of the arsenals would be measured in weeks and months, greatly marginalizing their role and significantly facilitating further steps toward* complete elimination. It would also put the stockpiles into a full “lock-down” status that would offer the optimal conditions for preventing accidental and unauthorized use, or theft, of nuclear weapons. However, this option must be implemented with great caution. Depots stocked with large numbers of warheads present a potentially lucrative target. The breakout of even a few weapons could pose an extreme threat if the opposing forces' nuclear ordnance is concentrated in only a few depots. Therefore *before any transition to this storage option is completed, a number of preconditions should be satisfied.*

First, monitoring and verification must be able to perform at a very high level with exact accounting of warheads in storage down to the single weapons unit. *Second*, all of the P-5 states and perhaps other nuclear states need to be involved in this option—even limited capabilities in the hands of third parties could pose a potentially severe threat to the locked-down forces of the U.S. and Russia. This de-alerting regime should thus be comprehensively multilateral with stringent and enforceable monitoring and verification provisions. *Third*, given the enhanced threat represented by a single nuclear weapon, a strict re-alerting protocol would be essential should any nuclear nation deem it necessary to take this highly momentous and potentially destabilizing step. *Fourth*, similar protocols and constraints may need to be devised for conventional forces. A party that covertly begins to reconstitute its nuclear forces could use conventional forces to degrade an ostensible opponent's ability to respond in kind. *Fifth* and last, storage depots on land can and should be designed to withstand a small-scale nuclear attack. With respect to the U.S., the 50 empty MX Peacekeeper silos and the 50 Minuteman silos slated for mothballing could be utilized to protect a stockpile of reserve warheads for submarines, land-based missiles, and bombers.

Introduction

The inertia of almost half a century of maintaining the U.S. and Russian nuclear arsenals on launch-ready alert has proven difficult to wind down, even though the practice runs a host of dangerous risks and sustains a technical state of nuclear confrontation that is politically incongruent with the end of the Cold War. In the wake of the recent surge of terrorism and the growing danger of cascading nuclear proliferation around the world, however, estimates of the liabilities of maintaining the *status quo* are being revised upward. An array of new risks is coming to light. The war-ready nuclear postures perpetuate the danger of mistaken or unauthorized use, and may be susceptible to physical or cyber exploitation by terrorists. The war-footing postures keep nuclear weapons in constant motion and thereby create opportunities for terrorists to capture or steal them during the relatively exposed phase of their operation—transportation and temporary storage. They perpetuate a dynamic mutual reliance on nuclear weapons that lends legitimacy to the nuclear ambitions of other nations, whose proliferation makes intentional use more likely and whose deficiencies in nuclear command and warning systems multiply the global risk of accidental and unauthorized use, or terrorist theft.

In a new age of heightened nuclear danger, major benefits would accrue from standing down the legacy postures (called "de-alerting" herein), especially if it facilitates real progress toward the global elimination of nuclear weapons. This paper presents a set of feasible options to do that. They are designed to remove U.S. and Russian nuclear forces from launch-ready alert, reduce the risk of mistaken or unauthorized launch to negligible proportions, increase the time needed to re-alert them by hours, days, weeks, and months, and strengthen safeguards against terrorist exploitation, while preserving stable deterrence during a transition to a nuclear-free world.

The conditions favoring progress in de-alerting are numerous. The requirements of mutual deterrence between the United States and Russia are far less demanding today than they were during the Cold War. The end of the Cold War was an epochal event in U.S.-Russian relations that dramatically altered threat perceptions and the calculus of deterrence—e.g., the number of targets that need to be held at risk of destruction to deter an attack, and the promptness with which retaliatory strikes need to be delivered in order to underscore the threat of punitive retaliation. The former Cold War adversaries also share the view that while deterrent requirements have eased, the vexing challenge of preventing proliferation and nuclear terrorism has grown during the post-Cold War period. This ascendance is reflected in the high priority accorded the Nunn-Lugar program to secure "loose" fissile materials and nuclear weapons in the former Soviet Union. Many nuclear specialists believe that preventing the theft, illicit purchase, or capture of nuclear weapons by terrorists represents the single most important challenge of U.S. and Russian nuclear policy, and that it eclipses even nuclear deterrence as the overriding priority of our times.

Despite this strong mutual U.S.-Russian interest in cooperating in strengthening nuclear security, a number of obstacles impede progress on a de-alerting agenda in particular. Progressively reducing the alert status of nuclear forces demands commensurately more intrusive and cooperative verification in areas such as warhead monitoring for which the parties possess scant experience. Progress also depends upon addressing the conventional imbalance between them that puts Russia at a stark disadvantage with serious implications for Russia's ability to re-alert if necessary. Progressively deeper de-alerting—particularly if it involves the separation of warheads from delivery vehicles and their transfer to central storage depots—also cannot remain a strictly bilateral affair. Other nuclear states' arsenals become a major threat to warhead storage facilities and therefore new, complex multinational issues come to the fore. Lastly, their traditional nuclear strategies remain highly resistant to change in spite of the new deterrent climate and dramatic decline in the level of fear of a deliberate nuclear attack by either nation against the other. The drastic change of focus and concern away from U.S.-Russian deterrent relations and toward the urgent need to eliminate the threat of nuclear terrorism and arrest the danger of runaway proliferation has not yet altered the nuclear postures nearly as much as the objective situation warrants.

Baseline Posture

The nuclear superpowers manage their strategic arsenals today in almost exactly the same manner as they did during the Cold War. Many hundreds of missiles on land and sea are fully armed, fueled, and targeted. The land-based missiles in silos will fly as soon as they receive a few short computer signals whose transmission is as simple as stroking a few keys on a keyboard, hitting "Enter," repeating the sequence once more, and then turning two keys in unison. The sea-based missiles on submarines will pop out of their tubes as soon as their gyroscopes are spun up, the onboard computer uploads their wartime targets and arms their warheads, and additional computer signals open the hatches and ignite the steam generators that propel the missiles to the surface.[1]

If the Kremlin and the White House ordered the launch of their alert strategic missiles right now, this minute, without any prior notice and advance preparation, the amount of firepower unleashed and the speed of its release would be astonishingly large and rapid. U.S. land-based launch crews would receive the order almost instantaneously, remove launch keys and codes from their safes, compare the authorization codes in the launch order with those in their safes, insert their launch keys, punch in the number of the selected war plan that automatically instructs their missiles which specific target file to pull from their computer files and what trajectory to fly, key in the "enabling code" contained in the launch order that arms the warheads on the missiles, and turn the launch keys that transmit the "Fire" command to the dispersed unmanned missiles in underground silos.

The time needed to execute all of these steps in the Minuteman fields of central plains America: one to two minutes. (They are called Minuteman for a reason.) At sea, analogous steps taken by submarine

1. For a complete step-by-step description of the launch procedures for Trident submarines, see Douglas C. Waller, *Big Red: Three Months On Board a Trident Nuclear Submarine* (New York: HarperCollins, 2001), pp. 203–237.

crews include retrieving a special firing key from a safe inside a safe, the access code to which is provided by the launch order from higher authority. From that point in time until missiles leave their tubes in quick succession only about 12 minutes would elapse.

Very similar procedures and timelines apply in Russia. Extremely high launch readiness for large numbers of alert missiles prevails on both sides. About one-third of their total strategic forces are poised for immediate launch under normal conditions. *The combined firepower that could be unleashed within these short time frames measured in minutes is approximately 2,654 high-yield nuclear warheads (1,382 U.S. and 1,272 Russian)—the equivalent of approximately 100,000 Hiroshima bombs* (assuming the Hiroshima bomb yielded 15 kilotons of explosive power).[2]

A high degree of vigilance suffuses the entire U.S. and Russian chains of nuclear command and warning, from the bottom all the way to the top. In the warning centers, such as the hub of the U.S. early warning network in Colorado, crews labor under the pressure of tight deadlines to assess and report whether a satellite or land radar sensor indicating a possible threat to North America is real or false. Events happen almost daily, sometimes more than once daily, which trigger this assessment drill that is supposed to yield a preliminary assessment within three minutes after the arrival of the initial sensor data.[3] Analogous drills take place under comparable deadlines in Russia. A rush

2. Assumptions for alert rates: U.S.: Minuteman III (95%); Trident (4 boats launch-ready); all others (0%); Russian: SS-18 (80%); SS-19 (66.6%); Delta IV (1 boat launch-ready at sea; 1 boat launch-ready on pierside alert); all others (0%). Other assumptions on payloads and yields are available from author.

3. These frequent occurrences involve diverse events—e.g., nations launching rockets to place satellites in space; developmental tests of military and civilian rockets; combat use of rockets of all kinds (including short- and medium-range rockets as well as intercontinental range); and airplanes using after-burners. Assessment drills are also triggered by natural phenomena—sunlight reflected from clouds, for instance, and even wildfires may be detected by infrared heat sensors on surveillance satellites designed to detect the hot plumes of rockets during their 2–4 minute first-stage burn.

of adrenalin and rote processing of checklists, often accompanied by confusion, characterize the process.[4]

If their early warning assessment determines that a nuclear missile attack is possibly underway, the entire chain of nuclear command in the United States or Russia would immediately kick into high gear with thousands of duty crews and nuclear support personnel involved. The same rush of adrenalin and rote decisionmaking by checklist drive a process whose intensity and deadlines practically rule out any chance for careful deliberation. An emergency conference involving the presidents and their top nuclear advisors would be convened, whereupon on the U.S. side the commanding duty officer at Strategic Command headquarters in Omaha would brief the U.S. president on the nature of the apparent attack, the wide array of response options, and their anticipated consequences for Russian physical and human resources. The time allocated for this briefing is about 30 seconds depending on the nature of the attack. The U.S. president then would come under intense pressure to absorb this complex set of data, weigh the consequences of the various options, and choose a course of action. His decision window is typically 12 minutes, although under certain extreme conditions it can be much shorter.

The extraordinarily brief time for such a momentous decision is driven by four factors: the 30-minute flight time for an intercontinental missile, and about one-half that for a submarine-launched missile; the time required to validate and characterize the attack, using two separate sources of warning data to ensure high confidence; the time required to convene a phone conference of the principals involved in the decision process, and the time required following presidential decision to encode and transmit that decision worldwide to the strategic

4. On the occasions of the two major false alarms in U.S. history (caused by human error and computer malfunction, respectively), it took the crews 8 minutes instead of 3 to resolve the confusing contradictory indications, resulting in their being immediately relieved of duty ("fired") both times. Cases in Russia were similarly fraught with confusion.

nuclear forces. The importance of the latter seemingly mundane factor cannot be overstated. Any delay in transmitting the response order runs the risk of losing retaliatory forces to the Russian attack, thus undermining the calculus of expected damage for the response option chosen by the president. This risk is compounded in the event of a so-called "decapitation strike," that is, an opening attack on the National Command Authority (the president and the secretary of defense), most likely mounted by Russian missile submarines operating close to U.S. shores. Under this circumstance, the integrity of the U.S. retaliatory response is greatly compromised, thus calling into question the very calculus upon which nuclear deterrence is based.

Given these acute conditions, it is no wonder that as much of the response process as possible is designed to be quasi-automatic. It can reasonably be described as going to war by checklist, enacting a prepared script, with little margin for human error or technical malfunction. The nuclear war machinery has a hair-trigger quality. And that quality has been a constant in the nuclear equation for decades. Comparable pressures and deadlines apply to Russia. Both of the traditional nuclear rivals still stand ready, despite the Cold War's end, to inflict apocalyptic devastation on one another in a first or second strike whose essential course would be run in less than one hour.

Wartime Aims of the Nuclear Posture

The main underlying cause for this continuing state of affairs is the undiminished commitment on both sides to traditional deterrent strategies of nuclear war-fighting. Both the Kremlin and the White House evidently continue to issue presidential nuclear guidance that requires their respective nuclear forces to be constantly prepared to fight a large-scale nuclear war with each other at a moment's notice. These forces are assigned long lists of targets, running into the thousands on each side, to strike in the event of war, and they are expected to inflict serious damage with high probability on all target categories—opposing nuclear forces, conventional forces, war-supporting industry, and leadership. The forces cannot achieve this wartime objective of high "damage expectancy" if the opposing forces destroy them first, and so both strategic arsenals are kept on hair-trigger alert, ready to launch on warning of incoming warheads launched by the opposing side.

The insidious role played by stringent (and arguably excessive) "damage expectancy" requirements in keeping warning and decision times so short can be demonstrated mathematically. Taking the mid-1980s as a point of reference, open sources indicate that the U.S. strategic war plan at that time called for attacks on up to 16,000 targets in the full-scale variant (major attack option 4).[5] Assuming an average damage requirement across the spectrum of targets of 80 percent[6]—that is, U.S. strategic forces had to be able to destroy 80 percent of the complete target base of 16,000 targets—U.S. forces had to be able to deliver some 12,800 weapons to those targets.[7]

Since the entire U.S. strategic arsenal in 1986 was comprised of around 12,314 warheads,[8] all of them would have been needed in wartime to ensure adequate coverage of the target base and to emerge from a nuclear exchange having fulfilled the mission successfully. All U.S. forces would have had to be brought to alert, and all launched before incoming Soviet weapons could inflict losses to them (or to the even more fragile U.S. command system whose ability to direct U.S. forces to coherent wartime missions depended heavily upon exercising

5. See Bruce G. Blair, *The Logic of Accidental Nuclear War*, Brookings, 1993.

6. Declassified documents describing the U.S. strategic war plan indicate that U.S. guidance prescribed a 90 percent probability of causing severe damage to the highest priority targets—the adversary's strategic nuclear forces. See *History of the Joint Strategic Target Planning Staff: Preparation of SIOP-63*; www.gwu.edu/nsarchiv/nukevault/ebb236/SIOP-63.pdf

7. Note that some single weapons could destroy multiple targets, while sometimes multiple weapons had to be assigned to destroy a single target—an example of the latter was the assignment into the 1990s of 69 strategic weapons to attack the Pushkino battle management radar in the Moscow suburbs which controlled the ballistic missile defense system ringing Moscow. Personal communications with SIOP planner, 1998.

8. NRDC: www.nrdc.org/nuclear/nudb/datab1.asp.

the option of launch on warning[9]). The stability of a nuclear crisis in 1986 would have been low and warning and decision time would have been short indeed. All the pressures worked to generate maximum forces to alert and to use them before suffering *any* losses to Soviet strikes, lest the damage expectancy requirement that defined "success" in a nuclear war with Russia should be unfulfilled. Launch on warning was essential to the success of the war plan.

Twenty years later, the situation is much the same. The number of targets in the U.S. strategic war plan declined drastically over those two decades—from an estimated 16,000 to 2,500 in 1995,[10] and leveling out at around 2,260 (plus a smaller number of China targets) in the year 2000.[11] *Assuming about 2,000 Russian and 400 Chinese targets in a notional 2007 strategic war plan, the U.S. strategic arsenal today must be able to destroy about 1,920 targets combined in Russia and China. That is well within the scope of current numbers (3,800 warheads) and capabilities of U.S. strategic forces, but the United States would still need to put more forces on alert in a crisis and launch them on warning or preemptively in order to meet the "damage expectancy" requirements of a successful wartime mission.*[12] **Russia's posture depends even more upon force generation during a crisis and upon launch on warning.**[13]

9. Bruce G. Blair, *Strategic Command and Control,* Brookings, 1985.

10. Bruce G. Blair, *Global Zero Alert for Nuclear Forces*, Brookings, 1995.

11. Bruce G. Blair, "Trapped in the Nuclear Math," *New York Times*, June 12, 2000.

12. It was earlier noted that the United States maintains about 1,382 strategic weapons on launch-ready alert today, which alone could cover only 58 percent of the total target base. All of these forces would have to be launched on warning or preemptively, and an additional contingent of 538 off-alert strategic weapons would need to be generated to alert, and launched before Soviet weapons could destroy any of them. (Chinese strategic weapons are too few in number to represent a counterforce threat to U.S. strategic forces.)

13. The pressures for generating and dispersing Russian forces during a crisis are even more intense than the pressures on the U.S. posture because Russia's day-to-day posture is highly vulnerable to sudden attack. On a typical day, no Russian deterrent submarine is patrolling at sea (compared to nine U.S. Trident subs armed

In short, the mathematics of nuclear deterrence embedded in the current U.S. and Russian nuclear postures today offers practically no margin for extending warning and decision time. *In the remote event of a U.S.-Russian nuclear confrontation that brings the two sides to the brink of conflict, there would be enormous pressure exerted on the respective nuclear command systems to raise the defense readiness conditions, rapidly bring the arsenals to full alert, and not to hesitate to launch them upon receiving indications of an apparent enemy nuclear missile attack. However ample the current amount of "overkill" may seem to reside in the arsenals from the perspective of an outside observer, the margin is actually razor-thin to the inside strategic planner, and the high damage requirements levied by the planners on the strategic nuclear forces creates conditions in which an unstable crisis alert dynamic is guaranteed to unfold unless extraordinary political will is exerted to moderate it.*

In sum, **the U.S. and Russian nuclear postures are still primed for an alerting race and for rapid launch during a crisis. These current pre-programmed processes are more unstable overall than the relatively slow re-alerting and reconstitution processes associated with the de-alerting options outlined later in this report.**

Aligning the Postures with the Real Threats

The surrealism of the current nuclear war-fighting postures in the post-Cold War era is equaled only by their lack of efficacy in addressing the real nuclear threats that exist today. In the spirit of traditional deterrence, they are projecting a massive nuclear threat at potential contemporary adversaries that are scarcely in the same adversarial

---

with nearly 1,000 survivable warheads) and perhaps only one regiment of mobile land rockets—consisting of nine missiles and warheads—is operating covertly in the field away from home garrison. Practically the entire Russian arsenal depends on launch on warning and on crisis alerting to project a deterrent threat of severe punitive retaliation to attack. Similar rapid increases in command system readiness are planned on both sides to bolster their deterrent postures during a crisis.

league as the old Soviet Union. Meanwhile, this exercise in force projection not only wields no influence over transnational terrorist organizations, but also unintentionally legitimizes proliferation and increases a variety of immediate nuclear risks to ourselves. The operational postures reflect misplaced priorities driven by Cold War habits of mind, and what is worse, they are counterproductive in significant respects.

There are a host of reasons why removing forces from launch-ready alert and abandoning archaic nuclear war-fighting strategies are urgent priorities. *Beyond the familiar arguments about the danger of accidental nuclear attack triggered by false alarms, and unauthorized launches by unreliable personnel, lurk shadowy new threats stemming from terrorist scenarios and growing cybernetic threats to the nuclear command and warning systems.* In an era of terrorism and information warfare, staking the survival of humanity on the assumption that imperfect human and technical systems of nuclear command and control will forever prevent a disastrous breakdown of safeguards against mistaken or unauthorized use of nuclear weapons is simply imprudent in the extreme.

An in-depth discussion of the potential exploitable weaknesses in nuclear command systems is beyond the scope of this analysis, but a few general observations are pertinent. First, many of the deficiencies are unknown, some will never be found, and others will not be discovered until it is too late. The complexity of command systems prevents a full reckoning of the risks run by hair-trigger postures. Periodic investigations routinely discover glaring weaknesses, however. For instance, a Pentagon investigation conducted by an independent commission in the 1990s at the behest of then Sen. Sam Nunn to evaluate the effectiveness of U.S. nuclear safeguards against unauthorized launch found dozens of major deficiencies.[14] This commission

14. An especially noteworthy example is the discovery by the commission of an unprotected electronic back door into the naval broadcast communications network used to transmit launch orders by radio to the U.S. Trident deterrent submarine fleet.

recommended a multitude of remedies, including installing a special new safeguard on Trident subs—the inner safe described earlier—to create a technical barrier to unauthorized launch.

Second, many of the deficiencies that are identified and addressed turn out not to have been corrected. The introduction of "enable code" devices into Minuteman launch centers in the 1960s is a case in point. In theory, the devices required launch crews to receive an eight-digit code from higher authority in order to arm their missiles' warheads prior to launch. In practice, the Strategic Air Command, unbeknownst to higher authority (such as former Defense Secretary Robert McNamara, who initiated and pressed for this safeguard), configured the devices so that they were always set to all zeros—that was the secret password known to all launch crews. This circumvention persisted until 1976, when actual codes were finally introduced. In the interim, the posture ran a higher risk of unauthorized launch by crew members or others who might have gained access to the launch centers, including terrorists.[15]

Third, the nuclear command systems today operate in an intense information battleground on which more than 20 nations including Russia, China, and North Korea have developed dedicated computer attack programs.[16] These programs deploy viruses to disable, confuse, and delay nuclear command and warning processes in other nations. The U.S. Strategic Command is no exception. Information warfare is

---

Unauthorized persons, including terrorists, may have been able to seize electronic control of shore-based radio transmitters such as the very low frequency facility at Cutler, Maine, and actually inject a launch order into the network. The deficiency was taken so seriously that new launch order validation protocols had to be devised and Trident crews had to undergo special training to learn them.

15. During the mid-1970s this author personally pressed for the activation of these codes as a way to prevent the exploitation of Minuteman systems by terrorists. See Bruce G. Blair and Garry D. Brewer, "The Terrorist Threat to World Nuclear Programs," *Journal of Conflict Resolution*, 1977.

16. Estimates based upon Adam J. Hebert, "Information Battleground," *Air Force Magazine*, Vol. 88, No. 12, December 2005. www.afa.org/magazine/Dec2005/1205info.html.

now one of its core missions. *At the brink of conflict, nuclear command and warning networks around the world may be besieged by electronic intruders whose onslaught degrades the coherence and rationality of nuclear decisionmaking. The potential for perverse consequences with computer-launched weapons on hair-trigger is clear.*

Other information warfare programs are designed to infiltrate and collect information on, for example, the schedule of the movement of nuclear warheads during peacetime. Hacking operations of these sorts are increasing exponentially as the militaries of the world increasingly depend on computer and communications networks. *The number of attempts by outside hostile actors to break into Defense Department networks has surged by tenfold in the past couple of years.* Hostile intrusion attempts against Pentagon computer systems now run in the neighborhood of 1,000 per day. (China is especially active.)

What is worse, some of this expanding illicit penetration involves insiders, creating a whole new dimension to the "insider" threat to nuclear systems. If insiders with knowledge of special passwords or other sensitive information related to nuclear weapons activities collude with outsiders, the integrity of nuclear command and control systems and safeguards against the unauthorized launch of nuclear weapons on launch-trigger alert may well be compromised. *The guiding principle of nuclear safeguards during the past 50 years—the two-man rule—may be obsolete in the age of information warfare.* The notion that having a second person present during any sensitive nuclear operation would prevent an accidental or intentional nuclear incident may have been sound during the labor-intensive and analog-dominated era of nuclear command and control, but in the modern age of information warfare, new safeguards may be needed to prevent the electronic compromise of missiles on hair-trigger alert.

Adding terrorists to this equation gives further reason to believe that the Cold War nuclear postures are counterproductive—they exacerbate rather than alleviate nuclear problems, and they are an accident waiting to happen. There is a possibility that terrorists could spoof early warning sensors and thereby engender false alarms that precipitate nuclear overreactions. The possibility also exists that terrorists, possibly with insider help, may get inside the command and communications networks controlling nuclear forces. They might gain information useful to interdicting and capturing weapons, or unauthorized actors might discover ways to inject messages into the circuits.[17] Again, the wisdom of keeping nuclear forces ready to fly instantaneously upon receipt of a short stream of computer signals is dubious.

The more likely scenario is one in which nuclear weapons fall into the hands of terrorists because of intrinsic fault lines in the nuclear postures. The simple fact that maintaining war-ready nuclear postures requires many hundreds of nuclear bombs to be moving around on alert or going back and forth between the field and bomb refurbishment facilities means that they are exposed to terrorist capture or theft during the most vulnerable phase of their operating cycle: transportation, the Achilles Heel of security.[18] *As long as traditional deterrent practices continue, it will be impossible to truly "lock down" the arsenals to protect them from terrorist theft.* Sooner or later, the Nunn-Lugar program will fail unless the day-to-day adversarial nuclear relationship is ended.

One can also readily imagine the rampant problems of these kinds that afflict, or will afflict, the nuclear command, control, and early warning systems of nuclear proliferators who lack the technical sophistication, experience, and resources of the United States and Russia.

17. Recall the findings reported earlier concerning the Trident communications deficiency.

18. This is an especially acute concern for the Russian posture because of its relatively greater reliance on mobile nuclear forces, and also because of its need to transport large numbers of plutonium pits from the field to remanufacturing facilities and back to the field. Russian pits have a short shelf life—8–12 years (compared to 50–80 years for U.S. pits) and thus on average 10 percent of the Russian arsenal needs to be refurbished each year. At any given time in Russia, hundreds to thousands of nuclear devices are in transit or temporary storage.

Undoubtedly the global nuclear threshold will become steadily lower and easier to cross if, say, Pakistan and India follow in the footsteps of the nuclear superpowers by mating nuclear weapons to delivery vehicles and preparing to launch them on warning. Although this analysis focuses on the U.S.-Russian case, it is important to recognize that the second nuclear age involves a normal process of force "modernization" that leads militaries from other countries to increase the launch readiness of their forces. Arresting this trend on a global basis is essential to avert the mistaken or unauthorized, as well as the intentional, use of nuclear weapons by one or another of the nine nuclear nations, or by some future new proliferator.

On the face of it, *establishing a universal norm that prevents any nation from adopting a hair-trigger alert posture has considerable merit.*[19] Britain, France, and China ought to be formally engaged and assume obligations for verification. Their transparent adherence to a de-alerting regime would help bring Russia into full compliance with it. Russia may insist on maintaining at least a small portion of their current arsenals on high alert until all of the other major declared its nuclear-weapons states join the regime and adopt comparable restrictions on readiness.

19. By some indications, Britain, France, and China have already assumed a de facto de-alerted posture. China has traditionally maintained a low state of nuclear readiness, with warheads stored separately from their delivery vehicles. France has kept its missile submarines at sea on modified alert, and Britain has declared that its strategic monad of missile submarines are now routinely at a "'notice to fire' measured in days rather than the few minutes' quick reaction alert sustained throughout the Cold War." British Ministry of Defense, *Strategic Defense Review*, Supporting Essay Five: Deterrence, Arms Control, and Proliferation, June 1998. The information on the French SSBN modified alert posture is based on personal communications with a French military official. The Chinese nuclear posture is discussed in Hans M. Kristensen, Robert S. Norris, and Matthew G. McKinzie, *Chinese Nuclear Forces and U.S. Nuclear War Planning*, FAS/NRDC, Nov. 2006; www.nukestrat.com/china/chinareport.htm. Nevertheless, the operational postures of these nations as well as India, Pakistan, Israel, and North Korea are opaque and ought to become more transparent.

Precedents for De-Alerting

President George H. W. Bush led boldly to de-alert nuclear weapons at the end of September 1991, when the Soviet Union began to crumble in the wake of the August coup attempt, and as the Soviet nuclear weapons complex quaked along with it. On the advice of his advisors including Gen. George L. Butler, then commander of the Strategic Air Command, Bush ordered an immediate stand-down of U.S. strategic bombers that for decades had stood ready for takeoff within 15 minutes. Nuclear weapons on them were unloaded and placed in storage at the bomber bases. In addition, Bush took off alert a large number of land- and sea-based strategic missiles slated for elimination under START I—450 Minuteman II missiles along with the missiles in 10 Poseidon submarines. These measures, removing about 3,000 strategic warheads from high alert, were implemented in a matter of days, and they encouraged comparable actions by Russia.[20]

President Gorbachev followed suit a week later by ordering the deactivation of more than 500 land-based rockets and six strategic submarines, by promising to keep strategic bombers at a low level of readiness, and by consigning Russia's rail-based missiles to their home garrisons. These reciprocal steps would entail removing about 2,000 strategic warheads from high alert.

In subsequent months, both countries de-mated the nuclear warheads from the de-alerted missile forces. Furthermore, they withdrew many thousands of shorter-range tactical nuclear weapons deployed with their far-flung armies and surface navies and placed these weapons in central storage depots on their home territories.

Presidents Clinton and Yeltsin took a further step together in 1994, when they pledged to stop aiming strategic missiles at each other's country. The gyroscopes on U.S. land-based missiles were ori-

20. The de-alerting measures introduced initially for land-based strategic missiles were procedural and minor physical modifications similar to those discussed under *Option 2* below. The warheads were de-mated later on.

ented to ocean areas in the far northern latitudes, and Russia switched its land-based rockets to a “zero flight plan.” These adjustments of the primary target settings, though a welcome gesture, can be reversed in seconds and had negligible military significance.[21]

De-alerting Options and Criteria for Evaluating Them

This paper presents and evaluates several de-alerting options for the immediate-, near-, and medium-term future that show promise in satisfying the basic criteria outlined below. Our aim is mainly to *illustrate rather than prescribe* a blueprint for de-alerting. Military and technical experts will bear responsibility for devising steps that pass muster in practical operational terms and that meet the essential criteria. No claims are made that the plan outlined below represents an optimal course of action. This caveat especially applies to the illustrative Russian de-alerting steps, which are presented below with less detail and texture.

Having offered this disclaimer, it should be noted that the options described below survived the author’s winnowing of a multitude of

21. Pre-programmed wartime target coordinates remained in the computer memories of the missiles, and missile commanders could activate these target files within seconds. In other words, the Clinton-Yeltsin “de-targeting” agreement could and can still be reversed by either side in seconds. Selecting targets in this fashion is in fact a standard procedure for launching missiles in wartime (see earlier discussion of launch procedures) and hence the accord did not extend the launch preparation time by even a single solitary second. In the United States, local launch crews in the missile fields perform this standard procedure in accordance with the target plan designated by their launch orders. In the case of Russia, the local crews can perform the procedure or the General Staff, from their wartime command bunkers in the Moscow vicinity, can use a computer network called Signal-A to override the agreement and re-aim all their silo-based missiles at the United States in ten seconds. In fact, if the General Staff transmits a launch order directly to the missiles over Signal-A in the mode called “automatic regime,” then the missiles automatically switch over to their primary wartime target. For detailed discussions of all aspects of “de-targeting,” see Bruce Blair, “Where Would All the Missiles Go?” *Washington Post*, October 15, 1996, p. A15; Bruce Blair, *Global Zero Alert for Nuclear Forces* (Brookings, 1995); and Bruce Blair, “Russian Nuclear Policy and the Status of De-targeting,” Testimony before the House Committee on National Security, March 13, 1997.

possibilities. Furthermore, they have been reviewed by a cadre of knowledgeable U.S. and Russian military experts with experience in the operational arena of all three legs of the strategic triad—land- and sea-based missiles, and bombers. Without question *feasible de-alerting schemes that satisfy the basic criteria exist and can be defined.*[22] *Moreover, the number and variety of possible de-alerting schemes create an opportunity to fashion agreements that impose equitable constraints on asymmetrical force structures and operational practices*. The basic criteria are:

Criterion A: *time to re-alert*, which measures how long it would take to reverse de-alerting and restore forces to their original launch-ready configuration. The longer the time needed to re-alert the forces, the greater the merit of the option. It is important to recognize that the time to re-alert a given weapon may vary greatly depending upon its position in the queue of the larger force of similar weapons. Thus while it may take several hours or days to re-alert one or a handful of nuclear forces, such as Minuteman missiles, it may take many weeks or months to re-alert all of the weapons in the same category of forces. *This paper generally gauges both the time needed to re-alert the first batch of weapons and the time needed to re-alert the bulk or all of the weapons.*

Criterion B: *impact on strategic stability*, which for de-alerted postures places special emphasis on the stability of dynamic re-alert-

22. For additional reading of work to devise de-alerting options, see Bruce G. Blair, "De-alerting Strategic Nuclear Forces," in Harold A Feiveson, ed., *The Nuclear Turning Point: A Blueprint for Deep Cuts and De-alerting of Nuclear Weapons*. Brookings, 1999; Bruce Blair, Hal Feiveson, and Frank von Hippel, "Taking Nuclear Weapons off Hair-Trigger Alert." *Scientific American*, Vol 277, No. 5, Nov. 1997; David Mosher, David Howell, Lowell Schwartz, and Lynn Davis, *Beyond the Nuclear Shadow: A Phased Approach for Improving Nuclear Safety and U.S.-Russian Relations*. Rand, 2003; Bruce Blair, "Command, Control, and Warning for Virtual Arsenals," in Michael J. Mazaar, ed., *Nuclear Weapons in a Transformed World: The Challenge of Virtual Nuclear Arsenals*, St. Martin's Press, 1997; Thomas Karas, *De-alerting and De-activating Strategic Nuclear Weapons*, Sandia National Laboratories, Report 2001-0835, April 200l.

ing. De-alerting should not create exploitable advantages from breaking out and re-alerting. It especially should not be possible to seize a disarming first-strike advantage by reconstituting faster than an opponent can. Retaliatory forces need to be sufficiently survivable under normal peacetime circumstances as well as during a crisis period in which restraint may break down. *It is assumed that the certainty of retaliation is far more important to deterrence than is the timing of retaliation, and that stable deterrence would not be adversely affected by delays in retaliation.*

Criterion C: *degree of transparency/verifiability*. This refers to *monitoring the operational status* of nuclear weapons, placing emphasis on monitoring non-deployed forces as the importance of reserve forces increases during the transition to a nuclear-free world. Monitoring and verification should support the goal of preserving strategic stability (Criterion B) as well as help pave the way to the elimination of nuclear weapons (Criterion D).

Criterion D: *foster progress toward a nuclear-free world*. De-alerting options should serve to downgrade the role of nuclear weapons in national security policy and strengthen diplomatic efforts to curb and reverse proliferation. They should also serve the technical purpose of bringing reserve as well as operationally deployed warheads under surveillance in order to establish a baseline database of warhead numbers and types. An accurate global audit of warhead inventories is a precondition for the eventual verifiable elimination of nuclear weapons.

Criterion E: *impact on today's risk of accidental, mistaken, or unauthorized launch or theft.* Measures that reduce these risks and strengthen safeguards against terrorist exploitation of U.S. and Russian nuclear postures are critical today. Widening the margin of safety in these areas is arguably the overriding priority of the post-Cold War era. De-alerting options should above all enhance nuclear safety.[23]

23. For an elaboration of this thesis, see Sam Nunn and Bruce Blair, "From Nuclear Deterrence to Mutual Safety," *Washington Post*, June 22, 1997, p. C1.

De-alerting Option 1: Procedural Modifications (Present-term) to Eliminate Prompt Large-Scale Launch

The basic immediate aim of increasing warning and decision time, and reducing reliance on prompt launch procedures, can be achieved by modifying command and control practices. Two straightforward approaches involve changing Emergency War Orders, and substituting real de-targeting measures for the symbolic measures of the Clinton-Yeltsin agreement on nuclear de-targeting.

Dropping Prompt Launch from Emergency War Orders. A great deal of progress toward preventing hastily executed launch procedures can be made simply by altering the nuclear war plans and their implementing procedures. In U.S. military circles, these procedures are called Emergency War Orders, or EWO. All nuclear wartime operations are strictly governed by EWO, the mastery of which represents the crux of all nuclear war training. U.S. and Russian planners could readily revise EWO to ensure that none of their respective strategic forces could be launched on warning. Simple changes of EWO would suffice.[24]

Additional EWO changes could be made to increase the time needed to reach a launch decision as well as the time needed to carry out the decision. Top-level deliberations could be prolonged to preclude a hasty decision and enhance the quality of attack information.[25]

24. To illustrate, EWO could introduce an automatic, built-in delay for firing the forces, increasing the response time of the launch crews from the current period of a few minutes to a period of, say, one hour. According to the new procedures, launch crews would simply wait that long after receiving the authorization to fire before completing the launch sequence that unleashes the forces. As long as the crews followed their standing instructions under EWO, and there is every reason to expect them to comply, then no missiles would leave their silos or submarine tubes for an hour, during which time the validity of missile attack indications may be ascertained.

25. The timelines would be lengthened so that the president and his top nuclear advisors received more attack information before conferring in an emergency conference. This conference would be convened later than currently planned, and the period of consultation and deliberation among the top leaders would be lengthened.

In short, EWO procedures for organizing the launch decision process could be designed to discourage a quick decision.

Dropping Massive Attack Options from the Strategic War Plans. To excise massive attack options from the strategic war plans of the United States and Russia would mean the end of the practice of preprogramming large-scale strikes. The form this practice takes in the United States is a Single Integrated Operational Plan (SIOP). Specifically, the Major Attack Options (MAOs) in the SIOP and Russian war plans would be scrubbed, as would many if not the vast majority of the Limited Attack Options (LAOs) in their respective plans.[26] Preprogrammed, large-scale (MAOs) and medium-scale (LAOs) options would be replaced by EWO procedures designed for adaptive planning, targeting, and execution of small numbers of nuclear sorties.

In eliminating preprogrammed options from the strategic war plans, the wartime targets currently assigned to the forces would lose their priority. Their coordinates and related targeting information could be downloaded from the computers onboard the delivery vehicles or collocated at the launcher.

Keeping Submarines Out of Range of Targets. This oft-proposed option is essentially a procedural change that warrants a closer examination. Both U.S. and Russian submarine patrol areas would be moved as far south as the Southern Hemisphere, putting them far out of range and requiring many days to weeks of transit time to reach their launch stations. Patrol restrictions could thus establish a built-in delay for launching submarine missiles, an especially significant constraint for Trident D-5 missiles armed with W-88 warheads in the Atlantic that pose a potential first-strike counterforce threat. Departing from current practice, these hard-target-kill weapons assigned to Atlantic-based U.S. Trident boats could stop transiting to forward launch stations in the North Atlantic. Specifically, they could refrain from patrolling north of an imaginary line stretching from Kings Bay to

26. U.S. LAOs may unleash between 2 and 120 weapons; author's estimate.

Liberia in West Africa. Boats armed with the heavier W-88 warheads would be far out of range (by approximately 2,000 miles) of a wide spectrum of critical Russian targets—notably, the four Russian SS-18 missile fields in southern Russia.[27]

Trident boats armed with lighter and/or fewer warheads would be in firing range well south of this imaginary line, and thus it would need to be drawn much farther toward the equator. If Trident missiles were armed with four W-88 warheads, their range would extend another 2,000 miles, just close enough to deliver a counterforce blow against the SS-18 fields despite adhering to the proposed demarcation line restricting Trident patrols. Drawing the line farther south, indeed restricting the patrols of all Trident boats regardless of payload to the Southern Hemisphere, should solve the general problem.

It is true that as the number of warheads carried by a submarine missile decreases, as is the current trend, the range of these forces theoretically increases to a point where the missiles achieve infinite range around the globe. For example, a Trident missile carrying only two warheads could launch those warheads into orbit—i.e., infinite range. Deployment, even in the Southern Hemisphere, would not necessarily preclude strikes against very distant targets in Russia. As a practical matter, however, the range of Trident missiles appears to be limited to about 6,000 miles for various reasons having to do with speed limits on warhead fuzing during reentry, and on reentry vehicle stability and accuracy. The longer the range, the faster the speed and the shallower the angle of reentry. Warhead fuzing using altimeter readings during the final stage of reentry would be problematic at excessive speed and thereby degrade the capability to achieve the proper height of burst. Reentry vehicle stability would also suffer at excessive speeds and longer exposure to the atmosphere caused by a shallower reentry angle. If the vehicle goes too fast and shallow, it

27. Note that SSBNs in the Atlantic typically carry a heterogeneous mix of Mk-4 and Mk-5 armed missiles, and that any given D-5 missile carries a homogeneous load of either Mk-4 or Mk-5 warheads.

could actually skim off the atmosphere (the way a rock can be skimmed along the surface of a lake) resulting in a substantial degradation of accuracy. In any case, missile ranges of 6,000 miles or longer would at least provide longer tactical warning time—equal to the warning time for U.S. land-based missiles—for Russia to disperse its mobile ICBMs and command posts.

Verifying adherence to patrol restrictions should be adequate if special provisions are made. U.S. boats could be required to report their locations on a regular basis, and submit to visual or electronic identification by various means employed by joint monitoring stations such as surface ships. Boats could surface, or release buoys, to transmit position coordinates (as well as data from the electronic seals on the inverters and guidance sets) once a day, or less frequently depending upon their previously reported location. They would do so one at a time with intervals between them, in order to minimize the fleet's exposure. Submarines that operate well south of the demarcation line, even as far south as the Southern Hemisphere, could report at longer intervals of several days in view of their long transit times to launch stations. For instance, if their last report fixing their location established that it would take them a week to move within range of Russian targets, then in principle their next report would not be due for upwards of a week.

Assigning Russian submarines to patrol out of range of U.S. territory is much more problematic because of their vulnerability to U.S. anti-submarine warfare. Patrol areas for Russia's deterrent boats are close to home territory where they can be actively defended from the lethal forays of Western anti-sub forces. Russia historically sent them to patrol off the U.S. coasts but gravitated to home water patrols during the 1970s and 1980s. It would be justifiably reluctant to disperse them to far-flung regions of the ocean, and doubtless would strongly prefer other de-alerting measures for its fleet.

Furthermore, Russian submarine reactor safety would be a real problem while transiting the equator en route to the Southern Hemisphere. According to a Russian admiral interviewed by the author, Russian sub reactors need to operate in cool seas for safety reasons; ocean temperatures that exceed 20 degrees Celsius would pose a hazard. He noted that the water temperature at 200 meters depth at the equator was approximately 25 degrees Celsius, well above the safe limit.

This de-alerting option is not further considered in this report for two reasons. First, it is very unlikely to be adopted by the Russian posture, and therefore it would be an entirely asymmetrical obligation. Second, and more importantly, this option scarcely advances the goal of a nuclear-free world. It represents a diversionary rather than a progressive step.

An evaluation of the other candidate options—dropping prompt launch and massive attack options from current launch procedures—follows next.

Evaluation

Criterion A: (*time to re-alert*). *Hours to days*.

These changes to the emergency war plans would require significant time to reverse—many hours to re-target;[28] many days to change procedures back to their original form.

Criterion B: (impact on strategic stability). *Positive*.

Reasonable requirements of deterrence would be met under the worst of plausible circumstances.

Procedural modifications eliminating prompt large-scale launch

28. By stripping such targets out of the local computers that are integral to land- and sea-based missiles and associated launchers and fire control systems, any move to bring forces back to high alert status would incur lengthy delays in re-targeting. For Minuteman missiles, for instance, it would take 30 minutes to re-target 10 missiles, and 25 hours to re-target the entire force of 500 missiles. See Bruce G. Blair, *Global Zero Alert for Nuclear Forces*, Brookings, 1995, pp. 79–80.

would generally require the strategic postures to absorb an attack and suffer substantially greater losses than would occur if prompt launch remained in place. Reciprocal modifications of this sort, however, would preclude a full-scale coordinated first strike by either side. In the worst case of a covertly prepared large-scale Russian attack, a potent U.S. second-strike retaliatory force would still survive at sea, and depending upon the circumstances, substantial numbers of U.S. land-based missiles and bombers could also survive.

The procedural changes would prevent U.S. strategic forces from mounting a sudden coordinated and large-scale attack against vulnerable Russian forces in their normal peacetime configuration. Russian forces, especially land mobile rockets and submarines that surge out of garrison and port during a crisis warning period, would also be expected to constitute a bedrock of deterrence under virtually all plausible circumstances leading to nuclear conflict.

Criterion C: (degree of transparency/verifiability). *Low/Weak*.

Monitoring of the new wartime nuclear procedures and response timelines would be possible by monitoring nuclear exercises by communications intelligence gathering. The procedures could be covertly changed back to the earlier form, however, and go undetected for a prolonged period of time.

Criterion D: (foster nuclear-free world). *Positive*.

These procedural and targeting modifications would substantially alter the nuclear superpowers' postures and their underlying war-fighting strategies. This option would reduce their mutual reliance on nuclear weapons and demonstrate a genuine commitment to moving down the path toward zero weapons.

Criterion E: (impact on today's risk of accidental/unauthorized/ theft). *Positive*.

Removing prompt and large-scale launch from the repertoire of war options would extend warning and decision time well beyond the timeframe required to resolve false alarms in early warning systems, and would thus be a salutary move in reducing the risks of mistaken launch. The deprogramming of large-scale orchestrated attacks would also greatly reduce the amount of damage that an unauthorized or accidental launch could inflict, including terrorist-abetted launches.

De-alerting Option 2: Physical Modifications (Present-term) to Eliminate Prompt Large-Scale Launch

Overview of Illustrative U.S. Measures. The United States could immediately adopt measures that would align its nuclear alert posture with the Pentagon's 2002 Nuclear Posture Review, whose key provision pertinent to de-alerting is the determination that Russia does not pose today an immediate nuclear threat.

Land-based Missile Force. The key step for Minuteman missiles, whose wartime targeting is presumably concentrated almost entirely on Russia,[29] is that they be "safed" in their silos—a safety switch in each silo is flipped to isolate the missiles from remote launch control. This "safing" measure was taken to de-alert older Minuteman missiles in 1991 in accordance with the Bush-Gorbachev initiative. (The launch keys and authentication codes were also removed from the manned launch control centers that controlled the older missiles.) "Safing" involves actuating a safety switch in each missile silo to open the circuit used for first-stage missile motor ignition. When the circuit is open, any launch commands sent to the missile would fail to cause motor

29. U.S. nuclear planners avoid overflying Russia to strike China targets. Therefore, Minuteman forces would be expected to have primary wartime targets in Russia, while Trident submarines and strategic bombers would be expected to cover the China target set as well as Russia targets.

ignition. In 1991, maintenance crews went around from silo to silo and “safed” the older missiles (450 of them) almost overnight. A “safed” missile cannot be fired by ground or airborne launch crews unless and until maintenance teams return to the silo and deactivate the safety switch.

Trident Submarine Force. The key step for Trident submarines is to remain on “modified” alert throughout their sea patrol, during which time the electronic “inverters” remain off the missile tubes.[30] U.S. submarines in transit on modified alert have not reached their assigned launch stations and their weapons systems are technically unprepared for launch. When a submarine departs home port, the crew needs to perform numerous procedures to reach launch-ready (“hard”) alert, such as installing the “inverters” on the launch tubes that bring the missiles to a high state of launch readiness.[31] Also, U.S. submarines on modified alert only periodically listen for messages transmitted from shore. By contrast, boats on full alert release a long wire with a communications buoy at the end, which floats a few feet below the ocean’s surface, to listen continuously for emergency war orders that would be sent over very-low-frequency radio. Boats on full alert remain capable of firing within 15 minutes after receiving the order, while those on modified alert would need almost a day just to install the inverters.

As an alternative or supplementary measure, missiles onboard the submarine could leave port without their guidance sets installed, and those sets could be kept detached from the submarine for the duration of the patrol. This step would greatly increase the time needed to reconstitute the force.[32]

30. The guidance set of each missile could also be removed prior to patrol and kept off for the duration. See discussion below.

31. The inverters convert DC to AC to deliver a 2,800-volt charge to the pyrotechnics of the Westinghouse steam generator that when fired, propels the missile out of the tube under pressurized steam. These electrical boxes are always removed from the tubes and stored in a special compartment at the end of a patrol as a safeguard against accidental or unauthorized launch.

32. Normally a Trident boat carries 24 intact missiles with their guidance sets

Strategic Bomber Force. The bomber force would remain in its current unarmed disposition at several bases with warheads kept at local storage bunkers.

Overview of Illustrative Russian Measures[33]

Silo-Based Missiles. To de-alert these forces, Russian experts have proposed removing the gas generators that produce the explosive charges that blow the lids off the missile silos. Maintenance crews would open the silo lid, remove the generator, close the lid, and move the generator to a nearby storage location or main base. It is possible to remove the generator but store it inside the silo.

Road-Mobile Missiles. Russia operates mobile land-based missiles fitted on trucks called transporter-erector launchers. The United States has none. The road-mobile SS-25 and SS-27 missile force will eventually form the backbone of the Russian strategic arsenal. Devising measures to de-alert the road-mobile force is therefore an especially pertinent task. A menu of options for standing them down is available. It appears likely that re-alerting these forces would involve observable procedures and take substantial time—at least several

---

attached. It also carries a small number of spare guidance sets, each about half the size of an oil drum, to replace sets that malfunction during patrol. The maintenance crew onboard is well-trained in this replacement procedure, though it is seldom practiced due to the very high reliability of the sets. Under this blueprint, all 24 guidance sets would be detached at the time of departure from port, and would remain detached throughout a patrol. In an emergency that requires the re-alerting of this force, the onboard crew would take about 3 hours to install 1 guidance unit into 1 missile, or about 3 days per submarine to re-alert all 24 missiles, assuming the guidance systems were reloaded 1 at a time. Many additional hours would be required for electronic testing after installation.

33. This analysis draws heavily upon interviews conducted by the author with a dozen top Russian experts, and upon the best published sources of information about Russian nuclear force operations and de-alerting possibilities: Col. (ret.) Valery E. Yarynich, *Nuclear Command Control Cooperation*, Center for Defense Information, May 2003; Alexei Arbatov and Vladimir Dvorkin, *Beyond Nuclear Deterrence: Transforming the U.S.-Russian Equation*, Carnegie Endowment for International Peace, 2006.

hours to several days depending on the exact details of the de-alerting scheme adopted.[34]

Submarine Missiles. Russian submarines undoubtedly have critical components similar to the "inverters" used in U.S. boats, or other components that could be kept off the weapons systems during their sea patrols or pierside alerts in order to de-alert them. One of the key aims of this option would be to terminate the Russian practice of keeping one or more of its submarines on quick-launch alert while stationed on the surface in port. Special measures to de-alert these boats in particular could be taken. One of the leading deactivation techniques for submarines proposed by A. Arbatov and V. Dvorkin is to weld shut the hatches on submarine launch tubes. Any boat so configured obviously could not fire its payload without first restoring the combat readiness of the hatch.

34. One approach is to keep the missiles in their garages and to block their launch path. The one or two regiments of nine missiles that typically deploy out of garrison into the field would be confined to their garrisons in this scheme, and their garage shelters would be modified to prevent quick launch. Currently, the roofs of these shelters are designed to slide open, allowing the launcher inside to be erected and the missile fired. Metal beams or other obstacles built over the sliding roofs could either prevent the roofs from opening or obstruct the raising and launching of the missiles inside. To impede the rapid dispersal of mobile missiles from their garages, heavy obstacles could be placed at the garage exits. The removal of impediments would be time-consuming and require heavy equipment that provides a detectable signature. Another approach is to incapacitate the launcher itself in ways that would take a long time to reverse. Candidate methods for doing so include (1) emptying the hydraulic fluid from the erector mechanism of the launcher and storing the fluid in liquid-container trucks; (2) removing the large gas canister at the base of the missile and storing it in a local depot—the missile cannot be ejected from the launcher without the gas canister, thereby preventing liftoff; and (3) removing the struts and related mechanisms that erect and then support the missile after raising it to the vertical position.

Evaluation

Criterion A: (time to re-alert). *Hours for individual weapons; days to weeks for entire force*.

Reversing these de-alerting steps would take hours to days. For example, re-alerting Minuteman missiles would entail dispatching maintenance troops to the missile fields to reenter each individual silo to flip the "safing" switch back on, a process requiring many hours to complete. Re-alerting all 500 Minuteman III missiles at the three U.S. ICBM bases[35] on an emergency basis prior to enemy nuclear attack would take approximately 10 hours.[36] A group of 100 missiles could be re-alerted about 2.5 hours after the decision was made. The remainder would be re-alerted at a rate of about 100 every 2 hours. Reconstitution thus involves maintenance teams going from silo to silo. Full reconstitution of the U.S. silo-based force would take about one-half day.

For Trident submarines, the installation of "inverters" to re-alert

35. Malmstrom Air Force Base in Montana; Minot Air Force Base in North Dakota; and F.E. Warren Air Force Base in Wyoming.

36. This is best-case analysis. Maintenance teams dispatched to the silos would need about 1 hour travel time to reach the missile fields. Upon their arrival, a given team authenticates with the local launch control center over dedicated telephone links, receives the combination to open the entry hatch, waits 1 hour for the security plug on the hatch to open, descends into the silo, deactivates the safety switch, notifies the local launch center, and departs for the next silo. Since the silos in a given flight of ten missiles are located within a few miles of each other, the travel time between silos would be short. The time needed to re-alert the entire force in this manner would depend mainly on the availability of maintenance teams. We assume that 2 teams would be available for each flight of 10 missiles. There are 45 flights of Minuteman III ICBMs in the current arsenal. Based on an initial preparation and travel time of 1 hour, plus 1.5 hours at each silo, plus travel time between silos (.15 hours), the maintenance teams would return 100 ICBMs to full alert status in 2.5 hours. Additional ICBMs could be re-alerted at a rate of 100 every 2 hours. All 450 ICBMs (764 warheads) would be launch-ready about 10 hours after the decision to re-alert them. This process could be accelerated by several hours if advance penetration teams move from silo to silo to begin lowering the security plug prior to the arrival of maintenance teams.

all 24 missiles on a given Trident boat would take about 1 day. Maintenance teams normally need about 90 minutes to 2 hours per pair of launch tubes, and the pairs are processed sequentially. For a 24-tube Trident submarine ordered to re-alert during a crisis or reconstitute after an attack, the team would need 18 hours to 1 day to install all the inverters.

Russian forces appear to require somewhat more time to re-alert. For example, the reinstallation of gas generators for fixed silos takes about 1 hour once inside the silo with the device in hand. Counting travel time to a silo and several additional hours to raise its lid, the re-alerting time per missile would run in the neighborhood of 10 hours. Assuming the availability of 1 maintenance team for each regiment of missiles (6 to 10 missiles each), the silo-based force could be reconstituted fully within about 1 week.

It appears likely that re-alerting the Russian road-mobile rockets in garages or in the field would involve observable procedures and take substantial time—at least several hours to weeks depending on the exact details of the de-alerting scheme adopted.[37]

Russian submarines with launch tubes welded shut could be restored at a rate of about 2 hours per hatch, or about 1 day for each boat to reconstitute.

Criterion B: (impact on strategic stability). *Positive.*

This option is a modest but significant confidence-building measure that bolsters strategic stability by removing the capacity of either U.S.

37. One of the most time-consuming re-alerting procedures would be to reinstall struts on the truck erectors. This maintenance would almost certainly take place at the main maintenance facilities at each SS-25/SS-27 base. In our estimation, the depots could modify only 2 launchers (TELs) at a time, and would spend about 1 or 2 days working on each launcher. At this rate, the depots could re-alert 1 regiment (9 TELs) in 5 to 9 days. Using the conservative estimate of 5 days for re-alerting a regiment at each of the main mobile missile bases, a total of 10 regiments (90 missiles) would be returned to alert in 5 days, 20 regiments (180 missiles) in 10 days, 28 regiments (252 missiles) in 15 days, and 36 regiments (324 missiles) in 20 days.

or Russian strategic forces to initiate a bolt-from-the-blue surprise attack for as long as the de-alerting measures remain in place.

A U.S. de-alerting initiative along these lines would establish the nation's clear intention not to pose a first-strike threat to Russia while preserving ample capacity to satisfy reasonable requirements of deterrence. With almost 1,000 U.S. warheads remaining invulnerable at sea, each capable of destroying the heart of a large city, the United States would deter any potential nuclear aggressor with any hold on rationality. At the same time, the U.S. daily alert force would relinquish enough of its day-to-day counterforce threat to warrant a reciprocal relaxation of the Russian nuclear posture. This forfeiture would help persuade Russia to emulate the example by taking its missiles off hair-trigger alert. The net effect on force survival under static peacetime conditions would be positive overall given the constraint on the initiation of sudden attacks.

A breakout or re-alerting race during a crisis could confer significant attack advantages for the United States in particular, but considerably less advantage than it would enjoy under the *status quo ante* in which Russia's survivable forces would be counted in single digits or tens of warheads because of their low operational tempo. And if detected in a timely fashion, such U.S. reconstitution would give Russia enough time to disperse its submarines and land-mobile rockets into more survivable positions. The rates of reconstitution are roughly the same on each side, and could be calibrated to be more equivalent, which would work to bolster mutual deterrence and stabilize any crisis re-alerting dynamics that may ensue.

In the event of the preemptive use of nuclear weapons against the land-based missiles and bomber bases on either side, the rates of reconstitution would be slowed considerably due to radiation dangers. This degradation, as well as any degradation from preemptive strikes by conventional weapons, represents a much larger complication for Russian than for U.S. reconstitution, given Russia's greater dependence on land-based strategic forces and given the far greater capabilities of U.S. conventional weapons. However, the net assessment of re-alerting stability under this option is that it compares very favorably with the present-day postures in which the amount of latent instability is actually very large as shown mathematically in an earlier section.

Criterion C: (degree of transparency/verifiability). *Positive; builds mutual confidence over time.*

Monitoring and verification would certainly be possible. The considerable amount of time required to re-alert and the scale of reconstitution necessary to effect a significant shift in the strategic balance would increase the likelihood of timely detection. Periodic on-site inspections could confirm the status of "safing" switches, and special sensors for visual monitoring (like webcams) could be installed at the individual silos and linked to a monitoring agency. These video cameras could detect manned entry into silos and thus identify candidate sites for on-site inspection. However, the level of confidence that some electronic bypass does not exist would probably not be high.

To verify that inverters are not installed on U.S. submarines, special seals could be placed on the missile compartments where the inverters are normally attached. At minimum, the seals could be checked by Russian inspectors in port at the end of a typical 78-day patrol, proving that the boat never moved up this ladder of alert. The possibility that all U.S. Trident boats could re-alert fully within one day and escape detection in the process cannot be ruled out unless very frequent interrogation of the special seals were possible. Their reconstitution would take several days longer if guidance sets were kept off the missiles. Like inverters, the status of the guidance sets is not verifiable without special provisions, such as the use of seals on the missiles that could periodically report their status through burst satellite communications or buoys. Alternatively, as a confidence-building measure the U.S. could permit Russian inspectors to examine the guidance seals along with the inverter seals at the end of a 2-plus month patrol to reassure them that the submarine never went on full alert.

A thorough set of inspection procedures to verify Russian compliance with its de-alerting measures has been outlined by A. Arbatov and V. Dvorkin.[38] Restoration work on submarine hatches, for instance, would likely be visible to satellite observation and to on-site inspection. Other analyses by U.S. agencies suggest reliable methods of monitoring the obstruction of Russian garaged missile launches and the incapacitation of road-mobile missile launchers.[39]

Criterion D: (fostering a nuclear-free world). *Positive.*

This plan would mark a notable step on the path to nuclear latency and reduce the salience of nuclear weapons in ways that promote their ultimate elimination. It would still sanction arsenals whose size exceeds the threshold number estimated to cause mass social destruction and it would not repudiate traditional war-fighting strategy. However, it would contest the standard assumption that deterrence depends upon the capacity for instant retaliation and would thus represent a significant challenge to the primacy of traditional nuclear planning. On bal-

38. Arbatov and Dvorkin, *Beyond Nuclear Deterrence*, op.cit., esp. pp. 114–126.

39. Regarding the former measure—obstructing the launch path of missiles in garages—a JCS review of this option as presented by Nunn and Blair notes that "the metal beams could be verified through imagery. Emplacement of the beams would be monitored to ensure no explosive bolts were embedded to allow rapid removal. U.S. forces could even construct the beams." The latter measure—removing the support mechanisms—has been analyzed by Sandia National Laboratories. Sandia suggests substituting a "tamper-proof" surrogate for the original mechanism in order to ensure the timely detection of activities to restore the latter. ["This surrogate would be properly instrumented and configured to broadcast a message to a satellite if an attempt were made to remove it. Receipt of this message would in turn cue a challenge, on-site inspection team to take a closer look at the suspect TEL. In addition to these "Case-Tamper-Event" (CTE) messages, periodic "State-of-Health" (SOH) messages would also be transmitted indicating that all is well. Of course, each broadcast would require a unique or message-dependent password be appended to the end of each message to guarantee authenticity. The technology to rapidly implement such a device exists today in prototype form."]

ance it would convey an impression of growing commitment to nuclear disarmament and strengthen the non-proliferation diplomacy of both states.

Criterion E (impact on today's risk of accidental/unauthorized/theft). *Very positive.*

The de-alerting steps taken in this realignment would physically eliminate the hair-trigger and remove sudden first-strike and launch on warning from the repertoire of response options available to nuclear decisionmakers. This option would also effectively prevent unauthorized actors, including terrorists, from exploiting hair-trigger postures to cause a nuclear incident or actual firing. For these reasons the implementation of this option on both sides would represent a major accomplishment.

De-alerting Option 3: Physical Modifications (Near-term 1–3 years)

Responsive Warhead Force with On-site De-mating

In this option, the United States and Russia would relinquish all operationally deployed forces and rely instead on an off-alert reserve force. The de-alerting steps undertaken would be in unison with functionally equivalent Russian steps. A key feature of this suggested method of de-alerting is that it would preserve the survivability of the strategic forces by widely dispersing the responsive reserve force into protected positions.

For the United States, the transition to "zero alert" under this option would entail separating nuclear warheads from their delivery vehicles. The key step for the *Minuteman land-based missile force* (450 currently planned for silo deployment) is to keep the separated warheads nearby and protected from attack. *The novel twist in this recommendation is that the warheads would be stored individually in 225 otherwise empty silos, adjacent to 225 silos housing the unarmed*

Minuteman missiles. This highly dispersed and protected force could survive any plausible breakout attack by opposing forces that may covertly re-alert and fire at the Minuteman sites.

The key de-alerting step for the *Trident submarine fleet* consisting in this option of 14 boats, of which 2 are normally in overhaul, 9 are normally at sea, and 3 are normally undergoing short- to extended-maintenance of days to weeks before they could surge to sea, is also to separate the warheads from the missiles. *Rather than store the warheads on land, a possible way to reduce vulnerability problems is to store individual warheads on the boats in 11 otherwise empty tubes on each boat,* adjacent to 11 tubes housing the unarmed Trident missiles.

If force reductions down to a level of, say, 500 reserve warheads were negotiated with Russia, then 20 B-2 and B-52 heavy *strategic bombers could be deployed under this option.* The 143 warheads for these bombers would continue to reside in local base storage, i.e., bunkers at the primary bomber base. In this case, it would take 12 hours to upload the first group of bombers and 30 hours to upload the entire bomber force. Alternatively, the warheads could be stored at a different base and flown to the primary base in an emergency. This arrangement would increase the time to reconstitute the bomber force by an additional day.

The total U.S. strategic force would thus consist of 225 Minuteman warheads, 132 Trident warheads, and 143 bomber warheads (in local base storage for one wing of strategic bombers) for a grand total of 500 warheads on 357 strategic missile delivery vehicles and 20 bombers.

For Russia, it should be possible to adopt a similar de-mating approach to its silo-based force of about 229 missiles. A portion of the silos would house missiles and a portion would store the warheads in containers. In the Russian case, the missiles would have to be equipped with special devices that substitute electronically for the warheads in order to properly maintain the missile's internal environment.

A variety of measures that de-alert Russia's road-mobile launchers could be effective. Missiles could be removed from the launchers and put in base storage. Alternatively, warheads (or perhaps flight batteries) could be removed from the missiles and put in local storage.

Russian submarine crews do not have access to the onboard missiles in their tubes, and thus at-sea re-mating procedures of the sort described for U.S. submarines would not be possible. The feasible alternative would be for Russian submarines to download their warheads to nearby port storage, as described in the section below on Option 4.

Evaluation

Criterion A: (time to re-alert). *Days to many weeks.*

These measures would substantially delay launch preparations. To illustrate, in an emergency, re-alerting this Minuteman force would entail dispatching warhead transport vans to retrieve the warheads in silos and transport them to the individual missile silos for installation. This reconstitution would under plausible assumptions take about 1 full day to re-alert 18 missiles at each of the 3 Minuteman bases, and 2 full weeks to bring the entire Minuteman force back to launch-ready status.[40] For Trident submarines, it would take about one-half day to

40. Re-mating warheads to Minuteman missiles under crisis conditions could be accomplished at a rate of approximately 18 per day. This schedule assumes that each of the 3 Minuteman bases have 6 special warhead vans and corresponding maintenance support. A Minuteman base normally has 3 warhead vans but the consolidation of bases, equipment, and support teams increases the number to 6. Each van and team would each day retrieve a single warhead from a storage silo (or other storage site) and install it on a Minuteman missile in a different silo. A team drives to a storage silo; raises the silo lid using a hydraulic instrument (the size of a big snow blower); positions the van over the silo opening; retrieves a warhead using a winch/pulley; places it in the van; drives to a nearby silo housing a Minuteman missile; repeats the procedure for opening the lid; pulls up the nosecone using a winch; puts the nosecone

fully reload the 11 missiles on a given boat after it had surfaced and stabilized in calm waters.[41] Many additional hours would be required for electronic testing of the weapons system.

Russian experts estimate that re-alerting a silo-based missile would take at least 20 hours. Several hours are required for each of several tasks including opening the silo lid, removing the special devices, and installing the reentry vehicle containing the warhead. For road-mobile missiles, the normal reconstitution time would be lengthy—upwards of 30 hours for a single missile although the re-mating of the warhead to the missile itself can be accomplished within 5 hours. For Russian submarines, returning warheads to missiles onboard would take about 3 hours per warhead, which means that upwards of 2 days would be needed to fully re-arm a Russian submarine.

Criterion B: (impact on strategic stability). *Very Positive.*

This arrangement allows for extensive dispersion, position location uncertainty, and hardness of the force—thus avoiding common-mode failure and buying a large margin of survivability under worst-case conditions of breakout and attack by opposing forces. Some vulnerabilities would be present, particularly on the Russian side, where

---

aside; lowers the warhead onto the platform; restores the nosecone; closes the silo lid; and special maintenance teams conduct electronic tests. At this rate, which probably could not be sustained over a long period without resting the teams, the entire force of 225 Minuteman missiles could be re-alerted within a few weeks. This procedure would clearly be transparent to Russian surveillance.

41. The 12th pair of tubes on each boat would hold a 5-ton capable crane in one and other equipment in the other, which could be elevated after surfacing to transfer warheads one at a time between the adjacent hatches to the waiting missile if emergency circumstances would require the re-mating of weapons. This re-mating would have to take place in fairly calm waters, and depending upon engineering details might involve the submarine leaning for stability on another ship, pier, oil rig, or other stable fixture for maximum safety. The option to surface and re-mate the warheads (which only weigh about 500 pounds in their reentry vehicles) without outside stabilization does appear to be quite feasible, however.

various bottlenecks at maintenance depots and ports would exist. One Russian expert has determined that for road-mobile forces the warheads (but not missiles) could be placed on trucks before or during re-alerting, and then reinstalled after a rendezvous with the missiles in the field.[42] This approach, among others, could mitigate the vulnerability of warheads and service bottlenecks while preserving leeway for verification.

In general, reconstitution would involve elaborate and time-consuming operations on both sides, and force generation would proceed at roughly the same pace on both sides. In my estimation, sufficient weapons would survive even under worst-case conditions—i.e., a large differential in the technical pace of re-alerting favoring one side over the other, and a failure to detect covert re-alerting for a long time—that stability could be sustained even during an irrational re-alerting race. *A case can be made that today's nuclear postures are substantially more unstable in these terms than this posture.*

The end result would be a resilient reserve force on each side that removes any incentives for rushing to re-alert forces during a U.S.-Russian crisis, the likelihood of which is remote in any case. The amount of dynamic stability would be high.

Criterion C: (degree of transparency/verifiability). *Very high for large-scale breakout. Very high for small-scale breakout if intrusive, cooperative monitoring is arranged.*

This transition to "zero alert" would demand and benefit from a degree of cooperation, and transparency comparable to that required for the START I warhead inspections, in which each country is allowed to carry out a considerable number of short-notice inspections of randomly selected missiles in order to verify the number of warheads affixed to them. It is essential for the monitoring and verification of warheads and launchers in this de-alerting option that the START I

42. V. Dvorkin personal communications with author, 1998.

verification provisions in the expiring treaty be renewed by the parties. Preserving this transparency would contribute to the aim of ensuring that no party could gain a decisive preemptive advantage by breaking out of a zero-alert commitment.

Verification would involve on-site inspections, use of electronic seals that could be remotely electronically interrogated, and national technical means of verification. Since re-alerting tens of warheads would take at least tens of hours, and re-alerting the entire arsenals would take many weeks to months for each side to complete, even small-scale re-alerting would be relatively easy to detect in a timely manner, providing all parties with time to respond. As emphasized earlier, however, this posture is designed to ensure successful reconstitution even if an egregious failure of verification occurred and warning of a breakout was not provided.

Since monitoring and verification procedures would address warheads as well as their launchers, *this option would advance the cause of building an auditable database that in turn would facilitate progressive disarmament* (Criterion D).

Criterion D: (foster a nuclear-free world). *Very Positive.*

This down-scaled posture featuring de-mated warheads would transform the traditional war-fighting nuclear strategies. *The overall affect is to deeply downgrade the salience of nuclear weapons in national security, and to move further down the road toward total elimination.*

Criterion E: (impact on today's risk of accidental/unauthorized/ theft). *Very Positive.*

Removing all warheads (or, alternatively, separating other critical components from missiles) from all missiles would end the hazardous rapid-reaction postures of the strategic forces under normal circumstances. With de-mating, no strategic weapon could be fired quickly, and re-alerting would be fairly slow as a general rule. Since it would take at least a day to put any significant number of forces back on launch-ready alert, unauthorized actors—including terrorists—would be deprived of any opportunity to induce a launch, false alarms of any consequence, or other untoward events. Authorized actors would function within a command system that precludes mistaken launch on warning. *For these reasons, this option earns very high marks along this critical dimension of security and safety.*

De-alerting Option 4: Physical Modifications (Medium-term 4–6+ years)

Responsive Warhead Force in Warhead Storage Depots

Overview of Illustrative U.S. and Russian Measures. This posture consigns warheads to warhead storage facilities on their respective territories. This entails a large expansion of secure storage space that Russia and the United States evidently lack at the present time. Warheads in depots also require a controlled environment and, in the case of Russian missiles, special electronic monitoring equipment must be substituted for warheads in order to maintain the missiles within proper environmental (e.g., temperature, humidity) tolerances.

Land-Based Rocket Weapons De-mating. The normal destination for U.S. warheads taken off land-based missiles and placed in long-term storage is a large facility near Albuquerque, New Mexico. From that point of origin, the time needed to re-mate warheads to Minuteman missiles located in the plains states would be an average of one day per missile. Additional storage bunkers at the three main missile bases could be constructed, however, to provide some protective dispersion and to locate the warhead stocks closer to missiles in their silos. However, this configuration still concentrates hundreds of warheads in a small number of storage depots, creating a potential acute vulnerability to attack not only by Russian forces but also by other nations with large or small nuclear arsenals. An adversary might be tempted to attack them (along with warheads for bombers and submarines at other storage sites) preemptively.

Comparable arrangements would be established for de-mating Russian warheads and storing them in monitored storage depots (large central facilities or local weapons storage depots at missile division headquarters).

Russian experts argue that their country does not have adequate facilities to store such a large number of warheads taken from missiles and maintain them in good condition. They are therefore now considering other options, such as removing the battery that operates the missile-guidance system during flight.[43]

Download Submarine Warheads to Storage Depots. Both countries could remove all of their warheads, or all their warheads and missiles, from their submarines and place the warheads in storage. For Russia, this would involve removing warheads from its launch-ready boats surfaced in port on pierside alert as well as from its submarines deployed at sea. (The United States, by contrast, does not maintain submarines on alert in port and cannot launch its missiles from a surfaced Trident boat.)

Relocate Bomber Warheads. Strategic bombers could be further de-alerted by transferring their weapons to off-base locations. The arsenals could be distributed to depots at former bomber bases, achieving greater dispersion of warheads and improving their survivability. This adjustment is especially recommended for the B-2 bomber force

43. Russian experts have proposed that they remove the in-flight guidance batteries located under the nosecone and warheads of the top stage of their missiles. Reinstalling the batteries would require the use of a large crane to open the silo lids and would take as long to reverse as reinstalling warheads, according to these experts. Russian experts claim that the reinstallation of a battery into a missile would actually take longer to complete than the reinstallation of a warhead. As a result, no more than a few missiles per day per base could be re-alerted in either case, and the extensive re-alerting procedures would be readily observed from space. In addition, a battery's absence could be confirmed by inspectors conducting START I spot checks of warheads because it sits just below the warheads. Once confirmed, spot checks would not be necessary for lengthy periods because silo-based missiles normally require minimal maintenance; the lid of a particular silo may not be raised for up to three years.

and its warheads because of its potential for penetrating Russian territory undetected and delivering B-61 earth-penetrating bombs, which are designed to destroy underground command posts. Russian bombers should also conform to the same principle of removing their weapons to off-base locations.

Evaluation

Criterion A: (time to re-alert). *Days for small numbers; weeks to many months for arsenals of hundreds.*

For the U.S., re-mating warheads to Minuteman missiles under crisis conditions could be accomplished at a rate that is considerably slower than the rate for re-mating warheads stored in silos as described above under Option 3. The long distances between the main base depots and the far-flung silos would increase the reconstitution time by several times: about six warheads per day, or two to three months to restore a notional arsenal of 500 warheads to their missiles.

Regarding U.S. submarines, the return of U.S. payloads would happen slowly and lend itself to observation. Trident missiles could be installed in tubes at a rate of two missiles every three hours (one installation per port).[44] The installation of warheads onto the missiles could be accomplished at a rate of about two warheads per hour (one warhead per hour per port).

Regarding U.S. bombers, during a crisis the weapons could be transported back to the three primary bomber bases or the bombers could fly to the depots. In either case the initial re-alerting of U.S. bombers to launch-ready status would require at least several extra hours compared with the current arrangements. Thus the first several American bombers, each with 16 or 20 warheads, would achieve full alert perhaps 16–24 hours or so after the decision to re-alert was made.

Comparable reconstitution time lines apply to Russia. Due to the

44. Currently this procedure uses special cranes and nuclear-certified crane operators at the home ports at Kings Bay, Georgia, and Bangor, Washington.

small number of warhead-transportation vans, cranes for opening and closing silo lids, and crews to operate this equipment, reversing this step would be time-consuming and readily observable by satellite surveillance. Russia could take as long as one day per missile per base to reload its warheads, and as long as two to three months to reconstitute its entire silo-based force. At a breakneck pace in emergency conditions of reconstitution, this rate of re-alerting might be doubled or tripled.

Regarding Russian boats, due to the extensive procedures and heavy equipment needed to reinstall submarine warheads (and probably needed to reinstall batteries too), reversing this step would be slow and transparent. It would take approximately two to three days per boat per port for Russia to re-alert its fleet.[45]

Criterion B: (impact on strategic stability). *Very Negative to Positive: Tipping Point Danger.*

Due to the relative concentration of warheads, missiles, and submarines under this option, and the laborious and time-consuming process involved in reconstitution, the strategic deterrent postures could be severely degraded, and perhaps neutralized, by a relatively small-scale nuclear or even conventional attack.

This vulnerability would be most acute for submarine forces. The warhead and missile stockpiles in storage would be concentrated at a small number of depots and would be uploaded at a small number of ports. The off-alert submarines themselves would be exposed at these ports, as would the extensive support infrastructure that would be used to re-arm any of the boats. Boats would enter a queue for re-arming and those at the front of the line would sit on the surface for many days. The installation of the missiles and the mating of warheads

45. Re-mating warheads and/or missiles would be performed at two or three ports, two in the Northern Fleet—Nerpichya and Yagelnaya on the Kola Peninsula—and one in the Pacific Fleet at Rybachi, just south of Petropavlovsk on the Kamchatka Peninsula.

would require the use of cranes and could be accomplished only on calm seas. The entire delicate sequence of submarine re-alerting would be overt and readily detectable. The armada in either its static or re-generating disposition would be extremely vulnerable to attack by a very small nuclear force.

In principle, any forces covertly reconstituted to stage such a sneak strike would have difficulty circumventing the severe restrictions placed on their own readiness and operation without being detected. Strict monitoring and verification would have been essential and surely applied to these postures, and the wholesale reconstitution of forces would doubtless be readily detectable at an early stage.

But the stealthy re-alerting of a small number of strategic forces could be far more likely to escape detection, and even a small-scale breakout could be significant. It potentially could pose an extreme threat—a single weapon could destroy an entire depot consisting of hundreds of stored warheads. *Thus the initial breakout phase could be very volatile and probably more dangerous than any subsequent re-alerting race during a crisis.* A lopsided advantage might be seized by stealth and duplicity if the opening gambit goes unnoticed or unanswered during the initial stage, whereas a re-alerting race could quickly disperse enough weapons to stabilize the reconstitution process.

The role of conventional forces could be important and double-edged. On one hand they could be used as part of an opening gambit to degrade the opponent's ability to reconstitute. On the other hand they could be used to respond quickly to an opponent's breakout to prevent the latter from gaining the upper hand in a re-alerting contest. On both scores, U.S. conventional forces have far superior capabilities over Russian forces and thus represent an aggravating factor in re-alerting dynamics from a Russian perspective, and a mitigating factor from a U.S. perspective. Deep de-alerting with all warheads placed in storage depots may call for negotiated constraints on the use conventional weapons for offensive missions.

A gradual transition from Option 3 to Option 4 is recommended due to these questions about the stability of deterrence and the consequences of breakout. It seems imprudent to make the transition to depot storage too rapidly and completely. *A small force of de-mated reserve weapons deployed in silos and submarine tubes would provide an insurance policy during the transition to land-based storage until the breakout problem can be solved.*

In a similar vein, storage depots on land can and should be designed to withstand at least a small-scale nuclear breakout and attack in order to protect a minimum deterrent capability. On the U.S. side, for example, the 50 empty MX Peacekeeper silos and the 50 Minuteman silos slated for mothballing (along with additional mothballed silos over time) could be utilized for this purpose—they could well protect a stockpile of reserve warheads for submarines and bombers as well as land-based missiles.[46]

Lastly, the need for involving at least all of the P-5 nuclear states in this option is also clear. All of them have sufficient numbers of weapons in their arsenals to be significant under these buttoned-down arrangements for the U.S. and Russia.

Summary Recommendation: Before any transition to Option 4 is completed, a number of preconditions should be satisfied. First, monitoring and verification must be able to perform at a very high level with exact accounting of warheads in storage down to the single weapons unit. Second, all of the P-5 states and perhaps other nuclear states

46. It is even possible to relocate the operational reserve plutonium pits now stored or slated for storage at the Texas Pantex complex into the spare storage space in the headworks of the 225 Minuteman silos earmarked in Option 3 to store the reserve warheads (and/or the 100 empty MX and Minuteman silos to be mothballed). By my estimation, we can easily store the reserve pits (about 6,000 of them in drums) in 40 silo headworks. Furthermore, we could store the 34 tons of excess plutonium slated for eventual elimination in 50 silos, and if we want to store the pits from the ~5,000 warheads to be dismantled over the next 10 years, we can put them into 33 silos. In other words, U.S. missile silos could easily accommodate all of the current and planned inventory of pits from retired nuclear weapons in the U.S. inventory—upward of 20,000 pits in total. Author's estimates.

need to be involved in this option. All of them have sufficient arsenals to pose potentially severe threats under these buttoned-down arrangements for the U.S. and Russia. This de-alerting regime should thus be comprehensively multilateral with stringent monitoring and verification provisions to enforce it. Third, since even a single nuclear weapon is significant in this de-alerting scheme, protocols for re-alerting nuclear forces would have to be devised to provide adequate reassurance and stability if one nation decides that it must take this step to protect its national security. Fourth, similar protocols and constraints may need to be devised for conventional forces. A party that covertly begins to reconstitute its nuclear forces could use conventional forces to degrade the opponent's ability to respond in kind. On this score the United States would possess vastly superior capabilities and therefore conventional offensive missions may need to be regulated and constrained in order to allay Russian concerns. Fifth and last, storage depots on land can and should be designed to withstand at least a small-scale nuclear breakout and attack.

Criterion C: (degree of transparency/verifiability). *High, but adequate only under certain conditions. Adequate verification demands extremely high transparency achievable only through close cooperation on a multilateral basis.*

Monitoring and verification must be able to achieve very high levels of performance, for reasons made clear in the previous discussion. *The accounting of weapons would need to be exact, providing a reliable determination of the number of deployable weapons in storage down to the single weapons unit.*

The implication is that surveillance of both the warheads and delivery vehicles will require full declarations of warhead stocks and locations, and associated delivery vehicles, by all P-5 nations, and development of a sophisticated regime of international identification and continuous monitoring for accurate accounting. This will entail an extensive set of monitoring tools and unprecedented cooperation for intrusive inspections of both warhead depots and launchers belonging to the United States, Russia, China, France, and the United Kingdom. One upside to this otherwise daunting proposition is that the delivery vehicles are key to any breakout and reconstitution, and they do lend themselves fairly readily to continuous monitoring, especially if the historical START inspection regime for strategic forces can be extended through negotiation. The United States and Russia also have numerous other surveillance means to detect a large-scale reconstitution effort that would be extremely difficult to conduct stealthily for very long, given the elaborate and extensive operations that would need to be executed. It is only the stealthy leading edge of this process that is worrisome because of the extreme threat it could present.

The overall assessment of prospects for adequate verification for this option of placing all weapons in storage depots is that it faces serious obstacles but that they can be surmounted if the necessary political will can be mustered. This challenge must be squarely confronted sooner rather than later if the groundwork is to be laid for serious progress toward the complete elimination of nuclear weapons.

Criterion D: (foster a nuclear-free world). *Extremely Positive.*

Getting all U.S. and Russian, not to mention the other P-5 nations', nuclear weapons into storage sites, putting them and their potential delivery systems under continuous surveillance for purposes of monitoring and verification, and providing access to all pertinent areas of the nuclear weapons complexes to insure against breakout, would constitute a giant stride down the path toward complete elimination. Under this plan, strategic planners would also tend to phase nuclear weapons in storage out of contingency war plans and basically discount their utility to such a degree that their phaseout would become self-reinforcing. Dismantlement of the stockpiles would move inexorably forward, marking more strides toward a nuclear-free world.

Criterion E: (impact on today's risk of accidental/unauthorized/theft). *Extremely Positive.*

The transition to de-mated weapons consigned completely to storage depots would vastly simplify and reduce the nuclear dangers and risks associated with the current nuclear postures. The declining utility attached to the stored reserve weapons and the ensuing atrophy of war-fighting postures would also stanch the flow of weapons in the maintenance pipeline. The decline in the tempo and scale of weapons "circulation" would raise the barriers against terrorist theft or capture during weapons transportation. In general, this option receives the highest marks possible along this criterion.

Implications and Concluding Thoughts

The de-alerting options described in this paper represent alternative approaches to achieving the same goal of lengthening the fuse on strategic nuclear forces, which is currently timed to fire them within minutes and seconds. Taken as a sequence of de-alerting steps, these options chart a course for lengthening the fuse by progressively longer periods of time. The reconstitution time of a coherent force would be initially extended by hours and days (Options 1, 2), then by days and weeks (Option 3), and finally by weeks and months (Option 4).

Getting U.S. and Russian strategic weapons into warhead storage depots under strict surveillance (Option 4) would be a milestone of great significance. Not only would "locking down" the arsenals allow for the maximum degree of security and safeguards to be imposed, but it would also so demote the military role and utility of nuclear weapons that the process of force deactivation would only accelerate. This path of de-alerting thus appears to offer the single most promising route to rapidly reducing a host of immediate and growing nuclear dangers and to moving the world closer to its ultimate destination of zero nuclear weapons.

The path of zero nuclear alert culminating in "locked down" storage under Option 4 needs to be cleared of a multitude of thorny preconditions. A zero-alert regimen at this fourth stage could be exploited by even small launch-capable arsenals and thus needs to be adopted multilaterally by the major nuclear weapons powers, and instituted with unprecedented transparency and rigorous verification, demanding an abnormal amount of multinational cooperation. Conventional forces which can severely interfere with a nation's ability to reconstitute nuclear force for legitimate reasons will need to be addressed, and probably regulated in order to reassure the weaker parties. Ballistic missile defenses likewise will need to be considered and possibly regulated for the same reason.[47] Zero alert will require the command and warning systems to be redesigned to allow for riding out an attack instead of merely for launching on warning, and therefore the systems will need to be afforded far better protection than they currently receive. To relieve pressures on national decisionmakers to make quick execution decisions, they must have confidence in the continuity of command-control while under attack.[48]

Perhaps the thorniest of the preconditions concerns the core determinants of the U.S. and Russian nuclear postures. De-alerting implicitly contests the axioms of nuclear strategy that have shaped the operational character of the deterrent forces for nearly 50 years. Implementing any of the four options presented in this report will hinge

47. As a former senior general put it in commenting upon our de-alerting article (Nunn and Blair, "From Nuclear Deterrence to Mutual Safety," op. cit.): "The impact of one side having an asymmetric advantage in missile defenses could become significant at reduced alert rates." VCJCS Talking Paper, July 8, 1997, p. 8.

48. This is one of the dominant concerns of the U.S. military about de-alerting. As a former senior general said about our de-alerting article (Nunn and Blair, "From Nuclear Deterrence to Mutual Safety," op.cit.): "De-alerting forces does not necessarily eliminate the need to make quick execution decisions . . . De-alerting extends launch time, but does not reduce need to "launch on warning" since the C3 for launch execution become much less reliable after absorbing a first strike, i.e., there would still be strong pressures to get an execution order out before impact and degradation of the C3I system (which may include "incapacitation" of the key decisionmakers authorized to execute nuclear weapons)." VCJCS Talking Paper, July 8, 1997, p. 7.

on reconceptualizing deterrence and transforming the traditional war-fighting strategies. De-alerting presents more than a mere technical challenge of devising verifiable ways to reduce reliance on prompt-launch capabilities. It so challenges traditional deterrent concepts and operational practices that it must be grounded upon a visionary and enlightened conception of national and international security.

The core premise of that new conception is that the Cold War between the United States and Russia is finished and done, and that non-proliferation, the prevention of nuclear terrorism, and safeguards against accidental and unauthorized use of nuclear weapons now lie at the core of their national security interests, and head the list of urgent nuclear priorities. The leaders of the United States and Russia have but to assert in their nuclear guidance that U.S.-Russian mutual nuclear deterrence no longer demands launch-ready forces servicing war-fighting objectives and the cosmic risks that hair-trigger forces carry are no longer justifiable in the name of deterrence.

Such guidance would overturn the longstanding view that deterrence demands real-time coverage of a comprehensive and long list of military, economic, and leadership targets in Russia and China, a readiness to rapidly generate the full U.S. strategic arsenal to maximum alert during a crisis, and a predisposition to launch on warning of an enemy attack in progress. De-alerting, as well as reductions of weapons below a certain floor measured in units of thousands, would violate the traditional tenets of strategic planning.[49] Five hundred weapons at the upper limit of available forces, as an earlier notional strategic force was constituted under de-alerting Options 3 and 4, would clearly fall short of meeting the conservative standard of deterrence vis-à-vis Russia.

One variant of this conservative judgment was expressed by a

49. One longstanding conservative estimate holds that deterrence requires levels of damage involving 40 percent of populations and 75 percent of industrial floor space and would require attacks on 1,000 to 2,000 targets. Key military targets including nuclear forces lengthen the target list by another 1,000.

senior general in conversations with this author and Sam Nunn during his review of our joint article on de-alerting.[50] He said that "Finally, as we remove counterforce weapons from alert . . . virtually eliminat[ing] war-fighting capability in a day-to-day scenario . . . we must philosophically address the desirability of returning to a strategy of mutual assured destruction, since deterrence will then rest on the capability to destroy the 'soft' targets an enemy would value."[51] The general's point is well taken and deserves to be debated and resolved by national leaders. One pertinent datum based on computer modeling is that only a few tens to low hundreds of warheads could wreak havoc on such a scale as to meet a common-sense standard of deterrence based on mass destruction.[52] That a survivable and reconstitutable arsenal of 500 U.S. weapons, or even a relatively small portion of it, would project a threat of retaliation sufficient to deter an actor with any hold on rationality seems difficult to refute. That is also the judgment of S. Drell and J. Goodby, who argue that 200–300 would suffice.[53] Regardless of the actual targeting assignments given to these forces—counterforce or countervalue—the deterrent effect of their raw numbers would be sufficient to claim that stable mutual deterrence can be established at this level if the de-alerted forces are survivable in peacetime and during reconstitution.

50. Nunn and Blair, "From Nuclear Deterrence to Mutual Safety," op. cit.

51. VCJCS Talking Paper, July 8, 1997, pp. 7–8.

52. Recent modeling work shows that damage worthy of the term "mass destruction" can be accomplished with targets in the tens or low hundreds. Scientifically rigorous simulations of nuclear attacks find that 51 weapons (475 kiloton each) could kill 25 percent of the Russian population (~38 million people); and 124 such weapons could kill 25 percent of the U.S. population. The model indicates that a total of only 500 such weapons would inflict this level of damage (25 percent population fatalities) on the U.S., all other NATO member countries, Russia, and China. Matthew G. McKinzie, Thomas B. Cochran, Robert S. Norris, and William M. Arkin. *The U.S. Nuclear War Plan: A Time for Change*, Natural Resources Defense Council, June 2001, p. 126, Table 5.7 (www.nrdc.org/nuclear/warplan/warplan_ch5.pdf).

53. Sidney D. Drell and James E. Goodby, *What Are Nuclear Weapons For? Recommendations for Restructuring U.S. Strategic Nuclear Forces* (Washington, D.C.: Arms Control Association, April 2005).

As long as this debate remains unsettled and the default position is the traditional one, the path to standing down the Cold War postures will be obstructed. The default position, moreover, will create further barriers to de-alerting as it confronts China's nuclear modernization and general economic rise. The growing emphasis on China in U.S. threat perceptions, deterrence thinking, and actual nuclear planning since it was reinstated in the U.S. strategic war plan in 1998 is a trend that needs to be arrested, lest China become the next "designated enemy" for U.S. military planners and the rationale for maintaining a large U.S. nuclear arsenal on high alert.[54] The 2002 Nuclear Posture Review designated China as an "immediate nuclear contingency" and that designation appears to have led to steadily increasing U.S. nuclear operations aimed at a growing list of Chinese targets. This growing pressure on China may well induce it to adopt the traditional countermeasures that decrease warning and decision time and thus heighten the risk of inadvertent or unauthorized launch against the United States. Shortening the Chinese fuse and adding a third nation to the launch-ready alert club would scarcely represent progress in the quest for mutual nuclear safety.

The lesson suggested by the China complication is that a vision of nuclear de-alerting and force reduction ought to cast a wide net that brings all of the nuclear weapons states into the discussion, negotiation, regulation, and elimination. After all, that is the only path to a nuclear-free world.

54. China thus reappeared in the plan after a hiatus of nearly two decades, having been removed in the early 1980s by President Reagan following normalization of U.S.-China relations. Limited attack options for China were created by Strategic Command in January 1998 in response to President Clinton's nuclear guidance issued in November 1997 (NSDD-60). See Elaine Grossman, "Nuclear Weapons Expert Says U.S. Warfighting Plan Now Targets China," *Inside the Pentagon*, January 14, 1998; Bruce Blair, "Trapped in the Nuclear Math," op. cit.