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GLOBAL ZERO COMMISSION ON NUCLEAR RISK REDUCTION

April 2015

*De-Alerting and Stabilizing the World's
Nuclear Force Postures*

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April 2015

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I. EXECUTIVE SUMMARY

An arc of potential nuclear instability stretches around the globe. From Central Europe through South Asia to Northeast Asia and into the seas surrounding China, the nuclear weapons countries, or their close allies, are involved in geopolitical, territorial and other disputes that have the potential to erupt and escalate. Under the right conditions, any of the hotspots along this arc could expand by design or inadvertence into a nuclear crisis.

This report identifies ways to control crisis escalation and reduce the myriad risks of the deliberate or unintentional use of nuclear weapons. It is both diagnostic in that it examines the risk of nuclear weapons use, as well as prescriptive in offering some remedies. It discerns an overall pattern in which risks are generally trending in the wrong direction in today's security environment of proliferation, nuclear build-ups in Asia, spreading extremism, burgeoning cyber warfare, exploitable nuclear command and control networks, vulnerable and insecure nuclear weapons storage sites and delivery platforms (particularly silo-based strategic missiles), and de-stabilizing global military competition featuring rapid innovation in weapons technology and modalities of warfare. In the current environment, much needs to be done to reduce nuclear risks. The slope from a crisis to nuclear brinkmanship to escalation to the use of nuclear weapons with cascading global implications is a much too steep and slippery one.

This latent instability is tremendously aggravated by the simple fact that the amount of time for decision-making at any point along this spectrum may be far too short. In general, warning and decision timelines are getting shorter, and consequently the potential for fateful human error in nuclear control systems is growing larger.

The short fuses on U.S. and Russian strategic forces compound the risks. One-half of their strategic arsenals are continuously maintained on high alert. Hundreds of missiles carrying nearly 1,800 warheads are ready to fly at a moment's notice. These legacy postures of the Cold War are anachronisms but they remain fully operational.

Throughout the nuclear age the development, deployment and operation of nuclear weapons purportedly adopted a set of "best practices" – policy prescriptions designed to strengthen strategic stability, and a set of standards designed to minimize the risks of their accidental, unauthorized, and inadvertent use, or theft.

Foremost among the policy aims was survivability. Survivable forces and command, control, and communications were necessary to project credible threats of second-strike retaliation, considered the bedrock of nuclear deterrence. Besides underwriting deterrence, survivability would relieve the pressure to "use or lose" nuclear forces, thus extending the time available for deliberation and increasing the latitude for responding flexibly.

Second, sound nuclear policy dictated that national leaders maintain firm and exclusive control over nuclear weapons at all times to ensure that nuclear operations always carried out their orders and intentions, and never carried out actions that were not intended. This policy aim demanded resilient command and control capable of flexibly directing nuclear forces to coherent national purpose in all peacetime and conflict conditions. It also demanded high safety standards to prevent accidental detonations and strict safeguards to prevent unauthorized use.

And third, the decision-making process had to be rational, which not only required leaders who were mentally "stable" but also robust information networks to support their deliberations. Rational decision-making required timely, accurate information about any situation in order to avoid ill-considered and misguided choices, particularly a decision to launch nuclear missiles on the basis of false information.

In reality, the major nuclear antagonists – the United States and Russia – fell short of meeting these standards. The nuclear arms race produced tens of thousands of weapons on each side and rendered command and communications, and large portions of the nuclear arsenals, vulnerable to attack. Both sides feared that a "decapitating" strike could prevent them from striking back after absorbing an attack. In an attempt to avoid decapitation, both undertook some of the riskiest projects of the Cold War. All U.S. presidents extensively pre-del-

egated nuclear launch authority to military commanders during the Cold War. The Soviets built a fantastic doomsday machine designed to trigger semi-automatic retaliation in the event of a decapitating strike. “Use or lose” pressure grew in spite of these hedges, partly due to vulnerabilities but also due to ambitious wartime objectives that went well beyond seeking the ability to destroy the enemy’s war-making industrial base (and thus its cities) in retaliation to attack. Both sides also sought the capability to destroy the opponent’s nuclear forces and thereby limit the amount of damage the opponent could inflict.

To avoid decapitation and increase their counterforce capabilities to destroy thousands of military targets, both sides adopted a stance of launch on warning. They put their nuclear forces on hair-trigger alert and prepared to launch them after incoming warheads were detected by early warning satellites and ground radar but before the warheads arrived. As a consequence, both sides ran the risk of launching on false indications of enemy attack – and indeed false alarms have brought both close to mistaken launch on numerous occasions. The short timelines of just a few minutes for detecting and assessing an attack, briefing the top leaders, picking a response option, and implementing the option reduced decision-making on both sides to a checklist-driven rote enactment of a prepared script that could too easily have collapsed in confusion or led to a mistaken or unauthorized launch. And strongly doubting the feasibility of retaliating at all, both sides leaned toward initiating a first strike in a crisis. Second-strike retaliation and launch on warning were problematic, difficult options, and thus preemptive attack would have become more tempting during the heat of crisis.

Both sides inherited these ill-configured postures at the end of the Cold War. As they remain in place today, they are a continuing source of strategic instability. They run an unacceptable level of nuclear risk, offer inadequate warning and decision time to support rational decision-making, and severely constrain the flexibility of national leaders during crises and conflict.

A transformational change in U.S. and Russian nuclear strategy, posture and force structure is therefore urgently needed to address squarely the security threats facing them and the world in the 21st century. The current strategy of mutual assured de-

struction perpetuates nuclear stockpiles that are much larger than required for deterrence and that have scant efficacy in dealing with these contemporary threats – nuclear proliferation, terrorism, cyber warfare and a multitude of other threats stemming from the diffusion of power in the world today.

Mutual assured destruction based on a bilateral balance of nuclear terror, the unvarnished version of the anodyne euphemism “mutual deterrence,” is a dated and less useful construct in today’s security environment. Strategy and stability have both become a multipolar and multidimensional concern that includes many factors besides nuclear forces: cyber warfare capabilities, missile defenses, conventional forces, special operations and “softer” factors including diplomatic and economic clout.

The United States can and will proceed on its own accord to make many of the necessary changes to its nuclear strategy and force posture, but Russia and China are critical partners in the resolution of global security problems. The importance of achieving greater security cooperation among these three nations is difficult to overstate. The world looks to them for leadership in grappling with the global economic, environmental, and security problems of the 21st century and they cannot expect to solve these collective challenges while at the same time maintaining nuclear policies rooted in threats to annihilate one another. Preserving mutual assured destruction as the central organizing principle of their relationship obstructs the ability to achieve the level of mutual security that each side seeks, and the trust and cooperation needed to address effectively the real threats that they and the rest of the world face.

In this spirit of cooperative security we must persist in our efforts to join the United States, Russia, China, and others to set the world’s course toward the total elimination of nuclear weapons. The path forward is clear: a revamping of U.S. and Russian nuclear postures to reduce nuclear risk and increase stability, progressive reductions in the U.S. and Russian nuclear stockpiles, the elimination of their hair-trigger attack readiness, bilateral and multilateral agreements among the nuclear weapons countries that prohibit placing nuclear forces on high alert status, and the convening of the first-in-history multilateral nuclear weapons summit to consider proposals

for achieving a world free of nuclear weapons.

A new opportunity has emerged to revamp their nuclear policies and postures as the United States and Russia continue the historic drawdown of their nuclear stockpiles. Guided by a desire to shrink their oversized and costly arsenals following the end of the Cold War and driven by the emergence of new threats such as nuclear terrorism and proliferation that large arsenals do not address, the two sides reduced the size of their collective stockpile from a peak of nearly 70,000 total nuclear weapons in the mid-1980s to today's level of 16,000 total weapons, of which about 6,000 are slated for dismantling. Under the current nuclear arms treaty that regulates these arsenals, the two sides are each allowed a maximum of 1,550 operationally deployed strategic weapons. The United States seeks further reductions to 1,000.

Cuts below this level would put the United States and possibly Russia on the cusp of a policy transformation entailing a shift from a Triad to Dyad of strategic nuclear forces, driven in no small measure by the exorbitant cost of re-capitalizing all three legs of the strategic forces. This financial crunch presents an unusual opportunity to overhaul the entire system and shift to a new strategy that combines nuclear and non-nuclear capabilities.

From a U.S. perspective, the ideal paradigm shift would enable the United States to rebalance its security strategy away from a predominantly nuclear strategy featuring three nuclear legs and toward one in which the pillars of a "total force triad" include key non-nuclear elements as well: (i) conventional and nuclear offense – the latter mainly composed of a Dyad of survivable strategic submarines and bombers, (ii) active and passive defense, encompassing a wide range of components from ballistic missile defense to protective sheltering, and (iii) command and control, providing survivable information processing, the ability to identify the source of aggression (nuclear, conventional, or cyber), and the means to flexibly direct this "total force triad" to coherent national purposes at all times.

This shift in operational concept and strategy would allow the United States to make a host of important adjustments. The United States could substantially reduce the number of

total nuclear weapons, delivery systems, and weapons on alert; eliminate launch on warning tactics; increase decision time and reduce pressure to "use or lose" forces; focus on increasing the survivability of forces and command-control networks; de-mate weapons from delivery platforms and centrally store the weapons in high security storage facilities; introduce advanced security technologies throughout the weapons complex; and augment nuclear systems with a broader set of non-nuclear capabilities that increase operational flexibility and the perceived credibility of the extended deterrence guarantee to allies. As a consequence of these steps, the risks of accidental, unauthorized, and mistaken launch on warning would decrease drastically.

The revamped architecture could also optimize nuclear security against terrorist theft, and build more nearly foolproof command-control networks against cyber warfare. Such architecture would mitigate a plethora of risks while preserving basic deterrence and operational cohesion.

If Russia would move in the same strategic direction, and China and other nuclear weapons countries followed suit, then a genuine shift that ensures the sovereignty of the world's major powers at much lower levels of nuclear stockpiles could be possible. In the real world, disparities in resources and other factors work against a smooth collective transition. A shift in U.S. strategy may have destabilizing effects on other countries' security. It is vital to take such externalities into account and devise ways to mitigate the untoward consequences.

A fundamental shift in strategy could be undertaken as a project of the executive branch of the U.S. government, and would not necessarily require perfectly symmetrical U.S.-Russian nuclear arms reductions. While negotiated reductions are almost always preferable, progress in this arena has stalled and may not resume anytime soon. Therefore, until their relations return to normal, bilateral reductions may proceed in parallel in a manner similar to the past reductions in which the two sides independently culled their over-stocked arsenals. Today, it makes strategic sense for both the United States and Russia to shed vulnerable forces and depend upon leaner, smaller but highly survivable nuclear forces (mainly U.S. missile submarines and Russian road-mobile missiles) while strengthening the non-nuclear pillars of their military strategies.

Old nuclear habits and strategies die hard, however. The current nuclear modernization programs in both Russia and the United States are essentially replicating the old legacy postures with newer hardware. Unable to shake loose from the entrenched model, both cling to the Triad construct and to vulnerable silo-based missiles.

Further clouding the nuclear horizon is the prospect that other nuclear weapons countries will copy the old U.S.-Russia model. This will introduce all the liabilities mentioned above. In particular, it will increase pressure to raise the level of their nuclear attack readiness, and shorten their warning and decision times. This emulation appears to be underway as a natural progression of maturing nuclear force operations, stimulated further by tit-for-tat increases in the attack readiness of opposing forces. With as many as eight or nine countries heading in this direction, and more proliferators in the wings, the risks will multiply of accidental, unauthorized, inadvertent and irrational launch under short and pressure-packed decision timelines.

It is not too late to slow or halt this trend. On the contrary, at the current stage of their development, the nuclear postures of the majority of the nuclear weapons countries including China, India, Pakistan, France and the United Kingdom are “models” compared to the Russian and U.S. postures. Their architectures have provided for lower alert rates and afforded decision-makers more time to consider their nuclear options. The United States and Russia could learn from these models.

In the absence of a fundamental makeover of the U.S. and Russian nuclear policies and postures, it is still possible to remodel their nuclear postures on the margins to reduce nuclear risk. Central to this approach is to help create an international norm that pressures nations to operate their nuclear forces at a low level of attack readiness. This norm should be embodied in physical, organizational, and operational constraints – “de-alerting” measures – that eliminate the ability to fire nuclear forces quickly and conversely require lengthy visible preparations to get them ready for launch. Imposing such measures on nuclear postures originally designed for high alert status and prompt launch is a suboptimal remedy for the ills that concern us. But de-alerting is certainly feasible and it can be effective in increasing warning and decision time and

foiling the exploitation of nuclear command and control by unauthorized actors and hackers. Even a set of ad hoc “quick fixes” can offer an efficacious solution to many dangers.

De-alerting should be codified by a politically or legally binding agreement among the nuclear weapons countries that includes provisions for verification. Essentially, this report develops a de-alerting framework which has two pillars: (i) an early, priority agreement between Russia and the United States that seeks to get them both off their current launch-ready posture and in particular eliminate from both sides their leanings toward launch on warning, and (ii) a longer-term agreement that can be implemented globally with all nuclear weapons countries. The report recommends other cooperative measures designed to reduce nuclear risks, reflecting a belief that joint efforts among nuclear weapons countries to fashion plans to reduce nuclear risk can produce modest and sometimes impressive success. Security cooperation is an underlying theme of the prescriptive agenda of this study.

These efforts would affirm support for the Non-Proliferation Treaty (NPT), which continues to be the bedrock of the international community’s effort to prevent and roll back proliferation. The Article VI obligation to pursue good faith negotiations for nuclear disarmament may have been “essentially hortatory” at one time, but today it is and must be taken seriously. Through nuclear arms control, the United States, Russia and other nuclear weapons powers show respect for the nuclear disarmament aspirations of the vast majority of the treaty’s 189 signatories, and in return these powers can expect them to stiffen their resolve in enforcing the NPT, supporting the P5+1 talks with Iran, and in continuing to pursue North Korea to end its nuclear pursuits and return to compliance with its NPT obligations (notwithstanding its proclaimed withdrawal). The days of U.S. and Russian lax and introspective compliance with the disarmament clause of the treaty are over if we hope to preserve and strengthen the treaty in the face of growing proliferation pressures around the world. And the more the nuclear weapons countries regulate and reduce their nuclear stockpiles, the more vigilant the world will become in ferreting out and clamping down on clandestine programs and other NPT violations. This collective resolve is crucial to the security of all countries.

II. OVERVIEW

An arc of latent nuclear instability stretches around the globe. From Central Europe through South Asia to North-east Asia and into the seas surrounding China, the nuclear weapons countries, or their close allies, are involved in geopolitical, territorial and other disputes that have the potential to combust and escalate. The arc indeed girdles the world inasmuch as instability lies in the nature of bilateral and multilateral relationships and is affected by global problems of proliferation, terrorism, nuclear materials and weapons control, transparency and many others.

Crisis management is more difficult in today's security environment than it was in the bipolar world of the Cold War. Conflict dynamics are less stable. Under the right conditions, any of the hotspots along this arc could morph into a nuclear flashpoint. A nuclear crisis could escalate through inadvertence or intention and also spread virally to other parts of the world. Many countries possess nuclear forces, and their postures are coupled, tightly in some cases and loosely in others. A nuclear confrontation or detonation would raise nuclear tensions and alert levels around the world. Such a multipolar nuclear crisis could follow an unpredictable course and prove difficult to stabilize.

This report identifies ways to control crisis escalation and reduce the myriad risks of deliberate or unintentional use of nuclear weapons. It is both diagnostic in that it examines the risk of nuclear weapons use in the various nuclear weapons countries, as well as prescriptive in offering some remedies.

Any balanced assessment of worldwide nuclear risk finds cause both for encouragement and concern. One piece of good news is that the global stockpile of nuclear weapons has plunged from a peak of 70,000 in the 1980s to approximately 16,000 today. If nuclear risk and stockpile size are correlated, then dramatic progress has been achieved. But the overall decline masks the gloomy fact that some arsenals are growing rapidly and posing greater risks, as in South Asia.

This dichotomous pattern is pervasive. A few examples: Good news: Russian nuclear weapons and fissile materials

are substantially more secure against theft today than they were when the Soviet Union collapsed over two decades ago. Bad news: (i) the world is home to sponsors of proliferation, nuclear black markets, and promoters of terrorism, (ii) large quantities of nuclear weapons are constantly in transit around the world – and transportation is the Achilles heel of security, and (iii) the risks of terrorist capture of weapons and materials have increased in South Asia over the past two decades. Pretty good news: the number of nations possessing nuclear weapons has climbed slowly while a greater number of aspiring proliferators have abandoned their programs. Bad news: the number of nations that possess or aspire to possess a peaceful nuclear energy program that could be transformed into a nuclear weapons program is fast growing, and many of these potential proliferators are lacking in good governance. Good and bad news: non-kinetic and conventional weapons (offensive and defensive) and global surveillance and intelligence have provided a credible alternative to nuclear weapons for some nations, but they pose threats to other nations that lead them to increase their reliance on nuclear weapons.

While these overly simplified illustrations of risk correlations present a mixed picture, this commission finds an overall pattern: risks are generally trending in the wrong direction. The cup appears to be more than half empty in today's security environment of proliferation, nuclear build-ups in Asia, spreading extremism, burgeoning cyber warfare, vulnerable nuclear command and control networks, vulnerable and insecure nuclear weapons storage sites and delivery platforms (particularly silo-based strategic missiles), and de-stabilizing global military competition featuring rapid innovation in weapons technology and modalities of warfare. In the current environment, much needs to be done to reduce nuclear risks. The slope from a crisis to nuclear brinksmanship to escalation to the use of nuclear weapons with cascading global implications is a much too steep and slippery one.

This latent instability is tremendously aggravated by the simple fact that the amount of time for decision-making at any point along this spectrum may be far too short. In general, warning and decision timelines are getting shorter, and consequently the potential for fateful human error in nuclear control systems is getting larger.

The short fuses on U.S. and Russian strategic forces compound the risks. One-half of their strategic arsenals are continuously maintained on high alert. Hundreds of missiles carrying nearly 1,800 warheads are ready to fly at a moment's notice. These legacy postures of the Cold War are anachronisms but they have not yet been consigned to the trash heap of history. They remain fully operational.

These postures – geared to very rapid reaction – reflect an entrenched mindset of “use or lose” with roots in the Cold War and in past decisions that perpetuated vulnerabilities in strategic forces and their chain of command. Bureaucratic inertia perpetuated a status quo that featured vulnerable land-based forces and nuclear command, control, and communications networks prone to collapse under the weight of attack, even a small-scale strike. These vulnerabilities have not gone away. In some respects the situation was better during the Cold War than it is today. Vulnerability to cyber attack, for example, is a new wild card in the deck. Having many far-flung missiles controlled electronically through an aging and flawed command-control network and ready to launch upon receipt of a short stream of computers signals is a nuclear (surety) risk of the first order. It seems the height of folly in an era of rapidly mutating cyber warfare capabilities. This concern is reason enough to remove nuclear missiles from launch-ready alert.

The old architecture responsible for the short fuses on the nuclear forces and the compressed timelines of decision-making needs to be updated. A modern architecture could be designed to optimize nuclear security (against terrorist theft and similar types of scenarios), ensure survivable forces and command systems, build nearly foolproof command-control networks (against cyber warfare and unauthorized launch), and extend the control of nuclear weapons beyond the launch stage into the flight stage. Such a design would achieve three critical objectives that together would substantially reduce reliance on nuclear weapons and greatly reduce nuclear risk. First, it would remove the “use or lose” imperative. Second, it would greatly increase warning and decision time during a nuclear crisis. And third, it would reduce the need for large numbers of nuclear forces in the stockpile and on alert. Such architecture would eliminate a number of risks while preserving deterrence and op-

erational cohesion. It could be strengthened further through missile defense and other augmentations.

Such architecture could and should be designed as an integral part of a shift in security strategy to place less emphasis on nuclear threats and more on non-nuclear capabilities, as discussed in the executive summary.

The proposed overhaul is not even a massive undertaking. It would involve taking steps as elementary as eliminating the vulnerable land-based nuclear forces; building nuclear storage facilities to be harder, deeper, and more hidden; replacing large static command posts with mobile and evasive posts; manufacturing information-processing components on home soil and tightly controlling electronics assembly; and strapping onto weapons (ballistic, cruise, and gravity) sensors, auto-pilots and communications equipment. The overhaul would not entail re-designing the guts of weapons (the “physics package”) nor would it be prohibitively expensive. The size of the stockpile would shrink by a substantial fraction (without weakening the deterrent mission), the number of weapons on alert would be greatly reduced, and the cost of future modernization would be slashed. These savings would pay for the overhaul.

Old nuclear habits and strategies die hard, however. The current nuclear modernization programs in both Russia and the United States are essentially replicating the old legacy postures with newer hardware. Unable to shake loose from the entrenched model, both cling to the Triad construct and to vulnerable silo-based missiles.

Further clouding the nuclear horizon is the prospect that other nuclear weapons countries will copy the old U.S.-Russia model. This will introduce all the liabilities mentioned above. In particular, it will increase pressure to raise the level of their nuclear attack readiness, and shorten their warning and decision times. This emulation appears to be underway as a natural progression of maturing nuclear force operations, stimulated further by tit-for-tat increases in the attack readiness of opposing forces. With as many as eight or nine countries heading in this direction – and more proliferators in the wings – the risks will multiply of accidental, unauthorized, inadvertent, and irrational launch under short and

pressure-packed decision timelines.

It is not too late to slow or halt this trend. On the contrary, at the current stage of their development, the nuclear postures of the majority of the nuclear weapons countries including China, India, Pakistan, Israel, France, and the United Kingdom are “models” compared to the U.S. and Russian postures. Their architectures have provided for lower alert rates and afforded decision-makers more time to consider their nuclear options. The United States and Russia could learn from these models.

In the absence of a fundamental makeover of U.S. and Russian nuclear policies and postures, it is still possible to re-model their nuclear postures on the margins to reduce nuclear risk. Central to this approach is to help create an international norm that pressures nations to operate their nuclear forces at a low level of attack readiness. This would help diminish the salience of nuclear weapons and reinforce their role as weapons of last, not first, resort. Like policies of “sole purpose” and “no first use,” a lowering of launch readiness would represent a step toward the final objective of global zero – the total elimination of nuclear weapons.

This norm should be embodied in physical, organizational and operational constraints – “de-alerting” measures – that eliminate the ability to fire nuclear forces quickly, and conversely require lengthy visible preparations to get them ready for launch. Imposing such measures on nuclear postures originally designed for high alert status and prompt launch is a suboptimal remedy for the ills that concern us. But de-alerting is certainly feasible and it can be effective in increasing warning and decision time and foiling the exploitation of nuclear command and control by unauthorized actors and hackers. Even a set of ad hoc “quick fixes” can offer an efficacious solution to many dangers.

De-alerting should be codified by a politically or legally binding agreement among the nuclear weapons countries that includes provisions for verification. Essentially, this report develops a de-alerting framework which has two pillars: (i) an emergency agreement between the U.S. and Russia that seeks to get them both off their current launch-ready posture and in particular eliminate from both sides their

leanings toward launch on warning, and (ii) a longer-term agreement that can be implemented globally with all nuclear weapons countries. The report recommends other cooperative measures designed to reduce nuclear risks, reflecting a belief that nuclear weapons countries’ joint efforts to fashion nuclear risk reduction plans can produce modest and sometimes impressive success. Security cooperation is an underlying theme of the prescriptive agenda of this study.

A high immediate priority is to eliminate any possibility that U.S. or Russian missiles would be launched promptly in the mistaken belief that the other side has initiated a nuclear attack. This risk of launching on the basis of false attack indications from malfunctioning early warning sensors or information processing networks declined at the end of the Cold War but it has begun to climb as a result of the estrangement in U.S.-Russian relations and the recent loss of Russia’s space-based surveillance capability. The presidents of the United States and Russia should reach an executive agreement to modify their postures physically and procedurally in order to reduce to the risk to zero. The fixes would entail lengthening the current hasty timelines for launch decision-making and implementation of launch. The parties should aim to extend the timelines from a few minutes today to a period of days in future. In this report, the minimum proposed timeline is 24-72 hours.

The procedural fixes would mainly involve ending high-level exercises and training for prompt launch. For silo-based rockets, whose vulnerability to counterforce strikes partially drives both sides’ reliance on prompt launch (vulnerable nuclear command-control infrastructure also drives it), war-time targets could be removed from the missiles’ computers and the missiles “safed” in their silos. That latter would isolate them completely from outside launch control. Physical changes would mainly involve the removal and storage of essential components – warheads and flight batteries – and the deactivation of the explosive and gas generator devices used to open silo lids prior to missile lift-off. For mobile missiles on land, flight batteries could be removed and the retractable roofs of mobile missile garages could be obstructed from opening quickly. For submarine-launched missiles, restrictions on patrol patterns could be imposed to eliminate short-flight-time strikes and provide more warn-

ing, and essential components of the missiles – warheads, electronic “inverter” devices, and/or guidance sets – could be detached and stored onboard or at central base facilities. Launch tube hatches could be welded shut.

Although heavy strategic bombers could be uploaded with nuclear bombs and cruise missiles during a crisis and then launched on warning, they are recallable and pose nothing close to the risks associated with launching land- and sea-based strategic missiles on warning (these are not recallable). This report calls for freezing their current posture in which all bomber nuclear payloads remain in local base storage or in central storage facilities far removed from the airbases.

The de-alerting agenda should also encompass other classes of nuclear forces on low-level alert, including those that to date have escaped regulation by arms control agreements. For the unregulated tactical (nonstrategic, shorter range) nuclear weapons, the two sides should preserve the existing peacetime arrangements in which the warheads and bombs remain separated from their delivery vehicles and held in storage at local or central facilities. In due course, this principle of physical separation should be carried to the next level. All tactical nuclear weapons should be removed from forward combat base storage (collocated with the warplanes and missiles for delivering them) and transferred to central storage facilities in the United States and Russia.¹ And finally, weapons in the strategic reserve should remain in storage and fully off alert.

This report offers a long menu of de-alerting options developed by experts over the past twenty-five years. All of them were deeply researched by experts with military experience. At various times in the past a number of them have been evaluated for technical feasibility and for their contribution to strategic stability at senior levels within the U.S. military (the source of some of them), where they have generally been evaluated positively in these terms:

An initial assessment by the Joint Staff indicates that these proposals may be technically feasible and if mutually implemented in a verifiable manner would contribute to the mutual security of the U.S. and Russia.²

Verification presents a challenge. Many of the options require more intrusive monitoring than has previously been required under the New START agreement and its predecessors. Verifying de-alerting measures taken inside of strategic submarines that slip into the ocean depths for months on end is especially vexing. Nevertheless, this report finds that national technical means (NTM) of verification (mainly space surveillance) coupled with intrusive on-site inspections conducted in conjunction with existing New START procedures will generally suffice to verify adequately the key proposed options such as warhead and flight battery removal. The New START treaty may well require a change to its protocol or an amendment (the latter requiring re-ratification) in order for monitoring to proceed under its auspices. Alternatively, a new executive agreement between the presidents of the United States and Russia could stipulate the monitoring arrangements. For nuclear forces that fall outside the scope of the current strategic arms treaty, particularly tactical weapons and reserve strategic warheads, new verification provisions will be necessary.

For some new measures, monitoring will need to be more intrusive and frequent, and augmented by webcams and other surveillance devices. Depending upon the contours of the de-alerting regime, on-site inspectors will sometimes need much greater access than they currently enjoy under existing agreements. Some inspections may need to be performed inside missile silos and submarines. Such access has been strictly forbidden in the past, and granting it in the future would represent a breakthrough in cooperative monitoring. Such cooperation may strain credulity at this time of fractured U.S.-Russian relations and may have to wait until relations return to normal.

¹ See *Global Zero NATO-Russia Commission Report*, February 2012: http://www.globalzero.org/files/gz_nato-russia_commission_report_-_en.pdf.

² Lt. Col. John Betts, J-5 Strategic Plans & Policy Directorate, Joint Chiefs of Staff, unpublished paper, July 8, 1997; and personal communications with study director.

In the view of one group of U.S. military experts, these raised standards of monitoring and verification would be difficult to negotiate:

Joint Staff arms control experts' evaluation is that this [de-alerting] regime will require lengthy and difficult negotiations to balance the need to promptly detect any violation and the need to protect operational capabilities. These proposals would require breaking the "no below ground access" paradigm and will require access to ALL areas and functions of the nuclear complex on a nearly continuous basis.³

This commission acknowledges these difficulties, but only to a point. Most of the de-alerting options in this report, including the major ones like warhead removal, can be adequately verified with available monitoring techniques on an intermittent basis. Access to all areas of the nuclear complex on a nearly continuous basis is definitely not necessary to verify de-alerting measures adequately, any more than it is necessary for verifying New START.

This report recognizes that the governments will not likely accede to the clarion call of some to immediately stand down all strategic forces from high alert, but rather will insist upon phasing in de-alerting over many years. This position is arguably unwise given the growing risks of their use, unintentional or otherwise. One upside is that apprehension of "break out" and re-alerting instability during a crisis, whether justified or not, would be allayed if de-alerting is implemented gradually over many years. Another upside is that a prolonged drawdown of alert forces would mean that the verification regime could be less intrusive in the initial stages.

As the nuclear arsenals shrink over time and as growing portions of the arsenals are taken off alert, however, "break out" and instability loom larger in the equation if the deployed forces are not inherently survivable. Monitoring will

have to become increasingly stringent. As the stockpiles decrease eventually to very low numbers and all or almost all of the forces are taken off alert, the monitoring regime will have to be able to track and assess the alert status of practically every weapon and do so on a more frequent schedule than is currently possible. It will likely become necessary to develop new concepts, methods and technologies in order to meet the strict monitoring requirements envisioned by the U.S. Joint Staff.

Military-to-military talks should begin soon to assess de-alerting opportunities and begin tackling the verification challenges. The U.S. and Russian governments will surely determine the composition of the forces to be de-alerted. Their preferences would tend to favor the de-alerting of older weapons slated for early retirement. This report proposes initially de-alerting approximately 170 strategic warheads on each side. It suggests de-alerting a specific mix of silo-, road-mobile-, and submarine- missiles. Whatever the mix that the governments elect, those units would be subject to inspection to verify their de-alerted status. This report outlines a verification approach for each measure – though it does not begin to exhaust the creative possibilities. U.S. and Russian military experts and inspectors will need to devise and prove the necessary monitoring procedures. The parties should establish a joint working group to coordinate this effort.

De-alerting should eventually be extended to all of the strategic forces, new and old alike. The joint working group should analyze, test, refine, and demonstrate a de-alerting and monitoring regime applicable across the board. This will be relatively straightforward for U.S. forces because there are only a few types of delivery systems. The Russian arsenal consists of many more varieties and will present a tougher challenge. The menu of de-alerting measures listed above partially meets the challenge but a great deal of further study and official discussions among experts will be needed to crack this nut. The effort should extend to future nuclear forces as well as existing ones in order to lay the groundwork for more "de-alert friendly" weapons systems.

To smooth the transition from high- to low-alert postures, only a portion of the alert U.S. and Russian strategic forces

³ Ibid.

would be stood down immediately in conjunction with the initial steps taken to remove launch on warning from both side's plans, exercises, and training. The rest of the strategic forces would be taken off of high alert status in stages over a period of ten years. A case can be made for accelerating the drawdown in view of risks that exist today, such as cyber warfare, but, acceding to political realism, this commission proposes the following schedule of de-alerting of the current force of 800-900 high alert weapons on each side:

- Within one year, 20 percent (approximately 170 weapons on each side) of the current alert strategic forces would be stood down, leaving 680 on high alert on each side.
- Within three years, 50 percent (425 weapons on each side) would be off of alert, leaving 425 still on alert.
- Within six years, 80 percent (680 weapons on each side) would be off alert, leaving 170 on alert.
- Within ten years, 100 percent (850 weapons on each side) could be off alert if U.S.-Russian relations have returned to normal and their security cooperation has deepened.

These bilateral steps have broader implications. By de-alerting, the nuclear superpowers would reduce the risk of a nuclear exchange that deposits radioactive fall-out far beyond U.S. and Russian borders. The worldwide environmental and health consequences of the use of nuclear weapons could be severe.

By lengthening the fuses on their strategic nuclear forces and submitting to verification inspections, the nuclear superpowers would also set an example of responsible nuclear custodianship for the rest of the world. The proposed precedent of early U.S.-Russian de-alerting, beginning within one year from the signing of an executive agreement by the presidents of the United States and Russia should encourage the other nuclear weapons countries to follow suit. They would be expected to refrain from elevating alert status while entering into a process involving all nuclear weapons countries to achieve a comprehensive multilateral agreement that verifiably constrains the attack readiness of all their nuclear forces. In accepting such obligations, unilaterally or by for-

mal agreement, they would “lock in” the current low alert status of their nuclear forces and shelve any plans to raise it. This would arrest current trends toward rising alert levels in Asia and strengthen international security.

In the view of this commission, North Korea is a special case. The Six Party Talks need to be reinvigorated by China, Russia and the United States in order to roll back North Korea's nuclear program and enforce its obligations under the Non-Proliferation Treaty, notwithstanding its proclaimed withdrawal from the NPT.

Under the terms of a multilateral de-alerting agreement, the nuclear postures of all other countries would be configured and strictly regulated to minimize incentives to “break out.” The regimen would obviate the need to re-alert in a crisis by ensuring the robust survivability of retaliatory forces and preventing any meaningful first-strike advantage from accruing to the fastest re-alerting force. Surreptitious re-alerting could not succeed in trumping the opponent. Having submitted to strict verification obligations, any significant re-alerting would be detected at an early stage and would not confer advantage. An agreement would limit the scope and timing of any re-alerting operation (e.g., for training, exercising, and in the event of a national security emergency that justified it) and require pre-notification of re-alerting.

Strategic stability would be strengthened by downsizing the arsenals as well as by de-alerting them. In the case of Russia and the United States, robust stability would be achieved when the number of operationally deployed and highly survivable strategic nuclear weapons declines to 200-300 total on each side and when the attack readiness of these weapons declines to 24-72 hours. (The New START agreement allows each side 1,550 operationally deployed strategic weapons – the actual number is closer to 2,000 because each strategic bomber is counted as a single weapon even though it may carry ten or more weapons – of which approximately 850 weapons on average are poised for prompt launch today.) As previously mentioned, their reserve strategic weapons and their tactical nuclear weapons should also remain off of alert, as is done voluntarily today – and would be formally subjected to verifiable constraints under a comprehensive multilateral agreement. Counterforce first strikes could not

be even contemplated under these limitations.

These U.S.-Russian ceilings on weapons and constraints on readiness offer reasonable guidelines for limiting the force structure and alert postures of the other nuclear weapons countries. Given the current modest size and low alert status of the nuclear forces of China, France, United Kingdom, India, Pakistan, and Israel, and given projected levels of their stockpiles ten years from now at below 300 warheads in all cases, their adoption of these U.S.-Russian limitations would well align with their national security interests, strategies, modernization plans and operational requirements.⁴

Once agreed upon, these parameters for force size and alert status would pave the way for deep reductions in the U.S. and Russian stockpiles of reserve strategic weapons and sub-strategic (tactical) weapons. The road also would be paved for multilateral negotiations seeking the phased, verified elimination of all nuclear weapons in the global stockpile. Deep de-alerting would so diminish the role of nuclear weapons in national security strategy that it would facilitate much deeper reductions in the nuclear stockpiles than would be possible otherwise. To start this ball rolling, this report urges the nuclear weapons countries to begin official discussions on the elements of a comprehensive multilateral agreement on de-alerting. The report offers some guidelines.

Further, this report examines the merits of and objections to de-alerting from the perspective of all of the nuclear weapons countries as well as key non-nuclear countries that shelter under the umbrella of extended deterrence. De-alerting is contextualized – related to each individual nation's national security interests, security strategy, and other broad considerations. Needless to say, these considerations do not always converge, and yet the commission concludes that the individual and collective security of all countries would benefit from the establishment of a de-alerting regime.

In summary, the clock is ticking on the use of nuclear weap-

ons around the world. The countries that possess them do not enjoy a plethora of useful tools and options between low-intensity conflict and nuclear escalation. We are witnessing a steady lowering of the nuclear threshold and an increasing danger that the weapons will be used – deliberately, or as a result of inadvertent escalation, hasty decision-making, miscalculation, unauthorized acts, or capture and use by terrorists. That ticking clock is a global danger that requires greater international cooperation to de-fuse it.

Disciples of nuclear deterrence theory argue that leaders ought to behave very cautiously in the face of real risks of losing control and in the face of apocalyptic threats to their homeland. But deterrence is a poor construct for reducing operational risks. In fact, it is counterproductive in that deterrence encourages the players to take operational risks to impress and make credible their threats, even in peacetime. Its influence stems from taking and manipulating existential risk, especially during a crisis. Nuclear weapons then become tools of coercive diplomacy, blackmail and other intimidations that go beyond basic deterrence into uncharted territory. Waving the nuclear cudgel to frighten the opposing side into backing down is not an act of extreme caution – but is rather closer to its opposite. Such risky behavior has been on display in past nuclear confrontations like the Cuban missile crisis of 1962 and the Arab-Israeli war of 1973. Whatever leverage it conferred during the Cold War to resolve such disputes, today the risks outweigh the benefits.

Yet today, many players have joined the game and are rolling the dice. All are counting on a perpetually perfect run of good luck for their survival. By any objective reckoning, this is tempting fate beyond reason. It smacks of a fool's gamble. A much more dependable way to avoid nuclear weapons use is to lengthen the fuse on their nuclear postures. All nations with nuclear forces should stand them down, take them off of prompt launch alert, and reach a binding de-alerting agreement to refrain from putting nuclear weapons on high attack readiness. Deterrence would not suffer, but safety and security would go way up.

Progress on de-alerting will require governments to cooperate in framing a step-by-step process that is consistent with their national security interests and strategies. They will have

⁴ The bandwidth of uncertainty surrounding unofficial open-source estimates of the size and alert status of arsenals is especially wide in the cases of China, India, Pakistan, and Israel.

to draw up detailed de-alerting road maps, both near-term and longer term; verification procedures; and protocols for contingent re-alerting for purposes of training, exercising, or dealing with security emergencies. Military-to-military consultations would greatly facilitate these efforts.

Currently, U.S.-Russian consultations are moribund, a casualty of the abnormal rift in their political relations. This damage will need to be repaired and relations returned to their normal footing. Similar obstacles that stymie consultations among other nuclear weapons countries such as India and Pakistan also need to be surmounted. A high level of expertise in nuclear affairs and operations is essential to the success of such consultations. The commissioners who participated in this report's preparation represent unofficial advisors doing spadework intended to help lay foundations for future military-to-military engagement and other official endeavors to reduce nuclear risks. The single-most important recommendation of this study is that governments appoint task forces consisting of former senior national security officers and officials to review the other recommendations of this report!

III. INTRODUCTION

Today, nine countries possess a total stockpile of nearly 16,000 nuclear weapons.⁵ These weapons are the currency of complex and dynamic operations conducted largely in secret around the globe. At this very moment and around the clock, hundreds of thousands of nuclear weapons operators and their support teams are engaged in nuclear war preparations. Every day and night the airwaves and landlines buzz with nuclear test and exercise messages. Strategic submarines plying the oceans, and land-based rockets on mobile launchers and in underground silos, stand ready to receive the go-code for launch. In several western U.S. states, nuclear missile crews train around the clock in mock launch centers, pretending to fight a nuclear war. An aircraft manned by a battle staff capable of relaying orders for a nuclear strike

⁵ An estimated 6,000 out of the 16,000 are waiting in a queue for dismantlement. The Russian queue size is very uncertain, however.

may well be orbiting above the Midwestern plains.⁶ Russian high-level nuclear battle staffs sit on alert in deep bunkers at multiple locations around greater Moscow. A thousand nuclear weapons roam on combat patrol every day, and hundreds continuously stream back and forth between their combat alert sites and their maintenance facilities.

Missile attack early warning teams in the United States and Russia maintain constant vigilance searching space and the skies for incoming warheads. Each day they receive sensor data from satellites or ground radar requiring them to urgently assess whether or not a missile attack is underway. A host of phenomena catch the attention of their surveillance sensors and have to be evaluated rapidly – a Japanese civilian rocket lifting a commercial satellite into space, a Chinese anti-satellite missile test, a Russian test firing of a nuclear-capable missile from a submarine, a U.S. warplane on afterburners catapulting off a carrier, and even the moon rising, a flock of geese, a volcanic eruption or wildfire. The U.S. crew in the main early warning center in Colorado strains to render within three minutes an initial assessment that could start the countdown to a presidential (or successor) decision to launch U.S. missiles in retaliation to an apparent attack. Once or twice a week, typically, the phenomena appear to pose a possible nuclear missile threat requiring a second, closer look.⁷ On rare occasions, one of these will appear to represent a real threat, and all hell breaks loose.

These vignettes barely scratch the surface of the scope, dynamism and riskiness of the global nuclear weapons “enterprise.” Multiply this activity many-fold and extend it to many corners of the globe. All the nuclear weapons countries prepare and exercise detailed plans to employ their weapons in combat, and to blunt through offensive and defensive operations their adversaries’ employment of them should hostilities erupt. In jockeying for position, they conduct inten-

⁶ These airborne patrols are conducted randomly for eight hours each day in peacetime.

⁷ This sentence and the next are derived from *Recent False alerts from the Nation's Missile Attack Warning System*, Committee Print, Report of Senator Gary Hart and Senator Barry Goldwater to the Senate Committee on Armed Services, 96 Cong. 2 sess., GPO, 1980.

sive surveillance on one another and routinely square off in close quarters as, for instance, submarines trail each other, reconnaissance aircraft probe borders for leaky air defenses, and fighter planes hang on the wings of opposing strategic bombers on practice bombing runs.

The nuclear countries run myriad risks in their daily operations, risks that balloon during crises. The list is long. It includes the risk that deterrence could collapse if national survival seems at risk or under the pressure of critical military exigencies, resulting in the deliberate initiation of nuclear strikes. It includes such dark scenarios as the hasty ordering of a large-scale preemptive nuclear strike based on a misinterpretation of enemy intentions or on misleading indications of imminent enemy attack. The list of risks includes accidental detonations, unauthorized launches, and panicky mistaken launches caused by false indications of incoming enemy warheads coupled to hasty decision timelines. Other risks include low-level encounters that incite deliberate or inadvertent escalation that spirals out of control, nuclear weapons falling into the hands of terrorists, and other fateful incidents and scenarios that have not yet occurred to anyone. Cyber attack will probably be at the center of many such surprises.

Having carefully assessed this gamut of risks, this commission's overall assessment is that the large-scale operation of nuclear forces around the globe runs excessive risk of their use, and that new measures are needed to help mitigate those risks. The report takes a hard and critical look at current operational practices and at the overarching strategies from which they stem, focusing particularly on the United States and Russia. It comes as no surprise that the tenets of their nuclear strategies (forged a half-century ago during the height of the Cold War) and their associated force postures need to be revised or replaced. They and all nuclear weapons countries should adjust their nuclear postures – attack readiness and peacetime, crisis, and wartime operating procedures – in ways that advance the following specific aims:

- Increase nuclear warning and decision time for leaders and commanders;
- Remove the threat of sudden, surprise nuclear attack;
- Strengthen crisis stability: relieve pressure to generate

nuclear forces to launch-ready status in a crisis, and to “use or lose” forces in a conflict;

- Increase force and command survivability;
- Provide the time and information needed to identify/attribute the source of an attack, whether nuclear, conventional, or cyber;
- Strengthen safeguards against the accidental or unauthorized use of nuclear weapons;
- Protect nuclear forces and command-control-communications and early warning networks from cyber attacks;
- Prevent terrorists from capturing and using nuclear weapons; and
- Provide more tools for flexibly managing a crisis and containing a confrontation below the level of nuclear threat or conflict.

One key tool in advancing these aims is “de-alerting.” De-alerting is a means of lowering the attack readiness of nuclear forces, thereby lowering risks of the accidental, unauthorized, or mistaken launch of nuclear forces, as well as the chances of their deliberate use. It conveys the intention not to resort to nuclear violence and to pursue their ultimate elimination. Off alert forces cannot be fired in haste or by unauthorized action, or used in a surprise first strike. De-alerting also addresses a host of emerging 21st century dangers that are raising the global risks of nuclear weapons use – such as increasing “operationalization” and usability of the nuclear forces in several regions of the world, particularly Asia; growing cyber warfare and insider threats to the nuclear command and control networks of all countries; and growing opportunities for terrorists to capture nuclear weapons. Not least important, de-alerting also offers an alternative approach to nuclear arms control at a time of stagnation and even regression in the traditional arena of negotiated reductions in U.S. and Russian strategic arms.

The United States and Russia bear primary responsibility for pursuing a serious agenda of de-alerting. They own the lion's share (>90 percent) of the world's nuclear stockpile, and they continue to operate Cold War-era fast reaction postures that expose the entire world to unacceptable risks. Strong joint leadership by the White House and Kremlin would facilitate their revamping of nuclear command systems and alert postures.

Accordingly, this report outlines a U.S.-Russia de-alerting regime, taking into account pertinent national and international security interests. De-alerting proposals, such as removing warheads from delivery vehicles and putting them in storage, must be compatible with the basic security interests of the parties to an agreement or else they will be rejected. Proposals must not be designed and considered in a vacuum, solely in narrow technical terms set apart from the context of sound national strategy and doctrine, employment policy, force structure, and nuclear command-control systems. This wider context and nations' fundamental security priorities, which obviously vary and often diverge from nation to nation, should shape the contours of de-alerting proposals to ensure that they are useful. To a certain extent this means that consensus gets built on the lowest common denominator, but one must begin by considering de-alerting on a case-by-case basis.

In the U.S. case, proposals for de-alerting U.S. nuclear forces are set forth in a fictitious 21st century Nuclear Strategy, Force Posture, and Employment Guidance of the United States, presented in the form of a forward-looking Presidential nuclear directive as it might be crafted by the White House. This model guidance outlines the elements of a nuclear strategy redesigned for the 21st century. The overhaul reduces U.S. reliance on nuclear weapons, eliminates prompt launch ("launch-on-warning"), downsizes the strategic and tactical arsenal, removes the U.S. threat of a counterforce first strike against Russia, and otherwise strengthens strategic stability. De-alerting is a key component of the overhaul. The model guidance also frees up resources for the (non-nuclear) tools actually needed by the U.S. military and by the decision-makers responsible for managing crises, and relieves the unaffordable burden of modernizing all three components of the U.S. strategic arsenal. The currently planned nuclear modernization program would cost far more than the Pentagon can afford, produce a force that exceeds reasonable requirements of deterrence, and short-change the non-nuclear programs that the United States needs far more.

This model presidential directive takes into account the national security priorities of the United States and the other key nuclear weapons countries, as well as their positions on

de-alerting, as viewed by this report's experts from China, France, Germany, India, Israel, Italy, Japan, Pakistan, Russia, the United Kingdom and the United States. It seeks to strengthen security cooperation among them, instead of defaulting to the anachronistic organizing principle of mutual deterrence that governed Cold War relationships. At the same time it recognizes that the transition from legacy constructs like mutual assured destruction to more suitable constructs like cooperative security is far from complete. In fact it is still in its adolescence. The directive is therefore driven by "realism" and waxes hard-nosed and conservative in approach. After all, the central purpose of such presidential direction is to guide U.S. nuclear planners in preparing for peacetime, crisis, and wartime operations. It is not everyone's cup of tea.

De-alerting would be facilitated by shedding vulnerable silo-based forces and deploying only survivable weapons. The option exists for both Russia and the United States to shift to a more survivable and de-alerted force – primarily a missile submarine force for the United States and a road-mobile missile force for Russia. U.S.-Russian cooperation could greatly facilitate the re-structuring of their nuclear postures, however. The model U.S. presidential directive thus calls for reciprocal Russian de-alerting steps, which are elaborated alongside the U.S. steps in the appendix. In the initial stage of this de-alerting cooperation between the two nuclear superpowers, the overriding and urgent goal is to remove launch-on-warning from their nuclear operational plans.

The commission also concludes that coordinated multi-lateral efforts could prove instrumental in minimizing the global risks of nuclear weapons use. This report therefore recommends that the nuclear weapons countries negotiate a verifiable agreement that constrains the attack readiness of their nuclear forces, ensuring that they remain off high alert status, restricting the scale and schedule of any force generation required in the event of a national security emergency, and stipulating protocols for notifying the other signatories whenever such generation is undertaken.

A multinational de-alerting agreement regulating the nuclear force postures could greatly mitigate the myriad risks of nuclear weapons use that currently exist and, as importantly,

stave off future risks. A politically or legally binding agreement among all the nuclear weapons countries would help insulate the nuclear chains of command from human and technical dysfunctions that could otherwise cause the use of nuclear weapons and even trigger a nuclear exchange. It would offer protection from computer error, cyber seizure of nuclear command and control, accidental detonations, unauthorized “insider” launch, false warning of enemy missile attack, and rushed nuclear decision-making.

The de-alerting measures outlined and recommended in this report are admittedly near-term “stop-gap” steps. As explained earlier, a truly optimal de-alerting regime would require a more fundamental makeover of the U.S. and Russian nuclear force and command structures. They were built during the Cold War to maximize attack readiness and rapid force execution – positive attributes at the time but liabilities today. These postures resist quick fixes to stand them down. For example, the land-based strategic missiles must continuously operate their guidance gyroscopes in peacetime to remain reliable. If they are powered down and taken off alert, they could not be restarted reliably. The guidance systems become prone to malfunction during such a re-boot. Both countries need to go back to the drawing boards to re-configure their nuclear forces and command systems to make them “de-alerting friendly.” For the United States, this probably means that its silo-based missiles should be eliminated entirely. Modernization plans also need to build in features that make the job of de-alerting easier. Meanwhile, this report proposes a set of practical if not optimal ad hoc remedies.

IV. STILL AN ANARCHIC INTERNATIONAL SYSTEM

In the post-Cold War era it seems almost unimaginable that states could become embroiled in confrontations that escalate to the level of nuclear brinkmanship or worse. The growing interconnectedness and interdependencies among nations in the 21st century have made major conventional war extremely costly and nuclear war unthinkable. These thickening sinews of international stability include instantaneous worldwide communications and information transfer, rapidly growing trade, massive flows of people and corporations across national boundaries, and the dramatic rise

of direct foreign investment and global debt underwriting. Economic clout increasingly overshadows military might as the currency of power. And an expanding constellation of electoral democracies (tripling in number since the 1970s and growing from 70 to 125 during the past 25 years)⁸ has emerged. History shows that democracies do not wage war with each other. Despite counter-globalization trends in some isolated cases – notably, the partial re-nationalization and de-globalization in evidence in Russian state capitalism and in its societal introversion, and the pre-globalization stasis of the North Korean hermit kingdom – as well as the ebbing of democracy in a dozen key nations, the tide of history is heading inexorably toward greater integration of the 195 sovereign nations in the world. And this tide is ineluctably eroding the role of the threat of nuclear weapons use or actual use in arbitrating the outcome of inter-state conflict.

Further marginalizing this waning role are the elusive threats to international security emerging from the same dynamics of globalization. Globalization allows increasingly lethal technologies to propagate around the world – spreading even to insular states like North Korea (recipient of nuclear technology transfers), failing states like Libya (recipient of nuclear transfers before imploding during the Arab Spring) and sub-state groups like Hamas (recipient of technologies for building rockets with sufficient range to assault Tel Aviv). The world is bracing for even worse: the inevitable acquisition of truly deadly biological pathogens or nuclear weapons by non-state actors, enabling even small groups of individuals to cause mass casualties.

The world’s nuclear stockpile offers scant defense against the spread and use of virulent weapons by imploding states and fanatical terrorists. It also offers scant political or military leverage over nuclear proliferation, cyber warfare threats, or nuclear, chemical, and biological terrorism. In many respects the world’s 16,000 nuclear weapons create the problem, not the solution to these global ills. They do not solve the problem of loose nukes falling into the hands of terrorists, for

⁸ *Freedom in the World 2015*, Freedom House, 2015, https://freedom-house.org/sites/default/files/01152015_FIW_2015_final.pdf, p.6.

example. In fact the world's far-flung global stockpile creates the opportunity for diversion, theft, and capture in the first place. The 1,800 out of the 16,000 poised for prompt launch do not deter anonymous cyber strikes, but they do offer a tempting target for cyber warriors bent on infiltrating the launch circuits and playing havoc.

Although globalization has diminished the role of nuclear weapons in conflict prevention and resolution, the risk of the outbreak of nuclear conflict has not decreased proportionally. Globalization has not so much lowered the risk as raised the stakes if nations with entangled economies and peoples fall victim to nuclear attack. The use of even a small number of weapons – tens to hundreds out of the 16,000 in the world arsenal – would cause massive damage across the globe as well as in the belligerent countries. It would produce more widespread and longer-term devastation in a shorter period of time than ever before in history. Billions of lives hang in the balance. And although the dire economic, environmental, health and other humanitarian consequences of such conflict create powerful incentives to avoid it, the centrifugal forces of an anarchic international system could still overpower the centripetal forces of restraint.

Mutual assured destruction on a multinational scale may substantially subdue the temptations of many potential aggressors, but it cannot guarantee their non-use. Threatening severe punitive retaliation to attack erects only psychological barriers to nation-state aggression (as long as rational nuclear authorities remain in firm control, a herculean assumption in some situations). It does not physically block it. Certainly non-state actors, such as terrorists on suicide bombing missions, will not be deterred and little stands in the way of detonating a nuclear weapon that fell into their hands. As long as nuclear weapons exist, their use simply cannot be ruled out, even among nation states.

A crisis pitting the nuclear powers against each other in dangerous brinkmanship could flare up at any time in any number of hotspots around the world. Nuclear crisis management being an imperfect science and the powers being inexperienced in this arena, a crisis today could rapidly become unmanageable and escalate. In the fog of conflict, the use of nuclear weapons by accident or design becomes more likely.

V. ESCALATION: GENERAL RISK FACTORS

Of the countries that have the dubious distinction today of possessing nuclear arsenals and planning for their use, a number of them or their close allies are at loggerheads on a regular basis. Although many are bound by common interests, they often also share a history of belligerence, clashing over borders, land, adjacent seas, religion, ethnicity, and ideology. Their leaders are not above stoking the enmity with nationalistic rhetoric, often for cynical domestic reasons. Economic interests at the heart of globalization drive nations together, and sometimes apart. Competition for scarce natural resources is spawning acrimony and shadowboxing over access to and ownership of oil and mineral deposits.⁹ In today's multi-polar world, keeping a lid on these smoldering hostilities is harder than it used to be in the bipolar world of the Cold War, when two powerful blocs placed high value on stability.

A. THE NUCLEAR DEFAULT BIND

The potential for nuclear escalation stems in part from a shortage of tools for ending a crisis through diplomacy, and for securing a truce on conventional conflict. Nations may be tempted to reach for nuclear weapons for want of alternatives. Put differently, there are too few good options for filling two critical gaps in the spectrum of hostilities between opposing states: (i) the gap between crisis diplomacy and conventional conflict, and (ii) the gap between conventional and nuclear conflict. A confrontation could quickly exhaust diplomatic options and escalate to conventional military operations, and then it could quickly exhaust conventional options, leaving decision-makers in a bind: concede or escalate. If their national sovereignty is in jeopardy, and facing a paucity of non-nuclear tools, the nuclear option may be hard to resist. It could be the only remaining choice, however excruciating its election may be.

Among all the nuclear countries, the United States enjoys

⁹ For instance, the dispute over seabed resources in the South China Sea between China and the Philippines, a mutual defense treaty partner of the United States.

the largest range of options across the spectrum – including diplomatic, economic, and various “soft” power tools that expand U.S. policymakers’ “decision space” between crisis diplomacy and conventional intervention. The U.S. government is constantly churning out new diplomatic and financial instruments – for example, financial sanctions, rights of sea passage, proposals for resolving territorial disputes in the East and South China Seas, cyber warfare “rules of the road,” to name just a random smattering. Arms control initiatives constitute another critical set of options in this space – bilateral nuclear negotiations with Russia, multilateral talks to reverse North Korea’s nuclear program and contain the Iranian nuclear program, and multilateral operations to eliminate chemical weapons in Syria, to name a few. Such efforts obviously lie at the heart of U.S. global leadership. When successful, they suppress escalatory updrafts and aggression.

The United State also enjoys the richest menu of options in conventional military operations. U.S. conventional superiority, augmented by allies’ military capabilities, confers enormous flexibility in dealing with security threats of all kinds. The U.S. conventional juggernaut generally supplants nuclear forces in this space. As the head of the U.S. Strategic Command recently testified before the U.S. Congress:

[...] Conventional forces do, in fact, make a difference in terms that we are no longer in a position where we have to threaten nuclear use in order to overcome a conventional deficiency [...] overwhelming, conventional power projection that we can bring to bear around the world has made a difference in the role of our nuclear deterrent [...] we have been able to narrow the role of that nuclear deterrent, accordingly.¹⁰

U.S. conventional hegemony stems mainly from American

10 General C. Robert Kehler (USAF, Commander, U.S. Strategic Command), “Testimony on U.S. Strategic Command and U.S. Cyber Command in Review of the Defense Authorization Request for Fiscal Year 2014 and the Future Years Defense Program before the Senate Armed Services Committee,” March 12, 2013.

technological superiority in practically every important military technology in today’s battle space – precision-guided conventional munitions, global all-source intelligence collection and fusion, stealth warplanes, directed energy weapons, ballistic missile defenses, hypersonic glide vehicles, special operations and cyber warfare among others. (Anti-satellite weaponry is a conspicuous exception.) Owing to its prowess in these domains, and a deep-pocketed Department of Defense, the United States has been able to re-balance its security strategy over the past several decades to steadily reduce reliance on nuclear forces and shift to non-nuclear tools that are far more useable in conflict.

This rebalancing has increased U.S. credibility in dealing with threats that previously required a nuclear response, and boosted the confidence of U.S. allies around the world (particularly NATO allies, South Korea and Japan) in the ability of U.S. forces to protect them without resorting to nuclear weapons. For instance, South Korea once needed a huge lift from U.S. tactical nuclear weapons to deal with North Korea’s prolific artillery batteries north of Seoul. But nuclear strikes would have exposed Japan as well as South Korea to deadly radioactive fallout. The specter of massive collateral casualties in friendly populations greatly undermined the credibility and acceptability of the nuclear option. By contrast, South Korea with U.S. backing today has conventional superiority over the North and the profile of U.S. nuclear weapons for war-fighting on the Peninsula has very substantially ebbed. The North’s fledgling nuclear program does revive somewhat the role of the U.S. nuclear umbrella in extending deterrence in the region. However, the U.S. alliance capabilities in the non-nuclear sphere go a very long way toward reassuring allies in peacetime and parrying the North’s nuclear spear in wartime. These capabilities may also work to deter the North. (No one really knows.)

The nuclear default option remains in the U.S. repertoire, however. Despite having a kitbag brimming with diplomatic and conventional tools, they are not so robust and versatile that U.S. leaders cannot imagine any need for nuclear firepower. In a conflict situation, non-nuclear options are very rapidly crossed.

Nuclear proliferation is one of the sticky wickets responsible

for this unfortunate truth. It multiplies the odds of a crisis, incident, or conflict that escalates to a nuclear confrontation with the United States. Nor can U.S. leaders ignore a number of other contingencies that may fall within the ambit of nuclear planning, ranging from chemical, biological, and cyber warfare threats to conventional technologies and delivery capabilities, particularly short and medium-range ballistic missiles, all of which enable more states to inflict more harm in many new ways and places. Concern extends even to non-state actors who may acquire the wherewithal to inflict great harm on a grand scale in a short period of time. Nuclear terrorism is the obvious example. In the case of biological agents, too, a single individual potentially could cause harm of historic proportions.

Although U.S. nuclear weapons generally lack efficacy in dealing with such contingencies, their rapid speed of delivery sets them apart. In many situations the United States lacks a timely conventional alternative. A hypothetical case in point is a situation in which a terrorist cache of biological weapons located at a distant and remote geographic redoubt is being loaded onto vehicles and cannot be struck in a timely fashion by conventional weapons. With time running out before the deadly cargo is spirited off to be smuggled into a densely populated target city, a leader may feel pressure to reach for nuclear weapons as a last resort if that is the only choice available to quickly destroy the redoubt. While ordering up a nuclear weapon to be delivered to the target in 30 minutes by a strategic missile is an obviously difficult – indeed, virtually impossible – choice for any leader to make, this genre of threat scenario is what persuaded President Obama to retain a nuclear option to deal with biological threats, and not to declare that the sole purpose of nuclear weapons is to deter their use by others.

Another example of the questionable utility of conventional weapons in dealing with certain contingencies was the situation of Syria's chemical weapons prior to their recent elimination by an international task force led by Russia and the United States. Diplomacy settled the issue in this case. But had it not succeeded, conventional operations alone would not likely have managed to disarm Syria's chemical arsenal. The weapons could have been loaded onto Syrian aircraft and taken airborne or handed out to artillery units within

a few short hours after giving the order. If the United States detected this distribution in near-real time and had fully prepared in advance to intervene – perhaps using pre-positioned fighter aircraft, quick reaction and special operations forces and armed unmanned vehicles – a disruptive strike might possibly have been executed in time. A decisive quick conventional intervention was not available, however. (An intervention force of approximately 75,000 troops on the ground could have been required to take physical custody or destroy comprehensively the Syrian chemical weapons stockpile.) This is why Syria had not been scrubbed from U.S. nuclear war plans.

Even if the United States could anticipate where military intervention will be needed, which it almost never does (since the Vietnam War the U.S. security establishment has a perfect record of not once predicting the nature and location of the next military engagement),¹¹ the United States could not afford to deploy well-honed conventional tools to confront every adversary challenge. Such a global contest would be prohibitively costly. And cost aside, the U.S. military has its limitations; its adversaries are deploying weapons which are increasingly out of range, deeply buried or otherwise hardened against attack, and deployed in prolific numbers. The task is becoming harder in part because of domestic pressures in countries like Saudi Arabia to minimize the American military presence (“occupation” in the eyes of local citizenry) on the grounds that it infringes on their sovereignty. (This is less problematic for the forward-deployment of defensive systems such as U.S. missile defenses because, irrespective of their effectiveness, they are seen as “shields” to the local population.) Nuclear weapons continue to fill some of these gaps.

These U.S.-centric illustrations generalize to the entire population of nuclear weapons countries, which have even wider gaps to fill. Their non-nuclear capabilities are not nearly as robust and therefore nuclear weapons, despite their generally declining military utility, remain relevant to their mil-

¹¹ No one had any idea a year in advance of the U.S. missions to Grenada, Panama, Somalia, the Balkans, Haiti, Kuwait, Iraq, Afghanistan, that U.S. military forces would be dispatched to these destinations.

itary strategies and to the defense of their sovereignty

B. DISRUPTIVE TECHNOLOGIES, ZERO-SUM GAMES, AND NUCLEAR ESCALATION

That military competition between potential adversaries is “zero-sum” also creates escalatory updrafts in a crisis. The classic security dilemma applies in which action-reaction arms competition begets security for one side at the expense of security on the other. If Side A acquires an effective new non-nuclear tool and gains the upper hand over Side B, then Side B’s non-nuclear options shrink and its nuclear options rise to the surface by default. With the players pitted in a zero-sum game in a global competition over “disruptive” technologies, the threshold for the use of nuclear weapons ebbs and flows – often unpredictably. When the Soviet Union’s conventional military forces became hollowed out and its Warsaw Pact allies aligned with the West as the Cold War wound down, the United States and NATO ascended overnight to a position of conventional superiority, and so Russia abandoned its no-first-use doctrine in 1993 and turned to its nuclear arsenal to offset this superiority. But Russia found scant utility in them, and was spurred to innovate new non-nuclear tools such as so-called “hybrid” warfare that features special operations, information warfare, and energy manipulation, among other tactics designed for low-level asymmetric operations.

As an illustration of how double-edged disruptive technologies may spawn volatility in crisis interactions, consider the case of U.S. ballistic missile defenses. From a U.S. perspective, such defenses would have a positive, stabilizing edge if they eventually perform well enough to offer a credible strategic alternative to offensive nuclear firepower. In a regional conflict, the goal of missile defenses is to convince a potential adversary that it cannot count on succeeding with an initial strike, and to prevent success if the persuasion fails. Such defenses would also buy decision time for leaders, and buy time to generate (or “re-alert”) nuclear capabilities if needed. If missile defenses could provide a temporary buffer, U.S. decision-makers could consider their nuclear options at a more leisurely pace in a crisis than is currently the situation. U.S. allies would be actively defended, and then protected by

other generating U.S. forces. Nuclear risk would be reduced.

But Russian or Chinese decision-makers would find themselves on the other side of the fence. From their perspective, effective U.S. missile defenses would force their hand earlier than before. In the worst case, such defenses could possibly threaten to neutralize the ragged retaliation of Russian or Chinese strategic forces that survive a U.S. strategic first strike. In this scenario pressure would mount on them to initiate a strike against the United States while Russian or Chinese strategic forces (and command systems) were still intact. Such a preemptive strike might entail either conventional strikes against U.S. missile defense sites in order to degrade them, or nuclear strikes meant to beat the United States to the punch and gain a wartime advantage. In either case, U.S. missile defenses introduce instabilities. Nuclear risk would increase.

Disruptive technologies may thus prove to be counterproductive even to the innovator if they fan the flames of escalation and compel the opposing side to race across the nuclear threshold. In introducing such tools as missile defenses and precision-guided munitions, leaders may gain for themselves additional time for diplomacy, conflict resolution, and war termination before having to face the difficult choice of resorting to nuclear weapons – thus raising their own nuclear threshold. But the opposing decision-makers may lose time as a consequence and may be pressed for an earlier decision on nuclear use than previously required. The overall effect of these countervailing forces on stability is not intuitively obvious. It may or may not be destabilizing. Nuclear risk may shrink, or grow. To the extent that the impact of a new disruptive technology is unpredictable, caution would recommend putting it on the negative side of the risk ledger.

One of the most revolutionary of these double-edged technologies has been the advances in information processing: global intelligence collection, fusion and computer filtering. This was first demonstrated in the data feed into precision-guided munitions strikes. It is now finding such applications as the tracking of opposing mobile nuclear forces on land. Again, such tools support conventional alternatives to nuclear weapons and thus work to raise the nuclear threshold on one side, and at the same time they may create real

or perceived “use or lose” vulnerabilities that lower it on the other side. The overall effect of such crosscutting technologies on nuclear stability defies calculation, but once again a conservative view is that such unpredictability suggests increased risk.

Its get even more complicated. Disruptive technologies can have very complex effects on arms competition and crisis interactions. Again, consider U.S. missile defenses as an introductory move in an action-reaction sequence. If China regards the defenses in Asia as a threat to its second-strike nuclear deterrent, or to its non-nuclear missiles forces arrayed against Taiwan, then China could be strongly motivated to develop anti-satellite weapons capable of neutralizing the U.S. early-warning infrared surveillance satellites in geosynchronous orbit designed to detect the hot plume of missiles during their boost phase of launch. Such satellites could play an important role in cueing U.S. ballistic missile interceptors. Such a Chinese anti-satellite capability could help relieve pressure on Chinese decision-makers to mount a preemptive nuclear strike meant to overwhelm the U.S. defenses. An effective Chinese anti-satellite weapon, particularly one armed with a conventional warhead, would offer a credible strategic alternative to a Chinese nuclear offensive, and could thus work to delay a nuclear decision. Nuclear risk is lower at this stage in the interaction.

But while a conventional anti-satellite capability would work to raise the nuclear threshold for Chinese decision-makers, the program would motivate the United States to develop new disruptive technologies to suppress Chinese anti-satellite weapons on their launch pads. One such technology would be a hypersonic glide vehicle armed with a conventional warhead and capable of reaching and destroying a Chinese launch site soon (within one hour) after detecting Chinese preparations to loft its anti-satellite weapon into space. Absent the availability of such a U.S. hypersonic system (the situation today), the United States might assign Guam-based B-2 stealth bombers armed with conventional weapons to strike Chinese launch pads, but rapid Chinese advances in air defenses (disruptive!) have presumably compromised the B-2's chances of penetrating these defenses, possibly to the point that U.S. confidence in this mission has greatly declined. As a result, the United States currently de-

pends on U.S. offensive ballistic missiles armed with nuclear warheads for an option to destroy promptly (within one hour after launch) Chinese launch pads before anti-satellite weapons can lift off. Nuclear risk rises at this stage.

In this scenario, the combination of disruptive systems on both sides has the effect of raising the nuclear threshold for Chinese decision-makers, but lowering it for U.S. decision-makers. The situation is unstable and also fraught with possibilities for unintended consequences. For instance, if a Chinese anti-satellite weapon demolished the U.S. early-warning satellite parked over the Indian Ocean in geosynchronous orbit, then the United States would lose the key satellite used to monitor Russian as well as Chinese nuclear missile launches. Blinded in one eye, the United States would depend almost entirely upon ground radar for missile attack early warning (as Russia does today). And given U.S. reliance on launch-on-warning (see discussion below), the risks of mistaken launch on false warning would therefore increase. Cyber attack on the early warning system could further degrade its performance and exacerbate the problem of inadvertent nuclear launch.

A grasp of these synergies in geopolitical context is essential in order to develop new tools that actually strengthen rather than undermine crisis stability, reduce nuclear risk, and reinforce rather than undercut the utility of de-alerting measures.

VI. ESCALATION: SPECIFIC RISK FACTORS AMONG THE WORLD'S NUCLEAR POSTURES¹²

The specter of an unmanageable crisis escalating to nuclear dimensions also stems from a host of specific risk factors associated with the nuclear postures of the many countries that possess and operate nuclear forces. This commission concludes, once again, that these risks are trending in the wrong direction. Of particular concern is a trend toward fast-reaction postures – the bane of nuclear crisis management. Paradoxically, nuclear weapons are becoming more

¹² This section draws heavily upon the nuclear program descriptions for each country found in the appendix.

physically useable despite the steady erosion of their military utility.

A. PREVALANCE OF FIRST-USE DOCTRINES AND BROAD REJECTION OF “SOLE PURPOSE”

Several countries have made calculated decisions to lower the threshold for the intentional employment of nuclear weapons. They justify this as necessary to preserve their national sovereignty in the face of existential threats. Russia and Pakistan are especially inclined to employ nuclear weapons first during a conventional conflict. In the context of possible global conflict between Russia and the United States (and/or NATO), Russia relies on them to offset its conventional inferiority. In the recent past, Russia also viewed such weapons as useful in conducting regional warfare against a superior conventional adversary. This regional contingency called for “de-escalatory escalation,” which would unleash tens to hundreds of nuclear weapons (all or mostly tactical weapons) in a first strike meant to shock the adversary into standing down.¹³ Pakistan plans to confront Indian conventional incursions across its border with a barrage of nuclear explosions delivered by tactical missiles deployed some tens of miles inland from the border.

While China and India formally pledge not to be the first side to use nukes in a conflict, they attach a number of qualifications (see discussion below). In proclaiming no-first-

13 The current role of this novelty in Russian nuclear plans is unclear. It originally appeared in Russian military doctrine in 2000. It is akin to Cold War era U.S.-NATO nuclear first use plans meant to establish “escalation dominance.” The basic perennial formulation of Russian nuclear first-use doctrine, taken from the latest document on Russian military doctrine, is that: “The Russian Federation reserves the right to utilize nuclear weapons in response to the utilization of nuclear and other types of weapons of mass destruction against it and (or) its allies, and also in the event of aggression against the Russian Federation involving the use of conventional weapons when the very existence of the state is under threat.” The most plausible scenario in which conventional aggression in a regional context could threaten Russia’s existence is a losing war with China and the looming loss of territories in Siberia and the Far East. See *Russia And The Dilemmas of Nuclear Disarmament*, eds. Alexei Arbatov, Vladimir Dvorkin and Sergey Oznobishchev, (Moscow: IMEMO RAN, 2012), <http://www.imemo.ru/files/File/en/publ/2012/12009a.pdf>, p. 60.

use, they are alone among the nuclear weapons countries. The others eschew no-first-use doctrine, reserving the right to resort to nuclear firepower to deal with a wide range of non-nuclear situations including chemical, biological, and conventional threats. The others also keep open the option to initiate the use of nuclear weapons against opposing nuclear forces in preemptive or preventative strikes. None of these countries are seriously considering adopting the position that the sole purpose of nuclear weapons is to deter their use by others. This implies a belief, which this commission regards as a fallacy, that escalatory control can be exercised during a nuclear conflict. In the commission’s view, the use of tactical or strategic weapons would set in motion an uncontrollable chain reaction.

B. BROAD TRENDS TOWARD INCREASING ALERT STATUS

All the countries possessing nuclear weapons today are investing heavily, or planning to do so, in modernizing their forces and making them more responsive.¹⁴ Besides fielding new types of weapons, and dispersing them more widely, they are also shortening the time needed to employ them. While the United States and Russia established rapid-reaction postures for their nuclear forces a long time ago, the others appear to be following – albeit gradually and cautiously – in their footsteps in diversifying and dispersing nuclear forces on ever-higher states of alert. At the present time, however, they remain on low alert and provide ample time for decision-making in a crisis.

For 50 years, China has been a model of nuclear restraint. Practically its entire modest arsenal (estimated at 150 warheads and bombs) is concentrated at a single storage complex at Taibai (so-called “Base 22”).¹⁵ China is evidently 100

14 Appendix E contains detailed information on current and programmed nuclear forces for all of the countries.

15 This paragraph draws on Mark A. Stokes, *China’s Nuclear Warhead Storage and Handling System*, Project 2049 Institute, March 12, 2010, http://project2049.net/documents/chinas_nuclear_warhead_storage_and_handling_system.pdf. See also Ian Easton and Mark Stokes, *Half Lives: A Preliminary Assessment of China’s Nuclear Warhead Life Extension and Safety Program*, Project 2049 Institute, July 29, 2013, <http://>

percent de-alerted, although China's opaque nuclear posture leaves room for doubt. A small number of warheads may be forward deployed in a dismantled state at the six main land-based missile bases of the Chinese 2nd Artillery, the central nuclear command organization of the Chinese People's Liberation Army (PLA).

The time required to generate these forces to launch-ready status is lengthy. Warheads would need to be transported by rail or road – or by air in emergencies – considerable distances (typically many hundreds of miles) to rendezvous and mate up with delivery systems at the main missile bases, at hidden locations near these bases (if mobile missiles had already been dispersed out of garrison during a crisis), at the main heavy bomber base at Datong, and at the main submarine base at Qingdao.¹⁶ Transportation and uploading would take days to achieve an initial operational capability and weeks to complete the mating for the entire force of land missiles, bombers and submarines.

China thus runs minimal peacetime risks of mistaken, hasty or unauthorized launches, accidents, weapons falling into the hands of terrorists during transportation, or rapid escalation to their deliberate use in a crisis. The surging of forces to high combat readiness in a crisis would of course run significantly higher risks. As a leading Western expert puts it:

A preliminary examination of China's nuclear warhead storage and handling system indicates that Beijing takes security and safety seriously. With the bulk of its nuclear warhead stockpile nestled deep in secure mountain palaces, the 22 Base's physical protection system appears to be founded upon more than "guns, gates, and guards." In fact, in defending against real and perceived threats, Taibai may be one of the most secure warhead stockpile facilities in the world. However,

er, with warheads most vulnerable to theft or accident during transportation, the system's reliance on mobility creates opportunities for incidents and terrorist action.¹⁷

China's restraint may not last for long. It is deploying its first strategic submarine as well as new land mobile rockets. China's nuclear leadership may well want to improve the survivability of these forces by putting them on higher alert, sending at least some of them out on patrol armed with warheads, or at least pre-positioning nuclear payloads at forward locations in peacetime (e.g., naval facilities near submarine pens) to streamline the uploading of weapons to delivery platforms in crisis circumstances.

Marrying up warheads to land-mobile rockets or to strategic submarines presupposes high Chinese confidence in their safeguards against unauthorized launch. It must be presumed that China's technological prowess in the areas of electronic locking devices and cryptology is sufficiently advanced that it could install strict if not fool-proof safeguards on the weapons themselves (so-called "permissive action links") and on the delivery and command-control systems (so-called "coded switch devices"). Soviet strategic forces were mated up in the late 1960s after Soviet leaders grew confident in the integrity of the technical safeguards devices installed on their forces. China can be expected to follow this pattern. China's forces in fact may be already undergoing this transition to higher readiness under tight central command and control. Given that centralization is a hallmark of its political culture, China's national leadership and its General Staff will presumably retain the keys to the kingdom – the authorization and unlock codes, and perhaps the target coordinates – until a launch decision has been made at the pinnacle of national command. If the centralized Russian system is any guide to Chinese thinking on the question of nuclear command and control, launch authority will not be pre-delegated very far down the chain of command. (By contrast, the United States took the risk of decentralizing and pre-delegating a great deal of launch

project2049.net/half_lives_china_nuclear_warhead_program.pdf.

¹⁶ See Li Bin's discussion of mobile missile operations in "Tracking Chinese Strategic Mobile Missiles," *Science and Global Security*, Vol.15, 2007, pp.1-30.

¹⁷ Stokes, *China's Nuclear Warhead Storage and Handling System*, op. cit., p. 11.

authority during the Cold War.)

China's latest defense white paper not surprisingly indicates a departure from the previous one in expressing more interest and intention to shorten the reaction time of its forces.¹⁸ It may thus seek also to outfit the Chinese president with a nuclear suitcase in order to expedite launch authorization, just as the Russian and U.S. presidents are outfitted. In furtherance of this mindset, China is developing an early warning satellite network that could support a policy of launch on warning within the next decade. In short, China's nuclear operations tempo appears to be quickening, and the attack readiness of its forces appears to be trending upwards.

China's strategic path is guided by intelligent and stabilizing architecture, however. Its guide stars are: (i) low reliance on nuclear weapons; (ii) increased survivability through mobility, hardness, and location uncertainty (road-mobile missiles and some warheads inside hard tunnels, and submarines in hidden tunnel pens); (iii) immunity to capture, theft, and use (central warhead storage); and (iv) increased decision time (no first use; aversion to prompt launch; emphasis on second-strike retaliation; and post-launch flexibility to maneuver, divert, or abort based on re-entry vehicle terminal surveillance and terminal guidance). When fully implemented, this architecture could put decision-makers in the loop until the last minute of missile flight and allow warheads to be diverted or "safed" during the post-launch phase of plan execution. It would also create targeting efficiencies that reduce the size of the stockpile. In general, the Chinese model is an exemplar of smart architecture for the rest – including the United States and Russia – to emulate.

India, too, has been a model of restraint since its first nuclear weapon test in 1998, building nuclear weapons at a snail's pace and – under exclusive and tight central direction from the civilian leadership – taking graduated steps toward standing up a cohesive, trained operational force ready for

prime time. India's arsenal of approximately 110 weapons is sized for a static deterrent requirement that is nearly insensitive to the nuclear programs of China and Pakistan. Like them, India is 100 percent de-alerted in peacetime.

India's nuclear posture is problematic, however, in that it has not yet achieved a high level of operation cohesion. Inadequate training and experiential learning through exercises, and other deficiencies, bode ill for safety, security, and performance should India generate its forces to combat status during a crisis.¹⁹

The nuclear military is highly subordinate and deferential to the political leadership, to the point of exerting very little initiative in establishing functional nuclear command, control, communications links for directing the forces to coherent national purposes in crisis or wartime, and generally in preparing to conduct nuclear operations. Since the civilian leadership attaches low priority to these matters (although the Indian prime minister has a nuclear suitcase for emergency authorization of nuclear release), the operational side of India's nuclear force is lackluster and may be prone to high rates of accidents and other dysfunctions if India ordered a general mobilization of these forces.

India is commissioning its first strategic submarine this year (2015), rounding out a triad of nuclear weapons on land, air, and sea – and change is afoot. Its nuclear establishment is pressing hard for India to snap out of its readiness doldrums and invest serious effort and resources in "operationalizing" its arsenal. This would mean priming the weapons and the command system for rapid operations in peacetime, crisis, or war. Retired Vice Admiral Verghese Koithara, a member of this commission, has sketched out the managerial architecture needed to stand up the Indian nuclear forces as a functional operation. He does not foresee the need for high attack readiness under normal circumstances, however.

The contours of "operationalization" are shaping up along

¹⁸ See China, Ministry of National Defense, *The Diversified Employment of China's Armed Forces* (Beijing: Information Office of the State Council of the People's Republic of China, 2013); and China, Ministry of National Defense, *China's National Defense in 2010* (Beijing: Information Office of the State Council of the People's Republic of China, 2011).

¹⁹ The definitive study of India's inchoate nuclear operational posture is Verghese Koithara, *Managing India's Nuclear Forces* (Washington, D.C.: Brookings Institution Press, 2012), p. 147.

the following lines:

Regarding nuclear weapons storage in peacetime, all are kept disassembled under the custody of non-military departments, primarily the Department of Atomic Energy (DAE).²⁰ Some warheads and bombs are “near-mated” and final assembly could be accomplished in short order. The majority of weapons have two separated parts: the nuclear core (i.e., the plutonium pit) and the non-explosive assembly. A small number in the Indian stockpile have these parts conjoined as “sealed pit warheads.”²¹ The delivery vehicles – aircraft and missiles – in all cases are located at military bases removed from the warhead storage sites.

India's nuclear planners have produced a “Red Book” for nuclear crisis and war, which defines roles and responsibilities for each nuclear commander at each stage of a confrontation and conflict.²² Planners established a four-stage ladder of readiness (from lowest, or fourth stage, to highest, or first stage):

4. Arming the weapon.
3. Dispersing the armed weapons to avoid destruction by a counterforce first strike.
2. Mating of the weapon to the delivery system/launcher.
1. Turning control of the ready-to-use weapon to the military user.

In a crisis warranting an increase in nuclear attack readiness, the weapons would be flown by helicopters and airplanes to airbases and missile garrisons where they would marry up with the warplanes and missiles.²³ Non-military personnel from DAE or other agencies would apparently accompany this transfer and at some stage in the mating process they

would unlock the weapons to enable them to be employed by India's armed forces upon the latter's receipt of the strike order. Unlike Russia and the United States, and possibly China, India evidently does not have the ability to transmit these codes directly by electronic means from the national command centers to the forces. It is a more labor-intensive process.

The time required to mobilize the nuclear forces and generate them to maximum attack readiness would be measured in days and weeks. Once they are readied for combat at a high level of alert, very few steps, such as unlock code insertion, would be needed to fire them. At this high level of alert in the field, the goal of Indian nuclear doctrine is to be able to fire them within about 30 minutes, and no more than one to two hours.²⁴

India's subscribes to a no-first-use policy that is somewhat more conditional than is commonly known. Two qualifications merit highlighting: (i) nuclear weapons can be used in retaliation to a nuclear attack on Indian territory or on Indian forces anywhere, and (ii) India retains the option of nuclear retaliation to a major biological or chemical weapons attack against India or Indian forces.²⁵

After the Mumbai massacre in 2008, India devised a new plan for rapid, limited conventional operations in response to terrorist attacks. The so-called “Cold Start” strategy, which aims to enable India to insert forces into Pakistan in 72-96 hours, enjoys strong military support but unenthusiastic political support. This skepticism stems in part from Pakistan's threat to use tactical nuclear weapons against Indian forces participating in “Cold Start” operations. In order to combat the Pakistani notion that its limited use of nuclear weapons would not trigger a full-scale nuclear war, India has threatened massive nuclear retaliation to any

²⁰ Ibid.

²¹ Ibid.

²² This paragraph draws on Bharat Karnad, *India's Nuclear Policy* (Westport, CT: Praeger Security International, 2008), p. 99.

²³ This paragraph draws on Koithara, *Managing India's Nuclear Forces*, op.cit., pp. 147-48.

²⁴ Jasjit Singh, *Reshaping Asian Security* (Ann Arbor, MI: Knowledge World, June 1, 2001), p. 149 as quoted by Verghese Koithara, *Managing India's Nuclear Forces* (Washington, D.C.: Brookings Institution Press, 2012), p. 147.

²⁵ Rajesh Rajagopalan, “India's Nuclear Policy,” in *Major Power's Nuclear Policies and International Order in the 21st century* (Tokyo: National Institute for Defense Studies, 2010), p. 100.

nuclear attack on any scale.

Regarding the nuclear chain of command, the Strategic Forces Command (SFC), headed by a senior officer from the Indian Army, Air Force or Navy on a rotational basis, commands the land-based missile forces. Naval and air force units are dual-capable (configured to employ either nuclear or conventional armaments) and remain in the parent service until a crisis arises, at which time they “chop” (transfer over) to the SFC and receive specific nuclear missions and targets.

The prime minister authorizes their use through the National Security Council. The deputy prime minister or a Cabinet minister may assume this authority as a successor in the event of the prime minister's incapacitation during conflict. Approval of use passes down to the chairman of the Chiefs of Staff Committee, and then to the Commander in Chief of the Strategic Forces Command, which is responsible for the deployment, targeting, and employment of nuclear forces. A two-man rule for arming and launching nuclear weapons and a system of firing codes and electronic interlocks have been put in place to enhance security at lower levels in the chain of command. In the event of a decapitating nuclear strike that wipes out the top leadership, commanders in the field reportedly can take matters into their own hands and retaliate at their own discretion.²⁶

As India “operationalizes” its nuclear forces, it is improving the resilience and reliability of nuclear control, but it still needs to substantially strengthen both positive control (the capability to survive and carry out wartime missions) and negative control (the capability to prevent accidental, unauthorized, or inadvertent use). And India needs to locate and strike an appropriate balance between positive and negative control. Meanwhile, the Indian nuclear posture carries risk. It is not as survivable, stable, and controllable as it needs to be. Its virtues bear noting, however. It provides for a low level of alert, relatively ample warning and decision time,

26 Kanti Bajpai, “India and nuclear weapons,” in *Routledge Handbook of Indian Politics*, ed. Atul Kohil and Purna Singh (Oxon, England: Routledge, 2013), p. 34.

and growing survivability.

Similar pressures for “operationalization” are building in Pakistan, which like India normally keeps its 100 or so nuclear weapons disassembled and separated from the missiles and planes that would deliver them in wartime. In a crisis both countries will come under pressure to assemble and mate the weapons to their delivery platforms, and move them to forward locations.

The Pakistani nuclear posture suffers from many of the same deficiencies as India's posture. It has a long way to go to establish adequate positive and negative control. And gearing nuclear operations to early first-use is destabilizing. In short, Pakistan's nuclear posture carries excessive nuclear risk.

The contours of Pakistan's emerging nuclear “operationalization” are described below.²⁷

Regarding their peacetime storage, Pakistan's nuclear weapons, like India's, are kept unassembled and separated from the non-nuclear explosives as well as from their delivery vehicles, but it is believed Pakistan could assemble them quickly. Only the Strategic Plans Division (SPD) is responsible for carrying out mating procedures, readying the system for launch and firing the missiles.

After the attacks on September 11, 2001, Pakistan's military relocated nuclear weapons components to new sites and re-deployed the arsenal to at least six secret locations. Pakistan has also implemented various security measures to safeguard against unauthorized or accidental use, and theft,²⁸ including:

- Layers of concentric tiers of armed forces security personnel guarding nuclear weapons facilities;

27 See Zia Mian, “Commanding and Controlling Nuclear Weapons,” *Controlling the Bomb*, ed. Pervez Hoodbhoy (Oxford: Oxford University Press, 2013), pp. 204-36.

28 Shaun Gregory, “The Terrorist Threat to Pakistan's Nuclear Weapons,” *CTC Sentinel*, Combating Terrorism Center at West Point, vol. 2 issue 7, July 2009, <https://www.ctc.usma.edu/v2/wp-content/uploads/2010/06/Vol2Iss7-Art1.pdf>

- Intrusion detectors and physical barriers;
- Separation of warhead cores from their detonation components;
- Storage of components in protected underground sites;
- Institution of PAL-like authenticating code systems;
- Internal security undertaken by a large security force vetted through a system akin to the U.S. Personnel Reliability Program;
- “Cradle-to-grave oversight” applying to all engineering, scientific, and military personnel;
- Two-person rule within the army in which no action involving a nuclear weapon can be undertaken by fewer than two people (firing may require three people); and
- Dummy missiles to complicate adversarial military calculations.

According to a 2009 report, Pakistan locates much of its nuclear weapons infrastructure to the north and west of the country and many of the sites are close to or within Taliban and al Qaida dominated areas.²⁹ However, no nuclear weapons are stored in the area of Taliban activity, and the SPD has a 25,000-person security force and specially trained rapid-reaction forces to strengthen nuclear security. Views differ on the question of jihadist influence within the Pakistani army and the possible subversion of the nuclear establishment.³⁰ However, the army today seeks to dissociate

29 Ibid.

30 Zia Mian and Pervez Hoodbhoy argue that religion has divided into two armies: one is a national army that sees Islam as part of Pakistani cultural identity, the other believes it is God's army and that the state and Islam are inseparable. The authors believe that this division may have even trickled down to the Strategic Plans Division (see Pervez Hoodbhoy and Zia Mian, “Pakistan, the Army and the Conflict Within,” Middle East Research and Information Project, July 12, 2011, <http://www.merip.org/mero/mero071211>.) Shuja Nawaz argues that Pakistan's military realizes the need to provide security for the populace, but is ill-equipped to deal with the already difficult-to-police militants. The army is unprepared for war with India and unprepared to meet the challenges posed by internal insurgencies. He believes the army needs to be transformed from a “lumbering giant” to a “leaner and highly mobile force” in order to provide security to Pakistanis and isolate insurgents. (Shuja Nawaz, *Crossed Swords: Pakistan It's Army and the Wars Within*, Oxford: Oxford University Press, 2008.) Christine Fair argues that the behavior of Pakistan's army is based on a fear of Indian hegemony in the region. Pakistan's army has worked to limit Indian and Russian influence in Afghanistan, supported terrorism against India, and sought alliances

itself from terrorists.

Pakistan retains a first-use option as a counterweight to India's superior conventional forces, but officials have stated that nuclear weapons will be used only as a last resort. As earlier noted, India's Cold Start doctrine instigated Pakistani plans to develop and deploy tactical nuclear weapons for limited use on the battlefield. These weapons – primarily short range missiles – and their infrastructure would need to be forward deployed in peacetime in order to be effective. Pakistan, however, has yet to move battlefield weapons into forward positions and reports on the Pakistani nuclear arsenal continue to describe it as stored and de-mated.

Other key elements of Pakistan's nuclear war plans were revealed by the remarks of the SPD's head, General Khalid Kidwai, to private researchers (Pakistani officials later called General Kidwai's remarks neither an official statement nor a precise summary of nuclear use policy):

“Nuclear weapons are aimed solely at India. In case that deterrence fails, they will be used if India attacks Pakistan and conquers a large part of its territory; India destroys a large part either of its land or air forces; India proceeds to the economic strangling of Pakistan (i.e., naval blockade and stopping of the waters of the Indus River); or India pushes Pakistan into political destabilization or creates a large scale internal subversion in Pakistan.”³¹

Who decides when to cross the nuclear Rubicon? A troika

with the United States. and China among others strictly as a result of this fear. Fair argues that this strategic climate in Pakistan will not change because of the prevalence of military culture based in the two-nation theory and the ideology of Islam. [C. Christine Fair, *Fighting to the End: The Pakistan Army's Way of War*, (Oxford: Oxford University Press, May 27, 2014).]

31 Paulo Cotta-Ramusino and Maurizio Martellin, “Nuclear safety, nuclear stability and nuclear strategy in Pakistan,” January 21, 2002, <http://www.centrovolta.it/landau/content/binary/pakistan%20Januray%202002.pdf>.

of officials, reportedly. According to a senior Pakistani military official, the control of the nuclear arsenal is governed by a “three-man rule.”³² Any decision regarding the use of nuclear weapons requires the concurrent agreement of three persons: the president, the prime minister and an unidentified third person.

The SPD, which serves as the secretariat for these national command authorities, gives the Pakistani military a key role in managing nuclear operations. It has instituted a two-man rule and procedures for unleashing the forces. A senior Pakistani official has been quoted as saying that although final operational control of tactical nuclear arms resides in military hands, “The basic control remains with the civilian leadership, in consultation with the military commanders. And the usage will be controlled at the highest level, even if the smallest device in the smallest numbers has to be used.”³³

This centralization could unravel, however, if Pakistan proceeds to deploy battlefield nuclear weapons to counter India’s Cold Start plans. Battlefield nuclear weapons at forward positions require local commanders to have considerably more authority and capability to arm and launch nuclear weapons than other types of weapons require. Former SPD officials have warned that tactical nuclear weapons might force Pakistan to rethink centralized control over nuclear weapons and lead to pre-delegation.³⁴ A case could be made for devolving nuclear release authority to the level of corps commanders at an early stage of a crisis.

Given these trends toward decentralization, given both Pakistan’s and India’s lack of prior experience in managing nuclear forces on high alert, given the rapid growth in the size of their arsenals, given Pakistan’s strategy of early first

use, and given flight times of just a few minutes between the neighboring countries, the risks of nuclear weapons use in the region during a crisis are too high for comfort. Escalatory updrafts would blow strongly toward deliberate or unintentional use culminating in a large-scale nuclear exchange. Such a war would be cataclysmic not only for South Asia but the entire world.³⁵ The region’s vulnerability to nuclear terrorism contributes further volatility. Crisis dispersal of nuclear weapons in this part of the world increases their exposure to terrorist capture. The use of such a weapon against a major city like Mumbai could too easily set in motion a train of events that bring India and Pakistan to the brink of nuclear war.

North Korea is verging on a rudimentary capability to deliver a handful of nuclear weapons to targets in the vicinity of the Korean peninsula. While it is reportedly making headway in miniaturizing nuclear warheads to fit atop its missiles, existing missiles already have adequate space in their nosecones to carry crude nuclear fission bombs to targets as far away as Japan. North Korea’s small arsenal of 10-16 fission bombs, which may grow to 20-100 by 2020, probably could be married to some form of delivery vehicle – aircraft, ship, or land-based rocket – within a few days of a decision authorizing it. If and when this arming occurs, a nuclear disaster will be waiting to happen in, on, and around North-east Asia. North Korea increasing its attack readiness to the point of being able to strike quickly would be highly destabilizing and would bring the region to the brink of nuclear use by design or accident.

Doubts about the mental competence and balance of North Korea’s erratic ruler, Kim Jong Un, and his team call into serious question the standard assumption that nuclear deterrent forces are always under the control of rational individuals.

32 Hans Born, *National Governance of Nuclear Weapons: Opportunities and Constraints*, Geneva Centre for the Democratic Control of Armed Forces, 2007, pp. 13-14.

33 Elaine M. Grossman, “Pakistani Leaders to Retain Nuclear-Arms Authority in Crises: Senior Official,” *Global Security Newswire*, February 27, 2014, <http://www.nti.org/gsn/article/pakistani-leaders-retain-nuclear-arms-authority-crises-senior-official/>.

34 Ibid.

35 The global climatic and humanitarian effects of nuclear war are discussed in Department for Disarmament Affairs, *Study on the Climatic and Other Global Effects of Nuclear War*, New York: United Nations, 1989; Alan Robock, “Consequences of Nuclear Conflict: Nuclear Winter Still a Threat,” (presentation at the Second Conference on the Humanitarian Impact of Nuclear Weapons, Nayarit, Mexico, 2013); Michael J. Mills, “Global Famine after a Regional Nuclear War: Overview of Recent Research,” (presentation at the Third Conference on the Humanitarian Impact of Nuclear Weapons, Vienna, Austria, 2014).

In reality, national command authorities with fingers on the nuclear button are fallible, and some are quite susceptible to bouts of irrational, reckless, and even delusional behavior. Leader Kim is not exceptional in this respect. There have been many occasions in which the top leaders and senior commanders entrusted with responsibilities for authorizing the use of nuclear weapons would not have passed the stress tests of their own nuclear personnel reliability programs – standards of sobriety, physical and mental health, etc. During a protracted crisis, the entire chain of command may slide into a degraded state from sleep deprivation and exhaustion alone.

Israel's nuclear status is opaque and speculative.³⁶ Unofficial sources indicate that Israel has established a survivable and firmly controlled nuclear arsenal that it keeps at a low level of alert. But a trend toward stepping up the responsiveness of sea-based forces may be underway. According to some reports, Israel is deploying strategic submarines into the Persian Gulf that are capable of launching nuclear cruise missiles.³⁷ Depending on evolving threats in the region – and, particularly, the outcome of the P5+1 negotiations with Iran – Israel may establish regular nuclear-armed sea patrols in the future.

France and the United Kingdom and each keep their arse-

³⁶ Israel runs its nuclear program under a thick veil of secrecy, a policy said to be reflective of an understanding forged 40 years ago between President Nixon and Prime Minister Meir. David Stout, "Israel's Nuclear Arsenal Vexed Nixon," *New York Times*, November 29, 2007, <http://www.nytimes.com/2007/11/29/world/middleeast/29nixon.html>.

³⁷ From what fragments of unofficial data are publicly available, a current priority of the Israeli program is to acquire a fleet of 5-6 submarines capable of firing nuclear-armed cruise missiles, and stationing three of them in the Persian Gulf to project a nuclear threat at Israel's current and only nuclear-capable adversary, Iran. (Uzi Mahnaimi, "Israel stations nuclear missile subs off Iran," *The Times [Sunday Times]*, May 30, 2010, <http://www.timesonline.co.uk/tol/news/world/europe/article7140282.ece>; "Report: Israel to deploy nuclear-armed submarines off Iran coast," *Haaretz*, May 30, 2010, <http://www.haaretz.com/news/diplomacy-defense/report-israel-to-deploy-nuclear-armed-submarines-off-iran-coast-1.293005>.) The latest models of these boats and their weapons systems run into the billion-dollar range for each, though Germany has absorbed a substantial portion of the costs. According to unofficial sources, Israel also possesses aircraft and land-based ballistic missiles capable of delivering nuclear weapons.

nals on a low level of alert in peacetime – except for one submarine (out of the four in each country's fleet) that each keeps on routine patrol at all times on an alert status that is variable. At any given moment, the U.K. submarine may be days, hours, or minutes from the next regularly scheduled deployment of a receive antenna to check for orders from higher authority.³⁸ During a crisis, this schedule would doubtless become more frequent if not continuous. French submarine communications practices and launch readiness are believed to be similar. Also, both France and the United Kingdom normally maintain a back-up strategic submarine in port that can be readied and surged to sea on fairly short notice (approximately 1-2 days) in the event of a serious crisis.

C. GROWING SAFETY AND SECURITY CONCERNS; STRAINS ON COMMAND AND CONTROL

Taking steps toward advanced operational readiness puts additional strain on the ability of command systems to keep nuclear weapons under firm control. It increases the risks of an accident that produces a full-yield nuclear detonation, and the risk of terrorist capture. Security against terrorism declines the moment nuclear weapons are taken out of storage and dispatched to the field to assume combat alert.

Most of the countries possessing nuclear weapons appear to be more than a decade behind the United States in terms of safety and safeguards – lagging in areas like one-point safety for warheads, insensitive high explosives used as triggers for implosion, locking devices integrated with the inner workings of warheads, and personnel reliability programs.

³⁸ France has kept its missile submarines at sea on modified alert, and the United Kingdom 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*, London: Stationary Office, June 1998.) The information on the French SSBN modified alert posture is based on personal communications with a French military official.

As a result of this lag in safety standards, any increase in the attack readiness and operational tempo of their forces will incur increased risk of accidental detonations (as well as unauthorized detonations and terrorist capture). The early experience of the United States is instructive. During the growing pain years from 1950 until 1968, at least 1,200 U.S. nuclear weapons were involved in incidents of varying degrees of severity. The United States came close to disaster many times.³⁹

The accident records for recent years have not been fully declassified. One recently released list of so-called “Dull Sword” incidents shows that 1,500 reportable incidents involving U.S. Air Force nuclear weapons happened over the four-year period from 2009 to 2013.⁴⁰ They involved everything from mechanical failures of weapons or the equipment used in handling them, to lapses of security, to violations of nuclear weapon safety rules – intentional violations in some instances. The risk of a catastrophic accident will always hover above zero, and it increases as nuclear forces climb the ladder of alert readiness.

There have been a number of contemporary incidents that dramatically illustrate operational hazards. The most notorious of them occurred in 2007 when six nuclear cruise missiles were loaded by mistake onto a U.S. strategic bomber and flown across the country (from Minot AFB, North Dakota to Barksdale AFB, Louisiana). For more than a day, no one knew the payload was nuclear and no one knew the nukes went missing. Consequently, they were not guarded.

Soviet and Russian nuclear forces also have crashed and sunk on many occasions. Just three years ago, a Russian strategic submarine caught fire in dry dock with a full complement of nuclear-tipped ballistic missiles onboard.⁴¹ More recent-

ly, the Orel, a Russian nuclear submarine, caught fire while undergoing maintenance at a shipyard in Severodvinsk, although it was reported that no weapons or nuclear fuel were on board at the time.⁴²

Countries with a less advanced safety culture, far fewer resources, and lacking the technological sophistication of Russia and the United States are bound to run even higher risks of an accidental nuclear detonation, unauthorized use, or theft or seizure of weapons. These risks underscore the dangers posed by proliferation and nuclear terrorism. The risks are compounded by a growing insider threat in some of the nuclear countries. If jihadist sympathizers succeeded in infiltrating the armed forces of one of these countries, for instance, nuclear security could be significantly compromised, particularly since most nuclear security arrangements assume that insider collusion would not involve more than one person. That assumption needs to be revisited along with the two-man safety rule that stems from it. A three-man rule makes more sense in an era of extremism and cyber warfare (see next section).

Russia and the United States should more fully engage other nations’ nuclear establishments to share knowledge on matters of nuclear weapons safety and security. President Obama’s Nuclear Security Summits have set a precedent for this. So far the agenda of these summits has studiously concentrated on enhancing the security of civilian nuclear materials. It would be good to extend the discussion to nuclear weapons security, and command and control, and begin to define best practices in this arena.

D. CYBER WARFARE THREATS TO NUCLEAR COMMAND AND CONTROL

A new worry about nuclear command and control and missiles on high alert status is that they may be exploitable by cyber infiltrators. Questions abound: could unauthorized actors – state or non-state – spoof early warning networks

39 Eric Schlosser, *Command and Control: Nuclear Weapons, the Damascus Accident, and the Illusion of Safety* (New York: Penguin Books, 2013).

40 The full list of Dull Sword incidents can be accessed online at <http://speakingtruthtopower.org/DullSword.pdf>.

41 “Armageddon averted? Nukes ‘on board’ blazing sub,” *RT*, February 14, 2012, <http://rt.com/news/nuclear-sub-fire-missile-165>.

42 Anna Nemtsova, “Russian Nuclear Submarine Goes Up in Flames,” *The Daily Beast*, April 7, 2015, <http://www.thedailybeast.com/articles/2015/04/07/russian-nuclear-submarine-goes-up-in-flames.html>.

into reporting attack indications that precipitate overreactions? Could such hackers breach the firewalls, the air gaps, and transmit launch orders to launch crews or even to the weapons themselves? What if an insider colluded with them to provide access and passwords to the launch circuitry? Might they acquire critical codes by hacking?

Nuclear command systems today operate in an intense information battleground. As far back as a decade ago, more than 20 nations – including China, North Korea, Russia and the United States – had developed dedicated computer attack programs for planting viruses to disable, confuse, and delay nuclear command and warning processes in other nations.⁴³ Hacking operations of these sorts have since increased 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 U.S. Defense Department networks has surged into the thousands daily in peacetime. In 2012, NATO experienced over 2,500 “significant cyber attacks” against its systems, none of which evidently broke through.⁴⁴

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 decision-making. The potential for catastrophic consequences with computer-launched weapons on hair-trigger is clear. 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 may well be compromised.

Although by design the nuclear circuits are hermetically

sealed off with air gaps and firewalls, evidence is mounting that they are permeable. They are the Maginot Line of the 21st century. Wily and sophisticated cyber warriors can and do find ways to breach these electronic ramparts. Cracks in the firewalls appear upon close examination. For example, in the 1990s, a congressionally mandated investigation discovered an electronic back door to the naval broadcast network used to transmit launch orders to Trident strategic submarines on patrol in the Atlantic Ocean. An exploitable opportunity presented itself to outsiders or insiders: hack in and electronically seize and operate remotely the main radio transmission site (at Cutler, Maine) used for this purpose. The Navy took this discovery so seriously that it thoroughly revamped launch authentication procedures so that submarine crews would not immediately carry out launch orders received out of the blue.

This principle was not extended to the Minuteman crews because delay in launching the force during a bolt-from-the-blue surprise Russian attack would imperil their survival. Such a pre-condition ought to apply to all nuclear forces; procedures for validating launch orders should require forewarning and pre-alerting of the forces. The imperative of quick launch of vulnerable silo-based missiles has overridden this safeguard, however. This is another example of why these missiles carry relatively high nuclear risk compared to strategic submarines.

In 2010, U.S. Minuteman crews lost contact for an hour with a field of 50 silo-based missiles in Wyoming. Soon after contact was lost, the normally firewalled command and control system for these missiles was likely breached. In such situations (“LF Down”)⁴⁵, the missiles “assume” they have been cut off from their primary and secondary underground launch centers due to an attack that severed the links and destroyed the centers. After a timer expires a few minutes later, the missiles activate a radio antenna at each of the missile silos to receive launch signals from airborne launch centers sent

43 Estimates based upon Adam J. Hebert, “Information Battleground,” *Air Force Magazine*, Vol. 88, No. 12, December 2005, <http://www.afa.org/magazine/Dec2005/1205info.html>.

44 “The history of cyber attacks – a timeline,” *NATO Review Magazine*, <http://www.nato.int/docu/review/2013/Cyber/timeline/EN/index.htm>.

45 In the lexicon, silos are formally called “launch facilities,” and LF Down is shorthand for the loss of contact between the unmanned silos and their underground launch control centers. This control is normally maintained by underground cables connecting them. Silos and their launch centers are three to tens of miles apart.

to their airspace during an attack. During such a blackout of underground launch control and switch to airborne control, the opportunity exists for hackers to transmit signals directly to the missile receivers. If they are able to replicate the necessary codes (a tall feat that presumes insider collusion and/or other prior deep penetration of the computers used in nuclear command, control, and communications), then outsiders could hack into the circuits to inject the three short radio signal bursts needed to fire them – the target, arm, and launch commands. Another potential entry point to leap the air gap is the underground cabling network that interconnects the unmanned missile silos with the manned launch control centers. It may be possible to surreptitiously tap into these cables laid in trenches with a length of thousands of miles and thereby gain access to the actual conduits used for controlling and firing the missiles.

Very little is understood about the cyber threat to nuclear control. A group of top U.S. technical experts recently met to review nuclear safety and concluded “cyber security of nuclear command and control networks in the United States, Russia, and other states is of critical importance and warrants attention.”⁴⁶ A report by the Defense Science Board warned recently that the vulnerability of the U.S. nuclear command system to cyber attack has never been fully assessed.⁴⁷ Two years ago, the head of all U.S. nuclear forces acknowledged that a comprehensive review of the vulnerability of the U.S. nuclear command system to cyber attack still needed to be done, noting, “we don’t know what we don’t know.”⁴⁸ A recent report by the director of oper-

46 Pierce Corden, et al., *Summary Report: Workshop on U.S. Nuclear Weapons Safety and Security, December 12, 2012*, Post conference report of the American Association for the Advancement of Science’s Center for Science, Technology, and Security Policy and Union of Concerned Scientists, September 2013, <http://www.ucsusa.org/sites/default/files/legacy/assets/documents/nwgs/nuclear-safety-security-workshop.pdf>.

47 U.S. Department of State, *Task Force Report: Resilient Military Systems and the Advanced Cyber Threat*, report of the Defense Science Board, Washington, D.C., July 2013, <http://www.acq.osd.mil/dsb/reports/ResilientMilitarySystems.CyberThreat.pdf>, p. 42.

48 Senate Armed Services Committee, *U.S. Strategic Command and U.S. Cyber Command in Review of the Defense Authorization Request for Fiscal Year 2014 and the Future Years Defense Program: Hearing before*

ational tests and evaluation found in fiscal year 2014 that almost every U.S. weapons program tested showed “significant vulnerabilities” to cyber attacks.⁴⁹

China and Russia undoubtedly have similar cyber vulnerabilities, but we know even less about them. Could these countries prevent a cyber attack from launching their missiles? The U.S. general in charge of Strategic Command testified that he didn’t know.⁵⁰

In all likelihood, cyber warfare in this domain mainly threatens to cause massive disruption. It seems more plausible that cyber attack could shut down computers and turn the weapons into “bricks,” preventing authorized launch rather than triggering unauthorized launch. But given so many unanswered questions and our weak comprehension of this cyber threat, we have yet another reason for concern about strategic missiles on high alert and about trends among the other nuclear weapons countries toward increased attack readiness of their nuclear forces. If we cannot fully assess the risks, it would seem prudent to keep nuclear missiles off of high alert status at all times. This would be a sure-fire way to mitigate foreseeable risks as well as those that have not yet been imagined.

the Committee on Armed Services, 113th Cong., 1st sess., March 12, 2013, p. 202.

49 Andrea Shalal, “Nearly every U.S. arms program found vulnerable to cyber attacks,” *Reuters*, January 20, 2015, http://www.nytimes.com/reuters/2015/01/20/technology/20reuters-cybersecurity-pentagon.html?_r=0.

50 Col. (Ret.) Valery Yarynich, the lead systems integrator for the Russian “Perimetr” (Dead Hand) system that partially automated Russian strategic retaliation to an attack that decapitates the Russian top leadership, reviewed the main Russian strategic nuclear command and control networks and raised dozen of questions concerning avenues for unauthorized launches by insiders or outsiders. He recommended that U.S. and Russian experts dig into these issues in a track II non-governmental collaboration that would hopefully evolve into a track I governmental process. Cohesive and invulnerable nuclear command systems immune to cyber attack are critical to preventing the accidental, mistaken, or unauthorized use of nuclear weapons. Therefore, a full-scale thorough review of the cyber security of all nuclear networks to identify and remove cyber threats that could compromise the integrity of these networks is absolutely essential.

E. THE SPECTER OF NUCLEAR CONFRONTATION BETWEEN RUSSIA AND THE UNITED STATES⁵¹

Tension between Russia and the West over the Ukraine crisis has brought the parties one step closer to the precipice of nuclear brinkmanship, the point at which nuclear risk skyrockets. It is then that leaders strike belligerent poses and become stubborn adversaries out to cow the opponent. The nuclear cudgel is brandished not only to deter but also to coerce or otherwise threaten the opponent's very survival. As traditionally practiced, the aim of such brinkmanship is to warn an adversary's leadership that it had best back down or not interfere or else face an escalating risk of nuclear war, caused not so much by premeditated aggression, as by events spinning out of control.

This tension is uncharacteristic of their post-Cold War partnership, but it has flared to the point that it is producing dangerous misunderstandings and action-reaction cycles with strong escalatory updrafts. Rightly or wrongly, the opposing parties view one another with growing suspicion. Russia sees aggressive encroachment by the West backed by forward deployment of NATO rapid reaction forces, missile defenses and active wartime contingency planning with Eastern European NATO allies. The West sees a Russian territorial grab and hears veiled nuclear warnings backed by intensified Russian strategic bombers operations and other unusual military activities.⁵² The situation has reached a point at which warplanes fly in international airspace with their transponders turned off, thus becoming invisible to

51 Scenarios of nuclear confrontation among other nuclear weapons countries are considered in a later section of this report.

52 President Putin revealed in a Russian state television documentary on Crimea that Russia was ready to put nuclear weapons on alert. ("Ukraine conflict: Putin 'was ready for nuclear alert,'" BBC News, March 15, 2015, <http://www.bbc.com/news/world-europe-31899680>.) For other instances of veiled nuclear threats, see Greg Botelho and Laura Smith-Spark, "Putin: You better not come after a nuclear-armed Russia," CNN, August 30, 2014, <http://www.cnn.com/2014/08/29/world/europe/ukraine-crisis>; Zachary Keck, "Russia Threatens Nuclear Strikes Over Crimea," *The Diplomat*, July 11, 2014, <http://thediplomat.com/2014/07/russia-threatens-nuclear-strikes-over-crimea>.

commercial flights crossing their paths. Close encounters between Russian and Western military aircraft have spiked.⁵³ NATO fighters have intercepted Russian aircraft hundreds of times this year. Russian warplanes are also engaged in muscular interdiction: for instance, a U.S. spy plane (RC-135) recently fled into Swedish airspace to escape close-in trailing by Russian fighters.

Accidents and spontaneous escalation seem almost inevitable. The situation is reminiscent of the early 1980s when Soviet fighters shot down a similar RC-135 spy plane probing Soviet territory in 1983 – or so they thought. Tragically, the plane turned out to be a Korean airliner that had strayed into Soviet airspace. (The United States has made similar tragic mistakes, such as the case of mistaken identity that resulted in a U.S. naval ship shooting down a civilian Iranian airliner in the 1980s resulting in extensive loss of innocent lives.)

This ersatz Cold War is far from a full-blown nuclear crisis, but it is a slippery slope. The stakes are high, and there are high-rolling risk-takers in the game. Deliberate or inadvertent escalation to a higher plane of nuclear threat is quite possible if the current situation worsens and Russia and the West remain at loggerheads. The situation is getting worse, and relations are increasingly adversarial. The belligerents are moving closer to the point at which events begin to spin out of control.

F. NUCLEAR WAR POSTURING: SELF-FULFILLING PROPHECY?

Preparing for nuclear conflict continues to be serious business on both sides. The U.S. spy plane chased into Sweden routinely probes Russian borders looking for holes in air defenses through which U.S. strategic bombers could penetrate to drop bombs on Russia during a nuclear war. The last U.S. nuclear weapon to explode in an all-out war would likely be a bomb dropped on downtown Moscow by a B-2 stealth bomber that had managed to worm itself through one of those holes. It would be the last of about 100 nuclear weap-

53 See appendix D.

ons assigned to hit greater Moscow in such a war today.⁵⁴

All of the nuclear weapons countries in fact are preparing dutifully for the unthinkable. And in doing so they risk causing it – by miscalculation or accident, inadvertent escalation, or sans authorization.⁵⁵ The risk becomes more acute in a crisis when war preparations become mutually reinforcing and zero-sum maneuvering accelerates.

The danger that nuclear war planning becomes a self-fulfilling prophecy is perhaps most evident in the high attack readiness of U.S. and Russian strategic missiles. Hundreds of them, armed with a total of nearly 1,800 warheads, can be launched in seconds or minutes, even in normal peacetime circumstances. Both sides are operating one-half of their strategic forces as though a virtual state of war exists.

Either side could issue the go-code triggering launch in an instant. For the United States, the go-code comes as a message that is the length of a tweet.⁵⁶ After validating the order, U.S. underground crews can fire all of their missiles in 60 seconds.⁵⁷ (Minuteman missiles are so named for a reason.) As many as approximately 450 Minuteman missiles each armed with a single high-yield warhead – for a combined yield of 150 megatons – could thus quickly depart their silos for their 30-minute flight to targets on the other side of the planet in China, Iran, North Korea, Russia and/or Syria.⁵⁸

54 Bruce G. Blair, “Lowering the Nuclear Threshold: The Dangerous Evolution of World Nuclear Arsenals toward Far-Flung Dispersal, Hair-Trigger Launch Readiness, and First Use Doctrines,” presented to the Vienna Conference on the Humanitarian Impact of Nuclear Weapons, Austria, December 8, 2014, http://www.bmeia.gv.at/fileadmin/user_upload/Zentrale/Aussenpolitik/Abruestung/HINW14/Presentations/HINW14_S2_Presentation_Bruce_Blair.pdf.

55 Ibid.

56 Ibid.

57 As an official document puts it, “The entire launch sequence (up to rocket ignition) takes less than 60 seconds. Normally, two LCCs (launch control centers) are required to ‘vote’ to execute a launch. A single-vote capability and the Airborne Launch Control Center (ALCC) provide back-up capability.” Hill AFB, Utah Ogden Air Logistics Center, “Minuteman Weapon System History and Description,” July 2001, p. 7.

58 Assumes 95% launch readiness/reliability.

Eleven minutes later, on the heels of Minuteman launch, U.S. Trident submarine missiles onboard the four to five Trident submarines routinely patrolling within their launch stations in the Northern Atlantic and Western Pacific (two to three in each ocean) in peacetime could be fired.⁵⁹ U.S. submarine crews can start the sequential firing of their missiles (24 per boat, each armed with four warheads on average) out of their launch tubes in 12 minutes. (It takes 12 minutes to spin up the gyroscopes on the submarine’s missiles, during which time all other launch preparations including leveling the boat at the proper depth can be completed.)⁶⁰ A total of nearly 500 Trident submarine warheads combined with 450 Minuteman warheads for a grand total of nearly 1,000 warheads thus stand ready for immediate firing in peacetime.

In a crisis, the United States could expeditiously generate an additional five strategic submarines to high-alert status, including surging within days several in port undergoing replenishment and minor maintenance, and repositioning several more already at sea performing training and other tasks or transiting on modified alert (4-8 hour communications receive cycle) to relieve alert Trident submarines nearing the end of their 78-day patrol. The launch-ready arsenal would thus grow to nearly 1,500 warheads within a short number of days.

In addition, U.S. strategic bombers normally kept off alert in peacetime at three bases in the United States could be generated within 24-48 hours by uploading their payloads residing in nearby storage bunkers. Approximately 500 additional bomber warheads could thus be placed on bomber aircraft poised on runway (10-minute taxi and takeoff) or airborne alert, for a grand total of nearly 2,000 deliverable strategic nuclear weapons on high alert during a crisis, a doubling of

59 The Trident submarine fleet consists of 14 boats, of which two are normally in overhaul, nine are normally at sea, of which four to five patrol on combat alert, and three are normally undergoing short- to extended-maintenance of days to weeks before they could surge to sea.

60 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.

the number available for prompt launch in peacetime. On a much slower re-alerting schedule (weeks to months), the United States could upload tactical nuclear weapons to delivery platforms in Europe and the United States, expanding its total nuclear arsenal on high alert to approximately 2,500 weapons.

Russia has shortened the launch time even more, by automating the firing process. High command posts in the Moscow area need only seconds to directly fire rockets out of silos as far away as Siberia.⁶¹ Under normal peacetime conditions, Russia could fire approximately 80 land-based missiles carrying a total of 600 warheads within minutes, and fire an additional 160 warheads sitting atop one to two strategic submarines on patrol at sea or on pier-side alert (launching on the surface at dockside).⁶² A couple of regiments of land mobile rockets normally on peacetime patrol could also be fired quickly on command. In a crisis, the rest of Russia's operationally deployed forces could be generated to high alert in a matter of days to weeks, increasing Russia's strategic firepower on high alert to more than 1,000 warheads on land-based rockets, submarines, and heavy bombers. In this time frame Russia could also upload tactical weapons to their delivery platforms and thereby bolster its firepower by an additional 1,000 or so weapons, for a grand total of approximately 2,000 weapons.⁶³

G. THE DANGERS OF PROMPT LAUNCH

During the Cold War both sides honed procedures to send the go-code at the first signs of incoming warheads reported by early warning satellites and ground radar. Under this plan to launch on warning, which remains intact and frequently exercised on both sides today, nuclear decision-making is extremely rushed and emotionally charged. To prevent panic, it is pre-scripted, driven by checklists, and enacted

by rote. In some scenarios, after only a three-minute assessment of early warning data, the U.S. president receives a 30-second briefing on his nuclear response options and their consequences. He then has at most 12 and probably closer to six minutes to choose one, or else it would be too late to avoid the severe force attrition, command disruption, communications breakdowns, and possibly the decapitation of top nuclear commanders that an actual large-scale Russian attack could inflict.

Prompt launch is a holdover from the Cold War when riding out an attack was not a viable option because of the fragility of command and communications and the vulnerability of missiles in silos, garages, and submarine pens. Both sides stood to lose the bulk of their forces and the command centers that controlled them if they waited too long to retaliate. So during the 1970s and '80s, both shortened the reaction time of their nuclear missiles to seconds and prepared to launch them en masse at the first signs of incoming enemy missiles. Although U.S. nuclear strategy supposedly underwrote deterrence based on an ability to ride out an attack and then retaliate with sufficient nuclear firepower to assuredly destroy any nuclear aggressor, the U.S. operational posture was geared to unleash U.S. forces before the arrival of enemy warheads and the onset of massive disruption of command and control. As a former commander of the strategic forces in the waning years of the Cold War explained:

*Our policy was premised on being able to accept the first wave of attacks [...] Yet at the operational level it was never accepted [...] They built a construct that powerfully biased the president's decision process toward launch before the arrival of the first enemy warhead [...] a move in practice to a system structured to drive the president invariably toward a decision to launch under attack [...]*⁶⁴

61 Blair, "Lowering the Nuclear Threshold," op.cit.

62 Assumes 80% readiness/reliability for SS-18; 66.6% for SS-19; and 90% for all other land-based missiles.

63 Russia figures are based on Pavel Podvig, "Strategic Rocket Forces," *Russian strategic nuclear forces* (blog), January 15, 2015, <http://russian-forces.org/missiles>.

U.S. presidents reluctantly acquiesced to this systemic im-

64 Jonathan Schell, *The Gift of Time* (New York: Metropolitan Books, 1998), pp. 191–94.

perative of making a quick decision to fire on warning. While it was an accident-prone policy, top presidential advisors such as Henry Kissinger and Brent Scowcroft argued in a top secret meeting of the National Security Council that this risky policy bolstered deterrence and that: “It is not to our disadvantage if we appear irrational to the Soviets in this regard.”⁶⁵

Ronald Reagan lamented in his memoirs:

*Russian submarines off our East Coast with nuclear missiles could turn the White House into a pile of radioactive rubble within six or eight minutes. Six minutes to decide how to respond to a blip on a radar scope and decide whether to release Armageddon! How could anyone apply reason at a time like that?*⁶⁶

Former national security advisor Zbigniew Brzezinski wrote:

*[A] bolt out of the blue could create such initial disbelief among the U.S. decision makers that they would be unable to make a prompt response [...] A sudden massive attack would put the American leaders under extraordinary psychological pressure, capable of inducing erratic behavior and hesitation.*⁶⁷

Brzezinski spoke from experience, having received a shocking call in the middle of the night in 1979 informing him of the launch of 220 Soviet submarine missiles at the United States. A second call indicated that 2,200 missiles were streaking toward the United States – an all-out first strike. His biggest worry at this stage was figuring out how he would convince a groggy president that this was the real

65 “Minutes: National Security Council Meeting, Subject, SALT (and Angola),” December 22, 1975, top secret/sensitive/declassified, Washington, D.C.: National Security Archive, p. 9.

66 Ronald Reagan, *An American Life: The Autobiography* (New York: Simon and Schuster, 1990), p. 257.

67 Zbigniew Brzezinski, “From Arms Control to Controlled Security,” *The Wall Street Journal*, July 10, 1984.

thing requiring an immediate nuclear response. As he prepared to call President Carter, he received a call ending the nightmare. It was later found that a defective computer chip had caused the false alarm.⁶⁸

While acquiescing to the imperative of quickly authorizing the execution of the U.S. nuclear war plan, U.S. presidents and their key advisors also recognized the impracticality of launch on warning given the extremely short deadlines entailed and the need for near-perfect coordination throughout the chain of command. Accordingly, given the specter of a decapitating Soviet strike should prompt-launch fail to be carried out in time, every president from Eisenhower through Reagan pre-delegated nuclear release authority extensively to military commanders in the field. This increased the risk of an unauthorized launch.

On the Soviet side, where top leaders in an authoritarian political culture eschewed relinquishing nuclear launch authority, special command posts and communications links were dug deeply underground to protect them, and novel launch mechanisms capable of operating in a severe nuclear environment were invented. One such apparatus, called Perimeter (mentioned above), ensured semi-automatic retaliation in the event of a decapitating strike on Moscow and other central command facilities.⁶⁹

68 On the occasions of the two major false alarms in U.S. history (caused by human error and computer malfunction, respectively), including this one involving Brzezinski, it took the crews eight minutes instead of the requisite three 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.

69 Anton Valagin, “Guaranteed wages: how the Russian system ‘Perimeter,’” *Rossiia Gazeta* January 22, 2014; Michael Tymoshenko, “Retaliatory Nuclear Strike Will Be Mounted Under Any Circumstances,” *Red Star*, February 19, 2015; David Hoffman, *The Dead Hand: The Untold Story of the Cold War Arms Race and Its Dangerous Legacy* (Anchor, 2009); Russian Strategic Nuclear Forces, ed. Pavel Podvig (Cambridge, MA: MIT Press, 2004); Valery E. Yarynich, *C3: Nuclear Command, Control, Cooperation* (Washington, D.C.: Center for Defense Information, 2003); Pavel Podvig, “Russia lost all its early-warning satellites,” *Russianforces.org* February 11, 2015; Bruce Blair, “Russia’s Doomsday Machine,” *New York Times*, October 8, 1993. See also: William J. Broad, “Russia Has ‘Doomsday’ Machine, U.S. Expert Says,” *New York Times*, October 8, 1993.

The popular narrative of the Cold War slid past these facts on the ground in favor of the abstract theory that the nuclear arsenals provided a stable balance of terror based on mutual assured destruction (MAD). Every institution of American society accepted and even internalized the narrative that U.S. nuclear forces were prepared to absorb the worst attack the enemy could mount, and then mount a counterattack on presidential orders that would destroy the attacker's economy and population. A rational adversary would never dare to strike under these conditions. Moreover, the fact that the Soviets could do the same to the United States only strengthened the stability of mutual deterrence, according to a narrative that led many people to celebrate rather than lament the mutual vulnerability of entire populations.

Those responsible for carrying out the nuclear mission knew otherwise. In the real world, U.S. and Soviet nuclear strategy yielded operational postures that could not reliably ride out an attack. They were geared to such rapid and massive reaction to signs of enemy attack that little room was allowed for rational deliberation and real leadership in a crisis. Rote decision-making and rapid enactment of a prepared script were the orders of the day on both sides. The dynamic interaction of their operational postures in the midst of a confrontation carried grave risks of losing control and sparking an intentional or inadvertent nuclear conflict. The situation was anything but stable.

As a technical matter, nothing has essentially changed since then.

Planning to launch on warning is obviously a cosmic gamble, given the significant risk of ill-considered judgment based on incomplete or false information. And indeed, Russia and the United States have come close to disaster on several occasions involving false alarms.⁷⁰ And yet, President Obama in 2013 reiterated the need to maintain the capability

70 For information on known close calls see Patricia Lewis et al, "Too Close for Comfort: Cases of Near Nuclear Use and Options for Policy," *Chatham House Report*, April 2014, http://www.chathamhouse.org/sites/files/chathamhouse/home/chatham/public_html/sites/default/files/20140428TooCloseforComfortNuclearUseLewisWilliamsPelopidasAghlani.pdf.

for prompt launch in his nuclear employment guidance.⁷¹ The half-life of this tactic is long indeed.

The risk of mistaken launch would appear to be even higher today because of the decrepit state of Russia's early warning network. For many past years Russia's obsolescing early warning satellites provided only a few hours of reliable launch detection coverage over the U.S. Minuteman fields. In the fall of 2014, Russia lost its last two remaining functional early warning satellites monitoring that area.⁷² Lacking space-based coverage of U.S. Trident missile launches from the Atlantic and Pacific oceans, Russia now depends completely upon ground radar sites to detect and assess incoming U.S. ballistic missile warheads fired from land or sea. Russia's ability to detect low-flying nuclear-armed cruise missiles fired by bombers or submarines is even worse.

As the graph below shows, the lack of satellite early warning drastically reduces the timeliness of Russian detection of a U.S. strategic ballistic missile attack. Russia's radar detection timelines vary from ten minutes for a U.S. submarine missile fired from the Norwegian Sea to 17 minutes for a U.S. land-based missile raid launched from a Minuteman field in the Midwestern United States.⁷³ By comparison, U.S. warning sensors provide nearly twice as much warning time (18-28 minutes) of a Russian strategic strike, assuming Russia does not deploy its ballistic missile submarines closer to U.S. shores. However, the U.S. ability to detect Russian nuclear-armed cruise missiles flying at low altitudes is very poor.

Russia's attack indications emanate from ground radar only, whereas two types of U.S. detection systems – ground radar

71 U.S. Department of Defense, "Report on Nuclear Employment Strategy of the United States Specified in Section 491 of 10 U.S.C.," Washington, D.C.: June 12, 2013, p. 5.

72 See Pavel Podvig, "Russia lost all its early-warning satellites," Russian strategic nuclear forces (blog), February 11, 2015 http://russianforces.org/blog/2015/02/russia_lost_all_its_early_warn.shtml.

73 These are maximum performance estimates that may not be realistic at the present time because Russia has not yet completed the modernization of its ground radar warning network. Some newer radars may be operating in "test" mode and may not come online with full operational capability for some time.

and satellite infra-red plume detection – provide a means of crosschecking the validity of attack indications. This “dual phenomenology” redundancy is lacking on the Russia side, although a U.S. missile raid that is big enough to threaten the survival of the Russian ICBM force is almost certainly going to be picked up by multiple Russian ground radars. And so there would be some means of cross-checking the validity of attack indications reported by any given Russian radar site.

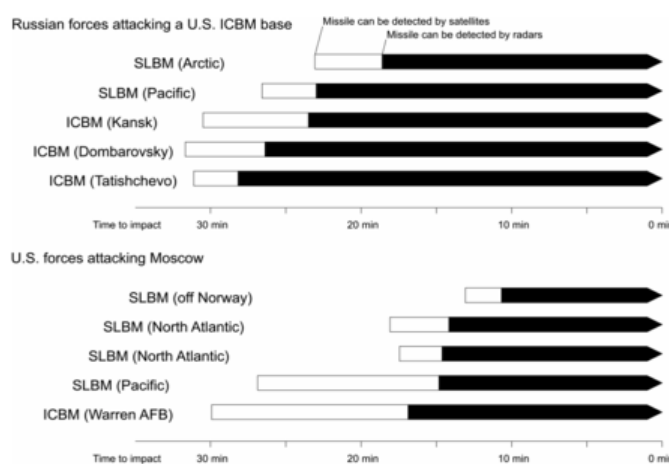


Figure 1: Missile flight and radar detection timelines.

These timelines⁷⁴ are obviously very compressed on both sides. The opportunities for ill-considered nuclear decision-making are extensive regardless of the accuracy of incoming early warning reports. Launch on warning puts enormous strain on the nuclear chains of command in both countries.

But the humanitarian consequences of a tragic mistake would not be constrained by the national borders of Russia and the United States. A mistaken launch that triggers a strategic nuclear exchange today would have global repercussions. A worldwide calamity would ensue.

Russia’s command and control will come under further

74 Pavel Podvig, “Reducing the risk of accidental launch,” *Science and Global Security*, vol. 14, October 2006, http://russianforces.org/podvig/2006/10/reducing_the_risk_of_an_accide.shtml.

strain as it fields a variety of new weapons. Russia reportedly is now deploying missiles in Crimea capable of carrying nuclear warheads⁷⁵ and will possibly deploy tactical nuclear weapons there, including for its Black Sea fleet. Russia is developing a train-mobile strategic missile. It is testing a new ground-launched cruise missile of intermediate range and may decide to withdraw from an existing treaty signed by Russia and the United States in which such missiles are banned. A force of hundreds may emerge. And Russia has other nuclear weapons in the pipeline that will pose a new set of command-control challenges.

Russia’s scattered arsenal is in perpetual motion over nine time zones – moving around on combat alert and shuttling back and forth to repair facilities at their main field bases. Warheads and bombs from the field are transported for routine maintenance several times per year.⁷⁶ Every ten years, on average, they are also transported long distances to national manufacturing facilities to re-forge their plutonium pits. (Russian pit shelf-life averages only 8-12 years compared to 80 years for U.S. pits.) Thus overall more than ten percent of the Russian nuclear arsenal is in transit during a given year. Since transportation is the Achilles heel of nuclear security: this constant movement runs a risk of terrorist capture.

VII. TOWARD BILATERAL AND MULTILATERAL DE-ALERTING AGREEMENTS

A compelling set of arguments can be made for pursuing a global multilateral de-alerting agreement that would stand down and lock down all of the world’s nuclear arsenals. Apart from the obvious benefit of reducing nuclear risk for all nations, several arguments in favor of de-alerting can be made. First, comprehensive de-alerting offers an alternative pathway to deeper reductions and to the end goal of global zero. Second,

75 Supreme Allied Commander, Europe and Commander of U.S. European Command General Philip Breedlove told reporters that NATO believes Russia is deploying nuclear-capable forces in Crimea. “Russian forces “capable of being nuclear” moving to Crimea, NATO chief says,” *CBS News*, November 11, 2014, <http://www.cbsnews.com/news/russian-forces-capable-of-being-nuclear-moving-to-crimea-nato-chief-says/>.

76 Study director’s estimate based on personal communications with Russian nuclear specialists.

it would well serve the near-term national security interests of both the possessor countries and the non-nuclear countries of the world. Third, the basic idea of de-alerting – decreasing the operational readiness of nuclear weapons – enjoys almost universal support among the nations of the world and it derives strong political and legal standing from the NPT. And fourth, it builds upon a set of historical antecedents in the form of confidence-building measures designed reduce the risk of the use of nuclear weapons stemming from misunderstanding, miscalculation, and breakdown of command and control.

An alternative pathway toward deep reductions and global zero. De-alerting offers an alternative to the other two main paths to this goal. Of the main paths, one has stalled completely and the other has failed to garner the support of the majority of the world's leading countries.

The traditional main path is the step-by-step process that for decades has dominated the arms control agenda of the P-5 nuclear countries, their allies, and most of the rest of the international community. The key steps are ending the production of fissile materials (the Fissile Materials Cut-Off Treaty), fully ratifying and implementing a treaty banning nuclear chain reactions in weapons testing (the Comprehensive Test Ban Treaty), and further shrinking the world-wide nuclear weapons stockpile through negotiated and unilateral reductions of U.S. and Russian weapons (the next follow-on treaty to the 2010 New START agreement).

All of these steps have ground to a halt. FMCT, CTBT, and New START follow-on negotiations are paralyzed by international and domestic politics between and within the nuclear weapons countries.

In the critical arena of U.S.-Russian nuclear arms reductions there are no near-term prospects for progress. Their stockpiles are leveling off, after 30 years of steady decreases brought them down from a peak of 70,000 weapons in the mid-1980s to 16,000 weapons today. There is also no realistic prospect today of bringing the other nuclear weapons countries to the table to negotiate cuts, especially given the impasse between the nuclear superpowers who possess the vast bulk of the global stockpile. On the contrary, all nuclear weapons countries are investing heavily, or planning to do so, in the long-term mod-

ernization of their nuclear arsenals.

A litany of obstacles can be recited. The bottom lines are that President Putin has rebuffed President Obama's overtures to resume strategic arms negotiations. Russia is also alleged to have violated the Intermediate-Range Nuclear Forces Treaty (INF), putting it in jeopardy of collapsing. The animus between Russia and the West over Ukraine has also created a domestic political climate that does not favor further unilateral or bilateral reductions by either side. Even if an arms reduction agreement could be negotiated, the U.S. Senate would resist ratifying it for domestic political as well as strategic reasons.

This traditional approach is deeply flawed in any case. It has profound structural deficiencies beginning with its complete neglect of tactical nuclear weapons (short-range, below 500 kilometers in range) even though these weapons are the most useable and dangerous in many respects. The Russia stockpile of these weapons is large. Strategic reserve weapons, whose proportion of the overall strategic stockpiles is increasing, get a free pass as well. The U.S. stockpile of these weapons is large. Furthermore, no other possessor countries besides Russia and the United States participate at all in negotiations to reduce either strategic or tactical weapons. The rest get a free pass, even though the risks of nuclear weapons use appear to be greatest in South and Northeast Asia, home of four nuclear weapons countries that steer clear of any multilateral regulation fora.

In short, this path leads down a blind alley at the present time, and in any case it offers diminishing returns. It needs to be fundamentally restructured to become comprehensive and inclusive, putting tactical weapons and strategic reserve weapons in the negotiating basket and bringing all nuclear weapons countries to the table to join the United States and Russia. This ideal is unfortunately a dead letter for the foreseeable future.

The other major pathway to arms reductions is less direct: delegitimize nuclear weapons. This approach emphasizes the disastrous humanitarian consequences of using nuclear weapons even on a small scale, the irreducible and growing risks of such use in an era of proliferation, and the utter lack of national, institutional, and organizational capacity to provide effective relief to victims in the event of their use. This approach seeks to reinforce the taboo against their use or possession by

promoting no-first-use, sole-purpose (accepting that as long as they exist their sole purpose is to deter their use by others), and other commitments that would further circumscribe the role of nuclear weapons in national security strategy.

The approach has made little headway. Some baby steps have been taken by the majority of the non-nuclear countries through their participation in the humanitarian consequences conferences held in recent years in Oslo, Nayarit and Vienna, but the nuclear weapons countries have balked at participation and view this approach with jaundiced eyes. That the approach falls short is further evidenced by President Obama's rejection of sole-purpose and no-first use commitments. The latter gets scant traction outside of China and India. As discussed earlier, the nuclear doctrines of most countries allow considerable leeway for nuclear weapons to be used against a wide range of non-nuclear threats including chemical, biological, and conventional threats.

De-alerting offers a promising third pathway. It works by consigning warheads and bombs to ever-deeper storage. The longer it takes to retrieve and return them to high alert status, the more the military war planners may discount their future value and offer them up for elimination. Thus, for example, the large stockpile of reserve Minuteman missile warheads in storage in New Mexico contribute almost nothing to the nuclear war plan. In theory they could be transported to mid-western missile bases during a crisis and uploaded to increase the payload of each missile from one warhead to three warheads. But this uploading would take years to complete, and so the war planners have largely written them off. These warheads are ripe for scrapping, although a different argument can be made for retaining them: they provide a reserve hedge of replacement warheads in the event that systemic technical flaws in the deployed warheads are discovered.

In short, de-alerting tends to reinforce the prevailing view of the U.S. military, and some other militaries around the world, that nuclear weapons have little or no military utility.

In the U.S. context, another virtue of de-alerting is that the president possesses full authority to order its implementation. As commander in chief, he has the constitutional power to change the operational disposition of his forces, convention-

al and nuclear, without Congressional approval. President George H. W. Bush exercised this power when he stood down thousands of nuclear weapons – both strategic and tactical – over the course of a few days in 1991. These are additional virtues. De-alerting can be carried out almost overnight and for all types of weapons.

In summary, de-alerting offers a relatively fast and clear path toward deep reductions in the number of operationally deployed warheads. By de-alerting, nations can hasten the transfer of weapons from active to reserve to inactive status. While de-alerting does not oblige nations to remove weapons from service permanently, it accelerates their retirement and dismantlement.

VIII. DE-ALERTING AND NATIONAL SECURITY INTERESTS OF OTHER KEY NATIONS

A. RUSSIA

The main threats facing Russia today arguably are proliferation and nuclear terrorism. The latter often originates in the Caucasus where indigenous and foreign “insurgents” regularly plot and execute deadly terrorist assaults on Moscow and other far-flung targets in Russia. Taliban and other extremist movements in Afghanistan and elsewhere represent external terrorist threats.

Russia's large nuclear arsenal neither deters such assaults nor provides any tools for preventing or responding to them. Indeed, Russia's nuclear stockpile of weapons and bomb-grade materials is itself at risk of terrorist theft and use against Russia. This danger inspired Russia and the United States to cooperate closely to enhance the security of the Russian stockpile from the early 1990s until recently. Over the past two decades, the United States contributed approximately \$1 billion per year toward this effort to prevent “loose nukes” from falling into the hands of terrorists or rogue nations. Approximately 20 attempts at smuggling bomb-grade uranium have been foiled; the total quantity of material seized was nearly enough for one Hiroshima-class bomb. If this seized material represents about 10 percent of the total material that has leaked onto the black market, then about seven bombs' worth

of material has gotten loose from Russia.

Strictly from the standpoint of nuclear terrorism as well as proliferation, another major concern to Russia, Russia's national security interest lies squarely in arms regulation that optimizes the security of its nuclear arsenal. A de-alerting agreement would advance this objective.

However, Russia has to contend with other potential threats to its security, and it views nuclear weapons as playing a critical role in dealing with them. The main purpose of Russia's large nuclear force is to deter nuclear attack by threatening large-scale retaliation to any nuclear attack. Despite the end of the Cold War decades ago and massive voluntary reductions in Russian nuclear stockpiles, this deterrent mission remains a core element of Russian security strategy. The mission is aimed primarily at the United States and its nuclear-armed NATO allies (France, and the United Kingdom, and other NATO allies assigned to deliver some of the 180 U.S. nuclear bombs stored in Europe), and China. As noted earlier, approximately 800 Russian nuclear missile warheads are poised for immediate firing in the name of classic deterrence, a posture that is interlocked with U.S. alert missiles in a mutually reinforcing stand-off that exposes both nations – and the world – to the risks of accidental, mistaken or unauthorized strikes by forces on either side.

In addition to providing the capacity for second-strike retaliation, Russia's nuclear arsenal serves a general war-fighting purpose. Russia's nuclear policy asserts its readiness to resort to nuclear weapons to defeat any aggression that threatens the very survival of the Russian nation. This position, adopted in 1993 and reaffirmed by recent military doctrine (2014), implies that Russia may initiate the use of nuclear weapons in situations of extreme danger to the state.

In Russia's estimation, these situations mainly include conventional attack against its territory by NATO or Chinese forces. Such attacks may take the form of a classic invasion of massed enemy forces overrunning border defenses and crossing into Russian territory. China and NATO (to a lesser extent) project this threat. Or they may take the form of a massive aerial assault spearheaded by warplanes armed with precision-guided conventional forces used for surgical strikes against key Russian facilities (e.g., national command posts, missile silos, early

warning radars). The United States alone possesses this capability.

Russian strategists believe such conflicts would likely grow out of lower-intensity regional conflicts on Russia's periphery (e.g., Ukraine and Georgia) that inadvertently escalate and spread to the next level. At an early phase in such scenarios these strategists envisage the first use of tens to hundreds of Russian nuclear weapons, primarily tactical nuclear forces, in order to shore up its conventional forces and establish escalation dominance, a throwback to the Cold War days of U.S.-NATO plans for early first use of nuclear weapons in the event of an overwhelming Soviet conventional assault. The risk of further nuclear escalation in such a situation is clearly high.

All of these scenarios, except for terrorism, could only unfold over a timeframe far longer than the 24-72 hour re-alerting timeline proposed by this report – even if this constraint applied to all of the nuclear forces on both sides. Such a timeline would more than suffice to allow Russia to respond in a timely way to any and all current and foreseeable contingencies involving conflict with the United States/NATO or China, or anyone else for that matter. There are no conflicts of interest among any of these nations that would justify direct military conflict. But in the improbable event of military hostilities among them, the Russian nuclear forces could maintain central deterrence and general war-fighting capabilities at much lower levels of attack readiness than presently exists.

The touchstone issue is reaching an understanding between Russia and the United States/NATO on the structure and operation of missile defenses being deployed in the European theater whose primary purpose is to protect Europe from short- and medium-range Iranian missiles. Russia's concern is that this defensive shield could evolve into one capable of threatening the remnants of Russia's strategic missile force decimated by a U.S./NATO nuclear first strike. Similarly, Russia views U.S. long-range precision-guided conventional weapons as a potential threat to a sizable portion of its nuclear arsenal and command-control facilities, and therefore seeks to count these weapons against treaty-imposed ceilings on nuclear weapons, or otherwise to constrain them.

The other major points of contention from a Russian perspec-

tive reflect its desire to prohibit the deployment of any weapons in outer space, including conventional missile defense weapons, to require nuclear weapons to be located only on the territory of their owners (this would only affect the 180 U.S. tactical weapons in Europe), and to ratify a new treaty that would redress Russia's overall conventional inferiority in the European theater (this treaty, the Adapted Conventional Forces Europe Treaty, was successfully negotiated but tripped up over the Baltic NATO states' refusal to ratify it until Russia withdraws its forces from non-NATO Georgia/Abkhazia, leading Russia to suspend its implementation of the treaty).

Russia's linkage of these contentious issues to future nuclear arms control, including presumably any opening round of bilateral or multilateral negotiations on de-alerting, reflects Russia's strong desire to broaden the security agenda and form new global security architecture on the principal of equal security for all nations. This broadened agenda and architecture would encompass much more than narrow military considerations and in this respect economic ties and "soft" power could significantly offset Russia's technical military disadvantages. A more cooperative security relationship between Russia and Europe would open the door much wider for deep bilateral nuclear arms reductions. The model U.S. presidential guidance presented later in this report seeks to find new ways to bridge the divide.

Unfortunately, the chasm is wider than ever. In light of the Ukraine crisis and the estranged relations between Russia and the West, such security cooperation has little pulse at the moment. In certain respects this state of affairs with its serious potential for further miscalculation and escalation gives all the more reason to pursue confidence-building measures like de-alerting. The potential for the Ukraine crisis to escalate inadvertently and become unmanageable is steadily growing and needs to be contained through urgent risk reduction measures.

Russia has nothing to lose and much to gain from beginning a constructive dialogue on de-alerting – even if all the other sticking points are not immediately resolved. There is a growing risk of nuclear inadvertence leading to the accidental, unauthorized or mistaken use of nuclear weapons that could be reduced through de-alerting measures. Russia would become more secure. Russia would also demonstrate anew its com-

mitment to international norms and law. By taking de-alerting steps that decrease the operational readiness of its nuclear forces, it would conform to the provisions of the NPT that Russia itself approved during prior Review Conferences. Taking the modest initial steps outlined in this report would be roundly applauded by all or virtually all of the nations of the world.

In this spirit, eminent Russian experts have advanced a bold proposal for de-alerting Russian strategic forces. These experts, who include several former senior Russian military officers who are members of this commission, studied the U.S. de-alerting and force structure proposals contained in the model U.S. guidance spelled out later in this report, and formulated a Russian plan for reciprocal de-alerting (and force reductions) geared to the same timelines. They recommend a total weapons ceiling of 1,500 strategic and tactical weapons combined – a 70 percent cut in the Russian arsenal – and endorse removing all remaining Russian strategic forces from launch-ready alert, on the condition that multilateral talks on nuclear arms reductions that include China are initiated. According to these analysts, their plan would be fully consistent with Russian national security interests and strategy:

Russia's Nuclear Forces in 2022: Possible Force Structure	
Total nuclear warheads	1,500
of which:	
Strategic and in a state of reduced operational readiness	1,000
Tactical and non-deployed	500
Total deployed strategic warheads	500
of which:	
On 270 ICBMs	270
On 8 nuclear submarines with 128 SLBMs	140
On 15 heavy bombers	90
All strategic warheads in active reserve	500
of which to be deployed:	
ICBMs	270
Nuclear submarines	140
Heavy bombers	90

Excerpts from the Russian study “Strategic Stability and Nuclear Disarmament in the 21st Century.”⁷⁷

In this option, nuclear deterrence rests upon 500 deployed strategic nuclear weapons, with the remainder in active reserve [...] Nuclear weapons being held in active reserve can be taken from storage and loaded on transporters over a period of several weeks to several months (and this cannot be done discreetly.) Moreover, it is feasible to maintain a large portion (80-85 percent) of deployed strategic nuclear weapons in a state of low readiness (they could be activated within 24-72 hours).

Thus, within a maximum of 72 hours in Russia, 590 strategic nuclear weapons, ready for immediate action could be deployed. This is sufficient for an adequate response to any emergency. In the event of a protracted nuclear crisis or a sharp deterioration in geostrategic relations between Russia and the United States or China, which would last for a period of several weeks or months, there would be ample opportunity to bring into readiness all the 1,000 strategic nuclear weapons.

In our opinion, if we take as a starting point the seriousness of the political leadership of Russia and the United States to move towards a nuclear-free world the most preferable option is [this one]. However, this option can hardly be realized without the participation of other nuclear weapons states, above all, China.

The ability of the Russian strategic nuclear forces to deliver 1,000 strategic nuclear weapons to their targets poses a threat of unacceptable damage to any potential aggressor. The current high operational readiness for the launch of the strategic nuclear missiles (alert status) in Russia and the United States creates unwarranted risk and mistrust between the two countries. It is impossible now to imagine a situation when either Russia or the United States suddenly decided to make a pre-emptive nuclear strike against the other side. There is simply no motivation for such an act. Therefore, the readiness to launch nuclear missiles should be reduced and brought into line with the existing military-political realities of Russian-American relations. Even if steps were taken to move all the nuclear missiles of Russia and the United States to a reduced state of readiness, the ability of Moscow and Washington to maintain nuclear deterrence will not suffer, since in the foreseeable future there is no motivation by other nuclear powers for a surprise nuclear attack on the Russia or the United States.

Russia's military and political leaders consider the possession of nonstrategic nuclear weapons as the most important deterrence factor at a regional level [...] Therefore, in contrast to the United States, which does not feel the need to deter its neighbors, Russia cannot abandon nonstrategic nuclear weapons. At the same time, in the face of modern realities, the size of the Russian nonstrategic nuclear arsenal seems excessive (the estimated active reserve of Russian nonstrategic nuclear weapons is about 2,000 units). The arsenal can be reduced to about 500 weapons by eliminating those types of nuclear systems, which have lost their military significance (ground-to-air missiles, depth charges, mines, etc.), and by reducing the number of tactical air nuclear missiles and bombs.

Of course, the U.S.-Russian agreement to reduce nuclear weapons, as described above, may not be sufficient to maintain the military-strategic balance, if we accept the “broad” definition of strategic stability, which on the one hand, should take into account non-nuclear strategic systems, and on the other, the multipolar nature of the modern world. It should be noted that limiting the militarization of space and the development of cyber weapons will have a greater impact on global stability. Clearly, the maintenance of strategic stability in the multipolar world in the 21st Century will require new efforts to address the serious threats posed by these areas of military competition, as proposed in the Global Zero report.

⁷⁷ Sergey Rogov, Col. Gen. (Ret.) Victor Esin, Maj. Gen. (Ret.) Pavel Zolotarev, and Vice Adm. (Ret.) Valentin Kuznetsov, Report by the Russian Academy of Sciences presented at the RIAC-Global Zero Conference, Moscow, Nov. 8, 2012.

De-alerting is thus consonant with Russia's national interest, in the view of these seasoned national security experts. Russia has a vital security interest in preventing nuclear proliferation and nuclear terrorist attack against its homeland, as well as other nations using nuclear materials or weapons stolen from Russia's own stockpile.

Russia identifies other potential threats besides terrorism, however, and as this report previously emphasized Russia does not possess a large kitbag of "soft" and "hard" power tools to deal with them. Although Russia is mastering a range of low-intensity tools such as those that fall under the rubric of "hybrid" warfare, Russia's strength lies at the very low and very high end of the spectrum of conflict – and Russia therefore finds it necessary to rely on its nuclear arsenal to deter, dissuade, and in extremis to suppress the middle-range threats.

As noted earlier, both China and the United States/NATO figure prominently in Russian threat assessment. Russia views its nuclear arsenal as essential to offsetting conventional inferiority as well as deterring the opposing nuclear forces. While Russia's conventional forces can overpower weak nations on its periphery, they cannot handle NATO or China, and therefore Russia would be forced to reach for the nuclear cudgel at a relatively early stage of conventional war. Thus the emergence of nuclear "de-escalatory escalation" discussed above. And thus the continuation of its legacy posture of strategic nuclear vigilance that keeps nearly 800 warheads always at the ready.

But as these Russian experts underscore in their report, Russia needs far fewer of them on far lower states of attack readiness. It can afford to relax its posture in tandem with U.S. de-alerting and still meet reasonable requirements of deterrence, and at the same time Russia cannot afford not to undertake this reciprocal de-alerting if it wishes to reduce its exposure to accidental, unauthorized, and mistaken launches by both sides. De-alerting would work to eliminate this danger as well as Russia's exposure to nuclear terrorism.

As the Russian experts reiterate, Russia predicates much of its support for the de-alerting agenda as well as deep reductions in nuclear stockpiles on cooperative efforts to resolve several specific issues led by missile defenses and conventional imbalanc-

es. The model U.S. presidential guidance recognizes this predicate and calls for redoubled efforts to find solutions, such as proposing that the United States would count all of its strategic and theater ground- and sea-based missile defense interceptors against its New START ceiling of operationally deployed weapons. (A single deployed interceptor could be treated as the equivalent of a single deployed nuclear warhead.) Assuming a constructive dialogue and real progress on the broader security agenda, Russia should be amenable to negotiating a far-reaching bilateral de-alerting agreement – but the absence of such progress should not preclude Russia from accepting an agreement with modest initial objectives. If headway can be made toward a bilateral agreement, Russia should be amenable to engaging in multilateral discussions aimed at a broader de-alerting agreement.

B. CHINA

Although China is in the middle of a long-planned program of nuclear modernization,⁷⁸ it has been exemplary in its nuclear restraint: building only a modest nuclear arsenal (< 200 total weapons today) for the sole purpose of deterring nuclear attack by India, Russia or the United States (the designated adversaries in Chinese threat assessment); staying out of nuclear arms races; rejecting doctrines of first-use, war-fighting, and launch-on-warning; and imposing stringent safeguards including keeping warheads separated from

⁷⁸ China perceives nuclear weapons as vital to its national security today – an essential means of complementing its conventional weapons and diplomatic tools as well as international institutions of conflict resolution. After the end of the Cold War stripped away some of the protection China enjoyed from the superpowers' stalemate and following the third Taiwan straits crisis in the mid-1990s, China redoubled its investment in modern and survivable nuclear forces in order to bolster its capability to deter a conventionally superior United States from intervening and possibly threatening the Chinese homeland in a future Taiwan crisis. U.S. pursuit of regional and national missile defenses only reinforced that quest. U.S. nuclear targeting of China during this period put further pressure on China to upgrade its aging and vulnerable nuclear arsenal. Other drivers of China's nuclear modernization were its requirement to acquire the capability to reliably target a variety of critical U.S. military facilities in the Asia-Pacific region, and to deter Russia and other nuclear-capable and nuclear-armed states in the region. Despite all these motivations, China is expanding its nuclear arsenal only modestly from about 200 weapons today to 250 weapons over the next 5-10 years.

delivery vehicles. China formally subscribes to nuclear disarmament – it has since 1964 – and takes seriously its obligations to Article VI of the NPT.

China's interest in global de-alerting begins with the fact that it sits at the epicenter of nuclear danger, surrounded by more nuclear-armed states and threats than any other country. Besides Russia, its neighbors include the newest proliferators (India, Pakistan and North Korea). Neighbor Japan is a virtual nuclear weapons country by dint of its massive holdings of stocks of separated plutonium. Neighbors Taiwan and South Korea have secretly pursued nuclear weapons in the past. U.S. nuclear-armed submarines lurk off its shores in patrolling strategic submarines. Proliferation to more neighboring countries is around the corner if the security environment deteriorates. And terrorists with nuclear ambitions populate the region. The prospects of terrorists getting hold of a nuclear weapon and exploding it nearby if not on Chinese territory are non-trivial. With radical extremists operating in the vicinity, and a vast Russia arsenal not far away, the specter of loose nuclear weapons and nuclear terrorism in China's backyard is cause for concern.

A de-alerting regime that locked down the world's nuclear arsenals and removed them from combat deployment would alleviate a multitude of direct and indirect threats to China. These threat scenarios range from nuclear terrorism to regional conflicts such as an Indo-Pakistani war escalating into a nuclear war, spilling widespread radioactive contamination into China. They range from an irrational act of nuclear desperation by North Korea, to an inadvertent nuclear exchange between Russia and the United States, to a deliberate nuclear attack by India, Russia, or the United States during a crisis. De-alerting would remove the constant threat of sudden nuclear attack posed by launch-ready Russian and U.S. forces and greatly reduce the likelihood of China's exposure to the dire consequences of a nuclear exchange on its periphery.

Against this backdrop, China has good reason to want to join – and possibly lead – multilateral negotiations to prohibit placing nuclear forces on high alert status. Several other factors are conducive to its participation. First, the regional and global circumstances are still conducive to restraint and to avoiding a costly no-win arms race. Although there is a steady expansion

of nuclear arms in South Asia with nuclear late-comers India and Pakistan substantially building up their arsenals, an arms race in the region is just beginning to get underway.⁷⁹ Second, China can effectively protect its national interest against its chief regional rival, India, without having to rely on nuclear weapons. The same is true of India. In their bilateral relationship, both enjoy the good fortune of having comparable national power, conventional military strength, and fortuitous geography in the form of a high mountain barrier between them. Third, nuclear weapons are less and less the currency of the realm. As growing public opinion worldwide repudiates nuclear weapons and demands their elimination, the prestige and “great power status” gained from possessing them will diminish everywhere that public opinion matters, including China. In fact nuclear weapons are fast acquiring an image-problem – they are increasingly seen as weapons of the weak rather than the strong, and as a source of discomfort rather than pride.⁸⁰ Fifth, the cross-Straits entente between Beijing and Taipei in recent years, coupled with their growing economic interdependence, suggests a waning of the primary contingency for Chinese nuclear weapons – deterring conflict with the United States over Taiwan.

China's ascent in the international system also promises to solve China's problem of conventional deterrence vis-à-vis the United States without nuclear weapons, particularly in dealing with the narrow security challenge of managing a Taiwan contingency through the use of force if that would ever come to pass. Although the resort to force in dealing with this contingency seems increasingly remote, a China-U.S. conflict over Taiwan no longer looks like a one-sided match in conventional terms. Certainly over the long term there is little doubt that the United States will lose its

79 This commission's Indian members doubt that an arms race will ensue. They point out that India's nuclear policy defines a static requirement for deterrence that is insensitive to the size of the Pakistani nuclear arsenal, and that India's no-first-use doctrine suppresses the motivation for arms racing and promotes stability in its relations with China.

80 In the 1980s and '90s in China, nuclear weapon and satellite technology were touted by Chinese leaders like Deng Xiaoping and Jiang Zeming as achievements that demonstrated China's entry into the top rungs of world scientific and economic prowess. That was true then – but in 2015 and beyond, China's high international standing flows from its many other impressive achievements, not from its nuclear weapons legacy.

conventional hegemony in the region. Therefore the role of China's nuclear forces in its national security strategy should actually shrink over time and, if so, China will have less reason to resist de-alerting obligations growing out of a multi-lateral negotiation. It would make good sense for China to maintain its de-alerted status quo for its own forces while welcoming comparable obligations on the part of other nuclear weapons countries at the same time that China moves into conventional military balance in the region and gains national power on par with the United States.⁸¹

C. UNITED KINGDOM AND FRANCE

The United Kingdom should be amenable to a global de-alerting agreement because it would substantially solve a security conundrum that has perplexed and disoriented U.K. decision-making on the future of its strategic nuclear submarine force. France is basically in the same boat and would benefit equally from global de-alerting.

No other nuclear weapons country has professed a stronger commitment than the United Kingdom to reducing the role of nuclear weapons in its national security strategy. Putting this commitment to the test, the United Kingdom is confronting an imminent decision between unilaterally disarming, investing upwards of 40 billion dollars to replace its aging fleet of ballistic missile submarines and their missiles, or building a different and less expensive nuclear weapons system. (A final decision on building a new submarine fleet is needed in 2016 so that new submarines could enter service in the 2020-25 timeframe.)

⁸¹ Chinese nuclear history further suggests a potential willingness to enter into a multilateral process to regulate nuclear arms on a global basis. In 1964, the year of its first atomic test, China advocated total global nuclear disarmament. In 1982, then Foreign Minister Huang Hua pledged that China would be ready to join the process if Russia and the United States cut their weapons by 50 percent, ceased testing them, and stopped producing them. At that time there were 57,000 weapons in the combined U.S.-Russian arsenals. Today there are 16,000, a cut of 70 percent. The two Cold War rivals also have maintained a moratorium on nuclear testing and on fissile materials production for two decades. This downsizing clearly meets Huang Hua's criteria for China entering into a new multilateral process of arms regulation.

Having long ago retired all tactical weapons and relinquished all secondary roles and missions (in the "war-fighting" category) for its nuclear forces, the United Kingdom's nuclear policy and posture have been stripped down to bare essentials. The employment of U.K. nuclear weapons is reserved for extreme situations that threaten its very survival – notably, a direct nuclear threat to the U.K. homeland. Such improbable threats can be partially countered by high-precision conventional weapons in NATO-allied operations, and missile defenses. The United Kingdom enjoys the luxury of belonging to a powerful alliance system that can defend the nation against practically any plausible current threat it faces without needing to resort to nuclear force. However, the U.K. consensus appears to see a continuing need for nuclear weapons to deter nuclear blackmail or cold-blooded nuclear attack, and appears to endorse maintaining a strategic submarine fleet to satisfy this need. The country is not prepared to disarm unilaterally in the face of residual nuclear threat, however remote and declining it has become.

The nuclear conundrum facing the United Kingdom stems from the fact that while it strongly desires to further shrink the size of its four-boat submarine fleet, in part for budgetary reasons, it has no margin to eliminate even a single submarine without losing the capability to maintain continuous sea patrols. Its fleet has reached a point of near indivisibility – an irreducible minimum – that does not lend itself to further cuts unless the it adopts a practice of discontinuous alert patrols. This would mean that a three-boat fleet would be anchored in port much of the time, where it would be vulnerable to a sudden nuclear (and possibly conventional) strike. This notion of unilateral de-alerting – maintaining a nuclear "deterrent" force that is not survivable much of the time and that in fact seems to invite an attack – rouses scant support, although the United Kingdom has flirted with the idea of coordinating alert sea patrol schedules with France in order to ensure that, jointly, they could keep either a U.K. or French submarine at sea at all times.

If the United Kingdom chose to abandon submarines altogether, it does still have the technical capacity to develop and deploy nuclear weapons delivered by sea- or air-launched

cruise missiles or land rockets, among other options,⁸² but it would be technically challenging to undertake a new weapons program and the cost might not compare all that favorably with the bill for building a new submarine fleet.⁸³

A global de-alerting agreement that verifiably takes all nuclear forces off of launch-ready alert would allow the United Kingdom to cease its continuous sea patrols. In peacetime, it could undertake sea patrols (including short patrols for training and exercising) on a random schedule and otherwise maintain a low-level alert status for its submarines in port – short-notice surge alert – when there is no perceived strategic threat. This would suffice to preserve the invulnerability of its fleet if adequate protection from surprise attack by torpedoes and other conventional weapons can be provided. As long as opposing nuclear forces require 24-72 hours to be generated to high alert status, one or two U.K. submarines could be surged out of port during this period of re-alerting, assuming that the agreement provides a verification regime that can detect re-alerting in a timely and reliable fashion.

For many decades France has consistently taken a clear and unequivocal position on its nuclear arsenal: it is the permanent cornerstone of French security and defense policy. Although France does not participate in NATO nuclear planning, it regards its independent Dyad of air- and sea-based nuclear forces – armed with approximately 300 bombs and warheads – as a means of providing European-wide protection as well as deterring existential threats to France. It is not a counterforce arsenal, but rather a strictly second-strike deterrent under which Europe shelters along with France.

This steadfast commitment to a nuclear deterrent force does not imply a rejection of further stockpile reductions or de-alerting, though neither is currently planned. France

82 See *The Trident Commission: Concluding Report*, British American Security Information Council, London, July 2014, http://www.basicint.org/sites/default/files/trident_commission_finalreport.pdf.

83 The Trident Commission determined that the savings associated with switching to another type of platform or delivery vehicle are not significant enough when taking into account reductions in capabilities, including range and accuracy, and increases in vulnerability. [Ibid. pp. 26-27.]

appears to be open to the possibility of endorsing a multilateral norm that eschews high alert status. France's current posture, like that of the United Kingdom, is already aligned with such a norm as it normally keeps only a single submarine on modified alert at sea. The nuclear aircraft maintain a low level of attack readiness in peacetime. There are no obvious military or political obstacles to France joining into a multilateral agreement. It has far more to gain from global constraints on nuclear attack readiness than it has to lose from accepting a constraint on its force operations that already informally exists.

D. PAKISTAN

Pakistan should welcome a serious effort led by the leading nuclear powers to begin multilateral negotiations to reach a de-alerting agreement. The Pakistani nuclear program imposes a heavy economic burden on a poor country, and it increasingly presents a security threat to Pakistan itself in an era of violent extremism and terrorism in the country and region. The terrorist capture and use of Pakistani nuclear weapons against Pakistan itself is arguably the gravest threat to Pakistani security. Growing internal threats of violent extremism created by three decades of strife in Afghanistan and by radicalization through jihadist indoctrination has spilled over into the country, putting strain on the Pakistani military and putting its expanding nuclear arsenal at some risk of diversion. The arsenal's security has been technically improved in recent years, thanks in part to U.S. assistance – but the security challenge has grown more difficult. Although Pakistan keeps its nuclear weapons in varying degrees of disassembly at dispersed secret sites, the safeguards are far from foolproof. In the event of conflict with India, these arsenals may be assembled and dispatched to the field where they would become at greater risk of capture or unauthorized use against either India or Pakistan. Both countries thus have strong reasons to support a de-alerting regime that keeps a lid on re-alerting during a crisis.

Pakistan still views Indian conventional superiority as the main threat to its security, however, and hence would be more inclined to participate in de-alerting negotiations if India would provide stronger security assurances to Pakistan than it currently does.

Pakistan's fast-growing nuclear arsenal (125 weapons today, increasing to 250-300 over the next 5-10 years) can be largely explained by Pakistan's insecurity in its relations with India and its answer to India's conventional superiority. Pakistan conducted its first nuclear explosive test in 1998 and has developed a classical military doctrine to guide its weapons program from design to field deployment. In a nutshell, the Pakistani military – which largely controls the nuclear plans, policies, infrastructure and forces – views nuclear weapons as tools of military warfare as well as strategic deterrence. The operational plan is to employ them to parry or defeat India's conventional forces in the event of war. Unlike India, Pakistan has not eschewed the first-use of nuclear weapons and reserves this right if India attacks the country and threatens its survival.

Given Pakistan's heavy reliance on nuclear weapons to offset India's conventional superiority, it would need strong security assurances from India and additional confidence-building measures that mitigate India's conventional threat in order to accept tough constraints on re-alerting during a crisis with India. Some strong credible assurances from India would greatly facilitate Pakistan's participation in multilateral de-alerting talks. India should be willing to provide such assurances since Pakistani nuclear weapons pose the primary threat to India's security today. The specter of intentional, accidental, or unauthorized use of these weapons by the Pakistani military or by violent indigenous extremists who get hold of them looms large in Indian threat assessment.

Pakistan historically has strongly advocated for both global and regional disarmament and often-proposed bilateral nuclear arms control with India. However, New Delhi rejects regional nuclear disarmament on the grounds that it is discriminatory, and so rebuffed the overtures (except for bilateral nuclear confidence building measures such as their mutual pledge to never attack each other's nuclear facilities). Pakistan has also indicated that, like India, it is amenable to broader multilateral talks to reduce and eliminate nuclear weapons on a global basis according to a timetable, as long as the U.S.-Russia arsenals are further slashed and all the nuclear powers join the negotiations. This bodes well for both India's and Pakistan's joining a multilateral forum on

de-alerting. If the United States and Russia forge an agreement on de-alerting, these South Asian powers should not be reluctant to join a broader effort. Their national security interests would be served.

E. INDIA

India has always minimized the role of nuclear weapons in its national security strategy, and strongly supports the idea of global multilateral talks to reduce and eliminate all nuclear weapons. The total elimination of nuclear weapons is popular among all the major political parties and the public. Its prominent political leaders – most notably Rajiv Gandhi – have proposed specific disarmament plans to world audiences. India's role as an emerging major power on the world stage gives it an opportunity to assume leadership in advancing the goal. Joining into de-alerting discussions with the other nuclear weapons countries would align well with this historical commitment. It would also serve its strong national interest in securing Pakistan's commitment to de-alerting, in order to avoid Pakistani weapons on crisis alert that could go off on India's doorstep through inadvertence, accident, unauthorized act, or terrorist capture.

India's current arsenal consists of 90-110 disassembled nuclear weapons under strict guidance of no-first-use (with qualifications as discussed earlier). India's conventional strength (which has grown substantially in recent years due to broad modernization) and overall national power relative to its two main historical adversaries – China and Pakistan – have kept nuclear weapons in the background of its relations with its neighbors. India in fact waited until the 1990s to acquire and test nuclear weapons – long after China tested its first bomb in 1964. While keeping a low nuclear profile and relying minimally on nuclear weapons, India's nuclear concerns have been shifting away from deterring China and Pakistan and toward the threats of nuclear proliferation and terrorism. India's fear of a breakdown of nuclear deterrence leading to nuclear conflict with either China or Pakistan pales in comparison to its fear that nuclear weapons will fall into the hands of terrorists and destroy an Indian city. This reordering of nuclear threat assessment by India gives further impetus to its potential de-alerting ambitions. The key conditions for India's participation in multilater-

al de-alerting negotiations are that they be universal and non-discriminatory. India expresses little interest in regional nuclear agreements or in bilateral nuclear arms control with Pakistan (beyond the nuclear confidence-building measures with Pakistan that have been successfully established). It would value and seek a global pact that equitably verifiably de-alerts all nuclear weapons in all countries. India's position thus aligns perfectly with this proposal for a multilateral process leading to a global de-alerting compact. India would certainly join a serious effort led by the United States and Russia to begin a process as long as China and Pakistan participated. India, unlike China, has not made U.S.-Russian deep bilateral cuts a precondition of its participation in nuclear arms negotiations. India instead emphasizes the importance of all nuclear-armed nations adopting the principle of no-first-use of nuclear weapons as a sign of their commitment to their elimination. Universal de-alerting would mark a true step in the direction of no-first-use – and thus India should not only embrace such an agenda but also consider leading it.

The main sticking points are the Pakistani desire for additional Indian security assurances to Pakistan, thereby enabling Pakistan to reduce its reliance on nuclear weapons to compensate for India's conventional superiority, and India's desire for a complete end to terrorism against India carried out by Pakistani-based jihadists, thereby relieving India of its need for counter-terrorism conventional forces that, while defensive in purpose, project an offensive cross-border capability. Although the two countries have improved relations significantly despite their longstanding border dispute and Kashmir-related terrorism, both will need to cooperate in solving this conundrum. The prospects that both India and Pakistan would join multilateral de-alerting negotiations and accept binding constraints on their nuclear postures depend significantly on the depth of their future cooperation.

F. ISRAEL

Israel's active participation in multilateral negotiations for a nuclear de-alerting agreement seems extremely doubtful in light of the nation's commitment to a policy of opacity by which its nuclear status is undeclared and uncertain. However, Israel would consider an agreement that constrains the attack readi-

ness of the other nuclear countries to be consonant with Israel's national security interest. Therefore Israel should, at minimum, lend tacit support to the process. Israel might go further and sign an agreement and submit it to the Knesset for ratification, as it is doing in the case of the CTBT. Much depends upon the verification requirements. Intrusive monitoring of the alert status of nuclear forces would be inconsistent with Israel's policy of opacity. But that policy might change over time, especially if de-alerting gains widespread international support among nuclear and non-nuclear countries alike.

Israel is widely assumed to possess a stockpile of nuclear weapons kept on low-alert status under normal conditions as well as stocks of weapons-grade fissile material. Unofficial sources estimate the former to range upwards of 80-120 weapons and the latter to be equivalent to 100-200 nuclear devices. Their role in Israeli security policy has long been receding, and could conceivably disappear if the Iranian nuclear program is rolled back and further proliferation in the Middle East does not occur.

Israel's security today depends far less on nuclear weapons than it did in 1967, when it reportedly acquired its first device, and surely much less than when Prime Minister Ben Gurion conceived the idea of the bomb in the 1950s. In those previous eras, Israel faced Arab states that denied its right to exist and pursued the point on the battlefield. Fearing the creation of a pan-Arab (conventional) war coalition against Israel and the inability of the small Israeli army to cope with large land armies and air forces, Prime Minister Gurion viewed the bomb as a powerful counterweight, an ultimate insurance policy against an existential threat, and a last resort means of deterring or defeating Arab aggression.

This rationale is no longer compelling. Israel now possesses sophisticated conventional capabilities that far surpass those of its potential adversaries, individually or in coalition. Indeed, Israel has become the region's conventional military powerhouse. Israeli conventional forces are more than adequate to handle current and foreseeable non-nuclear high-end threats to Israel's existence. Their capabilities for handling lesser threats – urban-and-guerrilla warfare, intifadas, mortar and rocket attacks launched from Palestinian lands, terrorism and other asymmetrical threats – are considerably less, but of course nuclear

weapons play no role in these kinds of contingencies.⁸⁴ The same holds true for chemical and biological weapons threats, which arguably pose less than existential threats to Israel and cannot be removed by Israeli resort to nuclear arms. Furthermore, the old coalitions against Israel have broken up. Israel has made (cold) peace with two key former Arab foes – Egypt and Jordan – and no Arab state (apart from Hamas) denies Israel's right to exist or openly seeks to destroy it.

The *raison d'être* for Israel possessing a nuclear arsenal today is thus significantly narrower than previously: to deter other regional nuclear powers, presently consisting only of Iran's potential nuclear threat which, if not suppressed, could drive other Arab states to acquire the bomb. The Israeli nuclear option, even though lacking a well-defined military rationale today, can thus provide a hedge against an uncertain future. It is a security blanket for a Holocaust-stricken nation and a leadership living in a hostile environment.

Israeli leaders have generally eschewed global approaches to nuclear arms regulation (to wit, the NPT in particular) in favor of approaches that emphasize regional relations. Israel deeply distrusts the efficacy of global approaches. It witnessed numerous instances of cheating on the NPT by Iran, Iraq, Libya and Syria, successful evasion of verification mechanisms, and lackluster enforcement. "Enforcement" defaulted to Israel on a number of occasions, which it carried out unilaterally with military force – notably, the aerial bombing of clandestine nuclear reactors under construction in Iraq (1981) and Syria (2007).

Despite Israel's skepticism toward global approaches, a multilateral process aimed at regulating nuclear postures through phased, verifiable de-alerting would serve Israel's security interest in a number of ways. First, a global de-alerting agreement would reinforce international commitments to stymie proliferation in the Middle East. Non-nuclear as well as nuclear weapons countries would be more motivated to prevent the emergence of new nuclear weapons threats and would try harder to establish an enforcement regime that cannot be circumvented. Second, an international norm that restricts combat readiness

would diminish the utility of a nuclear weapons program in the eyes of nations contemplating starting one. Third, the alternative to establishing efficacious regulation of nuclear arms is to either try to destroy the incipient nuclear programs of its neighbors in preemptive strikes, sabotage and other aggressive means, or to rely on nuclear deterrence – a psychological construct of unproven efficacy in the region. The former is an unsustainable policy over the long run and the latter's reliability is questionable, especially in a hydra-headed nuclear neighborhood that the Middle East could become. And fourth, although Israel's major adversaries reside in the region, its support for a multilateral nondiscriminatory de-alerting agreement that receives virtually universal support around the world would bring Israel into the mainstream of the nuclear playing field, on an equal footing with all the players.

These interests may or may not overcome well-known obstacles. Reaching agreement to regulate nuclear postures in the region faces the perennial arguments about the proper sequencing of the disarmament process and the peace process. The main players – Israel, key Arab states, Iran, and the United States – all take a different stance on whether peace or disarmament comes first. Israel has long insisted that a comprehensive peace settlement (an Arab-Israeli peace and full recognition of Israel with normal relations with all its neighbors) must precede nuclear disarmament. The Arab position has long argued the opposite – disarmament leading to a nuclear-free Middle East must come before peace (defined as complete Israeli withdrawal from occupied Arab lands and the establishment of a Palestinian state). Iran's position ostensibly endorses disarmament negotiations without preconditions, but in reality Iran will require a security guarantee in some form before giving up finally on its own nuclear option. The United States (along with much of the rest of the world) demands that peace comes first in Israel's case, and that disarmament comes first in Iran's case.

In view of the rising nuclear dangers in the region and the little time remaining to rein in Iran and stop the tide of proliferation, it seems clear that the key players need to intensify their efforts to advance both the peace and disarmament talks, and to seek progress on both tracks in parallel rather than sequentially. In the words of former Foreign Minister Shlomo Ben-Ami, whose advice equally applies to the more modest goal of regulating alert status:

84 An Israeli-Palestinian peace settlement is essential to overcome the difficulties of defending Israeli borders against these threats. [Ephraim Sneh, "Bad Borders, Good Neighbors," *The New York Times*, July 10, 2011, <http://www.nytimes.com/2011/07/11/opinion/11Sneh.html>.]

There might be no better formula for progress toward a nuclear-free zone in the Middle East than a return to a concept in which two parallel tracks move toward a comprehensive Israeli-Arab peace, along the lines of the Arab Peace Initiative, and to the establishment of a zone free of weapons of mass destruction in the region. To work, the Arabs must accord to Israel key benefits of peace before peace has been formally achieved. Israel, for its part, must recommit to the doctrine of former Israeli Prime Minister Yitzhak Rabin that only a comprehensive regional peace agreement can prevent the Middle East from declining into nuclear chaos.⁸⁵

Progress toward peace in Syria, a settlement with the Palestinians, and normalization of Israeli relations with all its Arab neighbors could accelerate the nuclear disarmament process in the region. It would be conducive to arms control if Israel's relations with its neighbors do not drastically deteriorate in the wake of the upheaval sweeping the region. But even adversaries can find common interest and mutual benefit in arms control, as the Cold War adversaries discovered 40 years ago. If the Soviets and Americans had insisted upon sequencing peace and nuclear arms control talks instead of pursuing both in tandem, little progress on either track may have been made.

Containing Iran's nuclear program remains a crucial objective that is not only key to Israeli and pan-Arab security but also to diminishing Israel's attachment to the nuclear option. It is also the key to saving the global non-proliferation regime. If Iran's nuclear ambitions can be verifiably repressed, either by dint of the mounting pressures being applied today by the international community or in the future by a broader regional agreement that bans all weapons of mass destruction in the Middle East – and if Iran's compliance with its non-proliferation pledge could and would be stringently enforced – then Israel's national security interest would be well served by proceeding to downgrade the importance of its nuclear option, notwithstanding the with-

drawal pangs experienced by some. Regional security for Arab states would be strengthened, and the global system in place to stop the spread of nuclear weapons would be saved from collapse. In this context, an Israeli commitment to a global multilateral de-alerting regime would make sense.

G. KEY NON-NUCLEAR WEAPONS COUNTRIES

The major question to address here is extended deterrence. Would U.S. de-alerting undermine the confidence of allies who shelter under the American nuclear umbrella? Would they oppose U.S. de-alerting, even if Russia and other nuclear weapons countries also de-alerted? What compensatory steps would need to be taken to restore lost confidence?

This commission, composed of many leaders from the key non-nuclear weapons countries, raised no major objections to de-alerting to be backed by non-nuclear defense to offset conceivable risks, and indeed endorse the report's recommendations. Of particular importance to these countries is increased transparency. Japan and other countries seek clarity on China's nuclear forces and strategy, and redoubled efforts to ensure the denuclearization of North Korea.

IX. A U.S.-RUSSIA EXECUTIVE AGREEMENT TO DE-ALERT NUCLEAR FORCES

This model presidential directive lays the groundwork for pursuing a de-alerting agreement with Russia, and a separate multilateral agreement with the other nuclear weapons countries. This section focuses on the bilateral agenda.

A. KEY PRECEDENTS FOR DE-ALERTING

A bold precedent was set by President George H. W. Bush at the end of September 1991, when the Soviet Union began to crumble in the wake of the August coup attempt. U.S. officials worried that Soviet control over its far-flung nuclear arsenal, much of it residing in Eastern European nations and Soviet republics that were declaring independence from the imploding Soviet empire, might break down and result in the unauthorized use of Soviet weapons – perhaps even an unauthorized launch of strategic forces against the U.S. homeland. President Bush

⁸⁵ Shlomo Ben-Ami, "Global Zero Requires Peace in the Middle East," *The Moscow Times*, Sept 8, 2011, <http://www.themoscowtimes.com/site-map/authors/shlomo-ben-ami/382455.html>.

ordered an immediate stand-down of U.S. strategic bombers that for decades had stood ready for takeoff within 15 minutes. Their nuclear weapons were unloaded and placed in storage at their bases. In addition, he 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 ten Poseidon submarines. These measures, removing about 3,000 strategic warheads from high alert, were implemented in a matter of days. (The warheads were de-mated later.)

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

In subsequent months, both countries also withdrew many thousands of shorter-range tactical nuclear weapons deployed with their far-flung armies and surface navies and placed these weapons in storage depots on their home territories.

A second, less noteworthy precedent occurred a few years later. Presidents Clinton and Yeltsin pledged in 1994 to stop aiming strategic missiles at each other's country. The guidance computers on U.S. land-based missiles were oriented to ocean areas in the far northern latitudes,⁸⁶ and Russia switched its land-based rockets to a "zero flight plan." These adjustments of the primary target settings, though a welcome symbolic gesture, can be reversed in seconds and had negligible significance in terms of launch readiness.⁸⁷ A Russian missile fired by accident auto-

matically switches over to its primary wartime target.

B. EXTANT AND PROPOSED CONFIDENCE-BUILDING MEASURES

Recognizing the dangers inhering in the Cold War nuclear standoff, the Soviets and Americans hammered out a spate of confidence-building measures (CBMs) to regulate and stabilize operational interactions between them. They were meant, by and large, to reduce the risk of misunderstandings that could result in the inadvertent or mistaken launch of strategic weapons and escalation to an all-out nuclear exchange.

A small number of significant post-Cold War measures were also established. The most recent efforts, in particular the Budapest Memorandum and the Founding Act – the former de-nuclearizing Ukraine in exchange for commitments from Russia, the United Kingdom and the United States to respect Ukraine's territorial integrity and sovereignty, and the latter deepening U.S.-NATO-Russian cooperation in the nuclear sphere – have proven less than confidence-inspiring in view of the recent Ukrainian developments. Russia's annexation of Crimea and active military support for the Ukrainian separatist rebellion, and the West's deepening involvement in Ukraine and in Central European defenses have worked to upend the Budapest Memorandum as well as NATO-Russian cooperation in nuclear affairs.

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 to re-aim all their silo-based missiles at wartime targets in ten seconds. In fact, if the General Staff transmits a launch order directly to the missiles in a 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* (Washington, D.C.: Brookings, 1995); and Bruce Blair, "Testimony on Russian Nuclear Policy and the Status of De-targeting before the House Committee on National Security's Committee on Military Research and Development," March 13, 1997. An excellent Russian reference is Col. (Ret.) Valery Yarynich, *C3: Nuclear Command, Control Cooperation*, Center for Defense Information, May 2003.

86 Cleverly, U.S. targeteers programmed these ocean aim points to lie on the direct path to the missiles' wartime targets so that a slight adjustment to the elevation angle of the missiles during lift-off would send them on their wartime trajectories – similar to pointing a hose at a near vertical angle and then lowering it for distance.

87 Preprogrammed 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 – 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

C. CURRENT U.S.-RUSSIA NUCLEAR WEAPONS-RELATED CBMs

DATE	COUNTRY	CBM
June 20, 1963	U.S.S.R. and U.S.	Memorandum of Understanding Between the United States of America and the Union of Soviet Socialist Republics Regarding the Establishment of a Direct Communications Link (“Hotline” Agreement) – Hotline established between national command authorities in Washington and Moscow (after Cuban Missile Crisis).
Sept. 30, 1971	U.S.S.R. and U.S.	Agreement on Measures to Reduce the Risk of Outbreak of Nuclear War – Agreed to notification of missile launches beyond national borders and prompt warning in case of accident or unauthorized launch.
June 22, 1973	U.S.S.R. and U.S.	Agreement on the Prevention of Nuclear War – Agreed to consult with each other in the event of a situation of nuclear confrontation or the danger of a nuclear confrontation between them or any other country in order to avoid risk of escalation.
Sept. 15, 1987	U.S.S.R. and U.S.	Agreement on the Establishment of Nuclear Risk Reduction Centers – Nuclear Risk Reduction Centers established in Washington and Moscow charged with transmitting notifications of strategic ballistic missile launches and other information.
Sept. 23, 1989	U.S.S.R. and U.S.	Agreement on Reciprocal Advance Notification of Major Strategic Exercises – Agreed to notify the other country no less than 14 days prior to carrying out any major strategic exercise involving heavy bombers.
Sept. 27, 1991	U.S.	Presidential Nuclear Initiatives: Announcement Regarding the Unilateral Reduction of Nuclear Weapons – Committed to reduce and limit the U.S. tactical nuclear weapons arsenal by withdrawing all overseas deployed ground-launched short-range weapons and destroying them as well as destroying existing U.S. stockpiles of the same weapons; de-alerting all strategic bombers and all intercontinental ballistic missiles; and ceasing deployment of tactical nuclear weapons on surface ships, attack submarines, and land-based naval aircraft during “normal circumstances.”
Oct. 5, 1991	U.S.S.R.	Presidential Nuclear Initiative: Announcement Regarding Unilateral Reductions of Nuclear Weapons – Committed to destruction of all nuclear artillery ammunition and nuclear mines; removal to central storage locations of nuclear warheads from anti-aircraft missiles and all tactical nuclear weapons on surface ships and multipurpose submarines; de-alerting strategic bombers and 503 ICBMs, including 134 with multiple warheads; stopping development of a short-range missile for heavy bombers and plans to develop mobile ICBMs and build new mobile launchers for existing ICBMs; pledging to eliminate an additional 1,000 nuclear warheads compared to what was required by START; and a one-year unilateral moratorium on nuclear weapons testing.
Jan. 29, 1992	Russia	Presidential Nuclear Initiative – Stated that Russia is legal successor to the Soviet Union and will continue to adhere to all agreements related to arms control; Russia will continue to work to eliminate nuclear weapons “gradually on a parity basis.”
Dec. 7, 1993	U.S.	Openness Initiative – Reformed the Department of Energy’s classification and declassification system; led to more declassification of warhead numbers, technical information on warheads, plutonium and highly-enriched uranium production and stocks and basic science related to nuclear weapons.
Jan. 1994	Russia and U.S.	Detargeting Agreement – Agreed to no longer target strategic ballistic missiles at each other, but missiles can be retargeted in seconds, implemented as of May 1994.
Dec. 1994	Russia, U.S. Ukraine & U.K.	Budapest Memorandum – Ukraine agreed to remove all nuclear weapons from its territory and sign the NPT; Russia, UK and US agree to respect Ukrainian territorial integrity and sovereignty
May 27, 1997	NATO and Russia	Founding Act on Mutual Relations, Cooperation and Security between NATO and the Russian Federation – Among various security measures the act contains NATO’s qualified pledge not to deploy nuclear weapons or station troops in the new member states and lays out areas of cooperation between Russia and NATO in nonproliferation, nuclear safety issues, and arms control.
May 24, 2000	China, France, Russia, U.K., U.S.	Target Declaration at NPT Review Conference – All nuclear weapons states party to the NPT declared that all their nuclear weapons are not targeted at any state.
2004	India & Pakistan	Hotline Agreement – Established hotline between Indian and Pakistani foreign ministries.

D. PROPOSED U.S.-RUSSIA NUCLEAR WEAPONS-RELATED CBMs

This report concurs with the suggestions for a “special system of confidence-building measures in the field of strategic arms” outlined by a Russian expert. The measures include several urgent steps in the military arena in addition to “measures to downgrade the alert mode of nuclear forces.”⁸⁸ These steps would complement de-alerting steps as part of a broader scaffolding of confidence building designed to avert a nuclear catastrophe.

The springboard for these proposals was a summit held several years ago in which the presidents of the United States and Russia declared that the relationship between the two countries had entered a new stage and that they no longer viewed each other as enemies (a position also stated in the 2002 U.S. Nuclear Posture Review). The expert outlines a set of tasks meant to reinforce that declaration in general, and particular to establish confidence that (i) “there is no possibility of the unintentional use of nuclear weapons due to provocation on the part of other countries, extremists or terrorists” and (ii) “a sudden nuclear attack that gives the attacker an advantage is likewise impossible.”⁸⁹

First, the two sides should provide detailed notification by each of the parties well in advance of intended missile launches, assure the timely detection of all missile launches, and exchange real-time information on detected missile launches and the identity of the country responsible for the launch. This sharing of missile launch information would be especially valuable to Russia because of the current severe limitations on the performance of its early warning system. A joint early warning center, manned by Russian and U.S. personnel (and later expanded with the participation of Chinese and others) would provide a conduit for this sharing. Russia and the United States agreed to establish such a center in a memorandum of agreement signed long ago by the two presidents (Vladimir

Putin and George W. Bush).⁹⁰ It was never built. Its resuscitation would serve both sides’ national interests.

The Memorandum of Agreement signed by the U.S. and Russia in June 2000 calling for the establishment of a Joint Data Exchange Center (JDEC) in Moscow envisioned that both countries would manage operations facilitating the exchange of information on detected missile launches in “near-real time,” including launches by third parties directly affecting either country.⁹¹ In the view of this commission, the JDEC would benefit from including the exchange of information on cyber warfare attacks as well missile launches. This cooperation could assist in identifying the source of attacks. Among other benefits, it would provide an additional safeguard against false warnings of missile launch and other corrupted nuclear command and warning processes that might otherwise result from a computer attack against a country’s nuclear systems.

Second, the two countries should inform each other of the general location of nuclear-armed missiles that “can be launched with a minimal arrival time.”⁹² The weapons of keenest interest in this regard are those based at sea. “It is this component of the nuclear triad that has a significantly greater capacity to secretly approach a target and launch missiles with a minimal arrival time.”⁹³ As a diagram shown previously in this report indicates, a U.S. Trident submarine at a launch station in the Norwegian Sea could lob warheads into Russia with as little as ten minutes warning provided to Russia by its ground-based surveillance radars. Russian decision-making within this fleeting timeline would be fraught; a false alarm could have dire consequences for the United States and for Russia and indeed for the world. The Russian expert wishes that the United States would let Russia know when U.S. strategic submarines enter or leave waters so close to Russian borders, and vice-versa, in

⁹⁰ See Notes in Appendix C.

⁹¹ Bureau of Arms Control, Verification, and Compliance, Memorandum of Agreement Between the United States of America and the Russian Federation on the Establishment of a Joint Center for the Exchange of Data from Early Warning Systems and Notifications of Missile Launches (JDEC MOA), Washington, D.C.: U.S. Department of State, June 4, 2000, <http://www.state.gov/t/isn/4799.htm>.

⁹² Col. Gen. (Ret.) Victor Esin, unpublished paper.

⁹³ Ibid.

⁸⁸ Col. Gen. (Ret.) Victor Esin, unpublished paper.

⁸⁹ Ibid.

order to create “a strong guarantee against undesirable reactionary missile launches by the president of the United States or the president of Russia.”⁹⁴ At a minimum, the two nations could notify each other whenever strategic submarines leave their homeports.⁹⁵ Failure to address this concern in some meaningful way means “the problem associated with a threat of a global catastrophe remains unresolved.”⁹⁶ The concern is heightened by the possibility, which the Russian expert argues cannot be excluded, that a third-party, a “rogue” state, or even extremists who might hijack a vessel and launch on-board missiles from waters close to the other’s territory and trigger a mistaken launch in retaliation based on misattribution of the responsible party.

The third major recommendation is that the two countries should notify each other whenever they are going to alert and deploy their back-up nuclear command systems, even if only for the purpose of exercising them.⁹⁷ These reserve elements such as ground mobile and airborne command posts, and airborne launch control centers, would be mobilized in preparation for nuclear war, as they provide the backbone for ensuring the survival and continuity of the nuclear chain of command in wartime. As such, their generation to high alert could be misinterpreted as a prelude to a first strike, and “hence there exists the possibility of an unfortunate reaction by the other party in the absence of reliable information.”⁹⁸

These principles and specific proposals underlie the de-alerting agenda presented in the next sections of this report. Notification protocols – for launches, forward positioning of strategic missiles with extremely short flight times, and mobilization of reserve nuclear command posts – are key to any de-alerting agreement. This principle should be expanded to cover the alerting or re-alerting of tactical nuclear weapons, reserve strategic weapons normally kept in storage, and operationally deployed strategic nuclear weapons that normally remain off

high alert in peacetime.

E. A FUTURE DE-ALERTING AGREEMENT

A future bilateral de-alerting agreement could unfold in two stages. In stage one, urgent steps would be taken to eliminate launch-on-warning from the U.S. and Russian postures within six months to one year. Initial steps would be taken to decrease the attack readiness of a portion of the individual strategic nuclear forces. These and additional de-alerting measures would be implemented in phases for the rest of the force until a total stand-down is achieved. The timeframe for this phased implementation is approximately ten years under a fast-track option.

The urgent task of eliminating prompt launch from the nuclear postures of both sides initially entails mainly adjustments in training, exercising, and planning in order to begin changing the mindset and organizational cultures in which the current postures are so deeply rooted. It would initially entail a reciprocal stand-down of a relatively small portion of their high-alert strategic forces. Keep in mind that today approximately one-half of their strategic forces, and none of their tactical nuclear forces, stand ready for immediate launch. The drawdown schedule thus applies to the fraction of day-to-day alert, assuming the off alert remainder stays off alert. (The agreement would so stipulate.)

The alert portion, currently consisting of approximately 950 weapons on each side, would stand down in phases according to this drawdown schedule:

- Within one year, 20 percent (approximately 170 weapons on each side) of the current alert strategic forces would be stood down, leaving 680 on high alert on each side.
- Within three years, 50 percent (425 weapons on each side) would be off of alert, leaving 425 still on alert.
- Within six years, 80 percent (680 weapons on each side) would be off alert, leaving 170 on alert.

Within ten years, 100 percent (850 weapons on each side) could be off alert if U.S.-Russian relations have returned to normal and their security cooperation has deepened. The key goal is to decrease attack readiness from current launch times

94 Ibid.

95 For the United States, this happens once a week or so.

96 Ibid.

97 Ibid.

98 Ibid.

of minutes to a future launch time of at least 24-72 hours for all deployed strategic forces, and much longer for nuclear weapons consigned to the active reserve force.

F. ELIMINATING LAUNCH-ON-WARNING

This aim is the brainchild of Maj. Gen. (Ret.) Vladimir Dvorkin, former head of the 4th Central Institute of the Russian Strategic Rocket Forces. Dvorkin is very familiar with the technical and operational characteristics of the Russian strategic forces. He writes and publishes extensively on the subject of de-alerting, and he contributed analyses, facts and ideas to this commission's report.

Dvorkin argues that it is “quite urgent” that Russia and the United States agree to abandon their current plans for launching on warning.⁹⁹ His concern is that “the leaders at the highest levels have just a few minutes to make the decision for a retaliatory counterstrike based on the information from early warning systems; therefore, there is always a risk that the decision will be wrong.”¹⁰⁰ Worse, Dvorkin – and this commission – believe that the deteriorating relationship between Russia and the United States is increasing the danger of inadvertent nuclear strikes stemming from false information from early warning sensors.

Dvorkin therefore advocates a “program of phased withdrawal of strategic nuclear forces from the state of high alert,” but pending the completion of this program, which he believes may “take a considerably long period of time,” he urges the two sides to take “emergency measures to prevent the possibility of missile launches on the basis of false warnings.”¹⁰¹ In addition to beginning to implement de-alerting measures that lower the attack readiness of the individual land-, sea-, and air-based strategic nuclear weapons, the two sides should adopt organizational, procedural, and technical measures that “confirm and strengthen their commitment to end the pos-

sibility of launching strategic nuclear weapons on the basis of information from early warning systems.”¹⁰² This commitment would require a radical departure not only from current operating practices, but also from the mindset and culture of strategic organizations. It represents quite a tall order, but a necessary one if we wish to eradicate the risk of an inadvertent nuclear exchange or accidental or unauthorized launch.

G. EMERGENCY AND 10-YEAR MEASURES TO ELIMINATE LAUNCH-ON-WARNING AND REDUCE THE ATTACK READINESS OF U.S.-RUSSIAN NUCLEAR FORCES¹⁰³

A core part of Dvorkin's proposal for eliminating launch-on-warning is to stop practicing it. At present, the two sides routinely exercise it. Dvorkin urges Russia and the United States immediately to “stop any exercises that involve the use of their land, sea, and air [strategic] missiles launched on the basis of information from early warning systems; exchange information about ongoing and planned [nuclear] military exercises; invite observers to each others' top command position during full-scale exercises; and also, if requested by the other side, to invite observers to any exercises of their strategic nuclear forces.”

Furthermore, Dvorkin calls on the two sides immediately to refrain from anti-satellite experiments that could interfere with the functioning and performance of missile attack early warning sensors. He also implies that they refrain from any acts, such as cyber attack, that could intentionally or inadvertently derange early warning networks.

Other organizational, procedural, and technical measures can be introduced to eliminate prompt launch options and thereby increase warning and decision time. Two procedural changes involve altering the nuclear war plans and their implementing procedures (known as Emergency War Orders, or

99 Maj. Gen. (Ret.) Vladimir Dvorkin, “Once Again, Concerning the Transformation of the Principles of Mutual Nuclear Deterrence for Russia and the United States,” unpublished paper.

100 Ibid.

101 Ibid.

102 Ibid.

103 This section draws on Maj. Gen. (Ret.) Vladimir Dvorkin's draft “Executive Agreement Between the Presidents of the Russian Federation and the United States on Urgent Measures to Exclude the Possibility of Strategic Missile Launch on False Alarm” (See Appendix B.)

EWO), and de-targeting the land-based missile forces on both sides. 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 could be made to increase the time needed to reach a launch decision as well as the time taken to carry out the decision. Top-level deliberations could be prolonged to preclude a hasty decision and enhance the quality of attack information. In addition, the coordinates of all wartime targets for the land-based intercontinental missiles could be downloaded from the computers onboard the missiles or collocated at the launcher. This would really constitute de-targeting and would replace the cosmetic Clinton-Yeltsin de-targeting agreement of 1994.¹⁰⁴

Regarding technical measures, they would initially be applied mainly to the vulnerable, “use or lose” land-based rocket forces on each side. The pressure-packed and short timeline of launch-on-warning stems largely from the fact that the stationary missiles in fixed underground silos and mobile missiles in garages at known garrison locations depend on very rapid reaction for their survival. Stationary missiles in silos and mobile missiles still in garrison at the time of attack (the latter may quickly disperse from garrison on warning in a nuclear crisis or launch quickly from inside their garages after retracting their sliding roofs) could be decimated if they were not fired before the arrival of incoming warheads whose flight time from the other side of the planet would not exceed 30 minutes.

Technical measures that decrease the launch readiness of Russian and U.S. land-based missiles forces from their current response times of a few minutes to a period of hours to days in future would effectively de-link this force from prompt-launch decision-making. However, strategic subma-

104 Fully reversing the changes to the emergency war plans would require significant time – many hours to re-target the 450 Minuteman missiles, for instance, and many days to reinstate launch-on-warning EWO to its original form. 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 15 minutes to re-target ten missiles, and 12 hours to re-target the entire force of 450 missiles..

rines, although they are not “use or lose” forces, should also be de-alerted in order to limit their offensive counterforce potential against the other side’s de-alerted land-based strategic forces and to increase warning and decision time, which are currently stressed and compressed by the forward deployment of strategic submarines capable of delivering warheads in ten minutes. Lastly, mobile Russian land-based missiles in garrison should be blocked from firing out of their garages, but they should have maneuvering room for a quick egress from their garages to hidden and relatively invulnerable positions in nearby forests.

As previously noted, the physical de-alerting of strategic forces that currently maintain high day-to-day alert status would be implemented in phases over time.¹⁰⁵ In the very near term – six months after signing the executive agreement – the goal is to physically de-alert 20% of the normal alert force on each side. This translates into a stand-down of about 170 strategic warheads. On the U.S. side, this is roughly the equivalent of one Minuteman squadron (50 missiles with one warhead each, or 50 warheads) plus one Trident submarine (24 missiles with four warheads each, or 96 warheads). On the Russian side, it is the equivalent of two Russian regiments of silo-based missiles (ten SS-19 missiles with six warheads each, or 60

105 For additional reading of work to devise de-alerting options, see Sam Nunn and Bruce Blair, “From Nuclear Deterrence to Mutual Safety,” *The Washington Post*, June 22, 1997, p. C1; Bruce G. Blair, “De-alerting Strategic Nuclear Forces,” in *The Nuclear Turning Point: A Blueprint for Deep Cuts and De-alerting of Nuclear Weapons*, ed. Harold A Feiveson, (Washington, D.C.: Brookings, 1999); Bruce Blair, Hal Feiveson, and Frank von Hippel, “Taking Nuclear Weapons off Hair-Trigger Alert,” *Scientific American*, Vol. 277, No. 5, November 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*, (Santa Monica, CA: RAND Corporation, 2003); Bruce Blair, “Command, Control, and Warning for Virtual Arsenals,” in *Nuclear Weapons in a Transformed World: The Challenge of Virtual Nuclear Arsenals*, ed. Michael J. Mazaar, (New York: St. Martin’s Press, 1997); Thomas Karas, *De-alerting and De-activating Strategic Nuclear Weapons*, Sandia National Laboratories, Report 2001-0835, April 2001; Bruce Blair, “De-Alerting Strategic Forces,” in *Reykjavik Revisited: Steps Toward a World Free of Nuclear Weapons*, eds. George P. Shultz, Sidney D. Drell, and James E. Goodby, (Stanford, CA: Hoover Institution Press, 2008); Hans M. Kristensen and Matthew McKinzie, *Reducing Alert Rates of Nuclear Weapons*, (Geneva: United Nations Institute for Disarmament Research, 2012).

warheads, and ten Topol-M SS-27 missiles with one warhead each, or ten warheads), two Russian regiments of land-based mobile rockets (18 Topol M missiles with one warhead each, or 18 warheads), and one Russian strategic submarine (Delta IV submarine with 16 missiles and 64 warheads).

The measures described in Appendix A provide an ample menu of options from which to choose for eliminating launch on warning and de-alerting increments of the forces over time until none stand on high alert. As noted earlier, governments will decide what forces to de-alert, and how to de-alert them. This report nominates these particular units because they represent a good cross-section of the various deployed forces and a balanced diversity of verification methods that will need to be devised. The de-alerting measures described in detail in the appendix should be viewed as illustrative possibilities. They by no means exhaust the creative possibilities, and moreover they are incompletely analyzed. They raise a significant number of questions that are flagged in the appendix and that constitute grist for the mill of future analysis by governments and official and unofficial task forces.

X. OVERALL EVALUATION BASED ON FIVE CRITERIA

Russian and U.S. strategic forces armed with 170 warheads on each side are de-alerted under this plan in an initial tranche meant to stand down 20 percent of the forces on each side within one year of signing an executive agreement. The plan assumes the implementation of the set or a subset of the de-alerting options found in the appendix. The regime is evaluated using five criteria:

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-alerting. 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 global zero. 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 Russian and U.S. 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.

A. TIME TO RE-ALERT

The previously derived timelines for re-alerting are given in the chart below:

RUSSIA	FIRST FORCES ONLINE	ALL FORCES IN UNIT
Silo-based Regiments:		
Restore Warheads	24 hrs	58 days
Restore Gas Generators	10 hrs	4 days
Restore Flight Batteries	8 hrs	3 days
Road-mobile Regiments:		
Restore Warheads	30 hrs	23 days
Restore Flight Batteries	8 hrs	6 days
Restore Removal of Metal Beams	12 hrs	9 days
Restore Re-build of Launcher	36 hrs	27 days
Strategic Submarines:		
Restore Warheads	12 hrs	8 days
Other (e.g., Open Welded Tubes*)	>24 hrs	>20 days
Strategic Bombers:		
Upload Weapons	>12 hrs	>2 days
Tactical Forces:		
Upload Weapons	24 hrs	30 days

* Potential safety hazard.

UNITED STATES	FIRST FORCES ONLINE	ALL FORCES IN UNIT
Silo-based Squadrons:		
Restore Targets	15 mins	24 hrs
Undo "Safing"	3 hrs	10 hrs
Restore Lid Explosives	10 hrs	5 days
Remove Heavy Objects	12 hrs	7 days
Restore Warheads	24 hrs	9 days
Reconnect Stages	6 hrs	4 days
Strategic Submarines:		
Restore Warheads (In Port)	3 hrs	3 days
Restore Warheads (Onboard)	12 hrs (weather dependent)	>5 days
Restore Inverters	2 hrs	1 day
Restore Range	>2 days	>2 days
Strategic Bombers:		
Upload Weapons	>12 hrs	2 days
Tactical Forces:		
Upload Weapons	24 hrs	7 days (1/3) / 100 days (all)

These estimates may be optimistic; actual re-alerting rates may be twice as long. The underlying assumption of the chart is that the re-alerting process takes place during a national security emergency that warrants around-the-clock effort to bring the forces back online. However, various factors may moderate the pace of re-constitution.

First, it is important to remember the initial conditions at the start of re-alerting. Nearly 700 strategic weapons on each side are already on high alert, while more than two-thirds of their arsenals in addition to the 170 de-alerted weapons were already off of alert in peacetime. The urgency of re-alerting the additional 170 warheads, and the priority of their re-alerting over generating the other off-alert forces, can both be questioned. Deterrence is already robustly provided for (see discussion below under “stability”). On the other hand, a national security emergency could well motivate both sides to re-alert all of their off-alert forces, in which case the line-up in the re-alerting queue may be quite different from the line-up for just the 170 weapons. New bottlenecks and backlogs may also form.

Second, the purpose of re-alerting in a national emergency is less to build up nuclear strength in preparation for war than it is to send a signal to the opponent that an escalatory updraft has commenced and the time for bargaining and concessions, tacit or overt, has arrived. During the Arab-Israeli (Yom Kippur) war in 1973, the United States raised the alert level of its strategic nuclear forces for precisely this purpose – to pressure the Soviets to refrain from military intervention on Egypt’s side, as they had threatened to do. The U.S. alert lasted for little more than 24 hours and generated more light than heat. U.S. leaders were reluctant to incur monetary costs to generate forces any further, and the signaling (abetted by front page headlines) had accomplished its purpose.

The timelines for re-alerting a more deeply de-alerted force in future were not calculated. For some components, such as the silo-based strategic forces, re-alerting activities could be undertaken simultaneously at several bases, and thus the timelines should remain fairly con-

stant. In other words, if it is possible to re-alert an SS-19 regiment by restoring its flight batteries in 4 days, it may be possible to replicate the activity at the same time in the other five regiments within the division, and at other divisions, other things being equal. But of course things are never equal. There are bound to be some shortages of trained people and equipment and therefore queuing may be necessary, extending the re-alerting times.

If two Trident submarines instead of just one had been de-alerted, the re-alerting time for the pair would be identical if they were home based at different ports. Re-alerting could proceed in parallel on each coast. But if additional subs were de-alerted, a queuing issue would arise. There is usually only one explosive handling pier at each submarine base in Russia and the United States, and so de-alerted strategic submarines needing to be uploaded in port with missiles and/or warheads from central storage would have to wait turns. Thus, if the entire fleet of U.S. strategic submarines had been de-alerted and had to wait in line to receive their nuclear arms, the re-alerting timeline would increase by multiples of the three days required for re-loading a single Trident submarine.

Calculating these timelines for deeply de-alerted arsenals is beyond the scope of this report and will require further in-depth analysis.

B. IMPACT ON STRATEGIC STABILITY

This menu of de-alerting options could bolster strategic stability by providing the means of reducing, and ultimately removing (at a later stage of the de-alerting schedule) the capacity of either U.S. or Russian strategic forces to initiate a bolt-from-the-blue surprise attack, and of ensuring that significant re-alerting could not escape detection nor confer advantage in a re-alerting contest. However, survivable forces and command systems are both necessary and sufficient to ensure stability in peacetime and crisis circumstances.

A serious U.S. de-alerting initiative would establish the nation’s clear intention not to pose a first-strike threat to Russia while preserving ample capacity to satisfy reason-

able requirements of deterrence. Almost 800 U.S. warheads would remain at sea in eight Trident submarines (instead of the usual nine after removing the warheads of the ninth boat under this initial de-alerting program aimed at a 20 percent reduction in overall alert forces). With so many survivable warheads, 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. and Russian daily alert forces, particularly silo-based missiles, would begin to relinquish their day-to-day counterforce threat that currently provides a dubious rationale for maintaining the forces on prompt launch alert on both sides. The steps taken to implement the Dvorkin proposal (the agreement to excise launch on warning from each sides planning and exercising) would reinforce and accelerate this shift away from prompt launch.

A breakout on any scale by either side would not make strategic sense because it would not alter the strategic balance or compromise the survivability of each side's forces. In any event, a breakout of any significant proportions could be detected in a timely fashion and would allow each side ample time to re-alert and disperse additional 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 stabilize any crisis re-alerting dynamics that may ensue.

In the event of the first use of nuclear weapons against the nuclear forces and their infrastructure on either side, the rates of reconstitution would be slowed considerably by the damage and by hazardous levels of radioactive fallout. This degradation, as well as any degradation suffered from early strikes by conventional weapons, represents a much larger complication for Russia 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 quite modest option of 20 percent de-alerting 20 is that it is high.

The stability question becomes more relevant when forc-

es are deeply de-alerted and when arsenals are much smaller than today's. At the point at which 80 or 100 percent of the strategic forces would be de-alerted, care must be taken to configure them to be robustly stable during any re-alerting race that might ensue. Verification also becomes more important in order to prevent a cheater from gaining a huge head start in re-alerting. And at the lower numbers, the possibility of shifting coalitions among cliques of nuclear weapons countries, each possessing comparable or equal numbers of weapons, raises concerns about the strong ganging up on the weak.

Rigorous analyses show that even fully de-alerted bilateral forces, if the de-alerting is done properly and verifiably, can sustain stability.¹⁰⁶ A well-designed posture with inherently survivable forces (e.g., strategic submarines at sea) can nullify any advantage and incentive to re-alert and launch a preemptive or preventive attack. The optimal posture appears to be organized around "tiers" of different types of forces with varying re-alerting speeds. Whether this finding holds for a multipolar situation with opportunities for forming coalitions remains an open question. Further study is required.

The optimal posture also presupposes a resilient nuclear command system that could survive a heavy attack and direct surviving re-alerted nuclear forces to coherent national purposes. A survivable force structure controlled by a vulnerable command system would not relieve the pressure on national leaders to make quick decisions. As the U.S. Joint Staff analysis points out:

De-alerting forces does not necessarily eliminate the need to make quick execution decisions [...] De-alerting extends launch

106 See Bruce Blair, et al., "Smaller and Safer: A New Plan For Nuclear Postures," Foreign Affairs, Council on Foreign Relations, September-October 2010, <http://www.foreignaffairs.com/articles/66540/bruce-blair-victor-esin-matthew-mckinzie-valery-yarynich-and-pav-smaller-and-safer>; and Bruce Blair, et al., "One Hundred Nuclear Wars: Stable Deterrence between the United States and Russia at Reduced Nuclear Force Levels Off Alert in the Presence of Limited Missile Defenses," Routledge Taylor & Francis Group, August 9, 2011, http://www.globalzero.org/files/bb_one_hundred_nuclear_wars_08.09.2011.pdf.

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 decision makers authorized to execute nuclear weapons).¹⁰⁷

As the de-alerting drawdown deepens over the next decade, command and warning systems will have to be redesigned to allow for riding out an attack instead of merely launching on warning. The systems will need to be afforded far better protection than they currently receive. To relieve pressures on national decision-makers to make quick execution decisions, they must have confidence in the continuity of command-control while under attack. The pre-delegation of authority would partially instill such confidence, but this creates its own set of thorny problems and thus represents a very suboptimal solution.

C. DEGREE OF STABILITY/VERIFIABILITY

Most of the major de-alerting options such as warhead and flight battery removal are amenable to monitoring using space surveillance and other national technical means supplemented by on-site inspections piggybacking on New START verification procedures. Some of the options such as “safing” and “de-targeting” do not lend themselves easily to strict and timely verification and would thus tend to fall into the category of confidence building measures that thicken over time. Other options fall between these two stools. But it is fair to say that the standard of “adequate verification” can be met with this collection of options. The considerable amount of time required to re-alert and the scale and visibility of reconstitution for the 170 de-alerted strategic warheads in this proposal also ensures timely detection.

¹⁰⁷ Lt. Col. John Betts, unpublished paper and personal communications, op.cit.

D. FOSTERING A WORLD WITHOUT NUCLEAR WEAPONS

This plan would mark an incremental but notable step on the path to reducing the salience of nuclear weapons in ways that promote their ultimate elimination. At the initial stage of de-alerting, arsenals would still exceed the threshold number estimated to cause mass social destruction and conduct traditional war-fighting operations as well. However, this initial de-alerting, including the steps taken to eliminate launch on warning, would begin to contest the standard assumption that deterrence depends upon the capacity for large-scale instant retaliation. It would also begin to whittle away at the primacy of counterforce strategy in nuclear planning. In short, this initial program would represent a step toward nuclear disarmament and bring a world free of nuclear weapons closer to the visible horizon.

E. IMPACT ON TODAY'S RISK OF ACCIDENTAL/UNAUTHORIZED USE OR THEFT

Removing prompt and large-scale launch from the repertoire of war options would extend warning and decision time well beyond the timeframe realistically required to interpret attack indications and resolve false alarms in early warning systems. It would thus be a salutary move in reducing the risks of mistaken launch. The deprogramming of large-scale orchestrated attacks would also reduce the capacity for sudden first-strike as well as excise launch on warning from the repertoire of response options available to nuclear decision-makers. The technical de-alerting steps taken in this realignment would physically eliminate the hair-trigger on a portion of the forces and reduce somewhat the amount of damage that an unauthorized or accidental launch could inflict, including terrorist-abetted launches.

The major weakness of this option is its limited effect on the untoward consequences of unauthorized actions within the strategic command system, particularly the consequences of cyber warfare. The theoretical opportunity still exists for state and non-state actors to target the

computer-based system with a view to disrupting or even negating control. The effectiveness of current safeguards in preventing such access and the neutralizing, deranging, or seizing of launch control is uncertain, at least to this commission. What can be argued is that a de-alerting regime that stands down 100 percent of the strategic forces on all sides would be effective in thwarting the most diabolical of cyber warfare scenarios that can be imagined – as well as those that have so far escaped imagination. In short, a persuasive case can be made to accelerate the de-alerting schedule proposed in this report.

XI. U.S.-RUSSIA JOINT PROJECT ON DE-ALERTING

In conjunction with the urgent business of eliminating prompt launch from the nuclear postures of both sides, and reciprocally standing down a portion of their high-alert strategic forces according to the draw-down schedule presented earlier, Russia and the United States need to resume nuclear talks. Their experts should work together to design, test, demonstrate, and validate de-alerting methods and associated verification procedures. As part of this joint undertaking, they should compare and share assessments of the risks posed by their current strategic postures, including the risks to the integrity of nuclear command, control, communications, and early warning networks posed by cyber warfare. They should jointly assess the nuclear programs of other countries, the risks they carry, and remedies including confidence-building measures and de-alerting.

XII. TOWARD A GLOBAL MULTILATERAL DE-ALERTING AGREEMENT

Previous sections and the model U.S. presidential nuclear guidance presented later explained the grounds for standing down and keeping down the nuclear forces of all nations. Simply put, de-alerting serves their national security interests. There are no exceptions. The dots between de-alerting and a wider set of Chinese, French, Indian, Israeli, Pakistani, Russian, U.K. and U.S. security considerations have been connected and elaborated. It is difficult to refute.

The present position of the U.S. government nevertheless does refute the basic claims presented in this report – notably, that the risks of nuclear weapons use are excessive, that they stem from inadequate warning and decision time, and that other weaknesses in nuclear command and control create opportunities for nuclear weapons use by accident or design. The official refutation is brief and to the point. It was most recently articulated in a letter written in response to a United Nations resolution calling for the nuclear weapons countries to reduce the operational readiness of their nuclear forces. (For further discussion of the de-alerting movement at the United Nations, see the next section of this report.) Speaking on behalf of the United Kingdom and France as well as the United States, U.S. Ambassador Robert Wood wrote:

We continue to disagree with the basic premises of this resolution, which suggest that the current level of readiness of nuclear weapons increases the risk of the unintentional or accidental use and that lowered alert levels will automatically and in all cases lead to heightened international security. While alert levels can and have been lowered in response to an improved international security climate, the relationship between alert levels and security is complex and not reducible to simple formulaic responses.

We would like to restate that the operational readiness of our respective nuclear weapons systems is maintained at a level consonant with our national security requirements and our obligations to our allies, within the larger context of the current global strategic situation. In reflection thereof, we have decreased the operational readiness and alert levels of our respective forces since the early 1990s. Additionally, our respective nuclear weapons systems are no longer targeted against any state.

Collectively, those steps have reduced the

value of further “de-alerting” as a priority for nuclear disarmament.

We would also like to reiterate that our nuclear weapons systems are subject to the most rigorous command, control and communication systems, to ensure against the possibility of accidental or unintentional use, and to guarantee that such weapons could only be used at the sole direction of the proper national command authority and to maximise that authority’s decision time.¹⁰⁸

With due respect to this official tripartite position, this report contends that current operational readiness is not consonant with French, U.K. and U.S. national security requirements and that significant adjustments to the current posture are necessary to align readiness with those requirements. The value of further de-alerting is not declining, but rather is growing – and the case for further de-alerting flows not from premises, but from fact-based analysis. The readers of this report can decide for themselves whether it builds a rigorous case.

This commission believes, furthermore, that de-alerting would also serve the national security interests of the larger constellation of nations including all the nuclear possessor states as well as key non-nuclear weapons countries.

A. WIDESPREAD INTERNATIONAL SUPPORT AND STANDING FOR DE-ALERTING

Since 2007, a group of five countries – Chile, Malaysia, New Zealand, Nigeria and Switzerland – has put forward a resolution on decreasing the operational readiness of nuclear weapons systems at the United Nations General Assembly (UNGA) on five separate occasions. Each res-

¹⁰⁸ Amb. Robert A. Wood, “Cluster One: Explanation of the Vote After the Vote,” statement to the Sixty-Ninth United Nations General Assembly First Committee, New York City, October 29, 2014.

olution calls on nuclear weapons states to take “further practical steps [...] to decrease the operational readiness of nuclear weapons systems, with a view to ensuring that all nuclear weapons are removed from high alert status.”¹⁰⁹ Taking up this call to action, they believe, would lower the risk of unintentional or accidental use of nuclear weapons and contribute to the process of nuclear disarmament by reducing the role of nuclear weapons in national security policy and strengthening transparency and confidence-building measures.

At the 2000 NPT Review Conference, states party to the treaty, including Russia and the United States, agreed that nuclear weapons states should further reduce the operational status of nuclear weapons systems as part of the “13 practical steps” toward nuclear disarmament. The importance of this step was underscored at the 2010 NPT Review Conference when all parties adopted a 64-point action plan to accelerate progress on nuclear disarmament, which included further reductions in the operational status of nuclear weapons.

In 2012, the General Assembly passed the fourth incarnation of the de-alerting group’s resolution with a vote of 164 in favor, 4 against, and 19 abstaining.¹¹⁰ The vote

¹⁰⁹ General Assembly resolution 69/42, Decreasing the operational readiness of nuclear weapons, A/RES/69/42, December 11, 2014.

¹¹⁰ U.N. General Assembly voting record for 2012 Resolution 67/46 Decreasing the operational readiness of nuclear weapons systems:

In favor: Afghanistan, Albania, Algeria, Angola, Antigua and Barbuda, Argentina, Armenia, Australia, Austria, Azerbaijan, Bahamas, Bahrain, Bangladesh, Barbados, Belarus, Belgium, Belize, Benin, Bhutan, Bolivia (Plurinational State of), Bosnia and Herzegovina, Botswana, Brazil, Brunei Darussalam, Bulgaria, Burkina Faso, Cambodia, Cameroon, Canada, Cape Verde, Central African Republic, Chad, Chile, China, Colombia, Comoros, Congo, Costa Rica, Côte d’Ivoire, Cuba, Cyprus, Democratic Republic of the Congo, Denmark, Djibouti, Dominica, Dominican Republic, Ecuador, Egypt, El Salvador, Eritrea, Ethiopia, Fiji, Finland, Gabon, Gambia, Germany, Ghana, Greece, Grenada, Guatemala, Guinea, Guinea-Bissau, Guyana, Haiti, Honduras, Iceland, India, Indonesia, Iran (Islamic Republic of), Iraq, Ireland, Italy, Jamaica, Japan, Jordan, Kazakhstan, Kenya, Kuwait, Kyrgyzstan, Lao People’s Democratic Republic, Lebanon, Lesotho, Liberia, Libya, Liechtenstein, Luxembourg, Madagascar, Malawi, Malaysia, Maldives, Mali, Malta, Mauritania, Mauritius, Mexico, Mongolia, Montenegro, Morocco, Mozambique, Myanmar, Namibia, Nepal, New Zealand, Nicaragua, Niger, Nigeria,

showed widespread support for work toward de-alerting nuclear forces, including support from China, India and Pakistan – nuclear weapons states in a region that is in some danger of an escalating the arms race, which would involve increasing the operational readiness of nuclear weapons systems. France, Russia, the United Kingdom and the United States, four of the five permanent members of the U.N. Security Council, all voted against the resolution.

The most recent resolution, tabled at the 2014 U.N. General Assembly, contained the same call to action as the previous resolutions: for steps to be taken to decrease the operational readiness of nuclear weapons with the view of taking all nuclear weapons off high alert status. There was an increase in support for the resolution with 166 countries voting in favor, 4 voting against and 11 abstaining.¹¹¹ Once again, China, India and Pakistan voted in favor; and France, Russia, the United Kingdom and the

Norway, Oman, Pakistan, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Poland, Portugal, Qatar, Rwanda, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Samoa, San Marino, Sao Tome and Principe, Saudi Arabia, Senegal, Serbia, Sierra Leone, Singapore, Slovenia, Solomon Islands, Somalia, South Africa, South Sudan, Spain, Sri Lanka, Sudan, Suriname, Swaziland, Sweden, Switzerland, Syrian Arab Republic, Tajikistan, Thailand, the former Yugoslav Republic of Macedonia, Timor-Leste, Togo, Tonga, Trinidad and Tobago, Tunisia, Turkmenistan, Tuvalu, Uganda, Ukraine, United Arab Emirates, United Republic of Tanzania, Uruguay, Uzbekistan, Vanuatu, Venezuela (Bolivarian Republic of), Viet Nam, Yemen, Zambia, Zimbabwe.

Against: France, Russian Federation, United Kingdom of Great Britain and Northern Ireland, United States of America.

Abstaining: Andorra, Croatia, Czech Republic, Democratic People's Republic of Korea, Estonia, Georgia, Hungary, Israel, Latvia, Lithuania, Marshall Islands, Micronesia (Federated States of), Netherlands, Palau, Republic of Korea, Republic of Moldova, Romania, Slovakia, Turkey. Recorded vote on General Assembly resolution 67/46, *Decreasing the operational readiness of nuclear weapons*, A/RES/67/46, December 3, 2012, https://gafv-vote.un.org/UNODA/vote.nsf/91a5e1195dc97a630525656f-005b8adf/e35fd89dd7a6f43485257ad7006bf022?OpenDocument&ExpandSection=3%2C2#_Section3.

111 “General Assembly Adopts 63 Drafts on First Committee’s Recommendation with Nuclear Disarmament at Core of Several Recorded Votes,” *United Nations Press Release*, December 2, 2014, <http://www.un.org/press/en/2014/ga11593.doc.htm>.

United States voted against the resolution. Enters U.S. Ambassador Wood, stage left, to explain their negative votes (see above).

As part of a statement to the 69th First Committee of the General Assembly, Ambassador Urs Schmid of Switzerland, a state leading the de-alerting resolution efforts, acknowledged past progress on de-alerting, highlighting that such actions demonstrate that de-alerting is possible and that political and technical challenges can be overcome in order to address the nearly 2,000 warheads that remain on high alert.¹¹²

B. DE-ALERTING BUILDS ON ANTECEDENT CONFIDENCE-BUILDING MEASURES

A multilateral effort to establish an agreed framework for de-alerting nuclear forces would build on a number of existing measures designed to reduce nuclear risks, and a growing array of proposals related to enhancing the transparency and stability of the nuclear postures of all the nuclear weapons countries.

112 Amb. Robert A. Wood, “Cluster One: Explanation of the Vote After the Vote,” op. cit.

C. CURRENT AND PROPOSED NUCLEAR WEAPONS-RELATED CBMs OUTSIDE U.S.-RUSSIA

DATE	COUNTRY	CBM
Oct. 1964	China	Declaration of No-First Use – Pledged to not use nuclear weapons unless first attacked with a nuclear weapon.
1966	France & U.S.S.R.	Hotline Agreement – Established hotline between Paris and Moscow.
1967	U.K. & U.S.S.R.	Hotline Agreement – Established hotline between London and Moscow.
July 16, 1976	France & U.S.S.R.	Agreement on Prevention of Accidental or Unauthorized Use of Nuclear Weapons – Agreed to improve measures to guard against nuclear weapon accidents and immediately notify the other country of any nuclear accident.
Oct. 10, 1977	U.K. & U.S.S.R.	Agreement on Prevention of Accidental or Unauthorized Use of Nuclear Weapons – Agreed to improve measures to guard against nuclear weapon accidents and immediately notify the other country of any nuclear accident.
Dec. 31, 1988	India & Pakistan	Prohibition of Attack Against Nuclear Facilities – Prohibited attacks against nuclear installations or facilities in either country; required annual exchange of lists of all nuclear-related facility locations in each country (lists have been exchanged annually since 1992).
Feb. 1994	Russia & U.K.	De-targeting Agreement – Agreed to de-target nuclear weapons to empty ocean zones.
Sept. 1994	China & Russia	Bilateral No First Use Accord – Pledged not to use nuclear weapons against each other or target each other with nuclear weapons.
1998	India & Pakistan	Informal CBM – Moratorium on further nuclear testing.
Apr. 1998	China & U.S.	Hotline Agreement – Established hotline between Beijing and Washington (activated in June 1998).
May 3, 1998	China & Russia	Hotline Agreement – Established hotline between national command authorities in Beijing and Moscow. In March 2008, a hotline was established between the Chinese and Russian Defense Ministries to enhance bilateral cooperation.
June 1998	China & U.S.	Nuclear Weapons De-Targeting Agreement – Pledged not to target each other with nuclear weapons.
Aug. 17, 1999	India	No First Use – Announced draft policy; policy reaffirmed in 2003.
2004	India & Pakistan	Hotline Agreement – Established hotline between Indian and Pakistani foreign ministries.
Oct. 3, 2005	India & Pakistan	Agreement on Pre-Notification of Flight Testing of Ballistic Missiles – Each country committed to notify each other in advance of ballistic missile flight tests (does not apply to cruise missiles).
Feb. 21, 2007	India & Pakistan	Agreement on Reducing the Risk from Accidents Relating to Nuclear Weapons – Five year agreement on improving measures to guard against nuclear weapon accidents and establish communication measures between the two countries in the event of a nuclear accident; extended for an additional five years in Feb. 2012.

D. ONGOING EFFORTS AND PROPOSALS FOR FUTURE CBMs

Non-Proliferation and Disarmament De-alerting Initiative (United Nations). A joint working paper on de-alerting submitted by a dozen countries¹¹³ (see attached for full version) proposed that all nuclear weapons states – both within and outside the NPT – take steps (unilaterally, bilaterally, or multilaterally) toward de-alerting and provide updates on actions taken toward the goal. The joint statement gave several reasons for urging states to de-alert including:

- Demonstrating commitment to reduce the role of nuclear weapons in national security doctrines, and to disarmament;
- Moving forward with commitments from the 2010 NPT review conference (see below);
- Reflecting post-Cold War tension reductions; and
- Taking steps to lessen the risk of nuclear war.¹¹⁴

Recent P5 Commitments on De-Alerting. All permanent members of the U.N. Security Council – China, France, Russia, the United Kingdom and the United States – approved the 2010 NPT review conference's action plan which called upon them to “consider the legitimate interest of non-nuclear-weapon states in further reducing the operational status of nuclear weapons systems in ways that promote international stability and security” (Action 5).¹¹⁵

The first P5 Conference on Confidence-Building Mea-

asures towards Nuclear Disarmament and Non-Proliferation was held in London in 2009. It was followed by gatherings in July 2011 (Paris), June 2012 (Washington), April 2013 (Paris), April 2014 (Beijing), and February 2015 (London). So far, the process has sidestepped the idea of pursuing multilateral nuclear arms reductions and de-alerting. Its modest agenda has:

- Established a Chinese-led working group on an agreed glossary of key nuclear terms to be submitted to the 2015 NPT Review Conference;
- Issued a pledge to renew efforts to promote a Fissile Material Cut-off Treaty;
- Committed to work toward the signature of Protocol to the Southeast Asia Nuclear Weapon Free Zone;
- Committed states to promote swift entry into force of the Comprehensive Nuclear Test Ban Treaty; and
- Committed states to full implementation of the 1995 Resolution on the Middle East for a Middle East Nuclear Weapon Free Zone.

Recent Non-Governmental Proposals for U.S./NATO/Russia Nuclear Weapons CBMs. The following list substantially overlaps the recommendations of this report:

- “Establish 100-mile exclusion zones for U.S. missile defense deployments adjacent to Russian territory”,¹¹⁶
- Increase warning and decision time in the command and control systems through de-alerting;¹¹⁷
- Data exchanges on nonstrategic nuclear warheads destroyed in the past 20 years;¹¹⁸
- Reciprocal visits to former naval and air force storage sites to ensure removal and tactical weapons are not available for quick re-deployment;¹¹⁹

113 Australia, Canada, Chile, Germany, Japan, Mexico, Nigeria, the Netherlands, the Philippines, Poland, Turkey and the United Arab Emirates.

114 Non-Proliferation and Disarmament Initiative, “De-alerting joint working paper,” submitted to the Preparatory Committee for the 2015 Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons, New York City, March 14, 2014.

115 “Final Document,” adopted by 2010 Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons, New York, May 3-28, 2010, p. 2.

116 “Global Zero U.S. Nuclear Policy Commission Report,” May 2012, p. 11.

117 Ibid.

118 Deep Cuts Commission, “Preparing for Deep Cuts: Options for Enhancing Euro-Atlantic and International Security,” April 2014, http://www.deepcuts.org/files/pdf/First_Report_of_the_Deep_Cuts_Commission_English.pdf, p. 5.

119 Ibid, p. 12. Also proposed in *Global Zero NATO-Russia Commission*

- Exchange declarations of intent of nuclear use including emphasizing that a strong nuclear deterrent does not require the ability to retaliate immediately;¹²⁰
- Exchange declarations on missile defense programs for the next ten years;¹²¹
- Increase transparency on current locations, types and numbers of nonstrategic nuclear weapons;¹²²
- Agreement to separate tactical nuclear weapons from delivery vehicles and keep them de-mated;¹²³ and
- Agreement to remove tactical nuclear weapons from combat bases in Europe.¹²⁴

In February 2014, a working group composed of 22 NATO and Russian experts analyzed various transparency confidence-building measure proposals and ranked them taking into account political, security, military/operation and practical considerations.¹²⁵

Breakthrough (options with low implementation costs and significant added value):

- None identified.

Low-Hanging Fruit (options with relatively low costs and relatively modest added value):

- Formalized, recurring joint seminars on nuclear doctrines and tactical nuclear weapons employment; and
- Joint nuclear incident response “live” exercises (sim-

ilar exercises exist between Russia and the United States).

Challenging (options in which agreement would create difficulties for either party, but are worth exploring if there would be robust political will by both sides):

- Collaboration on developing verification techniques;
- Exchanges of information on past and current numbers;
- NATO reaffirmation of nuclear “three NOs” (“no intention, no plan and no reason to deploy nuclear weapons on the territory of new members”);
- U.S.-Russia reaffirmation of commitment to 1991 Presidential Nuclear Initiatives (see earlier discussion of the informal reciprocal PNIs); and
- Pledges on transparent modernization of tactical nuclear weapons.

Dead Ends (options with excessively high implementation costs in the next decade):

- Exchange of information on all former tactical nuclear weapons storage facilities;
- Notifications on movements of tactical nuclear weapons (limited notifications of movements included in New START);
- Removal of weapons from NATO-Russian borders;
- Exchange of officers; and
- Pledge not to modernize existing warheads or make new delivery vehicles.

Report, op.cit., pp. 2.

120 Ibid, p. 16.

121 Ibid, p. 18.

122 Global Zero NATO-Russia Commission Report, op.cit., p. 2.

123 Ibid.

124 Ibid.

125 Jacek Durkalec and Andrei Zagorski, “Options for Transparency and CBMs Related to Nonstrategic Nuclear Weapons in Europe: Cost-Benefit Matrix,” presented at the Polish Institute for International Affairs (PISM) and Institute of World Economy and International Relations of the Russian Academy of Sciences Workshop, Warsaw, Poland, July 2014, http://www.pism.pl/files/?id_plik=17781, 19-43.

South Asia – Lahore Declaration. On February 21, 1999, the prime ministers of India and Pakistan signed the Lahore Declaration, a series of statements on a wide range of bilateral relations, regional cooperation and other issues of international concern. One of the agreements – the Memorandum of Understanding (MOU) by the Foreign Secretaries – emphasized measures to improve nuclear security and prevent an accidental nuclear exchange. Both countries committed to exchange information on nuclear doctrines; prevent accidental nuclear crises; improve control of nuclear weapons; review existing CBMs; work to make moratorium on nuclear testing binding;

and engage in bilateral discussion on disarmament and non-proliferation.¹²⁶

The details of the Lahore Declaration were left in limbo as fighting over Kargil soon broke out. The declaration served as the basis for further dialogue between the two countries on various bilateral matters, including talks on the nuclear risk-reducing CBMs noted above. However, these talks have been intermittent and not been very fruitful. The talks resumed in 2011 after the 2008 Mumbai attacks. They have largely been handled by mid-level officials. One obstacle is that while India believes nuclear CBMs should be kept separate from conventional CBMs, Pakistan views these strands as intertwined.

Some experts suggest revitalizing the talks with visits by heads of state and getting the International Atomic Energy Agency involved as a trusted facilitator in normalizing security relations between India and Pakistan.¹²⁷ Most recently, India cancelled a meeting between their foreign ministers scheduled for August 2014 after Pakistani officials met with the Hurriyat movement (a non-governmental political front calling for Kashmiri independence), which India viewed as Pakistani meddling in India's internal affairs.

South Asia – Ottawa Dialogue and De-Alerting. The Ottawa Dialogue involves talks on South Asian nuclear issues between senior retired officials and academics from India and Pakistan. This forum recently recommended a series of steps to improve strategic stability in the region, calling on the two sides to:

- Maintain their unilateral moratorium on nuclear explosive testing;
- Maintain their nuclear weapons in a de-mated,

de-alerted and non-deployed status;

- Renounce strikes against each other's national command authorities;
- Renounce destabilizing military doctrines;
- Agree to further mechanisms to prevent inadvertent nuclear escalation, including further CBMs (e.g., establish in each country a strategic risk management unit);
- Further strengthen the safety and security of their nuclear warheads and fissile material during storage, transportation and handling; and
- Reassure the other that stable command and control systems will be maintained especially in light of changing and advancing technologies.¹²⁸

Middle East – Arms Control and Regional Security. The Arms Control and Regional Security (ACRS) working group was set up to work to apply confidence-building measures to the Middle East and broadly discuss a nuclear weapons- or weapons of mass destruction-free zone. A wide gap between Israeli and Arab priorities on arms control emerged. Israel insisted that the first steps toward arms control and denuclearization consist of transparency CBMs, while Egypt suggested that all parties in the region first sign existing nuclear, chemical, and biological weapons treaties and allow international inspections. Further disagreements centered on Israel's lack of confidence in IAEA safeguards provided under the NPT insistence upon a tight and complementary regional verification regime. Conversely, Egypt maintains that the existing IAEA regime is sufficient.¹²⁹

ACRS talks ended in 1995. Middle East nations have held talks on establishing a nuclear weapons-free zone, but these talks have been hampered by the same issues as well as Israeli reluctance in using the NPT regime for the process.

126 "Lahore Declaration," signed February 21, 1999, (posted by United States Institute for Peace, Feb 23, 1999), <http://cns.miis.edu/inventory/pdfs/aptlahore.pdf>.

127 Rachel Oswald, "U.S. Sees Need for New Approach in Pakistan-India Nuclear Talks," *Global Security Newswire*, Nuclear Threat Initiative, Aug 2, 2012, <http://www.nti.org/gsn/article/us-sees-need-new-approach-pakistan-india-nuclear-talks/>.

128 "Elements of Strategic Stability in South Asia," Ottawa Dialogue meeting, Oct 8, 2013, <https://app.box.com/s/g45q2r9xdrdh9sflcv44>

129 Holly Higgins, "Applying Confidence-Building Measures in a Regional Context," paper presented at the Building Nuclear Confidence on the Korean Peninsula workshop of the Institute for Science and International Security, Washington, D.C., July 23-24, 2001. <http://isis-online.org/uploads/conferences/documents/higginspaper.pdf>

Korean Peninsula – Six-Party Talks. North and South Korea entered into agreements in the 1990s¹³⁰ that dealt with nuclear weapons on the peninsula, which were later abandoned by North Korea as the state continued to develop its nuclear weapons program.

The Six-Party Talks are a succession of multilateral discussions on denuclearizing North Korea attended by the China, Japan, North Korea, Russia, South Korea and the United States. After the fourth round of talks in 2005, a Joint Statement was issued that contained commitment from all parties to the goal of verifiable denuclearization in a peaceful manner of the peninsula and agreed upon steps toward North Korean denuclearization, including:

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- Agreeing to discuss the provision of light water reactor to North Korea for peaceful purposes;
- Normalizing relations, specifically between North Korea and the United States and North Korea and Japan;
- Promoting economic cooperation in the fields of energy, tradem and investment, bilaterally and/or multilaterally, including providing electrical energy to North Korea;
- Committing to joint efforts for lasting peace and stability in Northeast Asia through negotiation of a permanent peace regime on the Korean Peninsula at an appropriate separate forum; and
- Agreeing to explore ways and means for promoting security cooperation in Northeast Asia.

No new achievements were made at successive talks with the last round occurring in 2008.

130 For example, the North-South Basic Agreement signed in December 1991 in which both countries agreed to respect each other's sovereignty; resolve disputes peacefully; and establish a joint military commission to negotiate confidence-building measures including arms reductions, the elimination of weapons of mass destruction, notification of military exercises, verification mechanisms, and the installation of a hotline between national military authorities.

131 See U.S. department of State, "Joint Statement of the Fourth Round of the Six-Party Talks," Beijing: September 19, 2005.

XIII. DE-ALERTING AND NATIONAL SECURITY INTERESTS

Any de-alerting regime must be integrated into the broader framework of Chinese, Russian, U.S. and others' national security interests and strategies as well as their nuclear policies. Such integration is not a narrow technical exercise. It demands direction from the highest levels.

The following illustrative directive from the U.S. president outlines the contours of a U.S. de-alerting regime within the framework of a shift in U.S. security strategy from "mutual assured destruction" to "mutual assured security."

XIV. 21ST CENTURY NUCLEAR SECURITY STRATEGY, FORCE POSTURE AND EMPLOYMENT GUIDANCE OF THE UNITED STATES

A. INTRODUCTION

U.S. nuclear strategy, with its central organizing principle of mutual assured destruction, has been running on inertia for decades. Firmly anchored in 20th Century and Cold War thinking, it rationalizes a stockpile that far exceeds reasonable requirements of deterrence in the post-Cold War era, a nuclear posture that runs excessive risk of inadvertent launch, and a modernization program that the nation cannot afford and does not need. More broadly, it incurs opportunity costs by hobbling our ability to foster international cooperation in solving the biggest global challenges of our age. Put simply, U.S. nuclear strategy in its current form poorly serves U.S. national security interests. A sharp course correction in strategy is needed today, relying less on nuclear weapons organized around the concept of mutual assured destruction and shifting to a “total triad concept” with increasing emphasis on non-nuclear capabilities in the context of greater pursuit of security cooperation with Russia and China. What follows is a new set of principles and goals to be pursued immediately.

B. GENERAL

The United States would be far more secure in a world without nuclear weapons. The total worldwide elimination of nuclear weapons is therefore a high-priority goal. The time horizon for achieving it is undoubtedly long but concrete and instrumental steps must be taken in the near future, including an intensified effort by the United States to reduce our dependence on nuclear weapons, work with other countries to reduce their reliance on them, and bring all nuclear weapons countries into a multilateral process of nuclear arms control for the phased, proportional, and verifiable reduction of their stockpiles.

In the interim, we must always ensure the security, reliability, and safety of nuclear weapons until the last of them are permanently dismantled. We also must eliminate vulnerable

forces and reduce our reliance on prompt-launch in a crisis. These aims will be pursued bilaterally and multilaterally, but we also will take appropriate independent steps that serve the best interests of U.S. national security. The result should be a fundamental and stabilizing re-orientation of strategic arsenals and postures toward a broader strategy with non-nuclear offense and defense pillars as well as survivable nuclear components.

In furtherance of our commitment to seek a world without nuclear weapons, the National Security Council will coordinate the Departments of Defense, State and Energy, and the National Nuclear Security Agency to complete within six months a detailed action plan of the steps that would need to be accomplished in order to achieve global zero within a 20- to 40-year timeframe. Assuming these alternative target dates, the analysis should work back to the present to specify and elaborate the implications for the (i) nuclear force structure, command-control-communications-early warning networks, and operational posture including security and safety measures, (ii) nuclear weapons complex, including the national laboratories and other infrastructure involved in maintaining stockpile reliability and in dismantling weapons, and (iii) arms control strategy, including a timeline for negotiating phased, verified reductions leading to the total elimination of nuclear weapons in all countries.

This comprehensive study should include a contingency plan in the event that the objectives and timelines of some of the constituent parts – e.g., reaching arms control agreements with adequate verification provisions – are not met. The plan must allow for flexible adjustments to the blueprint including, if circumstances dictate, a suspension or even reversal of the steps in the process.

The spread of nuclear weapons technology around the world and the specter of its intentional or unintended use lend urgency to the global zero agenda and at the same time hamper progress toward its achievement. The United States itself today faces an ever-growing array of potential situations in which it may land in the middle of a volatile crisis or conflict with the potential to escalate to nuclear conflict. In some cases, the pressure to resort first to nuclear weapons may weigh heaviest on the United States even when the immediate threat

to U.S. interests is cyber, conventional, chemical, or biological. In such scenarios, nuclear options may be the only immediately available tools in the President's kitbag. This deficiency has been responsible for the past presidential decisions not to endorse "sole-purpose" in U.S. doctrine.

This deficiency must be remedied immediately. The President must have effective non-nuclear options readily available. As an integral part of the global zero study effort, the Department of Defense therefore will give high priority to expanding conventional options, to include options with cyber warfare, missile defense, special operations, and passive defense components. The Defense Department will assess deficiencies in these options, and develop new capabilities that remedy the shortfalls and increase the President's nuclear decision time and flexibility of response. The department's assessment will also assess their net effect on crisis stability insofar as they incorporate "disruptive technologies."

To further expand the President's "decision space" for dealing with situations prone to nuclear escalation, the State and Treasury Departments will conduct a parallel study to prepare new diplomatic and financial instruments for preventing and managing crises. The two departments together with the NSC will intensify their simulation, gaming, and exercises to better anticipate, comprehend, prevent, and contain the regional conflicts in which the United States may find itself in the future.

These efforts presuppose a comprehensive analysis of current and future threats to key sectors of the nuclear-weapons enterprise including manufacturing, assembly, storage, mating, and operations. The Defense Department will conduct this threat assessment. Against the vulnerabilities identified the department will identify modern technology that would decrease risk and increase safety, security, and surety. This technology, coupled with resilient command and control and active, passive and conventional offensive and defensive forces – including regional missile defenses – should effectively address the emergent threats associated with terrorism and cyber warfare, and mitigate or eliminate Cold War constructs, especially "use-or-lose" and "hair-trigger" alert postures.

C. RUSSIA AND CHINA

The primary objective of U.S. nuclear strategy is to achieve maximum stability in our relations with China and Russia in order to prevent nuclear conflict with them. Other high priorities are to expunge nuclear threats from our relationships, strengthen security cooperation and gain their support in advancing the goal of global zero. We seek over time to replace the anachronistic organizing principle of mutual assured destruction that governed our Cold War relationships and organize our relations around security cooperation. This transition is underway, but it is unfinished business. Mutual nuclear threat remains a receding, but still distinctive feature of our current relations.

China and Russia are neither allies nor enemies. We often forge pragmatic partnerships to address pressing global security challenges. The United States shares with them a common interest in reducing the role of nuclear weapons in our relations as well as our relations with other nuclear and non-nuclear states. Through U.S. declaratory and employment policy, the United States will clearly convey to China and Russia that it is not U.S. intent to negate their nuclear forces, introduce new threats, or in any way destabilize our military relations.

The United States will take steps to eliminate the constant projection of nuclear threat at China and Russia that is embodied in the U.S. nuclear force structure, operational posture, and planning enterprise. Within the near term future, the United States will, according to the global zero road map to be completed in six months, reduce the size of our arsenal, remove a portion of our forces from launch-ready alert status, and shorten the wartime target list. The Minuteman land-based missile component of the U.S. strategic Triad will be phased out over the next ten years. Minuteman forces have almost no other mission than to engage Russia in large-scale nuclear conflict, or engage China and Russia simultaneously in large-scale conflict. These missions are virtually obsolete. Minuteman forces are also vulnerable to Russian counterforce attack and depend on prompt launch for their survival. This exigency imposes an excessively hasty timeline on presidential decision-making and severely constrains the President's flexibility in responding to attack indications. Flexible response remains

the watchword of our strategy. It must not be compromised by tactical exigencies that stem from Minuteman vulnerability.

Although numerical parity with Russia will not be a rigid guideline for U.S. force sizing or for formal nuclear arms talks in the future, the United States will seek comparable Russian reductions and other modifications that preserve rough equality, work to assure U.S. allies, and mark progress toward the goal of the worldwide elimination of nuclear weapons. The U.S. “Berlin offer” to bilaterally cut the number of operationally deployed weapons by one-third on each side remains on the table. Lack of progress in nuclear arms negotiations with Russia will not, however, derail our efforts to remove pressures to “use or lose” nuclear weapons.

Given the infinitesimal probability of a nuclear conflict pitting the United States simultaneously against both China and Russia, U.S. nuclear forces will no longer prepare to conduct operations against both nations at the same time. Given the extremely remote likelihood that Russia would deliberately initiate a massive counterforce strike aimed at comprehensively destroying U.S. strategic forces in their underground silos, submarine pens and airbases, the United States will no longer plan an option for launch on warning (otherwise known as launch under attack) or an option for preemptive strikes against Russia. An inter-agency process should begin immediately to pursue negotiations with Russia to reach an executive agreement, as outlined by the Dvorkin memo (detailed earlier) that eliminates the option of launch-on-warning/launch-under-attack from the repertoire of U.S. and Russian nuclear command operations, exercises, and training.

The United States will not be the first to employ nuclear weapons in a conflict with China or Russia. This commitment will be reflected in declaratory and employment doctrine. To reinforce its credibility, the number of normally deployed U.S. warheads shall not exceed the threshold number (~270 warheads) that would theoretically pose a decapitating sudden first-strike threat to Russia, and the U.S. delivery vehicles carrying the deployed warheads will require 24-72 hours of generation to reach launch-ready status. The remainder of the total active stockpile (strategic reserve and tactical deployed and reserve warheads) will require much longer time to deploy.

In signaling U.S. intent not to negate Chinese or Russian nuclear forces, the United States will refrain from targeting their re-locatable land- and sea-based nuclear delivery systems that have dispersed from their missile (mobile ICBM) garrisons and submarine (SSBN) pens to field deployment sites and patrol stations. The United States will no longer target Chinese or Russian chemical facilities.

Close-in U.S. surveillance along Chinese and Russian borders and related intrusive activities devoted to nuclear employment planning will be discontinued as a routine peacetime activity.

In the unlikely event of a nuclear conflict with China or Russia, it would likely grow out of conventional conflict on the periphery of these countries, and begin with limited nuclear strikes. The canonical Cold War-like scenario of a bolt-from-the-blue massive Russian attack or smaller-scale surprise Chinese attack is so remote as to be negligible and shall not be a basis of contingency planning.

Accidental or unauthorized strikes are also improbable, but such possibilities must be taken into account in planning. The United States will encourage China and Russia and to join the United States in removing nuclear forces from launch-ready status in peacetime. (China already largely follows this practice.) As noted earlier, we will seek an executive agreement with Russia to eliminate the possibility of launching missiles on the basis of faulty indications from early warning systems. We also will encourage China and Russia to negotiate new bilateral confidence-building measures such as comprehensive pre-notification of ballistic missile launches, including short- and medium-range ballistic missiles as well as cruise missile launches within range of each others' territories, in order to minimize their risks of nuclear false alarms. China's expansion of its missile deployments and its intensifying testing program are increasing the frequency of urgent Russian attack assessment and of false readings.

In the remote event of a nuclear conflict involving China or Russia, the United States would seek, regardless of the nature and scale of strikes against us and/or our allies, to control escalation and terminate the conflict on the best possible terms. The President must be able to receive the intelligence and early warning assessments necessary to determine the nature and

consequences of such strikes, including whether the attack is deliberate, accidental, or unauthorized. The information must be sufficient to determine the U.S. national security interest and best course of action. The President must have a range of response options that serve such purposes, the necessary time to consider them, and the ability to conduct such operations through reliable command-control links.

To this end, a large percentage of deployed U.S. strategic nuclear forces and associated command-control-communications and early warning networks must be able to survive in an extremely adverse nuclear environment that may include a massive laydown of nuclear warheads and bombs, and electromagnetic pulse detonations at high altitudes. Reconstitution of a second-strike retaliatory force through force generation (“re-alerting”) that is responsive to operational direction by the President and his duly constituted successors must be ensured even under worst-case conditions. Continuity of government in accordance with the provisions of the Constitution and applicable legislation and other lawful Presidential instructions must be preserved under such conditions.

The President must have nuclear and non-nuclear options in such circumstances. Nuclear, cyber, special operations, and conventional force options designed for controlling escalation will target what the aggressor values most and inflict damage to reduce its power while leaving intact enough for it to prefer to terminate the conflict. The main objective of intra-war strategy is to make de-escalation less costly to the aggressor than escalation and terminate the conflict with the least amount of damage to the United States and our allies.

In addition to seeking to prevent escalation, the United States would attempt to limit damage to itself and its allies by disrupting the operations of Russian nuclear forces and command and communications systems while leaving intact those channels needed to end the conflict on acceptable terms. The United States would employ nuclear, cyber, and conventional forces to selectively target Russian nuclear forces withheld from the initial attack, leadership/military command facilities, and military and industrial facilities that support war fighting.

In the case of a nuclear conflict initiated by China, comparable efforts would be made to control escalation and limit

damage to the United States and its allies. Beyond disruption, the President will have nuclear and non-nuclear options for limiting damage to the United States and its partners by minimizing damage caused by Chinese nuclear forces. To this end, the United States would selectively target Chinese nuclear forces, leadership/military command posts, and war-supporting industry.

Although the United States may execute nuclear retaliatory options against any or all of the above target categories even if the targets are located in urban areas, the priority in employment planning will be to provide non-nuclear options against targets in urban areas. The President must have the ability to withhold nuclear strikes on leadership and other targets in urban areas, and must be provided with viable non-nuclear options if strikes against such targets are deemed necessary.

The United States cannot expect conventional forces, cyber warfare capabilities, and/or missile defenses to completely replace nuclear forces (unless and until global zero becomes a reality), and these non-nuclear capabilities in combination with nuclear forces cannot meaningfully limit damage to the United States in the event of an all-out Chinese or Russian first-strike. Furthermore, these non-nuclear capabilities will not be developed for the purpose of limiting damage to the United States in conjunction with a U.S. preventive or preemptive first strike against Chinese or Russian nuclear capabilities, and they may not be employed for such purposes in view of this guidance’s firm pledge not to initiate the use of nuclear weapons against China or Russia.

This no-first-use commitment does not preclude the employment of U.S. missile defenses to attempt to defeat limited nuclear missile strikes initiated by China or Russia, whether those aggressive actions are deliberate, accidental, or unauthorized, and to buy time in considering nuclear response options.

D. NORTH KOREA, IRAN AND SYRIA

These foes of the United States and our allies in Northeast Asia and the Middle East will be pressed to forgo nuclear weapons development and disarm. The priorities of U.S. nuclear strategy toward Iran and North Korea are: (i) prevent

their nuclear programs from sparking proliferation among threatened neighboring states in the regions, (ii) prevent Iran from acquiring a nuclear weapons capability – defined as the technical capacity to “break out” of its obligations and build a working weapon in less than one year – and ensure its full compliance with its obligations under the NPT, (iii) induce North Korea to relinquish its nuclear arsenal and rejoin the NPT in good standing, and (iv) prevent a nuclear conflict between the United States or our allies and Iran or North Korea.

The United States will mitigate the adverse effects of the Iranian and North Korean nuclear programs through arms sales and other military assistance to our friends and allies in the regions. Joint efforts with them to deploy effective missile defenses against existing and expected near- and medium-term missile threats will continue to have high priority.

In the event of nuclear conflict with North Korea, which possesses a small arsenal of nuclear explosive fission devices (10-12) and is developing means of their delivery, the United States will seek to minimize damage to the United States and our regional allies and defeat North Korea using all necessary means at our disposal.

The President has conventional options bolstered by missile defenses to suppress the nascent North Korean nuclear program and, in extremis, could resort to nuclear strikes to neutralize this threat. U.S. nuclear forces will target the spectrum of North Korean nuclear forces, leadership, and war-supporting industry in addition to selected bastions of conventional forces that threaten Seoul.

The President continues to need a nuclear option in light of the artillery threat to Seoul posed by North Korean units dug into the mountains to the north. The terrain provides a natural fortress that protects these units from conventional attack. The U.S. and South Korea possess conventional superiority over the North and could suppress the North's artillery over time, but currently lack the capability to quickly suppress a barrage of thousands of shells trained on the South Korean capital.

Nuclear weapons could quickly suppress the barrage but the close proximity of the explosions and radioactive fall-out to

U.S.-South Korean forces and South Korean population (if not evacuated from Seoul) and Japanese population renders the option extremely undesirable.

The United States therefore will seek to substantially strengthen its capabilities for timely non-nuclear counterforce strikes against North Korean conventional as well as nuclear threats. The President directs the Defense Department to develop effective non-nuclear options – active and passive defenses as well as conventional offenses – that would minimize the damage that could be inflicted by North Korea in wartime and preclude the need to employ U.S. nuclear weapons.

U.S. nuclear strategy toward Iran focuses on preventing Iran from acquiring a nuclear weapons capability through diplomacy, prohibition of nuclear materials trade, economic sanctions, sabotage and other covert action (e.g. cyber warfare) against its nuclear infrastructure.

If Iran breaks out and approaches the threshold of acquiring a nuclear weapons capability that could become operational on short notice (months or less), the President must have an effective missile defense option to intercept Iranian missiles. The President must also have a conventional option to severely damage its nuclear capability in a timely fashion and moreover to detect and inflict further severe damage on future reconstituted Iranian nuclear weapons infrastructure and delivery platforms.

If Iran would manage to successfully break out a deliverable nuclear arsenal and a nuclear conflict ensues, U.S. nuclear forces will be prepared to selectively target Iranian nuclear deployments and infrastructure. If the President elects to execute this option, its aim will be to neutralize Iran's nuclear program and forces and coerce Iran to yield to terms of conflict termination that are in the national security interests of the United States and our allies in the region.

U.S. nuclear forces will also hold Iranian leadership and war-supporting industry at risk. However, the close proximity of nuclear explosions and radioactive fall-out to Israel and other friends in the region makes it imperative that any nuclear strikes against Iran would be kept as limited as possible.

Regarding Syria, our goal is a peaceful transition of power. The raging civil war poses an imminent multipronged risk, including the possibility that Syria did not turn over its entire stockpile of chemical weapons and has hidden a cache of them for rainy day use. Such a cache could be broken out and unleashed by Syrian troops on short notice against the opposition rebels or against neighboring states (e.g., Turkey) if the civil war spills across borders and escalates into international conflict. Or, if such hidden chemical weapons exist, they could be seized by rebels and fall into the hands of terrorist factions that may use them against their sworn enemies (e.g., Israel).

Although nuclear weapons could destroy these weapons at their central storage facilities or field deployment locations, the United States will no longer plan for such contingencies. Nor will U.S. nuclear forces continue to target Syrian leadership facilities or military and war-supporting industry. In light of the chaos in Syria, and the successful elimination of the vast bulk of its chemical weapons by the international task force led by the United States and Russia, the United States will drop Syria from its nuclear war plans and seek to develop viable conventional alternatives.

E. OTHER NUCLEAR-ARMED STATES

The immediate priority of U.S. nuclear policy toward France, India, Israel, Pakistan, France and the United Kingdom – all allies or friends of the United States – is to bring them along with Russia, China and the United States to the negotiating table to begin multilateral talks leading to equitable reductions and eventual elimination of all nuclear weapons, and to an agreement to refrain from putting nuclear forces on high alert. The United States will also strongly encourage India and Pakistan to pursue additional bilateral confidence-building measures such as pre-notification of nuclear exercises and missile tests.

Another high priority is to provide assistance, if requested by their national command authorities, in strengthening the security and safety of India and Pakistan's arsenals. Technical assistance will be provided if so requested during peacetime or in the event of domestic emergencies that compromise security and render nuclear weapons vulnerable to capture. The United States will be prepared to intervene if so requested in

order to prevent "loose nukes" from falling into the hands of unauthorized parties.

F. NUCLEAR FORCE POSTURE AND STRUCTURE: 2015-2022

Strategic stability is the paramount aim of the U.S. nuclear force posture and structure. A balance of U.S. and Russian nuclear forces "sized" for stability creates room for phased reductions on the path toward global zero. Stockpile size per se is a lesser consideration. Priority must always be given to alleviating the conditions that could trigger and escalate a nuclear conflict.

Stability is achieved by (i) minimizing vulnerabilities in command systems and forces that may create incentives or pressures for early release (war plan execution) and escalation, (ii) maximizing the time allowed for nuclear decision-making, and (ii) minimizing deficiencies that create risks of mistaken, accidental, or unauthorized launch or theft.

The current U.S. and Russian nuclear force postures and structures are ill configured for avoiding dynamic instability in a crisis. They both are geared to rapid force generation and to launch on warning – and need to be re-designed to remove these pre-dispositions. This bolstering of stability would provide confidence in seeking further reductions in their arsenals.

To strengthen strategic stability, the guidance below will be followed in shaping the nuclear posture and force structure over the next decade (2015-2022).

The President alone possesses the authority to order the execution of U.S. nuclear attack plans. Nuclear release authority will not be pre-delegated to military commanders under normal peacetime circumstances. At the President's sole discretion based on authority vested in the Commander-in-Chief by the U.S. Constitution, special provisions for delegating nuclear authority may be arranged under crisis or wartime circumstances, or if relations between the United States and Russia deteriorate to the point of becoming predominantly adversarial and strategic intelligence and warning raise the level of nuclear threat.

The U.S. nuclear posture must provide under all circumstances, especially during an intense and threatening crisis or imminent nuclear strike against North America, the time and latitude for the President to consult, deliberate, and then direct nuclear forces to coherent national purposes through robust command and communications networks. It must not be geared for hair-trigger operations that relegate presidential leadership and the actions of hundreds of subordinates throughout the chain of command to short checklists and split-second choices. Instead of pressing the President to make fateful decisions in minutes and seconds, the posture should afford the President and senior advisors days to consider the best course of action.

Nor should the U.S. posture exert such excessive time pressure on a nuclear-armed potential adversary such as Russia that its decision-making apparatus is compelled to react at lightning speed. Thus the U.S. nuclear forces should not be constantly primed for launching a sudden strike on a scale that so threatens the opposing side's capacity for retaliation that it must always be prepared to launch its strategic missiles on warning during the 15- to 30-minute flight time of incoming U.S. nuclear warheads. Projecting a constant draconian first-strike threat is counter-productive inasmuch as it increases the risk that the United States will be on the receiving end of an attack triggered by false warning, misjudgment, panic or unauthorized acts.

The option to execute an immediate large-scale launch of U.S. strategic nuclear forces (launch-on-warning/launch-under-attack) during day-to-day operations will be eliminated in favor of time-sequenced procedures. The Defense Department will develop and recommend appropriate measures – such as “unsafing” missiles to restore launch circuits, loading target data into missile computers, and mating warheads to missiles – that delay the generation and use of U.S. nuclear weapons by a matter of days. The U.S. (and Russian) posture should be modified to allow 24-72 hours in which to assess threats, deliberate, and exercise national direction over any possible employment of nuclear forces.

Under such a “modified alert” posture, U.S. SSBNs at sea will no longer patrol at their Cold War launch stations ready to fire within 15 minutes of receiving the order. The current strict

requirements of speed, depth, navigation and communications will be relaxed. Thus the current requirement for alert submarines to maintain continuous receive communications and readiness to fire almost instantly will be relaxed to 24-72 hours – providing greater freedom to train and exercise at sea as an additional benefit. Other measures, such as the removal of “inverters” on submarine missile tubes will be considered to reinforce the new requirement for SSBNs to be able to achieve launch readiness within but not before this timeline.

Similarly, land-based ICBMs will no longer be poised for full-scale launches on a moment's notice. Instead, they will be “safed” in their silos, an existing safety measure (the reversal of which requires maintenance crews to re-enter the silos and flip a switch restoring the launch circuitry), thus precluding their launch during normal peacetime conditions and requiring many hours to reverse.

Additional de-alerting steps will be taken. We will consider removing all of the existing wartime targets from the SSBN databases and ICBM computers. Fully restoring this data would take a number of days, thus building in a larger firebreak – 24-72 hours – between the onset of a crisis or conflict and the capacity to initiate nuclear strike operations.

Regarding U.S. tactical nuclear weapons, the forward-based bombs in Europe assigned to U.S. and NATO allied dual-capable aircraft will remain in their storage vaults and bunkers in peacetime with force generation capabilities ranging from days to many months for different portions of the force. The United States seeks to withdraw these weapons back to U.S. central storage locations on the condition that Russia takes reciprocal steps. Forward-deployed Russian tactical nuclear weapons (~ 800) located at their dozen or so bases on the European continent (with warheads/bombs stored separately from the missiles and warplanes) would be re-located to Russia's central storage sites (so-called “S” sites). Also, Russia would agree not to introduce nuclear weapons into new locations in Europe including Crimea.¹³² If Russia introduces them into new regions, NATO reserves the right to determine that the security situa-

¹³² See *Global Zero NATO-Russia Commission Report*, February 2012, op.cit.

tion in Europe has changed sufficiently to justify forward deploying conventional forces or nuclear-capable NATO aircraft on a rotating or permanent basis on the territory of Central European NATO allies.

These changes if fully adopted by Russia as well as the United States will significantly reduce the risks of premature, mistaken, unauthorized, and accidental use of U.S. and Russian nuclear weapons. The overall effect will be to greatly strengthen strategic stability.

The desired timetable for this transition to a fully de-alerted posture calls for a phased (and verifiable) approach that steadily decreases the number of strategic weapons on alert. The goal is to reduce to 200-300 alert forces on each side within seven years with no more than 100 missile warheads on alert within the land-based rocket forces on each side. The remainder would require 24-72 hours to return to alert. At these lowered levels no defensible rationale or justification for launch-on-warning can be made. Off-alert units would periodically rotate back to alert status to relieve units rotating to off alert status.

Under this guidance, all of the U.S. ICBM force will be dismantled within ten years and therefore U.S. strategic submarines would assume all alert duties as long as nuclear forces remain on alert. The United States will seek a total drawdown of U.S. and Russian alert forces by 2025.

G. FORCE STRUCTURE, DISPOSITION AND CRISIS GENERATION

Over the next several years, the United States will face one of the weightiest decisions of the post-Cold War era: whether to replace any or all of its aging strategic nuclear bombers, submarines, and land-based missiles. These decisions have long-term consequences. They are 50-year decisions for each of the three types of weapons systems. The longevity of some of these platforms would run almost until the end of this century, and the bill for full-scale modernization of all three components has been estimated to run upwards of \$400 billion over the next decade and \$1 trillion over the next 30 years. Among other impacts, this tab would siphon off funds needed for vital non-nuclear defense programs. For instance, funding a re-

placement strategic submarine fleet would consume the lion's share of the Navy's shipbuilding budget for many years. It is reasonable to conclude that recapitalization of the U.S. nuclear Triad is unaffordable.

Prior to this directive, U.S. nuclear strategy provided ample justification for undertaking modernization across the board. Under this directive, however, the current U.S. nuclear stockpile is substantially larger than is required for any plausible mission today and the foreseeable future. Future modernization programs will thus be curtailed or scaled back.

A U.S. arsenal of 900 total weapons would easily meet reasonable requirements of deterrence for the next decade and beyond, irrespective of the modernization programs underway in Russia and China. U.S. modernization will be keyed to this stockpile size. If and when U.S.-Russian nuclear talks resume, we will pursue this ceiling in the negotiations. The total force of 900 may consist of strategic and nonstrategic weapons – with “freedom to mix” on both sides – and every individual warhead or bomb whether deployed or held in reserve would be counted against the ceiling.

Although the United States will seek equal Russian reductions through arms talks, we will plan, irrespective of Russian reciprocity, to base our arsenal on a Dyad of strategic nuclear delivery vehicles consisting of ten Trident ballistic missile submarines and 18 B-2 bombers. All other U.S. nuclear forces will be retired or converted to carry only conventional weapons. Land-based strategic rockets, B-52 bombers, and tactical forces have no place in the long-term nuclear future of the United States. Research and development funding for a Minuteman replacement missiles will be eliminated from the President's budget submitted to Congress.

One-half of the planned U.S. force will be deployed with the remainder kept in reserve.¹³³ As indicated earlier, the deployed

¹³³ The current ratio of deployed to reserve warheads is approximately 1:2.25. By 2022, it will be possible to achieve a 1:1 ratio. Further progress in increasing warhead interoperability in the out-years would further reduce the need for reserve warheads to back up the deployed arsenal and hedge against a systemic defect in any warhead types.

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

A 10-boat fleet of Trident SSBNs will assign seven to the Pacific and three to the Atlantic basins. Assuming two boats are normally in overhaul and the U.S. Navy maintains its historical at-sea rate of 70 percent for the remainder, there will normally be four and two SSBNs at sea in the Pacific and Atlantic, respectively, carrying a total of 270 warheads. This day-to-day force would be survivable under worst-case conditions and versatile in providing prodigious target coverage of all prospective nuclear-armed aggressors. As noted earlier, it would operate on modified alert outside the normal launch stations and require 24-72 hours to generate immediate offensive strike capability.

With only 270 U.S. warheads that could be made available for firing within 24-72 hours, Russia would be assured that the United States does not pose a threat of a sudden decapitating first strike. Russian strategic forces in garrison or port could easily disperse to hidden locations in the forests and oceans during the protracted period of visible re-alerting of any U.S. forces. Consequently, the specter of a one-two American knockout punch consisting of an offensive U.S. first strike designed to decimate Russian forces in combination with U.S. missile defenses mopping up the few surviving Russian missiles fired in retaliation would evaporate.

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

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

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

The decision to eliminate the Minuteman ICBM force and consequently the triad of delivery vehicles in favor of a nuclear dyad stems from severe Minuteman vulnerability and targeting deficiencies. Minuteman is vulnerable to sudden decimation unless it is launched promptly on tactical warning of an incoming Russian missile strike, a survival tactic that this guidance eliminates because it deprives the President of the time needed for careful deliberation. The second deficiency – targeting inflexibility – is equally severe. Minuteman forces are suitable for the most improbable scenario – large-scale nuclear war with Russia – and are unsuitable for nuclear operations against North Korea or Iran because the missiles would have to fly over both China and Russia to reach either of them. Nor does the possibility of U.S.-China nuclear conflict justify keeping the Minuteman force. Such a conflict is highly improbable and in any event Minuteman missiles would have to fly over Russia to reach China.

By contrast, submarines or bombers offer means of dealing with almost any scenario involving a weapon of mass destruction (WMD) threat to the United States from any nation-state adversary. Neither U.S. strategic submarine missiles nor strategic bombers are constrained by rigid flight trajectories. These are versatile platforms that offer highly flexible angles of attack against practically any target on the globe, and in the case of submarines a strike could be carried out within an hour.

H. DOWNSIZING THE NUCLEAR COMPLEX

Under this plan, the number of different types of nuclear weapons in the U.S. active inventory would decrease from seven types today to four by 2022.¹³⁴ The need to re-furbish weapons

¹³⁴ W-76 and W-88 on Trident SSBNs, and B61 (mods 7 and 11) and B83 on B-2 bombers. See Global Zero U.S. Nuclear Policy Commission Report, op cit., p. 12.

remaining in the stockpile would greatly diminish – almost all weapons previously requiring it would be eliminated from the active inventory. This drastic curtailing of the life-extension program for thousands of weapons currently in the pipeline would save many billions of dollars.

The existing plutonium pit facility at Los Alamos could readily service the regular pit manufacturing demands of a 900-warhead arsenal. Assuming a 50-year pit shelf life,¹³⁵ only 2 percent of the active stockpile (18 warheads) would need to be remanufactured each year. The facility has a normal throughput capacity of about 20 per year with the option to add extra staff shifts in order to raise capacity to 40 pits per year. With the addition of extra equipment (5-6 years to install), the capacity could be increased to perhaps as high as 80 per year.

This number would grow higher still if old pits could be reused and if pits with sensitive, conventional high explosives could be refitted with insensitive high explosives to improve safety. Current studies underway at the U.S. national laboratories to be completed within the next couple of years should determine the feasibility of these options. Preliminary analyses suggest that upwards of 50 percent of plutonium pits in the stockpile could be swapped out in these processes, allowing for a much faster rate of pit replacement.

In an emergency in which a systemic defect in one of the four warhead types warranted a crash effort to replace those warheads, it appears feasible that upwards of 120 defective weapons per year could be remedied through a combination of pit manufacturing and pit re-use. Such a systemic defect is a low-probability event, but assuming 225 defective warheads (notionally one-fourth of the 900-warhead total) needed to be repaired, it would take approximately two years of full-capacity work to finish the job.

In sum, the current plutonium facility – with some new equipment working overtime with other partners such as the Pantex facility – could probably handle an unusual emergency to replace a big chunk of the arsenal. This capability of the existing

facilities obviates the need to build the multi-billion-dollar new facility now in the early construction stage at Los Alamos. However, some small additional risk of reduced stockpile reliability must be acknowledged if we shrink the variety of warhead types from seven to four, and the margin of comfort for replacing an entire category of weapons in the event of a systemic defect is not large. On balance, these risks appear to be quite low, and acceptable.

Nevertheless, the President requests a full-scope survey by the pertinent agencies – NNSA, the national laboratories, and Strategic Command – to determine an optimal infrastructure in support of the 900-warhead arsenal outlined herein.

I. MISSILE DEFENSE AND CONVENTIONAL FORCE AUGMENTATION

While reducing U.S. reliance on offensive nuclear weapons on launch-ready alert, the United States will shift to a defensive strategy featuring vigilant missile defenses backed by advanced conventional forces kept on constant alert and by cyber warfare capabilities. This integrated new strategy will offset any risk incurred by the downsizing of the U.S. strategic arsenal, partially offset the decrease in target coverage, and provide a cushion during an initial 24-72 hours of conflict when U.S. offensive nuclear forces may be generated to combat alert status. It therefore will support the goal of increasing nuclear decision time and thus have a stabilizing effect on the U.S. nuclear posture.

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

This reduced burden would allow a theater missile defense program, such as the adaptive system for protecting Europe from

¹³⁵ This is extremely conservative. Recent government scientific studies estimate pit longevity at 85-150 years.

Iran, to be scaled down by 10 to 50 percent. This downsizing coupled with U.S.-Russian cooperation in this arena and confidence-building measures discussed below would reassure Russia that its strategic missile force would not be put in jeopardy.

This regional defensive strategy will be bolstered by advanced U.S. conventional arms whose accuracy of delivery allows them to reduce the role of nuclear weapons in covering the target base. The rapid increase in the lethality of conventional forces achieved in recent years allows conventional forces to threaten the destruction of very hard targets (including missile silos protected up to 1,000 pounds per square inch. This technological progress translates into the capability of using conventional forces to cover increasing portions of the Iranian, North Korean, and Syrian target bases previously covered by nuclear forces.¹³⁶ (Dug-in North Korean artillery batteries within range of Seoul remain largely invulnerable to U.S. and South Korean conventional strikes during the initial phase of a conflict.) A prompt conventional assault on an adversary's missile installations (e.g., in Iran or North Korea) could severely degrade its capacity and ease the work of U.S. missile defenses. For many such scenarios, U.S. conventional forces may well suffice to defeat a regional adversary without needing to generate any U.S. nuclear forces at all.

The United States could further shift from an offensive nuclear strategy to a dynamic defensive strategy and further reduce its reliance on nuclear weapons by investing more smartly and innovatively in new non-nuclear alternatives. A more diverse portfolio of active and passive defenses (against missiles, cyber warfare, and biological/chemical threats), non-nuclear offensive capabilities (e.g., general purpose forces, conventional intercontinental missiles, cyber warfare), forward-deployed equipment and supplies for U.S. and allied troops to converge to (as op-

posed to maintaining a permanent forward presence),¹³⁷ and coalition missile defenses on alert in region would help replenish the President's toolkit and thus expand his "decision space." These additional tools would strengthen our ability to ward off aggression, adapt flexibly and with sufficient timeliness to diverse threats, control escalation in complex situations, and deny tactical and strategic advantage to the adversary.

The Defense Department should put priority on "early prevention" measures such as joint exercises demonstrating rapid deployment to a given region and rapid mobilization in the region using prepositioned materiel. Other visible shows of coalition forces, including U.S. forces dispatched to the region for joint exercises, also serve this deterrent function. Long-range bombers and naval ships are especially versatile for such purposes. The traditional set-piece deployments of large land armies and heavy armor are least versatile. (The last U.S. heavy armor unit in Europe recently left the theater and returned to the U.S.)

As part of this shift to a dynamic defense strategy, the vast majority of U.S. units will be based in the contiguous United States or U.S. territories. Small contingents of U.S. forces would be deployed overseas to maintain aircraft and special operations bases in close cooperation with host nation militaries to receive and support U.S. troops rotating through and back in shows of defense solidarity, fulfillment of defense treaty commitments, and sundry exercises.

Requirement for Small-Scale Deployment of Conventional ICBMs. A conventional-armed extended-range ICBM – some variant of the Hypersonic Technology Vehicle-2 (HTV-2) – should be designed and developed to provide a one-hour global strike capability by 2022.¹³⁸ With a total of 20-50 such vehi-

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

137 A good example is the Marine Corps' Maritime Prepositioning Force program that keeps 55 heavy battle tanks forward positioned at all times on five maritime marine ships cruising the waters near potential hotspots such as the Baltics.

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

cles based in California, the Great Lakes region, and/or Alaska (co-located with missile defense bases), this ICBM would have the down- and cross-range agility and reach to span continents flying within the stratosphere and promptly hit virtually any target around the world (such as North Korean or Iranian missile installations) without overflying Russia or China.¹³⁹

This program would not be designed or deployed against Russia. Although it would possess an ability to destroy very hard targets including most Russian missile silos, the small number of vehicles built and deployed (a maximum of 50) would allay Russian concern about their impact on Russia's nuclear deterrent capability.¹⁴⁰ Moreover, like missile defense interceptors, the United States would agree to count these vehicles on a one-for-one basis against any ceiling on nuclear arms that may be negotiated in future.

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

J. DIPLOMACY AND OTHER “SOFT” POWER TOOLS

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

140 It appears realistic to achieve an accuracy of three meters with a payload of 1,000 lbs. We calculate that this performance translates into roughly a 50 percent chance of destroying a missile silo hardened to 1,000 lbs. per square inch. Fifty single-warhead HTVs would technically possess the capacity to destroy with high confidence only about 15 missile silos.

Diplomacy has offered an attractive and effective alternative to fill the void when neither nuclear nor conventional options promise to be effective in neutralizing threats. In the example given earlier of the Syrian chemical weapons threat, the “hard” options appear to be ineffective and they have other severe drawbacks. In contrast, U.S. and Russian diplomatic pressure has so far worked to keep chemical weapons off the battlefield. An important lesson is that “soft” power tools and ad hoc coalitions appear to be increasingly essential to expanding the President's “decision space” in dealing with regional or global conflicts.

Nuclear Arms Control. One of the key diplomatic tools is of course formal negotiations to regulate nuclear and non-nuclear arms. Regarding the former, the President remains committed to the goal of a world without nuclear weapons and seeks to set the world's course to zero nuclear weapons by taking four steps: (i) negotiating further U.S.-Russian cuts to approximately 900-1,500 total nuclear weapons on each side, (ii) reaching an executive agreement with Russia to eliminate launch-on-warning as an operational option on both sides and to de-alert U.S. and Russian nuclear forces across the board in a stable and verifiable manner, (iii) establishing the first multilateral dialogue (a “nuclear weapons summit”) for all nuclear weapons countries to present and critique proposals for eliminating nuclear weapons, and (iv) supporting multinational negotiations on a global de-alerting agreement that calls upon all the nuclear weapons countries to refrain from placing nuclear forces on high alert status.

Nuclear arms regulation must become comprehensive (covering all types of nuclear weapons) and universal (involving all nations possessing them). The nearly half-century of arms negotiations with the Russians has been an exclusively two-sided affair that has excluded China and the other nuclear-armed nations. The major risks of nuclear weapons use, proliferation, and arms race instability in fact mostly lie outside the U.S.-Russian arena, particularly in Northeast and South Asia and in the Middle East. Nuclear arms negotiations should therefore be extended to China and others. It is therefore essential to begin a multilateral process that brings the rest of the nuclear-armed world to the negotiating table to begin to cap, freeze, reduce, de-alert, and otherwise constrain these third-party nuclear arms programs.

It would be extremely beneficial if continuing reductions in the U.S. and Russian nuclear arsenals encourage China and the other nuclear weapons countries, including those outside the NPT (India, Israel, and Pakistan) to participate in a nuclear weapons summit to discuss multilateral force reductions and de-alerting. There are reasons to believe that China and some others would in fact join such a forum, particularly one devoted to framing a multilateral de-alerting agreement.

There exists some internal interests in these countries that oppose entering into a nuclear disarmament process, and some possibility that continuing U.S.-Russian reductions, especially deep cuts, would stimulate China or other countries to “rush to parity” with the United States. The prevailing view, however, is that China does not seek such equivalency. (According to recent Senate testimony by General C. Robert Kehler, “I do not see, nor has the intelligence community reported to me that they are seeking to have some kind of numeric parity with the United States or with Russia.”)¹⁴¹ China’s current small arsenal of approximately 150 total nuclear weapons reflects China’s traditional policy of “minimal deterrence,” which harks back to Mao Zedong’s guidance a half century ago to deploy only a small nuclear arsenal. The Chinese military has adhered strictly to this time-honored doctrine. Its arsenal is projected to grow to perhaps 200-250 total weapons over the next ten years, and no more than 250-300 in the worst case. A much larger effort to “rush to parity” with the United States appears to be very unlikely. In any event, such an effort would take many years, would be detectable, and would allow the United States to tailor or curtail further U.S. reductions as needed.

Based upon these considerations, the President will seek the Russian President’s cooperation in laying out a basic proposal to the other nuclear weapons states, as follows. They will propose that the United States and Russia negotiate deep bilateral cuts to 900-1,500 total weapons (strategic, nonstrategic, and reserve) – a 70-80% reduction from current levels – which will be fully implemented on the condition that the other nuclear powers agree to (i) cap their arsenals at 300 total nuclear weapons and (ii) begin consultations to enter into multilateral talks to

proportionately reduce their arsenals in the future (the reductions across the board, realistically, would not happen before approximately 2022).

The proposed ceiling of 300 is France’s current stockpile size but it is significantly higher than any other nation (the United States and Russia aside) and is the upper-end of the stockpile projections for Pakistan and China over the next 10 years. Thus all parties can comfortably agree to this cap whether or not they agree to join multilateral talks for reducing their arsenals.

Accordingly, the President will invite Russia to join together in pitching the P-5 countries to join multilateral talks and then enlist broader participation by the other nuclear weapons countries. The United States will indicate its intention to deploy the lower end of the range (900) if that flexibility can be leveraged into commitments from others to cap their arsenals at 300, join the multilateral talks, and/or agree to proportional reductions (40% in the U.S. case if 900 down from 1,500).

U.S.-Russian Missile Defense Cooperation. The beginning of a new round of bilateral nuclear arms negotiations has stalled in part because of Russia’s concern that the United States may acquire the capability to negate its strategic nuclear missile force through a combination of U.S. swords and shields. Russia is especially apprehensive about the later phases of U.S. missile defenses ten or more years down the road. Russia has sought a formal guarantee from the United States that missile defenses will not be aimed at Russia and will not undermine Russia’s strategic deterrent forces. The United States has not met this demand nor otherwise satisfied Russia’s need for assurances. As a result, Russia worries that the U.S. program will evolve into increasingly threatening variants (including space-based strike systems) that become more difficult for Russia to offset with inexpensive countermeasures.

To a large extent, Russian discomfort with U.S. missile defenses stems from a generalized fear of U.S. technological prowess and from the uncertainty and unpredictability surrounding the U.S. program. (Its programmatic elements are rather uncertain to Americans as well since they are works in progress.) There are also domestic political and economic reasons behind Russian complaints that the United States is bent on negating Russia’s strategic deterrent – complaints that are exploitable for domestic political gain by politicians and for economic gain by the

141 Gen. Kehler, Testimony to the Senate Armed Services Committee, March 12, 2013, op.cit.

Russian defense industrial sector.¹⁴²

The President seeks to redouble efforts to break this impasse in order to advance the global zero agenda of renewing bilateral nuclear arms negotiations and joining with Russia to initiate multilateral negotiations with the other nuclear weapons countries.

The President therefore seeks to implement the following guidelines to assure Russian that its strategic missile force will not be put in jeopardy:

First, the United States will, as noted earlier, declare its intent not to negate the Russian strategic deterrent or to introduce new threats that would destabilize our military relationship. This intent will be stated in U.S. declaratory doctrine and in a NATO-Russia Council memorandum of understanding.

Second, the United States will implement visible technical measures so as to reduce its strategic arsenal in size and readiness below the threshold (approximately 270 routinely deployed missile warheads) at which a decapitating first-strike could be suddenly mounted.

Third, the United States will establish and honor 100-mile exclusion zones for U.S. missile defense deployments adjacent to Russian territory.

Fourth, the operational status of U.S. missile defenses will be tailored to the actual third-country missile threat in the regions

of concern to Russia. U.S. defenses will be fully deployed and put on full alert only if and when a commensurate Iranian or North Korean threat materializes. China and Russia will receive full notification well in advance if U.S. missile defenses are going on high alert.

Fifth and last, the United States proposes that missile defense interceptors (as well as conventional hypersonic glide vehicles) be counted on a one-for-one basis against any ceiling on nuclear arms that may be negotiated in future.

Multilateral Security Cooperation. A 21st century security plan meant to reduce reliance on offensive nuclear weapons and shift toward a more defensive strategy would greatly benefit from multilateral cooperation both to share costs and operational responsibilities. No single nation can afford any longer to shoulder the full burden alone. Great mutual benefit accrues to nations with common interests that cooperate. For example, the phased adaptive approach to missile defense in Europe is only possible through a division of labor and burden-sharing within the NATO alliance. Japan is an essential partner of the United States in building the guidance and warhead for SM3-2A missile defense interceptors that will become the backbone of phased missile defenses for U.S. allies in Asia and Europe. A U.S.-Japan-South Korean partnership in missile defense is needed to assess missile attack raid size and triangulate missile trajectories. Stretching this envelope of cooperation even further, it is newly deployed radar in Israel supported by U.S. command-control-communications networks that enables Saudi Arabia's Patriot missile batteries to work effectively.

As the last example suggests, common interests create powerful incentives for cooperation among even former foes as well as traditional friends. The abundant opportunities are often missed – as evidenced by, for instance, the duplicative, inefficient deployment of three separate global space-based navigation systems. But economic forces and mutual security incentives are driving nations haltingly but surely toward security cooperation in the areas of monitoring, early warning, and active defenses. Future cooperation will take the form of generating global output on maritime, aircraft and space activities that increase worldwide real-time monitoring of the seas, skies and heavens – an unprecedented level of situational awareness of the earth. We will also witness the sharing of early warning

142 While there are many strategic, political, and psychological reasons for Russia's opposition to U.S. missile defenses, few informed Russians actually believe that their country's strategic nuclear deterrent can potentially be negated by these defenses. Cheap offensive countermeasures, such as missile warhead decoys, still have an overwhelming advantage over missile defenses. A seminal rigorous, objective Russian assessment by two retired Russian generals recently determined that the phase four "European missile defense cannot have any significant impact on reducing the capacity of the Russian Strategic Rocket Forces." Col. Gen. (Ret.) Victor Esin and Maj. Gen. (Ret.) Eugene V. Savostynov "Независимое Военное Обозрение" (приложение к "Независимой газете") (*European Missile Defense without Myths and Politics [Evaluation of Destabilizing Role of Missile Defenses in Europe]*), *Nezavisimoye voyennoye obozreniye* [Independent military survey], April 13, 2012, http://www.ng.ru/armament/2012-04-13/1_pro.html.

of missile launches and other potential threats through joint warning centers manned by Russians, Americans, Chinese, and many other nationalities. We may witness joint technological ventures such as U.S.-Russian early warning satellite deployments with the output widely shared with other nations. Over time, this increasingly global cooperation could lead to joint missile defenses among some strange bedfellows.

These trends appear to be deeply embedded in a globalizing world of growing economic and informational engagement and mutual dependence among the world's leading nations.

K. GUIDANCE SUMMATION

A transformational change in U.S. nuclear strategy, posture and force structure is urgently needed to squarely address the security threats facing the nation in the 21st century. The current strategy inherited from the Cold War perpetuates nuclear stockpiles that are much larger than required for deterrence today and that have scant efficacy in dealing with the main threats to U.S. and global security – nuclear proliferation, terrorism, cyber warfare and a multitude of other threats stemming from the diffusion of power in the world today.

Strategic stability based on a bilateral balance of nuclear terror, the unvarnished version of the anodyne “mutual deterrence,” is a dated and less useful construct. Today, stability is a multi-polar and multidimensional concern that includes many factors besides nuclear forces: cyber warfare capabilities, missile defenses, conventional forces, special operations and “softer” factors including diplomatic and economic clout.

The United States can and will proceed on its own accord to make many of the necessary changes to its nuclear strategy and force posture, but China and Russia are critical partners in the resolution of global security problems. The importance of achieving greater security cooperation among our three nations is difficult to overstate. The world looks to us for leadership in grappling with the global economic, environmental, and security problems of the 21st century, and we cannot expect to solve these collective challenges while at the same time maintaining nuclear policies rooted in threats to annihilate one another. Preserving mutual deterrence, a euphemism for mutual nuclear terror, as the central organizing principle

of our relationship obstructs our ability to achieve the level of trust and cooperation needed to effectively address the real threats that we and the rest of the world face.

“Mutual deterrence” must allow scope for security cooperation and we must persist in our efforts to join China, Russia, and others to set the world's course toward the total elimination of nuclear weapons. The path forward is clear: reduced reliance on nuclear weapons, deep bilateral reductions and de-alerting, the convening of the first-in-history multilateral nuclear weapons summit to consider proposals for achieving a world free of nuclear weapons, and seeking a multilateral de-alerting agreement that prohibits placing nuclear forces on an accident-prone posture of hair-trigger launch readiness.

These efforts would affirm U.S. support for the NPT, which continues to be the bedrock of the international community's effort to prevent and roll back proliferation. The Article VI obligation to pursue good faith negotiations for nuclear disarmament may have been “essentially hortatory” at one time, but today it is and must be taken seriously. Through nuclear arms control, the United States shows respect for the nuclear disarmament aspirations of the vast majority of the Treaty's 189 signatories, and in return the United States can expect them to stiffen their resolve in enforcing the NPT, supporting the P5+1 talks with Iran, and pressuring North Korea to end its nuclear pursuits and return to compliance with its NPT obligations (notwithstanding its proclaimed withdrawal).

The days of U.S. and Russian lip service to the disarmament clause of the NPT are over if we hope to preserve and strengthen the Treaty in the face of growing proliferation pressures around the world. And the more the nuclear weapons countries reduce their nuclear stockpiles, the more vigilant the world will become in ferreting out and clamping down on clandestine programs and other NPT violations. This collective resolve is crucial to the security of the United States and all countries.

XV. THE GLOBAL ZERO COMMISSION ON NUCLEAR RISK REDUCTION POLICY RECOMMENDATIONS

This commission encourages all nuclear weapons countries to adopt nuclear policies that place the highest priority on survivable forces and command systems in order to reduce dependence on first use, launch on warning, and “use or lose” strategies. Non-survivable nuclear forces should be eliminated during force modernization and through arms reduction negotiations whenever possible.

A. BILATERAL STEPS

This commission supports these U.S.-Russia bilateral steps:

1. Provide detailed notification by each of the parties well in advance of intended missile launches, assure the timely detection of all missile launches, and exchange real-time information on detected missile launches and the identity of the country responsible for the launch.
2. Establish a joint early warning center, manned by Russian and U.S. personnel (and later expanded for Chinese and other participation) to provide a conduit for this sharing. Expanding on the June 2000 Memorandum of Agreement to establish a U.S.-Russian Joint Data Exchange Center, this early warning center should also exchange information on cyber warfare attacks and the source of such attacks, particularly those attacks that impact early warning system performance and corrupt the output of early warning networks.
3. Notify each other whenever their strategic submarines leave their homeports.
4. Refrain from deploying strategic submarines at forward locations that allow their nuclear-armed missiles to reach the territories of Russia and the United States in less than 30 minutes.
5. Notify each other whenever they are going to alert and deploy their back-up nuclear command systems, even if only for the purpose of exercising them.
6. Sign an executive agreement with appropriate ratification processes calling upon them to take urgent, priority measures to prevent the possibility of missile launches on the basis of false warnings, and implement such measures within six months to one year.
7. Cease conducting exercises that involve the launch of land, sea, and air strategic missiles on the basis of information from early warning systems; exchange information about ongoing and planned nuclear military exercises; invite observers to each others' top command position during full-scale exercises; and also, if requested by the other side, invite observers to any exercises of their strategic nuclear forces.
8. Alter their nuclear war plans (Emergency War Orders, or EWO) to eliminate launch-on-warning procedures from them.
9. Strengthen command and warning systems to make them more survivable and capable of directing nuclear forces to coherent national purposes after absorbing an attack, in order to reduce pressure to launch on warning or pre-delegate nuclear release authority.
10. Agree to a specific phased plan to decrease the attack readiness of their individual strategic nuclear forces to 24-72 hours (time required to re-alert) until a total stand-down is achieved over a period of approximately ten years under a fast-track option.
11. Mutually stand down 20 percent of their current high-alert strategic forces (approximately 170 strategic weapons on each side) in the first tranche of de-alerting, and stand down additional forces over time according to this drawdown schedule:
 - Within one year, 20 percent (approximately 170 weapons on each side) of the current alert strategic forces would be stood down, leaving 680 on high alert on each side.

- Within three years, 50 percent (425 weapons on each side) would be off of alert, leaving 425 still on alert.
 - Within six years, 80 percent (680 weapons on each side) would be off alert, leaving 170 on alert.
 - Within ten years, 100 percent (850 weapons on each side) could be off alert if U.S.-Russian relations have returned to normal and their security cooperation has deepened.
12. Form a joint working group to (i) assess the static peacetime and crisis re-alerting stability of alternative configurations of de-alerted forces in order to design optimally stable postures (which appear to be organized around “tiers” of different types of forces with varying re-alerting speeds), (ii) exchange information that explains the physical de-alerting options under consideration, (iii) estimate time required to re-alert, (iv) propose the arrangements for verifying the de-alerting, and (v) demonstrate the end-to-end procedures of de-alerting and verification. Their experts should work together to design, test, demonstrate, and validate de-alerting methods and associated verification procedures. As part of this joint undertaking, they should compare and share assessments of the risks posed by their current strategic postures, including the risks to the integrity of nuclear command, control, communications and early warning networks posed by cyber warfare. They should jointly assess the nuclear programs of other countries, the risks they carry, and remedies including confidence-building measures and de-alerting.
13. Thereupon determine and declare the composition of the de-alerted forces. An illustrative initial configuration supported by this commission is the following: The U.S. would stand down one Minuteman squadron (50 missiles with one warhead each, or 50 warheads) plus one Trident submarine (24 missiles with four warheads each, or 96 warheads). Russia would stand down two regiments of silo-based missiles (ten SS-19 missiles with six warheads each, or 60 warheads, and ten Topol-M SS-27 missiles with one warhead each, or ten warheads), two regiments of land-based mobile rockets (18 Topol M missiles with one warhead each, or 18 warheads), and one Delta IV strategic submarine (16 missiles with 4 warheads each, or 64 warheads).
14. Determine and declare the physical de-alerting steps that will be taken at the initial stage of the drawdown schedule. An illustrative set of measures supported by this commission is given below along with estimates of the time required to re-alert (see next page):

GLOBAL ZERO COMMISSION ON NUCLEAR RISK REDUCTION REPORT
DE-ALERTING AND STABILIZING THE WORLD'S NUCLEAR FORCE POSTURES

RUSSIA	FIRST FORCES ONLINE	ALL FORCES IN UNIT
Silo-based Regiments:		
Restore Warheads	24 hrs	58 days
Restore Gas Generators	10 hrs	4 days
Restore Flight Batteries	8 hrs	3 days
Road-mobile Regiments:		
Restore Warheads	30 hrs	23 days
Restore Flight Batteries	8 hrs	6 days
Restore Removal of Metal Beams	12 hrs	9 days
Restore Re-build of Launcher	36 hrs	27 days
Strategic Submarines:		
Restore Warheads	12 hrs	8 days
Other (e.g., Open Welded Tubes*)	>24 hrs	>20 days
Strategic Bombers:		
Upload Weapons	>12 hrs	>2 days
Tactical Forces:		
Upload Weapons	24 hrs	30 days

** Potential safety hazard.*

UNITED STATES	FIRST FORCES ONLINE	ALL FORCES IN UNIT
Silo-based Squadrons:		
Restore Targets	15 mins	24 hrs
Undo “Safing”	3 hrs	10 hrs
Restore Lid Explosives	10 hrs	5 days
Remove Heavy Objects	12 hrs	7 days
Restore Warheads	24 hrs	9 days
Reconnect Stages	6 hrs	4 days
Strategic Submarines:		
Restore Warheads (In Port)	3 hrs	3 days
Restore Warheads (Onboard)	12 hrs (weather dependent)	>5 days
Restore Inverters	2 hrs	1 day
Restore Range	>2 days	>2 days
Strategic Bombers:		
Upload Weapons	>12 hrs	2 days
Tactical Forces:		
Upload Weapons	24 hrs	7 days (1/3) / 100 days (all)

15. Agree to a range of confidence-building stipulations that regulate the scope and timing of any re-alerting that may be undertaken for any reason – training, exercising, crisis preparedness, or rotational assumption of alert to relieve forces coming down from alert. Besides limiting the scope and timing of such re-alerting, they will agree to give advance notification of any re-alerting activity according to an accepted protocol.
16. Reaffirm commitment to 1991 Presidential Nuclear Initiatives on eliminating nuclear weapons.
17. Resume nuclear talks to resolve several specific hurdles to arms control progress led by missile defenses and conventional imbalances in order to get nuclear security cooperation back on track. Redouble efforts to find creative solutions, such as proposing to count all strategic and theater ground- and sea-based missile defense interceptors against its New START ceiling of operationally deployed weapons.
18. Other recommended steps: Establish 100-mile exclusion zones for U.S. missile defense deployments adjacent to Russian territory; exchange data on non-strategic nuclear warheads destroyed in the past 20 years; visit each other's former naval and air force storage sites to ensure that non-strategic nuclear weapons (NSNWs) – tactical weapons – are not available for quick re-deployment; exchange declarations of intent of nuclear use including emphasizing that a strong nuclear deterrent does not require the ability to retaliate immediately; establish formal, recurring joint seminars on nuclear doctrines and NSNWs employment; exchange declarations on missile defense programs for the next ten years; share information on current locations, types and numbers of NSNWs; pledge to be transparent about plans to modernize NSNWs; exchange information on command agreements, operational status and operational security levels; agree to separate NSNWs from delivery vehicles and keep them de-mated; and transfer NSNWs to centralized storage sites, and provide advance notification when

moving NSNWs from their current locations.

19. Appoint a track II commission of experts to assess the recommendations of this report and advise governments on next steps.

B. MULTILATERAL STEPS

This commission believes that de-alerting would also serve the national security interests of a far larger constellation of nations including the nuclear possessor states of China, the United Kingdom, France, Pakistan and India, and Israel as a unique case, as well as key non-nuclear weapons countries that shelter under the umbrella of extended deterrence.

The commission supports these multilateral steps:

1. The nuclear weapons countries meet to begin consultations laying the groundwork for a multilateral agreement limiting the alert status of their nuclear forces.
2. China, India, and Pakistan, who regularly join the rest of the nations in the United Nations General Assembly in passing resolutions calling for the nuclear weapons countries to decrease the operational readiness of their nuclear forces, assume a leading role in the initial global de-alerting consultations and in subsequent negotiations to reach a multilateral de-alerting agreement.
3. France, Russia, the United Kingdom and the United Kingdom participate in these consultations and negotiations and contribute to their success by sharing information on their alert status, plans for de-alerting, approach to verification, and monitoring technologies and techniques.
4. Russia and the United States invite the other nuclear weapons countries as well as key non-nuclear weapons countries to join the joint early warning center to be established for the purposes outlined earlier – par-

ticularly, circulating advance notifications of missile launches around the world and sharing real-time data on these launches.

5. The parties to the multinational de-alerting negotiation agree to (i) place and keep their nuclear forces on a low level of alert, requiring 24-72 hours to re-alert, (ii) reject prompt launch tactics, e.g., launch on warning, (iii) provide pertinent information on their de-alerted nuclear postures, (iv) allow on-site inspections to verify these postures according to agreed procedures, (v) collaborate on developing further monitoring technologies and techniques as needed to remedy any verification shortcomings, (vi) limit the scope and timing of any re-alerting activity undertaken for any reason, and (vii) provide prior notification of any such re-alerting activity.
6. Russia and China agree to provide advance notification of all tests of missiles capable of reaching the territories of the other nation.
7. India and Pakistan seek to revitalize talks on measures to improve nuclear security and prevent an accidental nuclear exchange, share information on nuclear doctrines, and improve their capabilities for crisis communications.
8. India and Pakistan renounce strikes against each other's national command authorities, establish in each country a strategic risk management unit, and further strengthen the safety and security of their nuclear weapons during storage, transportation, and handling.
9. NATO reaffirms the nuclear "Three NOs" ("no intention, no plan and no reason to deploy nuclear weapons on the territory of new members") predicated on Russia committing not to deploy nuclear weapons to new locations in European Russia.
10. The nuclear weapons countries and key non-nuclear countries appoint task forces consisting of former senior national security officers and officials to review the other recommendations of this report.

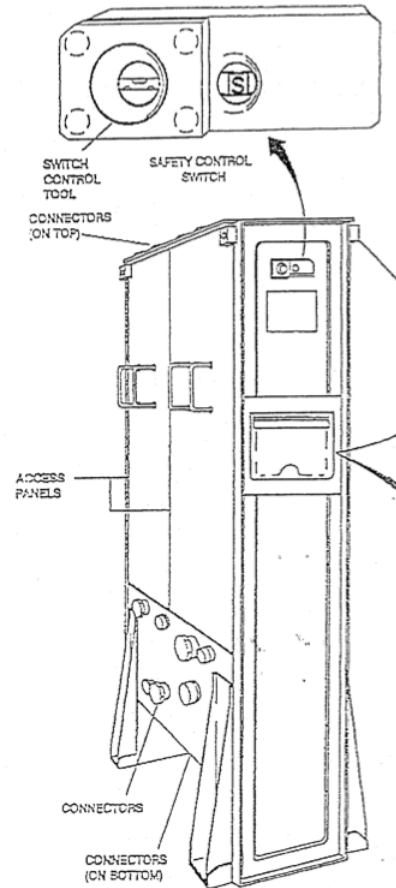
APPENDIX A: ILLUSTRATIVE DE-ALERTING MEASURES

U.S. Measures

U.S. Land-Based Missile Force: "Safing" the Missiles. A simple but effective de-alerting step for Minuteman missiles (whose current numbers, 450, will drop to 400 under New START limits; 50 empty silos will be kept on "warm standby") is to "safe" them in their silos – a safety switch in the silo is flipped to isolate the missile from outside ground and airborne launch control. This "safing" measure was taken to de-alert older Minuteman II 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 ignition. In 1991, maintenance crews went around from silo to silo and "safed" many hundreds of the older missiles 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. "Safing" of missiles is a standard safeguard that is implemented whenever special needs arise, such as equipment malfunctions that reduce normal protections against unauthorized launch. The U.S. Strategic Command considers it a critical safeguard to be implemented unilaterally in such circumstances.

Source: *Weapon System Operation Instructions, Technical Manual T.O. 21M-LGM30F-1-2, June 21, 1969, Change 34, June 13, 1973, p 1-23.*

Figure 1: Location of the Distribution Box (No. 22) in an ICBM silo.

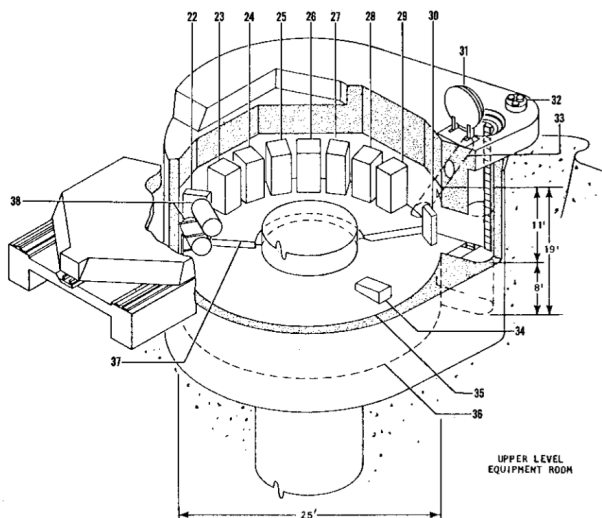


Source: *United States Strategic Command, "NPR Questions," obtained from the U.S. Air Force under the Freedom of Information Act.*

Figure 2: Close-up of the distribution box showing the safety control switch.

Re-alerting Minuteman missiles would entail dispatching maintenance troops to the 3 missile fields¹ to reenter each

¹ Malmstrom Air Force Base in Montana; Minot Air Force Base in



individual silo to flip the “safing” switch back on, a process requiring many hours to complete. Based on analysis provided by the U.S. Air Force, re-alerting all 450 Minuteman III missiles would take 3 days.² In our estimation, this could be shortened on an emergency basis to 1 day or less.³ If the Air Force estimates are accurate, then it would take approximately ten hours to re-alert the squadron of 50 missiles that this report nominated for de-alerting in the initial tranche.

Verification: 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 through access hatches (and watch other webcams on site to detect subterfuge) and thus identify candidate sites for challenge on-site inspection. Random challenge inspections piggybacking on the START warhead inspections could be demanded. In the event of escalating tensions, a burst of challenges inspections could be performed. However, on balance, the level of confidence that some electronic bypass does not exist would probably not be high. Other technical measures described

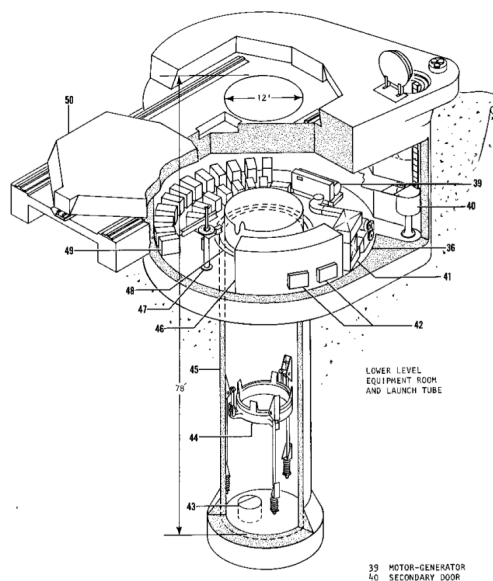
North Dakota; and F.E. Warren Air Force Base in Wyoming.

2 United States Strategic Command, “NPR Questions,” obtained from the U.S. Air Force under the Freedom of Information Act.

3 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 (450 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.

below would better lend themselves to high confidence verification.

U.S. Land-Based Missile Force: Place Heavy Objects on Silo Lids and Remove the Gas Generators Used to Remove the Silo Lids Prior to Launch. According to an analysis conducted by military staff of the U.S. Joint Chiefs of Staff: “[This] can be done by designing some kind of slug that would not roll off the door; it may not have to be heavy but just tethered so as not to ride the door open, and then designed to fall into the silo after the door opens.”⁴ As for removal of silo lid ejectors, this entails removing the four gas generators that drive a piston (closure actuators, see figure 4) that propels a 110-ton concrete-and-steel slab sideways down rail-like tracks off the top of the silo. “The lid sails through the security fence and skids for dozens of feet.”⁵ The restoration of these devices for a squadron of 50 Minuteman missiles would take ten hours for two silos and about five days in total, and the removal of heavy objects would take one week.



Source: *Weapon System Operation Instructions, Technical*

4 Lt. Col. John Betts, unpublished paper and personal communications, op.cit.

5 Joe Pappalardo, “Acronyms of a Nuclear Missile Launch,” *Popular Mechanics*, October 27, 2010, <http://www.popularmechanics.com/military/a6198/acronyms-of-a-nuclear-missile-launch>.

Manual T.O. 21M-LGM30F-1-2, June 21, 1969, Change 34, June 13, 1973, p 1-24.

Figure 3: The closure actuator (No. 47) consists of the pistol gas generator, which contains explosives used to propel the lid out of the way just prior to lift-off.

Verification: According to the JCS analysts, “Teams would monitor removal of explosives and conduct frequent challenge inspections. A combination of NTM (national technical means of verification, referring generally to space surveillance using imaging sensors) and on-site presence would verify that the object was actually large and heavy enough (not fake) and that the silo opening mechanism was not restored to function. Continuous presence would prevent the use of fake objects, falsification of measures to disable the silo doors, covert regeneration of such capability, or explosive destruction of objects on silo doors.”⁶

U.S. Land-Based Missile Force: Warhead Removal. Under Plan A, warheads would be removed from the missiles and placed in central storage at the three Minuteman bases, or at a large national facility in Arizona. Re-mating warheads to Minuteman missiles under crisis conditions would take a long time due to limited equipment, teams, and the long distances between the main base depots and the far-flung silos. If the warheads are stored at the local bases, the pace of reconstitution would restore about six warheads on six missiles per day, or two to three months to re-arm a force of 400 missiles. If stored in Arizona, the pace would drop to one warhead on one missile per day, at best.⁷ It would take an estimated 8-9 days to re-arm a squadron of 50 Minuteman missiles using warheads stored locally.

⁶ Lt. Col. John Betts, unpublished paper and personal communications, op.cit.

⁷ 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 at best. 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.

Under Plan B, Minuteman silos would house missiles without their warheads, and empty adjacent silos would each hold a warhead in their headworks. 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 six missiles and one month to bring the entire Minuteman force (split 50:50 into 200 missiles in silos and 200 warheads in silos) back to launch-ready status.⁸ At this rate, it would take about 8-9 days to re-arm a squadron of 50 Minuteman missiles.

Verification. National technical means and on-site inspections at the silos could verify the absence of warheads on Minuteman missiles. These inspections fall squarely under current New START inspections procedures and could be carried out without negotiating any new protocols. The re-mating procedures also would clearly be transparent to Russian surveillance, and would be assuredly detected during on-site inspections.

U.S. Land-Based Missile Force: Stage Separation. According to the U.S. Joint Staff, a “spacer” could be installed between the missile’s stages. This is “a non-functional piece which physically separates the lower stages and the missile guidance/reentry vehicle. (The U.S. Minuteman system uses this method as a safety feature during electronic testing of the

⁸ Re-mating warheads to Minuteman missiles under emergency conditions could be accomplished at a rate of approximately six per day. This schedule assumes that each of the three Minuteman bases have two special warhead vans and corresponding maintenance support. 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 in its front section 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; 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 force of 200 Minuteman missiles could be re-alerted in about one month.

deployed MM force.) This would be a cost effective, safe, and secure alternative to central [warhead] storage.”⁹

Verification. The U.S. Joint Staff asserts, “Spacer removal would be maintenance intensive to return the missiles to alert and would be highly visible to NTM [national technical means of verification] and on-site inspectors.”¹⁰

U.S. Trident Submarine Force: Remove Inverters and/or Guidance Sets. Trident submarines should operate on “modified” alert throughout their sea patrol, during which time the electronic “inverters” remain off the missile tubes. 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.¹¹ Also, U.S. submarines on modified alert only periodically listen (4-8 hour cycle) 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.¹² Thus,

9 Lt. Col. John Betts, unpublished paper and personal communications, op.cit.

10 Ibid.

11 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.

12 The installation of “inverters” to re-alert all 24 missiles on a given Trident boat would take about one day. Maintenance teams normally need about 90 minutes to two 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 18-24 hours to install all the inverters.

a single Trident submarine de-alerted in the first tranche of the proposed drawdown schedule would take 24 hours to return to launch-ready alert.

As an alternative or supplementary measure, missiles onboard the submarine could leave port without their guidance sets installed. Those sets could be kept onboard but detached from the missiles for the duration of the patrol. This step would greatly increase the time needed to reconstitute the force.¹³ At minimum, a Trident submarine would need 72 hours to install 24 guidance sets, and an additional 24-48 hours to run tests on them, for a total of 4-5 days.

Verification: End of patrol on-site inspection of seals disclosing whether or not any inverters or guidance sets were installed during sea patrol. 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 in-

13 Normally a Trident boat carries 24 intact missiles with their guidance sets 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 three hours to install one guidance unit into one missile, or about three 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.

verter seals at the end of a 2-plus month patrol to reassure them that the submarine never went on full alert.

U.S. Trident Submarines: Keep Out of Range of Targets. New U.S. submarine patrol areas could be demarcated with a view to putting them far out of range. Patrolling as far south as the Southern Hemisphere, many days of transit time would be necessary 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 that pose a potential first-strike counterforce threat to Russian missile bases. While a Trident missile carrying only two warheads as planned under the model U.S. presidential guidance could launch those warheads into orbit – i.e., infinite range – its practical range appears to be limited to about 6,000 miles for various reasons having to do with speed limits on warhead fusing during reentry, and on reentry vehicle stability and accuracy.¹⁴

Additional measures that could be taken to reduce range include loading extra weight onto the missiles and defueling their third stage. Trident submarine transit time to launch stations under any of these options would always exceed 48 hours.

Verification: 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 trans-

¹⁴ The longer the range, the faster the speed and the shallower the angle of reentry. Warhead fusing 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. Re-entry 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 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.

mit 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 far outside target range (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.

U.S. Trident Submarines: Remove Warheads to Central Storage Onboard. The main de-alerting option for Trident submarines is to off-load some or all of the boat's missiles and warheads to central storage at the two main port facilities. Trident missiles could be installed in tubes at a rate of two missiles every three hours (one installation per port).¹⁵ 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). This relatively brisk pace stems from the ease with which the warheads are returned to the boat. A tube is opened, the missile shroud winched onto the top of the boat (into a tented "doghouse"), the warheads installed onto the front section of the missile, and the shroud reinstalled. For the single Trident boat in this report's de-alerting plan, it would take only a few hours to arm the first of the boat's 24 missiles, and only 3 days to re-arm the entire boat.

A novel storage idea for later phases of the de-alerting draw-down schedule is to separate some or all of the warheads from the boat's missiles but keep them onboard the submarine. This option would reduce the vulnerability problem that emerges if warheads are consigned to central storage at the bases. Rather than store the warheads on land, they could be stored individually in empty tubes on the boat, adjacent to the tubes housing the unarmed missiles. Any

¹⁵ Currently this procedure uses special cranes and nuclear-certified crane operators at the homeports at Kings Bay, Georgia, and Bangor, Washington.

mix of normal armed missiles and de-mated missiles would be feasible – for instance, one-half of the 24 tubes could be loaded with armed missiles and one-half divided into unarmed missiles with adjacent tubes holding the warheads. It would take about one-half day to fully reload up to 11 missiles on a given boat after it had surfaced and stabilized in calm waters.¹⁶ Many additional hours would be required for electronic testing of the weapons system. For this configuration, weather permitting the restoration of the warheads to the missiles including the boat's transit and stabilization and electronic check-out could realistically require at least 1 day and possibly much longer.

Verification. NTM and New START inspection procedures would provide for adequate verification of the removal of missiles and warheads to central storage. The alternative on-board storage scheme could also be inspected in port prior to the Tridents departure for patrol. Opening the tubes while in port for space surveillance would also provide an excellent means of monitoring the separated state of the missiles and warheads.

U.S. Strategic Bomber Force. The U.S. bomber force would remain in its current unarmed disposition at several bases with warheads kept either at local storage bunkers or at other distant airbases. If the former, then the time to upload their current payloads – approximately 10 weapons per plane – is a minimum of 12 hours for the first plane to be re-armed and a total of 1-2 days to re-arm the entire bomber fleet. If the latter, the warheads would be flown to the bomber bases for uploading. This arrangement would increase the time to reconstitute the bomber force by an additional day. Once re-alerted in a crisis, bombers can taxi and takeoff within

15 minutes. It would be launched on warning of incoming warheads, but its dispatch is revocable and therefore this force runs a much lower degree of risk than the irrevocable launch of ballistic missiles.

Verification: The off-alert and unarmed status of the bomber force can be readily monitored by space surveillance and on-site inspections. Existing New START procedures would fully serve this purpose.

*U.S. Tactical Nuclear Weapons.*¹⁷ The first few nuclear-capable fighter aircraft deployed in Europe and the U.S. could be loaded with tactical nuclear arms in approximately 24-48 hours but weeks would be required to reconstitute about one-third of the U.S. and allied NATO fleet, and additional months to fully re-alert the remainder.

¹⁶ 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, oilrig, or other stable fixture for maximum safety. The option to surface and re-mate the warheads (which only weigh about 500 pounds in their re-entry vehicles) without outside stabilization does appear to be quite feasible, however.

¹⁷ This section draws heavily upon the Global Zero NATO-Russia Commission Report, February 2012.



Figure 4: Kleine Brogel Air Base, Belgium.



Figure 5: Kleine Brogel Air Base, Belgium.

Verification: The bomb uploading process and other aircraft sortie preparations would not be highly visible to space surveillance or other external observation because the weapons are stored in vaults underneath the fighters based in Europe at locations such as Klein Brogel Air Base pictured above, which themselves reside inside protective shelters. To determine whether or not a fighter had been uploaded, on-site inspectors would need access to the shelter to verify the absence of bombs using a radiation detector. No provisions currently exist to conduct such examinations. Monitoring arrangements would need to be incorporated into a de-alerting agreement if its scope encompassed tactical weapons.

Russian Measures¹⁸

Missile system	Number of systems	Warheads	Total warheads	Deployment
R-36M2 (SS-18)	46	10	460	Dombarovsky, Uzhur
UR-100NUTTH (SS-19)	60	6	360	Tatishchevo, Kozelsk
Topol mobile (SS-25)	72	1	72	Yoshkar-Ola, Barnaul, Vypolzovo
Topol-M silo (SS-27)	60	1	60	Tatishchevo
Topol-M mobile (SS-27)	18	1	18	Teykovo
RS-24 mobile	45	4	180	Teykovo, Novosibirsk, Nizhniy Tagil
RS-24 silo	4	4	16	Kozelsk
Total	305		1166	

Source: Pavel Podvig, "Strategic Rocket Forces," *Russian strategic nuclear forces*, January 15, 2015, <http://russianforces.org/missiles/>.

Figure 6: Missile systems, warheads, and deployments of Russian strategic rocket forces.

¹⁸ 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, C3: 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.

Russian Silo-Based Missile: Warhead Removal. Consigning warheads to warhead storage facilities would entail a large expansion of secure storage space that Russia lacks 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.

Assuming these bottlenecks could be resolved, it would be feasible for Russia to de-mate its missile warheads and store them at the nearby missile division headquarters. Reconstitution would take a long time. Due to the 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. 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 environmental control boxes, and replacing them with the reentry vehicle containing the warhead. 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. For the nominated silo-based forces proposed for de-alerting in the initial tranche – 10 SS-19 and 10 SS-27 missiles – it would take about two months to generate them fully to launch-ready status.

Verification: On-site inspection under New START procedures would suffice to monitor and verify the absence of warheads on silo-based missiles. Space imaging of the missile sites could readily reveal both the removal and the installation of warheads.

Russian Silo-Based Missiles: Gas Generator/Explosive Device Removal. Russian experts have proposed that in lieu of warhead separation and storage, Russia could remove the gas generators (explosive devices?) that produce the pressure that ejects the lids off the missile silos. Maintenance crews would open the silo lid, remove the devices, close the lid, and move them to a nearby storage location or main base. It is possible to remove them but store them inside the silo.



Source: REUTERS / Str Old

Figure 6: The ejection devices (not visible in this picture) propel the lid up and out of the way just prior to lift-off.

The reinstallation of the ejection devices 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 ten hours. Assuming the availability of one maintenance team for each regiment of missiles (six to ten missiles each), the silo-based force could be reconstituted fully within about 1 week. It would take four days to restore devices on the ten SS-19 and ten SS-27 silo-based missiles nominated for de-alerting in the initial tranche of the drawdown plan.

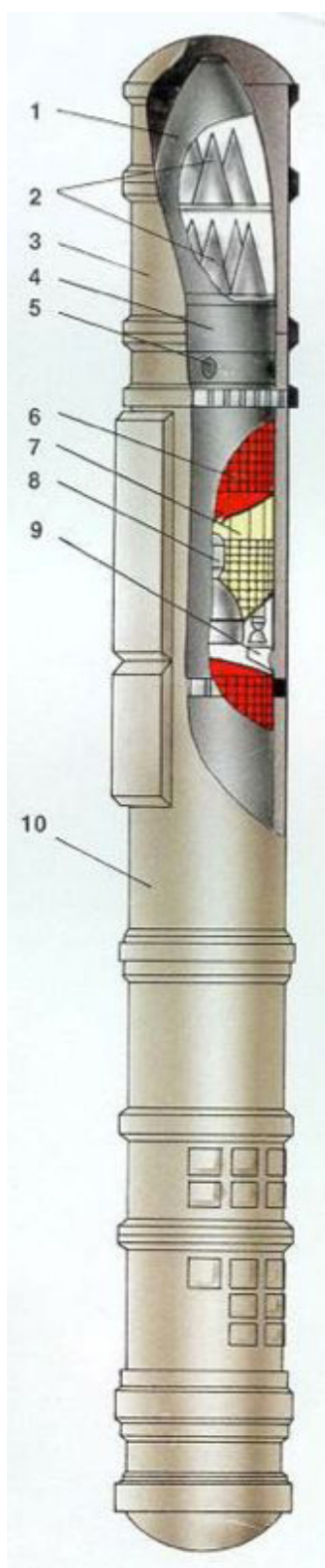
Verification: National technical means (space reconnais-

sance/imaging satellites) can normally observe the raising and lowering of silo lids and the presence of people and equipment involved in doing so. On-site inspection piggybacking on New START warhead inspections at Russian silos appears to be feasible. The Bilateral Consultative Commission probably could revise the treaty's protocol to enhance the "viability and effectiveness" of verification and facilitate this monitoring.

Russian Silo-Based Missiles: Flight Battery Removal. Russian experts have proposed that in lieu of removing warheads from Russian missiles that they remove the flight batteries. These batteries provide the electrical juice needed by the missile-guidance system during flight. Absent the flight battery, a missile is going nowhere.

Located under the nosecone and the warheads of the top stage of their missiles, they are removed and installed using a large crane to open the silo lids. It takes as long or longer to swap out batteries as it does to swap out warheads, according to these experts. As a result, no more than a few missiles per day per base could be re-alerted in either case. It would take at about three days to restore flight batteries on the ten SS-19 and ten SS-27 silo-based missiles nominated for de-alerting in the initial tranche of the drawdown plan.

Verification: The extensive re-alerting procedures associated with reinstallation of batteries on any significant scale could be readily observed by imaging satellites. In addition, a battery's absence or presence could be confirmed by inspectors conducting New START spot checks of warheads since the battery sits just below the warheads. Once the absence of the battery is confirmed, additional spot checks would not be necessary for lengthy periods because silo-based missiles normally require minimal maintenance, and the lid of a particular silo may not be raised for up to three years. If suspicions are raised for any reason, follow up on-site inspections would be warranted.



Source: *Oruzhie i tekhnologii Rossii: entsiklopediia XXI vek [Russia's Arms and Technologies: The XXI Century Encyclopedia]. Moskva: Oruzhie i tekhnologii, 2000, p. 77.*

Figure 7: Diagram of a Russian RS-20V. The flight battery (No. 4) is located below the warheads.

U.S. military experts from the Joint Staff assessed this option for Russian silo-based and mobile land rockets and concluded that its verification would have to be intrusive if the goal is to detect even a single surreptitious re-installation:

Can be done by monitoring removal, frequent challenge inspections and maintenance activity monitoring. Possibilities range from assigning individual teams to monitor each individual launcher to assigning teams to monitor some level of maintenance and/or access to launchers, with frequent (daily?) challenge inspections. The verification regime would rely on on-site presence, which would include accompanying maintenance teams inside the silos at all times (to observe removal of components and prevent covert regeneration of capability), spot checks (sampling) of individual silos, and continuous monitoring using sensors to ensure that no one enters the silo.

Russian Road-Mobile Missiles. Russia operates mobile land-based missiles fitted on trucks called transporter-erector launchers. (The United States has none.) The vast majority sit on alert inside garages at fixed known garrison locations, from which they can be launched on warning following a quick drawing back of their movable roofs. Typically 2-4 regiments (18-36 missiles) are out of garrison at covert field locations at any one time.¹⁹

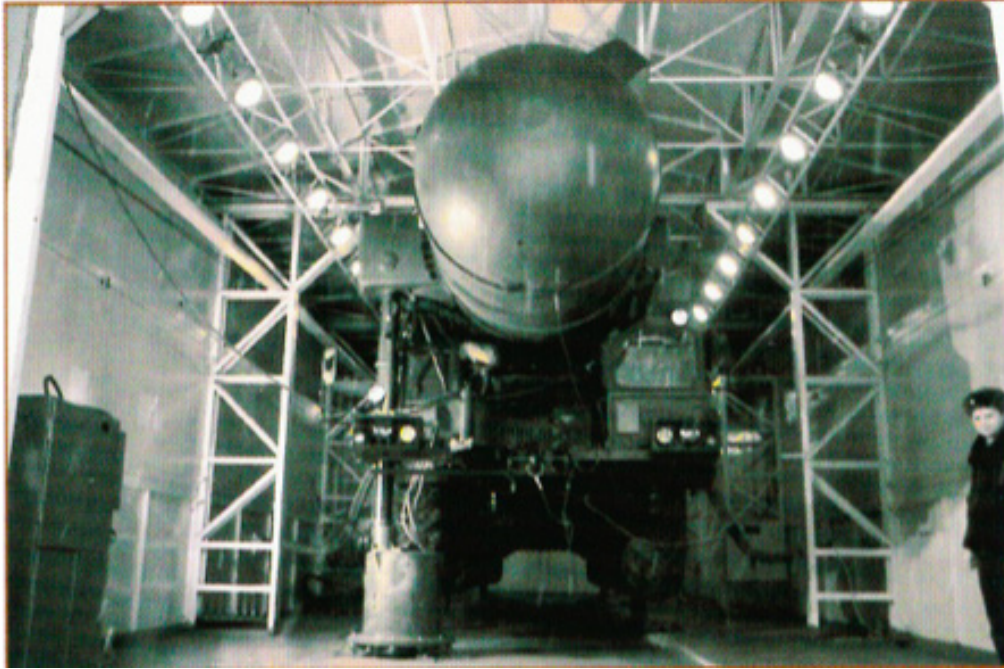
The road mobile missiles hiding in the field constitute a survivable force that need not be launched on warning, and need not be de-alerted for that reason. For the rest – the launch-ready mobile force hunkered down in garages – a menu of de-alerting options to prevent their prompt launch is available.

Russian Road-Mobile Missiles: Flight Battery or Warhead Removal. The discussion above for silo-based missiles also

applies to road mobile missiles. It would take eight hours to restore the battery on the first SS-27 missile in this tranche, and six days to reconstitute the 18 missiles de-alerted under this plan. For warhead installation, the normal reconstitution time would be upwards of 30 hours for a single missile although the re-mating of the warhead to the missile itself can be accomplished within five hours.

Russian Road-Mobile Missiles: Obstruct Egress from Garages; Incapacitate the Launcher. The optimal approach is to modify their shelters in ways that would block their launch path at lift-off. As indicated above, 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.

¹⁹ Lt. Col. John Betts, unpublished paper and personal communications, [op.cit.](#)



Source: *Oruzhie i tekhnologii Rossii: entsiklopediia XXI vek [Russia's Arms and Technologies: The XXI Century Encyclopedia]*. Moskva: *Oruzhie i tekhnologii*, 2000, p.83.

Figures 8 and 9: Russian road-mobile missiles in their garrison garage.

These options should be designed so as not to impede the rapid emergency-dispersal of mobile missiles from their garages into the field. (Measures to temporarily block crisis dispersal could be imposed eventually under a comprehensive “zero alert” agreement.²⁰) Russia should initially retain the ability to disperse these forces in a crisis for the sake of stability. Doing so would increase the size of Russia’s survivable second-strike forces to 135 land-based missiles armed with 270 warheads. These forces would not constitute a formidable first-strike counterforce threat to U.S. strategic forces during a crisis.

As the de-alerting regime is deepened over time, it may be desirable to remove the missiles from their launchers, or the warheads from the missiles, and consign them to base central storage. Alternatively, it may be desirable to incapacitate the road-mobile missile launcher itself in ways that would take a long time to reverse. Candidate methods for doing so include (i) emptying the hydraulic fluid from the erector mechanism of the launcher and storing the fluid in liquid-container trucks; (ii) 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 (iii) removing the struts and related mechanisms that erect and then support the missile after raising it to the vertical position.

It would take substantial time to regenerate an initial small force capable of quick launch – at least many hours to weeks depending on the de-alerting scheme adopted.²¹ For the 18

20 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.

21 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 two launchers (TELs) at a time, and would spend about one or two 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.

SS-27 missiles in this initial drawdown, it would take approximately 1-2 days to re-alert the first missile, and 2-4 weeks to reconstitute all of them.

Verification: A thorough set of inspection procedures to verify Russian compliance with its de-alerting measures has been outlined by Arbatov and Dvorkin.²² It appears very likely that re-alerting these forces would involve observable procedures over the course of days and weeks. 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.²³ Certainly the removal of heavy metal beams over missile garages would be time-consuming and require heavy equipment that could not be hidden from view. The U.S. Joint Staff concluded that these measures “can be verified with NTM and on-site presence.”²⁴

Russian Strategic Submarines. 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

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

23 Regarding the former measure—obstructing the launch path of missiles in garages—a JCS review of this option determined 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.”]

24 Lt. Col. John Betts, unpublished paper and personal communications, op.cit.

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.

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 patrols in protected home waters during the 1970s and 1980s when their missile ranges were greatly extended. 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.²⁵

One distinctive characteristic of Russian submarines is that the restoration of warheads and flight batteries would require winching the entire missile out of its tube and loading it to a vehicle for transport to the base maintenance facility. (By contrast, the U.S. can simply remove the missile's front section right on the boat to replace warheads.)

Depending upon the de-alerting option adopted for the Delta IV submarine in this initial tranche of de-alerting, the time needed to restore launch-ready status to a few missiles could range upwards of 24-48 hours and more than a week to re-alert the entire boat with 20 armed missiles. To restore a Delta IV complement of 64 warheads on its 16 missiles would take three hours per warhead (i.e., 12 hours for a single missile), and eight days to fully re-arm the boat.

Verification: NTM and on-site inspections piggybacking on New START are adequate.

Russian Tactical Nuclear Weapons. Based on a report authored by knowledgeable Russian experts, Russia deploys approximately 800 tactical nuclear weapons spread across about one dozen combat bases in European Russia, and an additional 500 in Asia.²⁶ These weapons are collocated with their delivery vehicles – mainly warplanes and land-based rockets. An example, shown in the picture below, is a base in Kaliningrad whose warhead storage area is located not far from the missiles that would deliver them.

25 Furthermore, Russian submarine reactor safety would evidently 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 into the hazardous range.

26 Global Zero NATO-Russia Commission Report, February 2012, op.cit., p. 6.



Figure 10: Missile Brigade Technical Area, nKaliningrad, Russia.



Figure 11: Belgorod National-Level Nuclear Warhead Storage, Russia.

An estimated 1,000 additional warheads reside in large central storage facilities such as Belgorod site shown in the picture below. It is located only a few miles from the Ukrainian border. The uploading of weapons to delivery vehicles at the forward combat bases would take about 24-48 hours for a portion of the forces. Deeper de-alerting could be instituted by moving the tactical weapons from their combat bases to the central storage facilities in order to extend the re-mating time by many tens of hours to days.

Verification. Space surveillance and other independent technical means of monitoring would provide adequate verification, but regular on-site inspections to verify that combat delivery vehicles are not armed with nuclear weapons and that the combat base storage facilities do not contain any nuclear weapons, are recommended.

APPENDIX B: MAJ. GEN. (RET.) VLADIMIR DVORKIN'S DRAFT EXECUTIVE AGREEMENT

Executive Agreement

Between the Presidents of the Russian Federation and the United States On Urgent Measures To Exclude the Possibility of Strategic Missile Launch on False Alarm

(Draft)

The Russian Federation and the United States of America, hereinafter referred to as the "Parties,"

Facing new challenges to international security, including nuclear missile proliferation, the growing threat of terrorist acts with the use of weapons of mass destruction;

Considering that the Cold War has become a thing of the past, and the leading countries no longer fear a surprise nuclear missile attack by a potential enemy aimed to deliver a disarming strike against their strategic forces, control and early warning systems;

Seeking to establish a strategic partnership based on the principles of mutual security, cooperation, trust, transparency and

predictability, and aimed to counteract new threats to security;

Considering the catastrophic consequences of a missile launch on false alarm, which is possible regardless the highly reliable ways of preventing unauthorized launch of nuclear missiles of the Parties;

Recognizing the need for additional measures to prevent the threat of erroneous missile launch;

Convinced that coordination of measures for guaranteed prevention of erroneous missile launch promotes strengthening of world peace and security;

Believing that coordination of such measures between Russia and the U.S.A. will contribute to the strengthening of international security and by no means infringe on the interests of any third country;

Have agreed as follows:

Article I

1. The Parties shall immediately exclude from the combat employment plans of their strategic offensive forces (strategic nuclear forces) launches of ground-, sea- and air-based missiles on the information received from early warning systems (in Russia – Missile Attack Warning System, in the U.S.A. – Ballistic Missile Early Warning System).

2. The Parties shall immediately discontinue all exercises of strategic nuclear forces that involve the employment of their own ground-, sea- and air-launched missiles based on early warning information; they shall exchange information about the exercises that are being planned or conducted and invite inspection groups from each other's side to high-level command posts to attend large-scale exercises of strategic offensive forces, or any exercises of strategic offensive forces on request from the other Party.

3. The parties shall consider the possibility of permanent attendance of the other Party's liaison officers at the command posts of various levels of own strategic nuclear forces.

4. Each Party shall take organizational and technical measures confirming its commitment to exclude the employment of own high-alert strategic missiles on the basis of the information from missile attack warning systems; it shall also take technical measures to gradually reduce the on-warning alert status of strategic missiles of various basing.

Article II

1. Each Party shall implement, the way it deems necessary, organizational and technical measures that it assumes under this Agreement and shall demonstrate their verity during inspections in the framework of the Strategic Arms Reduction Treaty (START-1).

2. Each Party shall notify the interested Party that it has taken the aforementioned measures, demonstrate their reliability and the duration of bringing the missiles back to the alert status; the Parties shall also work out procedures to exercise control over these measures on a regular basis.

3. The Parties shall make efforts to coordinate controllable, joint and individual, organizational and technical measures in order to confirm the impossibility of missile launch on false alarm from early warning systems.

4. The Parties shall jointly formulate and adopt amendments to the documents providing for the effectiveness of this Agreement, including procedures of regular control over every coordinated or unilaterally taken measure.

Article III

1. The Parties shall make efforts to ensure joint operation of their missile attack early warning systems with the Center for the Exchange of Information about Missile Launches in order to prevent reaction to accidental or provocative missile launches; the Parties shall also use other national technical facilities and other means of control over missile and missile technology non-proliferation.

2. The Parties shall refrain from carrying out experiments in outer space that may disturb or disable missile attack warning systems.

Article IV

To ensure continuous exchange of information pertaining to this Agreement and promptly resolve any obscure situations due the information from early warning systems, the Parties shall use the Center for the Exchange of Information about Missile Launches.

Article V

The information provided by any of the Parties under this Agreement, shall be deemed confidential and sensitive. This information shall not be made known to any third country, or any legal or private entity without a written agreement from the Party that has provided this information.

Article VI

To promote the implementation of this Agreement, work out possible amendments intended to improve this Agreement, develop and coordinate measures to implement this Agreement, the Parties shall use a Special Conciliation Commission.

Article VII

1. The present Agreement comes into force upon the date of its signing.

2. The present agreement shall be of unlimited duration.

3. In case of a threat to the national interests of one of the Parties, the present Agreement can be terminated by any of the Parties six months after the other Party has been notified about such a decision. The written notification shall contain the explanation of the threats to the national interests of the Party that have made further execution of this Agreement impossible.

This Agreement is executed in two copies, each in Russian and in English, both copies being authentic.

From the Russian Federation

From the United States

APPENDIX C: U.N. RESOLUTIONS AND WORKING PAPERS

2010 Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons

New York, 3-28 May 2010

*Working paper submitted by New Zealand on behalf of Chile, Malaysia, Nigeria and Switzerland*²⁷

Background

1. In 2000, States parties agreed on 13 practical steps, which constituted “systematic and progressive efforts” to implement article VI of the Treaty on the Non-Proliferation of Nuclear Weapons. One of these agreed steps was that all nuclear weapon States should “further reduce the operational status of nuclear weapons systems”.

2. In its resolutions 62/36 and 63/41, the General Assembly also called for reductions in the operational readiness of nuclear weapons systems, with a view to ensuring that all nuclear weapons were removed from high alert status.

3. Despite the end of the cold war, large numbers of nuclear weapons still remain on high levels of readiness. The decision-making process with respect to the launch of any nuclear weapon must be substantially lengthened not only to minimize the risk of use in error but also to improve levels of mutual confidence and in order to indicate a diminished role for nuclear weapons in military doctrines.

4. Lowering the operational readiness of nuclear weapons systems is consistent with the imperative expressed in the first preambular paragraph of the Treaty to make every effort to avert the danger of nuclear war and to take measures to safeguard the security of peoples from

the devastation of such conflict. Lowering the operational readiness of nuclear weapons systems will also contribute

²⁷ Obtained from http://www.un.org/ga/search/view_doc.asp?symbol=NPT/CONE.2010/WP.10.

to the climate in which reliance on nuclear weapons is reduced, benefiting the causes of both nuclear disarmament and non-proliferation.

Progress regarding operational readiness at the 2010 Review Conference

1. States parties at the 2010 Review Conference should approve an ambitious outcome on decreasing operational readiness as a tangible demonstration of the implementation of article VI commitments and as an interim step towards the complete elimination of nuclear weapons. We recommend that the Conference:

2. Recognize that reductions in alert levels would contribute to the process of nuclear disarmament through the enhancement of confidence-building and transparency measures and a diminishing role for nuclear weapons;

3. Urge that further concrete measures be taken to decrease the operational readiness of nuclear weapons systems, with a view to ensuring that all nuclear weapons are removed from high alert status;

4. Call on the nuclear-weapon States to regularly report on measures taken to lower the operational readiness of their nuclear weapons systems.

Sixty-seventh session

Agenda item 94

4 January 2013

###

Resolution adopted by the General Assembly on 3 December 2012 [on the report of the First Committee (A/67/409)]

*67/46. Decreasing the operational readiness of nuclear weapons systems*²⁸

²⁸ Obtained from <https://gafc-vote.un.org/UNODA/vote.nsf/91a5e1195dc97a630525656f005b8adf/e35fd89dd7a->

The General Assembly,

Recalling its resolutions 62/36 of 5 December 2007, 63/41 of 2 December 2008 and 65/71 of 8 December 2010,

Recalling also that the maintenance of nuclear weapons on high alert was a feature of cold war nuclear postures, and welcoming the increased confidence and transparency since the cessation of the cold war,

Concerned that, notwithstanding the end of the cold war, several thousand nuclear weapons remain on high alert, ready to be launched within minutes,

Noting the continuing engagement in multilateral disarmament forums in support of further reductions to the operational status of nuclear weapons systems,

Recognizing that the maintenance of nuclear weapons systems at a high level of readiness increases the risk of the unintentional or accidental use of such weapons, which would have catastrophic humanitarian consequences,

Recognizing also that reductions in deployments and the lowering of operational status contribute to the maintenance of international peace and security, as well as to the process of nuclear disarmament, through the enhancement of confidence-building and transparency measures and a diminishing role for nuclear weapons in security policies,

Welcoming the steps taken by some States in nuclear disarmament, including de-targeting initiatives, increasing the amount of preparation time required for deployment and other measures to diminish further the possibility of nuclear launches resulting from accidents, unauthorized actions or misperceptions,

Welcoming also the adoption by consensus of the con-

clusions and recommendations for follow-on actions of the 2010 Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons,²⁹ including the commitments of the nuclear-weapon States to promptly engage with a view to, inter alia, considering the legitimate interest of non-nuclear-weapon States in further reducing the operational status of nuclear weapons systems in ways that promote international stability and security,

Acknowledging, in this regard, the continued dialogue among the nuclear-weapon States to advance their nuclear non-proliferation and disarmament commitments under the action plan of the 2010 Review Conference¹ and the potential of this process for leading to deeper engagement on nuclear disarmament and greater mutual confidence,

1. Welcomes the opportunities provided by meetings of the Preparatory Committee for the 2015 Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons to address the further reduction of the operational status of nuclear weapons systems as a step leading to nuclear disarmament, and looks forward to the reporting of the nuclear-weapon States on their undertakings in this regard to the Preparatory Committee at its third session, in 2014;
2. Calls for further practical steps to be taken to decrease the operational readiness of nuclear weapons systems, with a view to ensuring that all nuclear weapons are removed from high alert status;
3. Urges States to update the General Assembly on progress made in the implementation of the present resolution;
4. Decides to remain seized of the matter.

²⁹ See 2010 Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons, Final Document, vols. I–III (NPT/CONE.2010/50 (Vols. I–III)), vol. I, part I).

General Assembly Voting Record³⁰

In favour (164): Afghanistan, Albania, Algeria, Angola, Antigua and Barbuda, Argentina, Armenia, Australia, Austria, Azerbaijan, Bahamas, Bahrain, Bangladesh, Barbados, Belarus, Belgium, Belize, Benin, Bhutan, Bolivia (Plurinational State of), Bosnia and Herzegovina, Botswana, Brazil, Brunei Darussalam, Bulgaria, Burkina Faso, Cambodia, Cameroon, Canada, Cape Verde, Central African Republic, Chad, Chile, China, Colombia, Comoros, Congo, Costa Rica, Côte d'Ivoire, Cuba, Cyprus, Democratic Republic of the Congo, Denmark, Djibouti, Dominica, Dominican Republic, Ecuador, Egypt, El Salvador, Eritrea, Ethiopia, Fiji, Finland, Gabon, Gambia, Germany, Ghana, Greece, Grenada, Guatemala, Guinea, Guinea-Bissau, Guyana, Haiti, Honduras, Iceland, India, Indonesia, Iran (Islamic Republic of), Iraq, Ireland, Italy, Jamaica, Japan, Jordan, Kazakhstan, Kenya, Kuwait, Kyrgyzstan, Lao People's Democratic Republic, Lebanon, Lesotho, Liberia, Libya, Liechtenstein, Luxembourg, Madagascar, Malawi, Malaysia, Maldives, Mali, Malta, Mauritania, Mauritius, Mexico, Mongolia, Montenegro, Morocco, Mozambique, Myanmar, Namibia, Nepal, New Zealand, Nicaragua, Niger, Nigeria, Norway, Oman, Pakistan, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Poland, Portugal, Qatar, Rwanda, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Samoa, San Marino, Sao Tome and Principe, Saudi Arabia, Senegal, Serbia, Sierra Leone, Singapore, Slovenia, Solomon Islands, Somalia, South Africa, South Sudan, Spain, Sri Lanka, Sudan, Suriname, Swaziland, Sweden, Switzerland, Syrian Arab Republic, Tajikistan, Thailand, the former Yugoslav Republic of Macedonia, Timor-Leste, Togo, Tonga, Trinidad and Tobago, Tunisia, Turkmenistan, Tuvalu, Uganda, Ukraine, United Arab Emirates, United Republic of Tanzania, Uruguay, Uzbekistan, Vanuatu, Venezuela (Bolivarian Republic of), Viet Nam, Yemen, Zambia, Zimbabwe

Against (4): France, Russian Federation, United Kingdom of

Great Britain and Northern Ireland, United States of America

Abstaining (19): Andorra, Croatia, Czech Republic, Democratic People's Republic of Korea, Estonia, Georgia, Hungary, Israel, Latvia, Lithuania, Marshall Islands, Micronesia (Federated States of), Netherlands, Palau, Republic of Korea, Republic of Moldova, Romania, Slovakia, Turkey

69th session of the General Assembly

###

First Committee Nuclear Disarmament Cluster New York, 20 October 2014

H.E. Mr. Urs Schmid

Permanent Representative of Switzerland to the Conference on Disarmament³¹

Mr. Chairman,

I have the honor of taking the floor on behalf of Chile, Malaysia, New Zealand, Nigeria and my own country Switzerland, on the issue of decreasing the operational readiness of nuclear weapons systems, or De-alerting.

Since 2007, our countries have been tabling the De-alerting resolution, which calls for practical steps to address the significant number of nuclear weapons that remain at high levels of alert.

We are deeply concerned that today almost 2,000 warheads are ready for use within a matter of minutes. Such high alert levels multiply the risks posed by nuclear weapons. They increase the probability of an inadvertent, erroneous, unauthorized or precipitated launch. They represent an unacceptable danger to humanity as even a small percentage of these warheads, if used, could kill millions of people. In the

30 Recorded vote on General Assembly resolution 67/46, Decreasing the operational readiness of nuclear weapons, A/RES/67/46, December 3, 2012, https://gafc-vote.un.org/UNODA/vote.nsf/91a5e1195d-c97a630525656f005b8adf/e35fd89dd7a6f43485257ad7006bf022?OpenDocument&ExpandSection=3%2C2#_Section3.

31 Obtained from <https://papersmart.unmeetings.org/media2/4653552/switzerland.pdf>.

context of heightened international tensions, awareness of the risks associated with such postures is all the more important.

Mr. Chairman,

The growing international focus on the catastrophic humanitarian consequences of nuclear weapons has served to highlight the threat that the destructive capacity of nuclear weapons poses to the survival of humanity and the urgent necessity of nuclear disarmament, and specifically reducing alert levels.

Lowering the operational readiness of nuclear-weapon systems has been recognized as being a key part of the nuclear disarmament process. De-alerting is a long-standing, unfulfilled NPT disarmament commitment, agreed as part of the 13 practical steps of 2000. It also constitutes an “effective measure” for the purposes of Article VI of the NPT. De-alerting is thus a prime example of a necessary, reasonable and practical disarmament step and progress in this area of NPT implementation would strengthen the NPT’s credibility.

Action in this regard would also result in a significant nuclear disarmament dividend through a reduction of the role of nuclear weapons in nuclear doctrines.

We acknowledge and welcome the progress that has been made in the past, including lowering the level of operational readiness of non-strategic nuclear weapons and the standing down of strategic bombers.

These steps highlight the fact that de-alerting is possible and that technical and political challenges can be met. However, more can and should be done to address the disproportionately high levels of alert of many nuclear weapons today.

In this context, we are encouraged by the numerous calls made by former high ranking officers from nuclear-weapon States in support of reducing the level of operational readiness of nuclear weapons – their expert testimony that de-alerting is not only feasible but also necessary surely increases the volume of our call to action. Our countries wel-

come the steady increased in support, from non-nuclear and States possessing nuclear weapons alike, that the resolution has garnered since it was first submitted in 2007.

Mr. Chairman,

It is against this background that the De-alerting group will table this year the resolution entitled De-creasing the Operational Readiness of Nuclear Weapons.

The main object of the resolution remains unchanged in calling for further practical steps to be taken to decrease the operational readiness of nuclear weapons systems, with a view to ensuring that all nuclear weapons are removed from high alert status.

This year’s resolution takes note of the references to operational readiness in reports of the nuclear-weapon States to the 3rd Session of the Preparatory Committee for the 2015 Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons. It also looks forward to the issue being addressed further at the 2015 Review Conference.

This growing support demonstrates our collective commitment to a diminishing role for nuclear weapons and our recognition that reducing alert levels is an important interim step towards a nuclear-weapon-free world. We look forward to continued strong backing for the resolution this year and invite all States to support it. We would like to recall that this resolution is open for Co-sponsorship.

Thank you.

NPT/CONF.2015/PC.III/WP.6

###

Preparatory Committee for the 2015 Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons

14 March 2014

Original: English

Third session

New York, 28 April - 9 May 2014

De-alerting

*Joint working paper submitted by the members of the Non-Proliferation and Disarmament Initiative (Australia, Canada, Chile, Germany, Japan, Mexico, Nigeria, the Netherlands, the Philippines, Poland, Turkey and the United Arab Emirates)*³²

1. The 2000 Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons, in its consensus final document, included in its 13 practical steps towards nuclear disarmament the need for “concrete agreed measures to further reduce the operational status of nuclear weapons systems”.

2. Action 5 of the action plan adopted at the 2010 Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons further highlighted the importance of de-alerting nuclear weapons. It called for nuclear-weapon States to “commit to accelerate concrete progress” on the 13 practical steps agreed at the 2000 Review Conference. It specifically called upon nuclear -weapon States to “consider the legitimate interest of non-nuclear-weapon States in further reducing the operational status of nuclear weapons systems in ways that promote international stability and security” (action 5 (e)) and to “reduce the risk of accidental use of nuclear weapons” (action 5 (f)).

3. The issue of de-alerting is also closely related to the other aims found in the action plan. For example, de-alerting may provide a much-needed boost to disarmament efforts (action 5 (a)) and help to de-emphasize the role of nuclear weapons (action 5 (c)).

4. As expressed in our ministerial statement of 26 September 2013, the members of the Non-Proliferation and Disarmament Initiative urged all nuclear -weapon States and those States outside of the Treaty on the Non -Proliferation of Nuclear Weapons to take steps towards de-alerting their nuclear forces to help lower the risk of inadvertent use.

5. A lowered operational readiness for nuclear weapons systems would demonstrate a commitment to reducing the role of nuclear weapons in security and defence doctrines. It would also be a valuable confidence -building measure and an important step towards nuclear disarmament.

6. While we acknowledge steps taken by the United States of America and the Russian Federation to mitigate the risk of avoidable nuclear war, including through the operation of nuclear risk reduction centres, we are concerned by the lack of declared or assumed reductions in operational status since the 2010 Review Conference.

7. The high alert nuclear force posture is based on a security environment that existed during the Cold War, but there has been no correspondingly significant change to reflect the major reduction in levels of tension since the end of the Cold War.

8. We therefore recommend that the 2015 Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons:

a. Urge all nuclear-weapon States to take concrete and meaningful steps, whether unilaterally, bilaterally or regionally, to implement actions 5 (e) and 5 (f) in the action plan adopted at the 2010 Review Conference;

b. Call on all nuclear-weapon States to provide an update to States Parties to the Treaty on efforts they have undertaken to implement actions 5 (e) and 5 (f);

c. Highlight the importance of nuclear armed States outside the Treaty also taking steps towards de-alerting their nuclear forces.

###

32 Obtained from <http://www.mofa.go.jp/mofaj/files/000035332.pdf>.

Resolution adopted by the General Assembly on 2 December 2014 [on the report of the First Committee (A/69/440)]

69/42. *Decreasing the operational readiness of nuclear weapons systems*³³

The General Assembly,

Recalling its resolutions 62/36 of 5 December 2007, 63/41 of 2 December 2008, 65/71 of 8 December 2010 and 67/46 of 3 December 2012,

Recalling also that the maintenance of nuclear weapons on high alert was a feature of cold war nuclear postures, and welcoming the increased confidence and transparency since the cessation of the cold war,

Concerned that, notwithstanding the end of the cold war, several thousand nuclear weapons remain on high alert, ready to be launched within minutes,

Noting the continuing engagement in multilateral disarmament forums in support of further reductions to the operational status of nuclear weapons systems,

Recognizing that the maintenance of nuclear weapons systems at a high level of readiness increases the risk of the unintentional or accidental use of such weapons, which would have catastrophic humanitarian consequences,

Recognizing also that reductions in deployments and the lowering of operational status contribute to the maintenance of international peace and security, as well as to the process of nuclear disarmament, through the enhancement of confidence-building and transparency measures and a diminishing role for nuclear weapons in security policies,

Welcoming the steps taken by some States in support of

³³ Obtained from [https://gafc-vote.un.org/UNODA/vote.nsf/e9e05f9ef-74d8c7f05256705006e0a60/a5056353c02f74c685257dc80073be4d/\\$-FILE/A%20RES%2069%2042.pdf](https://gafc-vote.un.org/UNODA/vote.nsf/e9e05f9ef-74d8c7f05256705006e0a60/a5056353c02f74c685257dc80073be4d/$-FILE/A%20RES%2069%2042.pdf).

nuclear disarmament, including de-targeting initiatives, increasing the amount of preparation time required for deployment and other measures to diminish further the possibility of nuclear launches resulting from accidents, unauthorized actions or misperceptions,

Welcoming also the adoption by consensus of the conclusions and recommendations for follow-on actions by the 2010 Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons, including the commitments of the nuclear-weapon States to promptly engage with a view to, inter alia, considering the legitimate interest of non-nuclear-weapon States in further reducing the operational status of nuclear weapons systems in ways that promote international stability and security,

Acknowledging, in this regard, the continued dialogue among the nuclear-weapon States to advance their nuclear non-proliferation and disarmament commitments under the action plan of the 2010 Review Conference¹ and the potential of this process for leading to deeper engagement on nuclear disarmament and greater mutual confidence,

Taking note of the references to operational readiness in reports of the nuclear-weapon States to the third session of the Preparatory Committee for the 2015 Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons,

Welcoming all opportunities to address the further reduction of the operational status of nuclear weapons systems as a step leading to nuclear disarmament,

1. *Calls* for further practical steps to be taken to decrease the operational readiness of nuclear weapons systems, with a view to ensuring that all nuclear weapons are removed from high alert status;
2. *Looks* forward to the issue of the lowering of the operational readiness of nuclear weapons systems being addressed further at the 2015 Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons;
3. *Urges* States to update the General Assembly on progress

made in the implementation of the present resolution;

4. *Decides* to remain seized of the matter.

62nd plenary meeting
2 December 2014

###

Recorded vote in the General Assembly 02 December 2014, Resolution 69/42. Decreasing the operational readiness of nuclear weapons systems³⁴

In Favor: 166
Against: 4
Abstaining: 11

In Favor: Afghanistan, Albania, Algeria, Angola, Antigua and Barbuda, Argentina, Armenia, Australia, Austria, Azerbaijan, Bahamas, Bahrain, Bangladesh, Barbados, Belarus, Belgium, Belize, Benin, Bhutan, Bolivia (Plurinational State of), Bosnia and Herzegovina, Botswana, Brazil, Brunei Darussalam, Bulgaria, Burkina Faso, Cabo Verde, Cambodia, Cameroon, Canada, Central African Republic, Chad, Chile, China, Colombia, Congo, Costa Rica, Côte d'Ivoire, Croatia, Cuba, Cyprus, Czech Republic, Denmark, Djibouti, Dominican Republic, Ecuador, Egypt, El Salvador, Equatorial Guinea, Eritrea, Ethiopia, Fiji, Finland, Germany, Ghana, Greece, Grenada, Guatemala, Guinea, Guinea-Bissau, Guyana, Haiti, Honduras, Iceland, India, Indonesia, Iran (Islamic Republic of), Iraq, Italy, Jamaica, Japan, Jordan, Kazakhstan, Kenya, Kiribati, Kuwait, Kyrgyzstan, Lao People's Democratic Republic, Lebanon, Lesotho, Liberia, Libya, Liechtenstein, Luxembourg, Madagascar, Malawi, Malaysia, Maldives, Mali, Malta, Marshall Islands, Mauritania, Mauritius, Mexico, Mongolia, Montenegro, Morocco, Mozambique, Myanmar, Namibia, Nepal, Netherlands, New Zealand, Nicaragua, Niger, Nigeria, Norway, Oman, Pakistan,

Panama, Papua New Guinea, Paraguay, Peru, Philippines, Poland, Portugal, Qatar, Republic of Moldova, Romania, Rwanda, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Samoa, San Marino, Sao Tome and Principe, Saudi Arabia, Senegal, Serbia, Seychelles, Singapore, Slovakia, Slovenia, Solomon Islands, Somalia, South Africa, Spain, Sri Lanka, Sudan, Suriname, Swaziland, Sweden, Switzerland, Syrian Arab Republic, Tajikistan, Thailand, the former Yugoslav Republic of Macedonia, Timor-Leste, Togo, Tonga, Trinidad and Tobago, Tunisia, Turkmenistan, Tuvalu, Uganda, Ukraine, United Arab Emirates, United Republic of Tanzania, Uruguay, Uzbekistan, Vanuatu, Venezuela (Bolivarian Republic of), Viet Nam, Yemen, Zambia, Zimbabwe.

Against: France, Russian Federation, United Kingdom, United States.

Abstaining: Andorra, Democratic People's Republic of Korea, Estonia, Hungary, Israel, Latvia, Lithuania, Micronesia (Federated States of), Palau, Republic of Korea, Turkey.

###

APPENDIX D: U.S.-RUSSIAN MEMORANDUM OF AGREEMENT ON A JOINT DATA EXCHANGE CENTER

Memorandum of Agreement Between the United States of America and the Russian Federation on the Establishment of a Joint Center for the Exchange of Data from Early Warning Systems and Notifications of Missile Launches (JDEC MOA)

June 4, 2000³⁵

Key Items

34 Recorded vote on General Assembly resolution 69/42, Decreasing the operational readiness of nuclear weapons systems, A/RES/69/42, December 2, 2014, https://gafc-vote.un.org/UNODA/vote.nsf/91a5e1195d-c97a630525656f005b8adf/a5056353c02f74c685257dc80073be4d?OpenDocument#_Section3.

35 Bureau of Arms Control, Verification, and Compliance, Memorandum of Agreement Between the United States of America and the Russian Federation on the Establishment of a Joint Center for the Exchange of Data from Early Warning Systems and Notifications of Missile Launches (JDEC MOA), Washington, DC: U.S. Department of State, June 4, 2000, <http://www.state.gov/t/isn/4799.htm>.

- Establish the Joint Data Exchange Center (JDEC), a joint center for the exchange of data from early warning systems and notifications of missile launches, in Moscow. Each party to have equal rights in managing the activities of the center.
- JDEC shall provide for the implementation of
 - a) “an exchange of information on launches of ballistic missiles and space launch vehicles detected by the warning systems of the Parties;”
 - b) “efficient resolution of possible ambiguous situations related to information from the warning systems of the Parties;”
 - c) “creation of the conditions for the preparation and maintenance of a unified database for a multilateral regime for the exchange of notifications of launches of ballistic missiles and space launch vehicles.”
- Information exchange of
 - a) “all launches of ICBMs and SLBMs of the United States of America and the Russian Federation;”
 - b) “launches of ballistic missiles, that are not ICBMs or SLBMs, of the United States of America and the Russian Federation;”
 - c) “launches of ballistic missiles of third states that could pose a direct threat to the Parties or that could create an ambiguous situation and lead to possible misinterpretation;”
 - d) “Each Party, at its discretion, may also provide information on other launches and objects, including de-orbiting spacecraft, and geophysical experiments and other work in near-earth space that are capable of disrupting the normal operation of equipment of the warning systems of the Parties.”
 - e) “Each Party shall provide processed launch information in a time frame that is near real time, if possible.”
- Implementation of information exchange:
 - a) “Phase I Each Party shall provide information on detected launches of ICBMs and SLBMs belonging to either Party, and detected launches, with rare exceptions, of SLVs belonging to either Party, including such launches of ICBMs, SLBMs and SLVs belonging to either Party that are launched from the territories of third states, and such launches of ICBMs, SLBMs and SLVs of third states that take place on the territory of either Party.”
 - b) “Phase II Each Party shall provide information on detected launches included in Phase I, as well as detected launches of other types of ballistic missiles belonging to either Party with a range in excess of 1500 kilometers or an apex altitude in excess of 500 kilometers.”
 - c) “Phase III Each Party shall provide information on detected launches in Phase II, as well as detected launches of ballistic missiles of third states with a range in excess of 500 kilometers, or an apex altitude in excess of 500 kilometers, if part of the flight trajectory of the ballistic missile as calculated by the launch azimuth would take place over, or the impact area of its payload is projected to be within, either Party’s territory. Each Party shall also provide information on detected launches of SLVs of third states if the projection of the initial launch azimuth would intersect the territory of either Party within the first half-orbit of launch. At its discretion, a Party may provide information on other detected launches of SLVs of third states, regardless of launch azimuth. Each Party shall provide information on launches of third states that it believes could create an ambiguous situation for the warning system of the other Party and lead to possible misinterpretation by the other Party.”

APPENDIX E: NUCLEAR WEAPONS STATES: MILITARY INCIDENTS

March 2014 – April 2015

Compiled by Jessica Sleight

Publicly known interactions involving nuclear weapons states' aircraft, ships, or other military units over the past year.

Russia and the West

Date: April 3, 2015

Involving: U.S.

Summary: A U.S. destroyer arrives in the Black Sea in support of NATO drills designed to strengthen security in the region during the Ukraine crisis. The U.S. has also deployed 65 tanks and thousands of troops to Estonia, Latvia and Lithuania.³⁶

Date: March 24, 2015

Involving: NATO and Russia

Summary: NATO fighter jets intercept two Russian Tu-22 nuclear-capable bombers and two SU-27 fighters flying with their transponders switched off near Sweden and the Baltic states.³⁷ That same day, U.S. Army troops crossed into Poland from Lithuania during a 1,100 mile trek through Eastern Europe meant to show NATO's commitment to the region.³⁸

Date: Mid-March 2015

Involving: Russia

Summary: Russia completes a successful test launch of the

36 Lance M. Bacon, "Joint exercises put U.S. Navy at Russia's doorstep," Navy Times, April 4, 2015, <http://www.navytimes.com/story/military/2015/04/04/russia-navy-exercises-aggression/25265193/>.

37 Agence France-Presse, "Russian Bombers Spark NATO Scramble," Defense News, March 24, 2015, <http://www.defensenews.com/story/defense/international/europe/2015/03/24/russian-bombers-spark-na-to-scramble-protect-baltic/70405698/>.

38 Nolan Peterson, "NATO Intercepts Russian Warplanes as US Convoy Enters Poland," The Daily Signal, March 26, 2015, <http://dailysignal.com/2015/03/26/nato-intercepts-russian-warplanes-as-us-convoy-enters-poland/>.

RS-26, a solid-fueled ICBM that is scheduled for combat duty in 2015.³⁹

Date: March 19, 2015

Involving: Russia

Summary: Russian Navy Commander Adm. Viktor Chirkov reports that the number of patrols by Russian submarines, including nuclear submarines, from January 2014 to March 2015 rose by 50 percent.⁴⁰

Date: March 18, 2015

Involving: NATO and Russia

Summary: NATO jets intercept Russian military aircraft over the Baltic Sea.⁴¹

Date: March 16-20, 2015

Involving: Russia

Summary: Russia conducts military exercises seemingly simulating a full-scale confrontation with NATO including forward-deployed nuclear submarines, strategic bombers, and ballistic missiles. There was no advanced notification of the exercise, which included around 45,000 servicemen, over 40 surface vehicles, 15 submarines and 110 aircraft.⁴²

Date: March 11, 2015

Involving: U.S.

Summary: The U.S. asks Vietnam to stop allowing Russian nuclear-capable bombers refuel at a former U.S. base.⁴³

39 "Final test launch of Russia's new RS-26 Rubezh ballistic missile successful – designer," Tass, March 31, 2015, <http://tass.ru/en/russia/786100>.

40 "Russian Nuclear Submarines Step Up Patrols Over Past Year – Navy Commander," Sputnik International, March 19, 2015, <http://sputniknews.com/russia/20150319/1019714161.html>.

41 Matthew Chance, Barbara Starr and Richard Greene, "NATO intercepts Russian military aircraft," CNN, March 19, 2015, <http://www.cnn.com/2015/03/18/europe/nato-russia-aircraft-intercepted/>.

42 Stratfor "Russia Targets NATO With Military Exercises," Forbes, March 20, 2015, <http://www.forbes.com/sites/stratfor/2015/03/20/russia-targets-nato-with-military-exercises/>.

43 David Brunnstrom, "Exclusive: U.S. asks Vietnam to stop helping Russian bomber flights," Reuters, March 11, 2015, <http://www.reuters.com/article/2015/03/11/us-usa-vietnam-russia-exclusive-idUSKB-N0M71NA20150311>.

Date: February 15, 2015

Involving: NATO

Summary: Troops from 15 countries, including the U.S., begin military exercises in western Ukraine that officials say were planned before the current crisis. NATO also announces the formation of a “spearhead” force of several thousands troops that can be deployed in a matter of days to protect member countries.⁴⁴

Date: February 12, 2015

Involving: Russia

Summary: Large-scale exercises involving Russia’s nuclear missile force take place in 12 regions across the country. More than 30 regiments of the Strategic Missiles Force participate in drills to combat sabotage and chemical weapons attacks.⁴⁵

Date: February 6, 2015

Involving: NATO and Russia

Summary: NATO Typhoon fighter jets intercept Russian Ilyushin IL-38 plane over the Baltic Sea.⁴⁶

Date: February 5, 2015

Involving: NATO

Summary: Members of NATO agree to establish six new command and control posts in Eastern Europe.⁴⁷

Date: February 3, 2015

Involving: NATO and Russia

Summary: NATO Typhoon jets are sent by the Latvian mili-

tary to escort a Russian IL-76 military transport plane flying in neutral airspace.⁴⁸

Date: February 3, 2015

Involving: NATO and Russia

Summary: Italian Air Force Eurofighter jets deployed in Lithuania over the Baltic Sea intercept a Russian warplane after flying close to NATO airspace.⁴⁹

Date: February 2015

Involving: Russia

Summary: Russian naval nuclear units, including Borei-class submarines, engage in military exercises in international waters underneath the North Pole. A Russian officer reported the drills focused on “hazard and threat detection, but also on missile launching and navigation maneuvers, ice reconnaissance, submerging and emerging from ice, using torpedoes to undermine ice and many other issues.”⁵⁰

Date: January 28, 2015

Involving: U.K. and Russia

Summary: The Royal Air Forces’ Euro Typhoon fighter jets intercept two Russian Tupolev Tu-95s after the Russian bombers, which have the ability to carry nuclear weapons, are seen flying close to British airspace.⁵¹

Date: December 13, 2014

Involving: Russia

Summary: Two Russian Tu-95 bombers conduct a circum-

44 “U.S. and Nato troops begin Ukraine military exercise,” BBC, February 15, 2015, <http://www.bbc.com/news/world-europe-29204505>.

45 Dennis Lynch, “Russian Nuclear Missile Forces Conduct Large-Scale Exercises Across Country,” International Business Times, February 12, 2015, <http://www.ibtimes.com/russian-nuclear-missile-forces-conduct-large-scale-exercises-across-country-1814052>.

46 Kukil Bora, “NATO Typhoon Jets Scrambled To Intercept Russian Patrol Aircraft: Latvian Army,” International Business Times, <http://www.ibtimes.com/nato-typhoon-jets-scrambled-intercept-russian-patrol-aircraft-latvian-army-1808768>.

47 “Lavrov slams NATO buildup in Eastern Europe,” PressTV, February 7, 2015, <http://www.presstv.ir/Detail/2015/02/08/396652/Lavrov-slams-NATO-buildup-in-E-Europe>.

48 Kukil Bora, “NATO Typhoon Jets Scrambled To Intercept Russian Patrol Aircraft: Latvian Army,” International Business Times, <http://www.ibtimes.com/nato-typhoon-jets-scrambled-intercept-russian-patrol-aircraft-latvian-army-1808768>.

49 “Italian jets stop Russian warplane over Baltic,” The Local, February 3, 2015, <http://www.thelocal.it/20150203/italian-jets-intercept-russian-warplane-over-baltic>.

50 Damien Sharkov, “Russia Sends Nuclear Submarine Troops on Arctic Exercise,” Newsweek, February 6, 2015, <http://www.newsweek.com/russia-sends-nuclear-submarines-arctic-exercise-304931#.VNexDFIdYH0.twitter>.

51 Damien Sharkov, “Two Russian Bombers Intercepted by RAF off Bournemouth,” Newsweek, January 29, 2015 <http://www.newsweek.com/two-russian-bombers-intercepted-raf-bournemouth-302944>.

navigation of Guam. No U.S. jets are dispatched.⁵²

Date: December 12, 2014

Involving: Sweden and Russia

Summary: A commercial flight leaving Copenhagen was almost hit by a Russian military jet the Swedish military reports. Russia's defence ministry denies the report saying the Russian plane was a safe distance of more than 70 kilometers from the flight path of the jet.⁵³

Date: December 8, 2014

Involving: NATO and Russia

Summary: NATO releases a video showing alliance F-16s intercepting Russian military aircraft over the Baltic Sea. More than 30 types of Russian military aircraft were reported to be in the area.⁵⁴

Date: December 8, 2014

Involving: Canada and Russia

Summary: Two Canadian F-18s intercept two Russian Bear bombers that had entered into the Alaska air defense identification zone and the Canadian air defense identification zone. The bomber never entered sovereign U.S. or Canadian airspace.⁵⁵

Date: December 7, 2014

Involving: NATO and Russia

Summary: Two Russian military transport aircraft and one bomber training aircraft are intercepted by two Canadian CF-18 Hornets based in Lithuania.⁵⁶

52 Bill Gertz, "Russian Nuclear Bombers Again Buzz Guam," The Washington Free Beacon, December 19, 2014, <http://freebeacon.com/national-security/russian-nuclear-bombers-again-buzz-guam/>.

53 "Russia denies near miss with Copenhagen flight," The Local, December 14, 2014, <http://www.thelocal.dk/20141214/russia-denies-jet-near-miss-close-to-denmark>.

54 "Nato video shows Russian military jet being intercepted," BBC, December 11, 2014, <http://www.bbc.com/news/world-europe-30427069>.

55 Bill Gertz, "Russian Nuclear Bombers Again Buzz Guam," The Washington Free Beacon, December 19, 2014, <http://freebeacon.com/national-security/russian-nuclear-bombers-again-buzz-guam/>.

56 Hal Roberts, "Canadian CF-18s intercept three Russian aircraft over Lithuania," Toronto Sun, December 8, 2014, <http://www.torontosun>.

Date: December 6 and 7, 2014

Involving: NATO and Russia

Summary: U.S. and NATO intelligence closely monitor about a dozen Russian aircraft including bombers in the Baltic Sea.⁵⁷

Date: December 1, 2014

Involving: Norway and Russia

Summary: The Norwegian Armed Forces release video of a Russian MiG-31 cutting in front of two Norwegian F-16s sent to intercept the aircraft in international airspace by NATO. The date of the incident was not disclosed.⁵⁸

Date: November 28, 2014

Involving: Russia

Summary: Russia successfully test-launches the new submarine-launched Bulava intercontinental missile in the Barents Sea.⁵⁹

Date: November 25, 2014

Involving: U.K. and Russia

Summary: Russian warships are permitted to move through the English Channel under international law. The warships – a destroyer, a landing craft, a rescue tugboat and a tank ship – carry out exercises and are monitored by the U.K.'s HMS Tyne patrol boat, armed with a canon and machine guns. The Russian ships comply with all maritime reporting regulations.⁶⁰

[com/2014/12/08/canada-signs-deal-to-help-ukraine-strengthen-security-against-russia](http://www.freebeacon.com/2014/12/08/canada-signs-deal-to-help-ukraine-strengthen-security-against-russia).

57 Barbara Starr, "Russian military ramps up flights near Western airspace," CNN, December 8, 2014, <http://www.cnn.com/2014/12/08/politics/russian-flights-near-nato/>.

58 Kjetil Malkenes Hovland, "Norwegian F-16 in Near-Miss With Russian Fighter Jet," The Wall Street Journal, December 1, 2014, <http://online.wsj.com/articles/norwegian-f-16-in-near-miss-with-russian-fighter-jet-1417449268>.

59 Reuters, "Russian submarine test-launches Bulava intercontinental missile," Reuters, November 28, 2014, <http://www.reuters.com/article/2014/11/28/us-russia-missile-idUSKCN0JC1SZ20141128>.

60 Lizzie Dearden, "Russian warships tailed by Royal Navy as they move through the English Channel," The Independent, November 28,

Date: November 25, 2014

Involving: Russia

Summary: Tass reports that Russia's Borei-class submarine, the Alexander Nevsky, will launch the Bulava missile from the Barents Sea at the Kura test range later this month, around November 28-30. It will be the only missile on board. The Alexander Nevsky continues to undergo sea trials and will receive a full load of missiles in 2015.⁶¹

Date: November 21, 2014

Involving: NATO and Russia

Summary: NATO Sec. Gen. Jens Stoltenberg states that there have been more than 400 intercepts of Russian aircraft by NATO fighter jets this year – a 50% increase in Russian air activity over the past year.⁶²

Date: November 19, 2014

Involving: NATO and Russia

Summary: NATO CF-18 Hornet fighters intercept a Russian IL-20 military surveillance plane over international waters near Latvian seas.⁶³

Date: November 18, 2014

Involving: NATO and Russia

Summary: A Russian navy tanker ship is spotted 11.6 nautical miles from Latvian waters – the second sighting in the past three days.⁶⁴

2014, <http://www.independent.co.uk/news/uk/home-news/russian-warships-tailed-by-royal-navy-as-they-move-through-the-english-channel-9890681.html>.

61 "Bulava missile to be launched from Alexander Nevsky submarine in late November – source," Tass Russian News Agency, November 25, 2014, <http://en.itar-tass.com/russia/763514>.

62 Brad Lendon, "NATO jets scramble more than 400 times this year for Russian intercepts," CNN World, November 21, 2014, <http://www.cnn.com/2014/11/21/world/europe/nato-russia-intercepts/>.

63 Ott Ummelas and Milda Seputyte, "NATO Intercept Russian Planes Over Baltic For Third Day," Bloomberg News, November 19, 2014, <http://www.bloomberg.com/news/2014-11-19/nato-jets-track-russian-aircraft-over-baltic-latvia-says.html>.

64 Ott Ummelas and Milda Seputyte, "NATO Intercept Russian Planes Over Baltic For Third Day," Bloomberg News, November 19, 2014,

Date: November 17, 2014

Involving: NATO and Russia

Summary: NATO F-16 jets intercept a Russian Su-27 fighter plane over international waters near Latvian seas.⁶⁵

Date: November 15, 2014

Involving: NATO and Russia

Summary: Eurofighter Typhoons intercept two Russian Su-27 fighter planes over international waters near Latvian territory.⁶⁶

Date: November 12, 2014

Involving: NATO and Russia

Summary: Two Dutch F-16 fighter jets intercept a Russian Ilyushin transport aircraft flying near Lithuania and Estonian airspace. The Dutch Foreign Ministry release a statement saying the Russian aircraft was flying in international airspace when it approached the airspace of the two countries without filing a flight plan.⁶⁷

Date: November 12, 2014

Involving: Russia and U.S.

Summary: Russian Defense Minister Shoigu announces the country will send long-range bombers to patrol the western Atlantic and eastern Pacific in response to NATO's "anti-Russia inclinations." He does not say when the flights would start or how frequently they would be conducted. Shoigu also says conditions in Ukraine "dictate the necessity

<http://www.bloomberg.com/news/2014-11-19/nato-jets-track-russian-aircraft-over-baltic-latvia-says.html>.

65 Ott Ummelas, "NATO Jets Intercept Russian Fighter Plane Over Baltic Sea," Bloomberg News, November 17, 2014, <http://www.bloomberg.com/news/2014-11-17/nato-jets-scrambled-to-intercept-russian-plane-over-baltic-sea.html>.

66 Ott Ummelas, "NATO Jets Intercept Two Russian Fighter Planes Over Baltic Sea," Bloomberg News, November 15, 2014, <http://www.bloomberg.com/news/2014-11-15/nato-jets-intercept-two-russian-fighter-planes-over-baltic-sea.html>.

67 AFP, Reuters, "Russian plane intercepted by Dutch fighters over Baltic Sea," The Sydney Morning Herald, November 14, 2014, <http://www.smh.com.au/world/russian-plane-intercepted-by-dutch-fighters-over-baltic-sea-20141113-11mf7o.html>.

to maintain readiness of troops” along Russia’s border with Ukraine and that defense reinforcements would continue to be provided to Crimea.⁶⁸

Date: November 10, 2014

Involving: Russia

Summary: A Lowy Institute military fellow reports that the Russian guided missile cruiser Moskva is conducting unilateral live-fire drills in the South China Sea. The US Naval Institute described the appearance of the ship in Southeast Asia as “a rare show of surface presence in the region.”⁶⁹

Date: November 6, 2014

Involving: NATO, Ukraine and Russia

Summary: The Latvian Army’s announce NATO F-16 fighter jets intercepted a Russian IL-20 surveillance plane in the Baltic Region near Latvia’s territorial waters. A Ukrainian military spokesman told reporters the Russian Air Force command put some units of transport planes on high alert. A spokesman for Russia’s armed forces said he was not able to comment.⁷⁰

Ukraine also claimed that Russia continues to supply military vehicles and manpower to the rebels in Eastern Ukraine. According to a military spokesman, “32 tanks, 16 howitzers and 30 trucks with ammunition and manpower crossed the border from Russia” into the Luhansk region.⁷¹

68 Carol J. Williams, “Russia resuming Cold War-era bomber flights close to U.S. shores,” Los Angeles Times, November 12, 2014, <http://www.latimes.com/world/europe/la-fg-russia-bomber-flights-20141112-story.html>.

69 James Brown, “Putin flexes muscle ahead of G20,” Lowy Interpreter, November 10, 2014, <http://www.lowyinterpreter.org/post/2014/11/10/Putin-flexes-muscle-ahead-of-G20.aspx?COLLCC=1522515965&COLLCC=1254146416&>.

70 Ott Ummelas and Aaron Eglitis, “NATO F-16 Jets Intercept Russian Spy Plane, Latvia Says,” Bloomberg News, November 6, 2014, <http://www.bloomberg.com/news/2014-11-06/nato-f-16-jets-intercept-russian-spy-plane-latvia-says.html>.

71 Kateryna Choursina and Daryna Krasnolutska, “Ukraine Says Up to 200 Rebels Killed in Donetsk Fighting,” Bloomberg Businessweek, November 7, 2014, <http://www.businessweek.com/news/2014-11-07/ukraine-lurches-back-toward-open-war-on-east-fighting>.

Date: November 4, 2014

Involving: Portugal and Russia

Summary: A Portuguese news site reports that a Russian hydrographic ship was detected in Portugal’s exclusive economic zone and escorted by a Portuguese navy ship.⁷²

Date: October 29 - November 1, 2014

Involving: Russia

Summary: Russia tests each leg of their nuclear triad in a 72-hour period near the Barents Region, north of Scandinavia and Russia:

- Oct. 29: Russian SSBN Yury Dolgoruky complete a test launch of the Bulava missile while submerged in the Barents Sea. It is the first operational test launch of the Bulava and the first time a Borei-class sub was equipped with a full set of missiles on board when the test launch was completed.⁷³
- Oct. 31: Norwegian F-16s intercept 4 Russian Tu-95 strategic bombers and 4 II-78 tankers; two bombers fly on toward U.K. airspace and are intercepted and escorted out of UK-monitored airspace by RAF Typhoons.⁷⁴
- Nov. 1: Russia successfully tests the Topol-M ICBM.⁷⁵

Date: October 30, 2014

Involving: NATO and Russia

Summary: NATO F-16 jets intercept a Russian Su-27 fighter, and Eurofighter aircraft shadow an IL-76 military trans-

72 Ott Ummelas and Aaron Eglitis, “NATO F-16 Jets Intercept Russian Spy Plane, Latvia Says,” Bloomberg News, November 6, 2014, <http://www.bloomberg.com/news/2014-11-06/nato-f-16-jets-intercept-russian-spy-plane-latvia-says.html>.

73 Thomas Nilsen, “Russia plays nuclear war-games in Barents Region,” Barents Observer, November 1, 2014, <http://barentsobserver.com/en/security/2014/11/russia-plays-nuclear-war-games-barents-region-01-11>.

74 Lizzie Dearden, “RAF Typhoons scrambled to intercept Russian bomber ‘approaching the UK,’” The Independent, November 1, 2014, <http://www.independent.co.uk/news/uk/home-news/raf-typhoons-scrambled-to-intercept-russian-bomber-approaching-the-uk-9833231.html>.

75 Nilsen, “Russia plays nuclear war-games in Barents Region,” op.cit.

port plane. “NATO warplanes (monitor) four groups of Russian military aircraft conducting ‘significant’ maneuvers in European airspace over the Baltic, North and Black seas.”⁷⁶

Date: October 28-29, 2014

Involving: NATO and Russia

Summary: NATO officials report that they have intercepted at least 19 Russian aircraft flying close to European airspace in the past two days. Fighter jets from the U.K., Sweden, Norway, Portugal, Britain, Turkey, Germany, Denmark, and Finland respond to Russian aircraft. There were no invasive actions into national airspace, but Lt. Col. Jay Janzen, spokesman for NATO’s military command, said there has been “an unusual level of activity.”⁷⁷

- Oct. 28: German Typhoon fighter jets from Baltic air patrols intercept 2 MiG-31s, 2 Su-34s, 1 Su-27 and 2 Su-24 jet in the Baltic Sea.
- Oct. 29: Norwegian F-16s intercept 4 Tu-95 strategic bombers and 4 II-78 tanker aircraft over the North Sea; six of the Russian aircraft turn back toward Russia while two bombers continued south-west. U.K. Typhoon fighters are scrambled to intercept as the two bombers fly on to the Portuguese coast where Portuguese F-16s intercept them. After the Russian bombers turn back toward the U.K., NATO aircraft in the U.K. and Norway are on stand by tracking progress of the bombers.
- Oct. 29: Portuguese F-16s assigned to the NATO air-policing mission over the Baltic members intercept two MiG-31s, two Su-34s, one Su-27 and two Su-24s over the Baltic Sea.
- Oct. 29: Turkish fighters intercept 2 Tu-95 Bear H-bombers and 2 Su-27 fighters over the Baltic Sea.

76 Ott Ummelas, “NATO Baltic Jets Intercept Russian Airplanes for Third Day” Bloomberg News, October 30, 2014, <http://www.bloomberg.com/news/2014-10-30/nato-baltic-jets-intercept-russian-military-planes-for-third-day.html?cmpid=yahoo>.

77 “NATO tracks large-scale Russian air activity in Europe,” North Atlantic Treaty Organization, October 30, 2014, http://www.nato.int/cps/en/natohq/news_114274.htm.

Date: October 21, 2014

Involving: NATO and Russia

Summary: A Russian maritime spy plane (an Ilyushin 20 “Coot”) flies into Estonian territory. Fighters are scrambled from Lithuania, where NATO’s Baltic air policing force is stationed, and from Denmark and Sweden as the aircraft circle the Baltic Sea. An Estonian official reports the Russian spy plane flew more than 500m into Estonian airspace for about a minute close to the large, inhabited islands of Hiiu-maa and Saaremaa off the Baltic state’s west coast. According to a NATO military officer, the spy plane took off from Kaliningrad “At 12:53pm CET [...] from the northeast.” The spy plane is intercepted and escorted out of Estonian airspace by Portuguese F-16 fighters, based in Lithuania as part of NATO’s Baltic air policing mission.⁷⁸

Date: October 18, 2014

Involving: Sweden and Russia

Summary: More than 100 reports of public sightings of near-coast activity by an “unknown craft” trigger the largest sub hunt by the Swedish Navy since the end of the Cold War. Sweden’s operations commander clarified that they have not signaled out Russia, saying they are searching for a “foreign vessel.” Sweden seemed to pull back on its search on October 24. Russia’s reaction: all “underwater vessels are accounted for” and Russia has never violated Swedish territorial waters. The Swedish Navy also monitors – in coordination with Denmark and Finland – the movement of the NS Concord, a Russian-owned oil tanker that has been “zig-zagging” close to the Swedish coast despite having a listed port destination in Denmark. The last observed movements were reportedly consistent with “normal movements of a crude oil tanker.”⁷⁹

Date: September 19, 2014

Involving: Lithuania and Russia

Summary: Lithuanian Ministry of Foreign Affairs send a

78 “NATO, Swedish fighters scrambled to intercept Russian plane,” Reuters, October 22, 2014, <http://www.reuters.com/article/2014/10/22/us-nato-russia-idUSKCN0I-B2AU20141022>.

79 Gerard O’Dwyer, “Sub Search Highlights Growing Unease With Russia,” Defense News, October 25, 2014, <http://www.defensenews.com/article/20141025/DEFREG01/310250025>.

note to the Russian embassy protesting the detainment of a Lithuanian fishing vessel in international waters. Russian officers accused the vessel of illegal crab fishing in Russia's exclusive economic zone.⁸⁰

Date: September 18, 2014

Involving: Canada and Russia

Summary: A patrol of Russian bombers flies within 40 nautical miles of Canada's northern landmass the day after Ukraine's President received a hero's welcome in Ottawa for his struggle to defend his country from Moscow's aggression. Canada scrambles CF-18s to intercept the two Russian long-range bombers at about 4:30 a.m. ET. The Canadian planes encounter Russia's planes in the Beaufort Sea.⁸¹

Date: September 17, 2014

Involving: U.S. and Russia

Summary: American F-22 jets are dispatched to intercept six Russian military aircraft including Mig-31 fighters flying within 55 nautical miles of the Alaskan coastline. Officials in Washington believe the two incidents – Russian aircraft coming within 74 kilometers of Canada's coastline (above) and less than 102 kilometers of Alaska – are linked to Mr. Poroshenko's trips to Canada and the U.S.⁸²

Date: September 11, 2014

Involving: Canada and Russia

Summary: Canadian CF-18 fighter jets armed with Sidewinder missiles intercepts a Russian An-26 flying over the

80 "Lithuania and Russia exchange diplomatic notes over detained fishing vessel," Delfi, September 23, 2014, <http://en.delfi.lt/lithuania/foreign-affairs/lithuania-and-russia-exchange-diplomatic-notes-over-detained-fishing-vessel.d?id=65920560#ixzz3EJpBt0sS>.

81 Steven Chase, "Russian military jets flew within 100 kilometres of Canadian mainland," The Globe and Mail, September 19, 2014, <http://www.theglobeandmail.com/news/politics/russian-military-jets-flew-within-100-kilometres-of-canadian-mainland-source-says/article20706528/>

82 Steven Chase, "Russian military jets flew within 100 kilometres of Canadian mainland," The Globe and Mail, September 19, 2014, <http://www.theglobeandmail.com/news/politics/russian-military-jets-flew-within-100-kilometres-of-canadian-mainland-source-says/article20706528/>.

Baltic Sea.⁸³

Date: September 2014

Involving: Canada and Russia

Summary: A Russian surveillance aircraft and two Russian fighter jets circle Canadian warship HMCS Toronto in the Black Sea.⁸⁴

Date: Early September 2014

Involving: Russia and U.S.

Summary: Two Russian Tu-95 Bear bombers practice cruise missile attacks on the United States.⁸⁵

Date: August 28, 2014

Involving: Finland and Russia

Summary: A Russia AN-72 transport plane crossed the Finnish border after two similar incidents earlier in the week.⁸⁶

Date: August 28, 2014

Involving: NATO and Russia

Summary: NATO MiG-29 jets intercept a Russian advance warning aircraft and two Su-27 fighter jets over the Baltic Sea near Latvia.⁸⁷

83 Matthew Fisher, "Matthew Fisher: Canadian fighter jets intercept Russian military aircraft in Baltics," National Post, September 29, 2014, <http://news.nationalpost.com/2014/09/29/matthew-fisher-canadian-fighter-jets-intercept-russian-military-aircraft-in-baltics/>.

84 "Aboard HMCS Toronto for 'Operation Reassurance' on the Black Sea," CTV News, September 21, 2014, <http://www.ctvnews.ca/world/aboard-hmcs-toronto-for-operation-reassurance-on-the-black-sea-1.2017821#ixzz3E2YOdNIQ>.

85 Bill Gertz, "Russian Strategic Bombers Near Canada Practice Cruise Missile Strikes on US," The Washington Free Beacon, September 8, 2014, <http://freebeacon.com/national-security/russian-strategic-bombers-near-canada-practice-cruise-missile-strikes-on-us/>.

86 Kati Pohjanpalo and Kasper Viita, "Finland's Fighter Jets on Alert as Russia Violates Airspace," Bloomberg Business, August 29, 2014, <http://www.bloomberg.com/news/articles/2014-08-28/finland-puts-fighter-planes-on-alert-as-russia-violates-airspace>.

87 "NATO air patrol intercepts more Russian planes," LSM.LV, August 28, 2014, <http://www.lsm.lv/en/article/politics/bap-intercepts-russias-military-aircraft-over-baltic-skies.a96219/>.

Date: August 7, 2014

Involving: U.S. and Russia

Summary: Russian news agencies report that the Russia Northern Fleet's anti-submarine force detected a foreign submarine in the country's boundary waters. Russia sent an anti-submarine attack group and an Il-38 submarine aircraft to the area to track the sub presumed to be a U.S. Navy Virginia-class vessel.⁸⁸

Date: Early August 2014

Involving: U.S. and Russia

Summary: Russian Tu-95 Bear bombers conduct 16 incursions into northwestern U.S. air defense identification zones within 10 days. U.S. fighter jets are sent to intercept on several occasions.⁸⁹

Date: August 2, 2014 and early September 2014

Involving: Finland and Russia

Summary: Finnish Environmental Institute reports Russian military ships intercepted one of the institute's research vessels in international waters twice recently. On August 2, a Russian warship ordered the Aranda to change course through radio contact. A month later, a Russian helicopter and a military vessel approached it. The institute said the Aranda did not change its course or speed in either case.⁹⁰

Date: August 1, 2014

Involving: NATO and Russia

Summary: Polish Mig-29 fighter jets intercept Russian fighter jets flying over neutral waters over the Baltic Sea near Estonia.⁹¹

88 "Russia detects, 'expels' presumed US submarine – Russian news agencies," Reuters, August 9, 2014, <http://in.reuters.com/article/2014/08/09/ukraine-crisis-russia-submarine-idINL6N0QF0J420140809>.

89 Bill Gertz, "Russian Strategic Bombers Conduct More Than 16 Incursions of U.S. Air Defense Zones," The Washington Free Beacon, August 7, 2014, <http://freebeacon.com/national-security/russian-strategic-bombers-conduct-more-than-16-incursions-of-u-s-air-defense-zones/>.

90 Finland: "Russia warships intercept research vessel," AP: The Big Story, October 11, 2014 <http://bigstory.ap.org/article/0ff542d0d94e43bbadb9f009b32cfc9/finland-russia-warships-intercept-research-vessel>.

91 "NATO fighter jets escort Russian aircraft from Lithuania," DELFI,

Date: July 18, 2014

Involving: U.S. and Russia

Summary: Russian military tracks the A U.S. Air Force RC-135 Rivet Joint (spy plane) – flying in international airspace conducting an electronic eavesdropping mission on the Russian military – with land-based radar. "At least one fighter jet" is sent by the Russians to intercept the spy aircraft causing the spy plane to quickly divert into Swedish airspace without permission from the Swedish military.⁹²

Date: July 16, 2014

Involving: Sweden and Russia

Summary: A Russian Su-27 Flanker intercepts a Swedish electronic intelligence aircraft flying as close as 10.7 meters to the spy plane. Swedish officials say that while the spy planes are almost always intercepted by Russian armed fighters, the behavior of the Russian jets have become increasingly aggressive.⁹³

Date: June 21 - August 8, 2014

Involving: Latvia and Russia

Summary: Latvian reports of Russian naval activities close to Latvian borders:

- Aug. 8: Russian corvette *Stoiky* and tugboat *Victor Konetsky* spotted 12 nautical miles from Latvia's maritime borders.
- Aug. 3: Russian corvette *Stereguschiy* spotted 5.7 nautical miles from Latvia's maritime borders and an unnamed Kilo-class submarine spotted 1.7 nautical miles from Latvia's maritime borders.
- July 22: Russian naval ship *Syzran* spotted about 6.5 nautical miles from Latvia's maritime bor-

August 1, 2014, <http://en.delfi.lt/lithuania/defence/nato-fighter-jets-escort-russian-aircraft-from-lithuania.d?id=65454778#ixzz3E3WJztwZ>.

92 Barbara Starr, "U.S. official: Spy plane flees Russian jet, radar; ends up over Sweden," CNN U.S., August 4, 2014, <http://www.cnn.com/2014/08/02/us/us-spy-plane/>.

93 David Cenciotti, "Russian Su-27 Flanker performs dangerous intercept putting itself within 10 meters of Swedish plane," Free Republic, October 2, 2014, <http://www.freerepublic.com/focus/news/3210582/posts>.

ders.

- June 21 and 24: Russian *Soobrazitelny* and *Boikiy* spotted just off Latvia's maritime borders.⁹⁴

Date: June 20, 2014

Involving: Russia

Summary: Russia test launch six AS-15 missiles from a Bear bomber during military exercises.⁹⁵

Date: June 18, 2014

Involving: U.K./NATO and Russia

Summary: U.K. Royal Air Force Typhoons are launched after detection of four separate groups of Russian aircraft – including a Tu-22 bomber, 4 Su-27s fighters, a Beriev A50 early warning aircraft and an Antonov An-26 transport aircraft – in international airspace near the Baltic States. The Russian aircraft are monitored and “escorted on their way.”⁹⁶

Date: June 12, 2014

Involving: NATO and Russia

Summary: NATO patrol aircraft spots four Il-76 transport aircraft, one Tu-134, seven Su-34 fighter bombers, and on Su-24 fighter near Latvian borders – one of the largest groups of Russian military aircraft to be spotted near Latvia's borders in recent years.⁹⁷

Date: June 9, 2014

Involving: Russia and U.S.

Summary: Two Russian Bear bombers fly within 50 miles of the California coast, the closest strategic bomber flights to a

U.S. coast since the Cold War.⁹⁸

Date: June 2014

Involving: Denmark and Russia

Summary: A Danish Defence Intelligence Service assessment reveals that Russia carried out a simulated attack on a Danish island in June when politicians and journalists were gathered for an annual political meeting.⁹⁹

Date: May 18, 2014

Involving: Russia and U.K.

Summary: Royal Air Force Typhoon fighters are diverted from a training to intercept a Russian naval helicopter close to Latvian airspace.¹⁰⁰

Date: April 23, 2014

Involving: Russia and U.S.

Summary: A U.S. Air Force RC-135U aircraft flying on a routine mission over the Sea of Okhotsk near Japan and is intercepted by a Russian Su-27 Flanker aircraft. The Russian jet flew within 100 feet of the nose of a U.S. Air Force reconnaissance plane. The Russian aircraft turned and “showed its belly” to the U.S. crew so they could see it was armed with missiles, a U.S. military official said. On April 28, a Russian Defense Ministry statement said Russian Defense Minister Sergey Shoygu and U.S. Defense Secretary Chuck Hagel had discussed both incidents during a phone call that day. Shoygu “offered to instruct the commanders in chief of the armed forces of both countries to discuss possible additional measures to address the interests of both countries to prevent future misperceptions of actions.”¹⁰¹

94 “More Russia warships spotted near Baltic waters,” *The Baltic Times*, August 8, 2014, <http://www.baltictimes.com/news/articles/35333/#.VFKLSifd7GM>.

95 Bill Gertz, “Russian Strategic Bombers Near Canada Practice Cruise Missile Strikes on US,” *The Washington Free Beacon*, September 8, 2014, <http://freebeacon.com/national-security/russian-strategic-bombers-near-canada-practice-cruise-missile-strikes-on-us/>.

96 “Royal Air Force Typhoons Intercept Russian Aircraft,” *Royal Air Force*, June 18, 2014, <http://www.raf.mod.uk/news/archive/baltic-air-policing-18062014>.

97 “15 Russian military aircraft are spotted near Latvia's border,” *Baltic News Network*, June 12, 2014, <http://bnn-news.com/15-russian-military-aircraft-spotted-latvias-border-115087>.

98 Bill Gertz, “Russian Strategic Bombers Near Canada Practice Cruise Missile Strikes on US,” *The Washington Free Beacon*, September 8, 2014, <http://freebeacon.com/national-security/russian-strategic-bombers-near-canada-practice-cruise-missile-strikes-on-us/>.

99 “Russia simulated an attack on Denmark,” *The Local*, October 31, 2014, <http://www.thelocal.dk/20141031/russia-simulated-a-military-attack-on-denmark>.

100 Ben Farmer, “RAF Typhoons sent to intercept Russian helicopter over Baltic,” *The Telegraph*, May 18, 2014, <http://www.telegraph.co.uk/news/10839095/RAF-Typhoons-sent-to-intercept-Russian-helicopter-over-Baltic.html>.

101 Jim Sciutto and Barbara Starr, “U.S. official: ‘Dangerous’ Russian jet fly-by was ‘straight out of a movie,’” *CNN World*, June 4, 2014, <http://>

Date: April 23, 2014

Involving: Denmark and Russia

Summary: Two Russian military aircraft enter Dutch airspace prompting two Dutch F-16s to be dispatched to escort the Russian planes out of national airspace. A Dutch official called this a fairly routine action with these types of incidents happening about four or five times each year.¹⁰²

Date: April 23, 2014

Involving: Russia and U.K.

Summary: Royal Air Force Typhoon fighter jets are sent to investigate two Russian military aircraft approaching U.K. airspace. The aircraft turn away shortly after the RAF fighter jets are dispatched.¹⁰³

Date: April 12, 2014

Involving: Russia and U.S.

Summary: An unarmed Russian Su-24 attack aircraft makes 12 passes of the USS Cook, a U.S. warship patrolling in the western Black Sea.¹⁰⁴

Date: April 10, 2014

Involving: Lithuania and Russia

Summary: Lithuanian Navy's Lindau-class mine hunter and an air force Mil MI-8 helicopter intercept two Russian Navy vessels that had entered Lithuania's Baltic maritime economic zone during live missile firing exercises.¹⁰⁵

www.cnn.com/2014/06/03/world/russia-us-jet-fly-by/index.html?iref=allsearch.

102 Lindsay Isaac and Greg Botelho, "Dutch fighter jets intercept 2 Russian bombers in their airspace," CNN World, April 23, 2014, <http://www.cnn.com/2014/04/23/world/europe/russian-bombers-intercepted/>.

103 "RAF fighter jets scrambled to investigate Russian planes," BBC, April 24, 2014, <http://www.bbc.com/news/uk-27130125>.

104 Jim Garamone, "Russian Aircraft Flies Near U.S. Navy Ship in Black Sea," U.S. Department of Defense, April 14, 2014, <http://www.defense.gov/news/newsarticle.aspx?id=122052>.

105 Bruce Jones, "Russian warships in Baltic incident with Lithuania," The Local, April 14, 2014, <http://www.janes.com/article/36715/russian-warships-in-baltic-incident-with-lithuania>.

Date: March 14, 2014

Involving: Russia and U.S.

Summary: Russia reports interception of a U.S. surveillance drone flying about 4,000 meters above Crimea.¹⁰⁶

East Asia and the United States

Date: April 7, 2015

Involving: North Korea

Summary: North Korea fires two short-range missiles off the west coast two days before the arrival of U.S. defense secretary in Japan.¹⁰⁷

Date: April 3, 2015

Involving: North Korea

Summary: North Korea fires four short-range missiles off its west coast.¹⁰⁸

Date: March 13, 2015

Involving: North Korea

Summary: North Korea fires seven missiles off its east coast.¹⁰⁹

Date: Early March 2015

Involving: North Korea, South Korea and U.S.

Summary: North Korea fires two short-range missiles off its east coast in a show of displeasure with U.S.-South Korea annual joint military drills.¹¹⁰

106 Agence France Presse, "Russia Says It Intercepted A US Drone Over Crimea," Business Insider, March 14, 2014, <http://www.businessinsider.com/russia-intercepted-us-drone-over-crimea-2014-3#ixzz3HjY82DDD>.

107 David Brunnstrom, "North Korea fires missiles into sea as U.S. defence chief visits region," Reuters, April 9, 2015, <http://www.reuters.com/article/2015/04/09/us-northkorea-missiles-idUSKBN0N008D20150409>.

108 David Brunnstrom, "North Korea fires missiles into sea as U.S. defence chief visits region," Reuters, April 9, 2015, <http://www.reuters.com/article/2015/04/09/us-northkorea-missiles-idUSKBN0N008D20150409>.

109 Agence France-Presse, "North Korea fires four short-range missiles into sea," The Times of India, April 3, 2015, <http://timesofindia.india-times.com/world/rest-of-world/North-Korea-fires-four-short-range-missiles-into-sea/articleshow/46795897.cms>.

110 Agence France-Presse, "North Korea fires four short-range missiles into sea," The Times of India, April 3, 2015, <http://timesofindia.india>

Date: February 13, 2015

Involving: South Korea and U.S.

Summary: The U.S. and South Korea finish annual joint exercises designed to shape deterrence strategies as a counter to military threats from North Korea.¹¹¹

Date: February 8, 2015

Involving: North Korea

Summary: North Korea fires five short-range missiles from its eastern coast into the sea, approximately 125 miles to the northeast.¹¹²

Date: February 7, 2015

Involving: North Korea

Summary: North Korean officials report a successful test of a new anti-ship cruise missile, an “ultra-precision” rocket that a South Korean expert said looked similar to the Russian KH-35 missile.¹¹³

Date: January 23, 2015

Involving: North Korea

Summary: South Korean officials report that North Korea has conducted a test of a missile ejection launcher used to help fire missiles from submarines.¹¹⁴

Date: December 20, 2014

Involving: China

Summary: China successfully test its ICBM DF-41 involv-

ing multiple, independently targetable reentry vehicles.¹¹⁵

Date: December 6, 2014

Involving: China and Japan

Summary: Japanese Self-Defense Force planes scramble to intercept a Chinese Y9 intelligence-gathering plane, two Y9 early warning planes and two H6 bombers flying over the East China Sea returning from naval and air combat exercises in the Western Pacific. A Japanese defense official said the Chinese aircraft did not violate Japanese airspace.¹¹⁶

Date: November 10-12, 2014

Involving: China and U.S.

Summary: China and the U.S. agree to military-to-military CBMs: notification of major military activities and rules of behavior for the safety of air and maritime encounters.¹¹⁷

Date: November 10, 2014

Involving: North Korea and South Korea

Summary: South Korea fired warning shots as about 10 North Korean soldiers approached the Military Demarcation Line around 9:40 a.m. The North Koreans did not return fire and retreated.¹¹⁸

Date: November 7, 2014

Involving: China and Japan

Summary: China and Japan, in a formal document, recognize their differing territorial positions on the East China

times.com/world/rest-of-world/North-Korea-fires-four-short-range-missiles-into-sea/articleshow/46795897.cms.

111 Oh Seok-min, “S. Korea, U.S. conduct deterrence drill against N. Korea,” Yonhap News Agency, February 13, 2015, <http://english.yonhapnews.co.kr/national/2015/02/13/0301000000AEN20150213006100315.html>.

112 Choe Sang-hun, “North Korea Tests Five Missiles,” The New York Times, February 8, 2015, http://www.nytimes.com/2015/02/09/world/asia/north-korea-launches-5-short-range-missiles.html?_r=0.

113 “North Korea Says It Test-Fires Anti-Ship Cruise Missile,” ABC News, February 7, 2015, <http://abcnews.go.com/International/wireStory/north-korea-test-fires-anti-ship-cruise-missile-28794913>.

114 “N. Korea conducts submarine missile ejection test: sources,” Yonhap News Agency, February 20, 2015, <http://english.yonhapnews.co.kr/national/2015/02/20/47/0301000000AEN20150220001900315Fhtml>.

115 Minnie Chan, “Chinese military conducts full test of long-range missile ‘which can hit any part of US’,” South China Morning Post, December 20, 2014, <http://www.scmp.com/news/china/article/1666525/pla-conducts-full-test-long-range-df-41-missile-report-says>.

116 Kalyan Kumar, “Chinese Military Bomber Aircraft Fly Menacingly Near Japan Islands; Analysts Say Guam Base Can Be Under Threat,” International Business Times, December 10, 2014, <http://au.ibtimes.com/chinese-military-bomber-aircraft-fly-menacingly-near-japan-islands-analysts-say-guam-base-can-be>.

117 “Fact Sheet: President Obama’s visit to China,” White House Press Release, November 11, 2014, <http://www.whitehouse.gov/the-press-office/2014/11/11/fact-sheet-president-obama-s-visit-china>.

118 K.J. Kwon and Jethro Mullen, “South Korea fires warning shots at North Korean patrol near border,” CNN World, November 10, 2014, <http://www.cnn.com/2014/11/10/world/asia/koreas-tensions/>.

Sea and the need to seek to overcome the problems in the relationship. The leaders of the two countries meet in Beijing at APEC three days later.¹¹⁹

Date: November 3, 2014

Involving: North Korea

Summary: North Korea launches a domestically built submarine designed to fire ballistic missiles. The sub is thought to be based on the Golf II-class Soviet submarine that could carry sub-launched ballistic missiles more than 880 miles. Meanwhile, U.S. and South Korean intelligence have warned that the North is close to perfecting miniaturization of nuclear warheads. A military analyst stated that while we should not ignore the threat a North Korean submarine capability poses, we should also not exaggerate it.¹²⁰

Date: Late October 2014

Involving: North Korea

Summary: A news report says North Korea tested an ejection launcher that helps fire missiles from submarines. U.S. intelligence agencies observed the test and on September 38 reported that commercial satellite imagery showed a new test stand to research and develop submarine-based ballistic missiles.¹²¹

Date: October 30, 2014

Involving: China and Japan

Summary: Around 10:00 a.m., three Chinese coast guard ships enter waters around the disputed Senkaku/Diaoyu islands in the East China Sea. The ships did not respond immediately when asked to leave the area by a Japanese Coast

Guard patrol ship.¹²²

Date: October 27, 2014

Involving: China and Japan

Summary: A Chinese fishing boat captain is arrested by the Japan Coast Guard on suspicion of poaching coral in Japan's exclusive economic zone. It is the fourth arrest in the month of October.¹²³

Date: October 18, 2014

Involving: China and Japan

Summary: China sent three coast guard vessels to patrol disputed waters in the East China Sea a day after the Japanese prime minister sent an offering to the Yasukuni Shrine, a controversial shrine to Japan's war dead.¹²⁴

Date: October 10, 2014

Involving: China and South Korea

Summary: The South Korean Coast Guard fires shots while trying to impound a Chinese vessel they said was illegally fishing in South Korean waters. The captain of the vessel was killed.¹²⁵

Date: October 10, 2014

Involving: North Korea and South Korea

Summary: North Korean military fires anti-aircraft machine guns at propaganda balloons released in the border city of Paju, South Korea (balloons containing leaflets, U.S. dollars, DVDs and books showcasing South Korean life). Some shells fall in South Korea, prompting the South Kore-

119 Jane Perlez, "Frosty Meeting at APEC Could Be Start of Thaw Between China and Japan," The New York Times, November 10, 2014 <http://www.nytimes.com/2014/11/11/world/asia/leaders-of-china-and-japan-hold-long-awaited-meeting.html>.

120 Julian Ryall, "North Korea launches Soviet-era style ballistic missile submarine," The Telegraph, November 3, 2014, <http://www.telegraph.co.uk/news/worldnews/asia/northkorea/11204667/North-Korea-launches-Soviet-era-style-ballistic-missile-submarine.html>.

121 "N. Korea conducts ejection launcher test for submarine missile: report," Yonhap News Agency, November 21, 2014, <http://english.yonhapnews.co.kr/full/2014/11/22/39/1200000000AEN20141122000300315F.html>.

122 "3 Chinese ships enter waters near Senkakus," The Japan News, October 30, 2014, <http://the-japan-news.com/news/article/0001681427>.

123 Agence France-Presse, "Japan arrests Chinese fishing boat skipper over coral-poaching," The Japan Times, October 27, 2014, <http://www.japantimes.co.jp/news/2014/10/27/national/japan-arrests-chinese-fishing-boat-skipper-over-coral-poaching/#.VFLfl4fd7dc>.

124 "Chinese coastguard vessels patrol disputed waters," Reuters, October 18, 2014 <http://www.reuters.com/article/2014/10/19/us-china-japan-idUSKCN0I801720141019>.

125 Choe Sang-Hun, "Fisherman From China Dies in Clash Off S. Korea," The New York Times, October 10, 2014, <http://www.nytimes.com/2014/10/11/world/asia/chinese-fishing-captain-killed-in-clash-with-south-korean-coast-guard.html>.

an military to give a pre-warning before firing 40 bullets in the air toward North Korea.¹²⁶

Date: September 26, 2014

Involving: China

Summary: China successfully tests the Dongfeng missile, which can carry a nuclear warhead 10,000 kilometers, putting all of Europe and parts of the U.S. within range.¹²⁷

Date: August 25, 2014

Involving: China and Taiwan

Summary: Two Chinese military surveillance aircraft enter Taiwan's airspace twice. Taiwanese fighter jets are sent to tail the two aircraft. Chinese defense officials state the military carried out "routine flight activities in relevant airspace with no unusual occurrences."¹²⁸

Date: August 19, 2014

Involving: China and U.S.

Summary: A Chinese J-11 fighter jet flashes past a Navy Poseidon P-8 patrol aircraft, performing a "barrel roll" at close range and bringing its wingtip within 20 feet of the U.S. plane. The incident occurs in international airspace about 135 miles east of China's Hainan Island. At the time, Pentagon officials protest publicly and release photos of the near miss, which they cite as evidence of rash and irresponsible behavior on the part of the Chinese pilot. They say the same Chinese military unit had conducted three other risky intercepts of U.S. aircraft in March, April and May this year.¹²⁹

126 Joohee Cho, "Koreas Trade Gunfire as Kim Jong-un Mystery Deepens," ABC News, October 10, 2014, <http://abcnews.go.com/International/koreas-trade-gunfire-kim-jong-mystery-deepens/story?id=26097426>.

127 Mark Piggott, "China Launches Test Missile Capable of Carrying Nuclear Warheads to Europe and US," International Business Times, October 5, 2014, <http://www.ibtimes.co.uk/china-launches-test-missile-capable-carrying-nuclear-warheads-europe-us-1468574>.

128 Adela Lin, "Taiwan Fighters Chase China Jets a Week After U.S. Incident," Bloomberg News, August 27, 2014, <http://www.bloomberg.com/news/2014-08-26/taiwan-says-chinese-military-aircraft-entered-island-s-airspace.html>.

129 Adela Lin, "Taiwan Fighters Chase China Jets a Week After U.S. Incident," Bloomberg News, August 27, 2014, <http://www.bloomberg.com/news/2014-08-26/taiwan-says-chinese-military-aircraft-entered-island-s-airspace.html>.

Date: August 6, 2014

Involving: China and Japan

Summary: China's Ministry of Defense claims Japanese F-15 fighter jets shadowed Chinese patrolling aircraft twice over the East China Sea. Japan's defense ministry said it had no information on the incident.¹³⁰

Date: June 11, 2014

Involving: China and Japan

Summary: Chinese Su-27 fighter jets fly "abnormally close" to a Japanese OP-3C surveillance plane and a YS-11EB electronic intelligence aircraft over the East China Sea. Chinese officials claim two Japanese F-15 planes followed a Chinese Tu-54 aircraft coming as close as 30 meters, prompting China to send the Su-27 jets. Japanese officials deny this.¹³¹

Date: May 24, 2014

Involving: China and Japan

Summary: Japanese Defense Minister Onodera reports that a Chinese Su-27 fighter and a Japanese navy OP-3C surveillance plane came as close as 50-meters apart and an hour later a Chinese Su-27 came within 30 meters of a Japanese air force YS-11EB. Both encounters were over international waters near where China and Japan have established overlapping air-defense zones in the East China Sea. China blamed Japan for operating near Russian-Chinese joint military exercises and claimed the Chinese aircraft was taking necessary control and identification measures.¹³²

[land-s-airspace.html](#)

130 "China says Japan fighter jets shadowed its planes over disputed waters," Reuters, August 7, 2014, <http://www.reuters.com/article/2014/08/07/us-china-japan-idUSKBN0G70B220140807>.

131 Reuters, "Japan denies brush with Chinese planes, demands Beijing withdraws footage," South China Morning Post, June 13, 2014, <http://www.scmp.com/news/asia/article/1531719/japan-denies-its-fighters-buzzed-chinese-plane>.

132 Atsuko Fukase and Brian Spegele, "Japan, China Accuse Each Other of Provocation," The Wall Street Journal, May 25, 2014, <http://online.wsj.com/articles/SB10001424052702304811904579583651509691882>.

India, Pakistan and China

Date: April 9, 2015

Involving: India

Summary: India completes a successful test launch of the Dhanush ballistic missile, which has a strike range of 350 km, off a naval ship.¹³³

Date: March 9, 2015

Involving: Pakistan

Summary: Pakistan completes a successful test launch of the Shaheen-III surface-to-surface ballistic missile, which has a range of 2,750 km.¹³⁴

Date: February 14, 2014

Involving: India

Summary: India completes a successful test of the supersonic BrahMos cruise missile from the INS Kolkata.¹³⁵

Date: February 14, 2015

Involving: India and Pakistan

Summary: The Pakistani military reports that a civilian was killed when fire was exchanged between Indian and Pakistani troops across the Line of Control (LOC).¹³⁶

Date: February 2, 2015

Involving: Pakistan

Summary: Pakistan successfully tests the Ra'ad air-launched

cruise missile capable of carrying conventional and nuclear payloads.¹³⁷

Date: January 31, 2015

Involving: India

Summary: India completes a successful test of Agni-V, India's first ICBM, firing the missile from a mobile launcher.¹³⁸

Date: January 5, 2015

Involving: India and Pakistan

Summary: Five people die in Jammu and Kashmir due to intensified clashes between India and Pakistan in the disputed areas. Pakistani officials claim four of the deaths were a result of unprovoked firing from Indian troops while India allege the individuals were planning an attack on Indian soil.¹³⁹

Date: January 3, 2015

Involving: India and Pakistan

Summary: Skirmishes break out in Kashmir between Indian and Pakistani troops. Four people were killed and 12 were wounded.¹⁴⁰

Date: January 2, 2015

Involving: India and Pakistan

Summary: A Pakistan fishing vessel allegedly carrying explosives came into confrontation with the Indian Coast Guard. The boat's occupants set the boat on fire killing four people from the fishing vessel.¹⁴¹

133 PTI "Nuclear-capable Dhanush missile successfully test-fired," The Economic Times, April 9, 2015, <http://economictimes.indiatimes.com/news/defence/nuclear-capable-dhanush-missile-successfully-test-fired/articleshow/46864757.cms>.

134 Beenish Altaf, "Pakistan's Shaheen III Ballistic Missile: A Deterrent Strengthened – Oped," Eurasia Review, March 9, 2015, <http://www.eurasiareview.com/09032015-pakistans-shaheen-iii-ballistic-missile-a-deterrent-strengthened-oped/>.

135 "India successfully test-fires BrahMos supersonic cruise missile," The Times of India, February 14, 2014, <http://timesofindia.indiatimes.com/India/India-successfully-test-fires-BrahMos-supersonic-cruise-missile/articleshow/46243956.cms>.

136 "Pakistani civilian killed in Kashmir shootout," PressTV, February 14, 2015, <http://www.presstv.ir/Detail/2015/02/14/397562/Pakistani-killed-in-Kashmir-firing>.

137 Franz-Stefan Gady, "Pakistan Tests New Air-Launched Cruise Missile," The Diplomat, February 5, 2015, <http://thediplomat.com/2015/02/pakistan-tests-new-air-launched-cruise-missile/>.

138 Santanu Choudhury, "India Tests Nuclear-Capable Missile," The Wall Street Journal, January 31, 2015, <http://www.wsj.com/articles/india-tests-nuclear-capable-missile-1422719598>.

139 Avaneesh Pandey, "India-Pakistan Border Clashes Kill 5 As Thousands Flee Intensified Violence," International Business Times, January 6, 2015, <http://www.ibtimes.com/india-pakistan-border-clashes-kill-5-thousands-flee-intensified-violence-1774194>.

140 Peerzada Arshad Hamid, "India, Pakistan border flare-up kills 4 in Kashmir," Xinhua News, January 3, 2015, http://news.xinhuanet.com/english/2015-01/03/c_127354946.htm.

141 Santanu Choudhury, "India Intercepts Suspicious Pakistani Boat Defense Ministry Says," The Wall Street Journal, January 2, 2015, <http://>

Date: December 16, 2014

Involving: China and India

Summary: The Chinese PLA enters Indian territory in support of Chinese civilians quarreling over disputed territory. Indian forces ask the Chinese forces to retreat to their territory pushing the troops back after three hours.¹⁴²

Date: December 2, 2014

Involving: India

Summary: India successfully test-fires the strategic Agni-IV missile for a range of 3,000 km, but the missile has a full range of 4,000 km.¹⁴³

Date: November 25, 2014

Involving: India and Pakistan

Summary: India's Defense Minister Manohar Parrikar writes that 13 civilians have been killed by Pakistan in ceasefire violations so far in 2014. That would make this year the bloodiest in the last four (there were no civilian casualties in 2011 and 2013, and there were 4 in 2012). The highest number of security personnel casualties due to ceasefire violations occurred last year with 12 soldiers killed. Five have been killed so far in 2014.¹⁴⁴

Date: November 20, 2014

Involving: India and Pakistan

Summary: Pakistan accuses Indian forces of unprovoked attacks on the Pakistani side of the Line of Control resulting in the death of a Pakistani soldier. Pakistan summoned a

www.wsj.com/articles/india-intercepts-suspicious-pakistani-boat-defense-ministry-says-1420198186.

142 Deeptiman Tiwary, "Chinese army intrudes again in Ladakh, pushed back after 3-hour stand-off," The Times of India, December 18, 2014, <http://timesofindia.indiatimes.com/india/Chinese-army-intrudes-again-in-Ladakh-pushed-back-after-3-hour-stand-off/articleshow/45554834.cms>.

143 T.S. Subramanian, "Agni-IV launch successful," The Hindu, December 2, 2014, <http://www.thehindu.com/news/national/ag-niiv-launch-successful/article6654494.ece>.

144 PTI, "13 civilians killed in ceasefire violations in 2014: Manohar Parrikar," The Economic Times, November 25, 2014, <http://economictimes.indiatimes.com/news/politics-and-nation/13-civilians-killed-in-cease-fire-violations-in-2014-manohar-parrikar/articleshow/45275322.cms>.

senior Indian diplomat to express strong condemnation of the shooting and call on New Delhi to take serious measures to prevent similar incidents.¹⁴⁵

Date: November 17, 2014

Involving: Pakistan

Summary: Pakistan conducts a successful test launch of the intermediate range Shaheen 1A (Hatf IV) ballistic missile aimed at re-validating various design and technical parameters. The missile is capable of carrying nuclear and conventional warheads up to a range of 900 kilometers.¹⁴⁶

Date: November 14, 2014

Involving: India

Summary: India successfully test-fires the indigenously developed Prithvi-II surface-to-surface missile as part of a training exercise according to defense sources.¹⁴⁷

Date: November 13, 2014

Involving: Pakistan

Summary: Pakistan successfully test-fires the Shaheen-II missile with a target somewhere in the Arabian Sea. Pakistani military sources said the missile is capable of hitting targets 900 miles away and that the purpose of the test was to revalidate various technical parameters of the missile and ensure operation readiness.¹⁴⁸

Date: November 2, 2014

Involving: India and China

Summary: Sri Lanka allows China to dock another attack submarine at their port, despite Indian concerns. In late

145 "Pakistan slams fresh Indian shelling in disputed Kashmir," Press TV, November 24, 2014, <http://www.presstv.ir/detail/2014/11/21/386964/pakistan-slams-india-over-kashmir/>.

146 "Pakistan conducts successful test launch of Shaheen 1A Ballistic Missile," Daily Times, November 17, 2014, <http://www.daily-times.com.pk/national/17-Nov-2014/pakistan-conducts-successful-test-launch-of-shaheen-1a-ballistic-missile>.

147 PTI, "India successfully test fires Prithvi-II missile," India Today, November 14, 2014, <http://indiatoday.intoday.in/story/india-successfully-test-fires-prithvi-ii-missile/1/400762.html>.

148 "Pakistan test-fires nuclear capable ballistic missile," PressTV, November 13, 2014, <http://www.presstv.ir/detail/2014/11/13/385851/pakistan-tests-nuclear-capable-missile/>.

September, Sri Lanka allowed China to dock a nuclear submarine at a Lankan port.¹⁴⁹

Date: October 2014

Involving: India and Pakistan

Summary: In the “worst spell of violence...in years,” Indian and Pakistani military troops exchange gunfire and mortar shells in Kashmir on-and-off throughout the first couple of weeks in October killing 20 civilians and injuring many on both sides. Both India and Pakistan have blamed the other side for unprovoked firing along the Line of Control (LoC). Cease-fire violations continue with the Pakistani Army reporting the death of a 70-year old civilian from unprovoked Indian firing on October 28.¹⁵⁰

Date: October 22, 2014

Involving: China and India

Summary: Indo-Tibetan Border Police intercept Chinese boats in Pangong Lake at the Line of Actual Control (LAC). They also block People’s Liberation Army (PLA) troops from crossing over the LAC by road.¹⁵¹

Date: October 17, 2014

Involving: India

Summary: India successfully test launches the first indigenously developed long-range cruise missile, which has a strike range of over 1,000 kilometers.¹⁵²

149 Sachin Parashar, “Sri Lanka snubs India, opens port to Chinese submarine again,” The Times of India, November 2, 2014, <http://timesofindia.indiatimes.com/india/Sri-Lanka-snubs-India-opens-port-to-Chinese-submarine-again/articleshow/45008757.cms>.

150 “Pakistanis hold anti-Indian demo in Kashmir,” Press TV, October 16, 2014 <http://www.presstv.ir/detail/2014/10/16/382406/pakistanis-anti-indian-demo-in-kashmir/>; “Fresh Indian firing across LoC kills 70-year-old,” The Express Tribune, October 29, 2014, <http://tribune.com.pk/story/782690/fresh-indian-firing-across-loc-kills-one/>.

151 Courtney Schuster, Neeli Shah, Jameel Khan, David Sterman, “Pak Suicide Bomber Kills 55 People; Chinese Army Enters Indian Waters; Afghan First Lady Quoted as in Support of Burka Ban,” Foreign Policy: The South Asia Channel, November 3, 2014, <http://southasia.foreignpolicy.com/posts/2014/11/03/pak-suicide-bomber-kills-55-people-chinese-army-enters-indian-waters-afghan-first-lady>.

152 “India test-fires indigenously developed sub-sonic cruise missile Nirbhay,” The Economic Times, October 17, 2014, http://articles.economic-times.com/2014/10/17/news/55148421_1_cruise-missile-mission-objectives-nirbhay.

Date: September 26, 2014

Involving: Pakistan

Summary: Pakistan successfully test fires a Nasr missile.¹⁵³

Date: September 8-30, 2014

Involving: India and China

Summary: In June, PM Modi ordered faster construction of roads and infrastructure along the LAC. After the Indian army built a small observation hut close to the LAC on September 8, Chinese soldiers started work on a road on territory claimed by India demanding the hut be destroyed. India refused and raised troop numbers in the area. Tensions continued to build as about 1,000 Chinese soldiers crossed the LAC in Ladakh, Kashmir prompting a face-off with an equal number of Indian troops and coinciding with Chinese President Xi Jinping’s arrival in India in mid-September. Both countries completed simultaneous withdrawal of troops on September 30.¹⁵⁴

Last year India reported over 400 Chinese incursions across the Himalayan border, up from about 140 in 2006. This year, India has claimed China has violated the ceasefire line 334 times. Incursions are usually temporary, harmless patrol exercises – there has not been a fatal confrontation in decades.

Date: August 23, 2014

Involving: India and Pakistan

Summary: Indian and Pakistani forces exchange fire along the LoC, killing four civilians – two Indian and two Pakistani. Indian Defense Minister Jaitley claimed Pakistan had violated the cease-fire agreement 54 times from the begin-

nomictimes.indiatimes.com/2014-10-17/news/55148421_1_cruise-missile-mission-objectives-nirbhay.

153 “Full spectrum deterrence: Pakistan test-fires Nasr missile,” The Express Tribune, September 27, 2014, <http://tribune.com.pk/story/767860/full-spectrum-deterrence-pakistan-test-fires-nasr-missile/>.

154 Sanjeev Miglani, “Insight – With canal and hut, India stands up to China on disputed frontier,” Reuters, September 25, 2014, <http://in.reuters.com/article/2014/09/24/india-china-modi-chumar-army-ladakh-idINKCN0HJ2FU20140924>; Press Trust of India, “Border row: Ladakh standoff ends with withdrawal of Chinese, Indian troops,” The Indian Express, September 30, 2014, <http://indianexpress.com/article/india/india-others/border-row-ladakh-standoff-ends-with-withdrawal-of-chinese-indian-troops/>.

ning of 2014 through July 16 and had violated the agreement 199 times last year.¹⁵⁵

Date: August 6, 2014

Involving: India and Pakistan

Summary: Pakistani forces arrest an unarmed Indian soldier after he accidentally crossed the border. He is released two days later.¹⁵⁶

Date: July 21, 2014

Involving: India and Pakistan

Summary: Pakistan and Indian troops on the border of the LoC exchange fire, killing at least one man and wounding two women and a child.¹⁵⁷

Date: July 16, 2014

Involving: India and Pakistan

Summary: Pakistan and India troops on the border of the LoC exchange fire, killing at least one border guard and wounding seven more including four civilians.¹⁵⁸

Date: March 24, 2014

Involving: India

Summary: India completes a secretive test of the K-4 SLBM, the country's "most advanced submarine-launched ballistic missile to date," which has a range of 3,000 km.¹⁵⁹

155 Adi Narayan, "Four killed as India and Pakistan exchange fire on border," *The Sydney Morning Herald*, August 24, 2014, <http://www.smh.com.au/world/four-killed-as-india-and-pakistan-exchange-fire-on-border-20140824-107q83.html>.

156 Hari Kumar and Salman Masood, "Pakistan Detains Indian Soldier Who Accidentally Crossed Border," *International New York Times*, August 6, 2014, <http://www.nytimes.com/2014/08/07/world/asia/pakistan-detains-indian-soldier-who-accidentally-crossed-border.html>.

157 "One Pakistani killed, three wounded during Indo-Pak border clash," *Dawn.com*, July 21, 2014, <http://www.dawn.com/news/1120463>.

158 "India, Pakistan border guards exchange fire on Kashmir border, 1 killed, 7 wounded," *Xinhua News*, July 16, 2014, http://news.xinhuanet.com/english/world/2014-07/16/c_133489043.htm.

159 Ankit Panda, "India Inches Closer to Credible Nuclear Triad

APPENDIX F: NUCLEAR WEAPONS ARSENALS BY COUNTRY

By Bruce Blair and Jessica Sleight

United States

The U.S. maintains a strategic nuclear triad of intercontinental ballistic missiles, submarine-launched ballistic missiles, and bombers. The nuclear arsenal consists of approximately 4,760 nuclear warheads, including an estimated 1,900 strategic operational warheads, 180 non-strategic warheads mostly based in Europe, and 2,680 non-deployed warheads in reserve as a hedge against future challenges. Another 2,340 warheads are awaiting dismantlement. Of the 1,900 deployed nuclear warheads, an average of 850 are on high alert including 430 ICBMs – capable of launch within 5 minutes – and 400 SLBMs – capable of launch within 15 minutes.

In 2010, the U.S. ratified the New START agreement committing to limit the number of deployed warheads to 1,550 by 2018. Data released in September 2014 showed the U.S. currently has 1,642 deployed nuclear warheads. (This number is misleading as bombers are counted as 1 warhead each, while in reality each carries approximately 10 warheads, making the actual total deployed warhead count approximately 2,425.) In order to reach New START limits, the U.S. will make reductions at each leg of the triad.

The U.S. plans to spend \$350 billion over the next decade to maintain and modernize each leg of the nuclear triad. Plans for a new ICBM, a new fleet of submarines, a Long Range Standoff Missile and investments in nuclear weapons infrastructure among other programs will cost upwards of \$1 trillion over the next three decades.

Current Nuclear Deployments

With K-4 SLBM Test," *The Diplomat*, May 13, 2014, <http://thediplomat.com/2014/05/india-inches-closer-to-credible-nuclear-triad-with-k-4-slbm-test/>.

Nuclear Weapons Numbers By Type¹⁶⁰

Type	Launchers	Warheads
Deployed Strategic Nuclear Weapons		
Minuteman III ICBMs	450	450
Trident II (D5) SLBMs	288	1,152
Bombers	94	300
Subtotal		~1,900
Deployed Nonstrategic Nuclear Weapons		
B61-3, B61-4 bombs		180
Total Deployed		~2,080
Reserves		~2,680
Retired & awaiting dismantlement		~2,340
Total		~7,100

¹⁶⁰ Hans M. Kristensen and Robert S. Norris, "US Nuclear Forces, 2015," Bulletin of Atomic Scientists, Vol. 71, no. 2, March/April 2015, p. 108.

Location of Bases and Operating Areas in the U.S.¹⁶¹

State	Base	Weapons Systems
California	Lawrence Livermore National Laboratory	Warhead design, surveillance and maintenance
Georgia	Kings Bay NSB	5 Trident II (D5) submarines; W76-0, W76-1, W88 warheads
	Strategic Weapons Facility Atlantic (Kings Bay NSB)	Navy warhead storage site
Missouri	Whiteman AFB	20 B-2 bombers; B-61 and B-83 nuclear bombs
Montana	Malmstrom AFB and Missile Field	150 Minuteman III missiles; W78-0, W87 warheads
New Mexico	Kirtland Underground Munitions Storage Complex	Air Force storage site
	Los Alamos National Laboratory	Warhead design, surveillance and maintenance
North Dakota	Minot AFB and Missile Field	150 Minuteman III missiles
Texas	Pantex Plant	Assembly, disassembly and dismantlement of warheads
Washington	Bangor (Kitsap) NSB	9 Trident II (D5) missiles; W76-0, W76-1, W88
Wyoming (extends into Colorado and Nebraska)	Warren AFB and Missile Field	150 Minuteman III missiles

Location of Bases and Operating Areas in Europe¹⁶²

Country	Base	Est. Number of B-61s
Belgium	Kleine Brogel Air Base	20
Germany	Büchel Air Base	20
Italy	Aviano Air Base	50
	Ghedi Torre Air Base	20
Netherlands	Volkel Air Base	20
Turkey	Incirlik Air Base	50
Total		180

161 Han M. Kristensen and Robert S. Norris, "Worldwide Deployments of Nuclear Weapons, 2014," Bulletin of Atomic Scientists, August 26, 2014, <http://bos.sagepub.com/content/early/2014/08/26/0096340214547619.full.pdf+html>, pp. 6-7.

162 Global Zero NATO-Russia Commission Report, 2012, op. cit.; and Hans M. Kristensen, "B61-12: The New Guided Standoff Nuclear Bomb," (Presentation to Side Event The Future of the B61: Perspectives From the United States and Europe, The Nuclear Age Peace Foundation, Third Preparatory Committee Meeting for the Nuclear Non-Proliferation Treaty United Nations, New York, May 2, 2014), http://fas.org/programs/ssp/nukes/publications1/Brief2014_PREPCOM2.pdf.

Stockpile Changes

The administration is undergoing efforts to decrease nuclear weapons stockpiles in order to comply with treaty limits set by New START and which go into effect in 2018. Data on U.S. numbers from September 2014 (see below) showed an increase from March 2014 numbers in deployed launchers (from 778) and deployed warheads (from 1,585); and a decrease in total launchers (from 952).

U.S. Numbers Under New START¹⁶³

	Total Launchers, Sep 2014	Deployed Launchers, Sep 2014	Deployed Warheads, Sep 2014	Total Launchers, 2018	Deployed Launchers, 2018	Deployed Warheads, 2018
Minuteman III	466	447	447	450	400	400
Peacekeeper	1	0	0	0	0	0
Trident II (D-5)	336	260	1,108	280	240	1,090
B-52H	89	77	77	46	42	42
B-2A	20	10	10	20	18	18
Total	912	794	1,642*	800	700	1,550

*Bombers are counted as 1 warhead each, while in reality each carries approximately 10 warheads, making the actual total deployed warhead count approximately 2,425.

March 2015 data shows a decrease in total launchers to 898, total deployed launchers to 785 and total deployed warheads to 1,597.¹⁶⁴

ICBMs. In order to comply with New START, the Air Force will reduce their ICBM force to 400 missiles, each carrying one warhead. Fifty missiles will be retired, but the launchers will be retained.

SLBMs. The fleet of ballistic missile submarines consists of 14 Ohio-class submarines, each with 24 launch tubes. The plan is to decrease the number of launch tubes on each submarine to 20.

Bombers. The fleet of bombers includes 10 B-2 deployed bombers and 77 B-52 deployed nuclear-capable bombers, which will be reduced to 60 total aircraft by 2018. The Air Force has also begun to retire the nuclear-armed cruise missiles carried by B-52 bombers. Some of the bombers will be converted to conventional-only missions.

Launchers. Currently, the U.S. has more than 800 launchers for the nuclear warheads. In order to comply with New START treaty limits, the Air Force plans to eliminate 103 empty silos by 2018: 50 have already been eliminated at Malmstrom Air

¹⁶³ Breakdown for March 2015 data was not available at the time of printing. Sep 2014 numbers from U.S. Department of State, "New START Aggregate Numbers of Strategic Offensive Arms," Bureau of Arms Control, Verification and Compliance Fact Sheet, January 1, 2015.

¹⁶⁴ U.S. Department of State, "New START Aggregate Numbers of Strategic Offensive Arms," Bureau of Arms Control, Verification and Compliance Fact Sheet, April 1, 2015.

Force Base, 50 will be eliminated from Warren AFB along with three test launch silos at Vandenberg AFB in California.¹⁶⁵

Nuclear Weapons Related Spending

Global Zero's 2011 study on nuclear weapons related spending estimated that the U.S. would spend \$34 billion on core costs for the nuclear arsenal in 2011 and an additional \$27.3 billion when taking into account full costs (for a total of \$61.3 billion).¹⁶⁶ This puts the U.S. on the path to spend over \$350 billion on nuclear weapons over the next decade on core costs for the nuclear arsenal and over \$623 billion on full costs.

The Congressional Budget Office (CBO) estimates that the U.S. will spend \$355 billion over the next 10 years on maintaining and modernizing nuclear forces and infrastructure. That number includes \$152 billion spent on fielding and maintaining systems; \$89 billion for modernization programs; \$56 billion for command, control, communications and early warning; and \$59 billion for additional costs based on historical growth costs.¹⁶⁷

The CBO also addressed other nuclear related costs including costs of missile defense, costs of threat reduction and arms control, and legacy costs. Over the next ten years, the U.S. will spend an additional estimated \$215 billion on these

nuclear related activities.¹⁶⁸

In February 2015, President Obama put forward a budget that included a \$1 trillion dollar investment in nuclear weapons modernization over the next three decades. The peak of that spending will come in a 4-6 year window between 2024-2029 at which time the U.S. will be spending 3% of the total defense budget on procuring strategic systems.¹⁶⁹

More specifics on some of the spending for certain programs are highlighted in the next section.

Modernization Plans

Over the next 10-20 years, all three legs of the nuclear triad are slated for modernization.

3+2 Strategy. The administration plans to use the "3+2 Strategy" to reduce the number of warheads in the nuclear arsenal and provide the nuclear triad with more flexibility. The plan will reduce the number of nuclear warhead types from 12 to 5-3 interoperable warheads on ICBMs and SLBMs and 2 non-interoperable warheads on bombers and fighters. This would not change the number of deployed warheads.

Each interoperable warhead will be very expensive with the IW1 projected to cost \$14.7 billion, the IW2 projected to cost \$15 billion and the IW3 projected to cost \$20 billion.¹⁷⁰ The National Nuclear Security Administration (NNSA) has estimated the price of the strategy to be \$60 billion.¹⁷¹

A positive aspect of this program is that there would be fewer warhead types, reducing the hedge and maintenance costs.

165 John Turner, "Demolition of final 'Deuce' squadron missile launcher is a New START milestone," Malmstrom Air Force Base News, August 6, 2014, <http://www.malmstrom.af.mil/news/story.asp?id=123420408>.

166 Core costs refer to researching, developing, procuring, testing, operating, maintaining, and upgrading the nuclear arsenal (weapons and their delivery vehicles) and its key nuclear command-control-communications and early warning infrastructure; full costs add unpaid/deferred environmental and health costs, missile defenses assigned to defend against nuclear weapons, nuclear threat reduction and incident management. Bruce G. Blair and Matthew A. Brown, Nuclear Weapons Cost Study, Global Zero Technical Report, June 2011.

167 Congressional Budget Office, "Projected Costs of U.S. Nuclear Forces, 2014 to 2023," December 2013, <http://www.cbo.gov/sites/default/files/cbofiles/attachments/12-19-2013-NuclearForces.pdf>, p. 2.

168 Ibid, pp. 6-7

169 Jon B. Wolfsthal, Jeffrey Lewis and Mac Quint, "The Trillion Dollar Nuclear Triad: US Strategic Nuclear Modernization Over the Next Thirty Years," James Martin Center for Nonproliferation Studies, Monterey, CA, January 2014, http://cns.miis.edu/ocpapers/pdfs/140107_trillion_dollar_nuclear_triad.pdf, p. 4.

170 Kristensen and Norris, "U.S. Nuclear Forces, 2014," op.cit, p. 89.

171 "NNSA's '3+2' Nuclear Warhead Plan Does Not Add Up," Arms Control Today, vol 5 Issue 6, May 6, 2014.

Possible negatives include questions of reliability, drops in stockpile diversity, and the introduction of modified warheads that might be considered “new.”¹⁷²

The Obama Administration has slowed progress on key parts of the \$60 billion plan.

ICBMs

- Minuteman III ICBM Modernization: modernization of the propellant, guidance systems, propulsion system, targeting system, and reentry vehicles, and continuation of work on the rocket motors; estimated at \$6-7 billion through 2030 (possibly longer).¹⁷³
- ICBM Dem/Val (demonstration and validation) program: maturation of Air Force technologies that could be used in maintaining the current force through 2030 and in future ICBM programs.
- Minuteman III replacement: first stages of planning for a new missile for deployment starting in 2018 with viability through 2030.
- GBSD replacement ICBM planning: current consideration of a system to follow the Minuteman III after 2030. An Analysis of Alternatives was due in June 2014.
- W78 life-extension/upgrade: partial replacement of W78 with W87 warheads with a price tag of \$5 billion and scheduled completion date in 2025;¹⁷⁴ the 2015 budget request delayed the life-extension program by 5 years.¹⁷⁵

172 Hans M. Kristensen, “Nuclear Weapon Modernization Programs of Nuclear-Armed States,” (Federation of American Scientists Presentation to Side Event on Nuclear Weapon Modernizations, Third Preparatory Committee Meeting for the Nuclear Non-Proliferation Treaty, United Nations, New York, May 1, 2014), http://fas.org/programs/ssp/nukes/publications1/Brief2014_PREPCOM1.pdf, p. 13.

173 Amy Woolf, U.S. Strategic Nuclear Forces: Background, Development, and Issues, Congressional Research Service, September 5, 2014, <http://fas.org/sgp/crs/nuke/RL33640.pdf>, p. 13.

174 “U.S. Nuclear Modernization Programs,” Arms Control Association, January 2014 <http://www.armscontrol.org/factsheets/USNuclearModernization>.

175 Kingston Reif, “Fact Sheet: FY2015 Budget Request for Replacement Nuclear Delivery Systems and Warhead Life Extension Programs,” The Center for Arms Control and Non-Proliferation, March 18, 2014, http://armscontrolcenter.org/issues/nuclearweapons/articles/fact_sheet

SSBNs / SLBMs

- The current Trident submarines will begin to retire in 2027.
- Trident II Life Extension Program (LEP): being pursued to ensure missiles remain capable and reliable throughout the lifespan of the submarines.
- SSBN(X): replacement of the current Ohio-class submarines with new SSBN(X) submarines. The 12 new subs will have 16 launch tubes and will enter the fleet in 2031. Due to the work schedule this would mean that for most of the 2030s, the fleet would decline to 10 SSBNs. Current estimates determine the cost of each sub will be around \$4.9 billion per sub.¹⁷⁶ The CBO estimates that the whole program could cost \$97-102 billion.¹⁷⁷
- W76 LEP: currently underway, covering 60% of the stockpile and adding 30 years to the warhead life. The program is scheduled to continue through 2019 and is estimated at \$4 billion.¹⁷⁸
- W88 LEP: scheduled to begin in 2016.

Bombers

- B-2 Bomber: continually going through modernization with a technological upgrade planned to keep the bomber through 2058. The ceiling cost for the plan is \$9.9 billion for 20 bombers.¹⁷⁹
- B61 Life-extension plan (B61-12): includes the addition of a guided tail kit to increase accuracy and reduce radioactive fallout and is expected to cost \$10 billion for 400 to 500 B61-12 bombs making it the most expensive nuclear bomb project in history.¹⁸⁰ The availability date

[fy 2015 budget request for replacement nuclear delivery systems and warhead life extension programs/](#).

176 Woolf, U.S. Strategic Nuclear Forces,” op.cit., p. 24.

177 Congressional Budget Office, An Analysis of the Navy’s Fiscal Year 2014 Shipbuilding Plan, October 2013, <http://www.cbo.gov/sites/default/files/44655-Shipbuilding.pdf>, p. 24.

178 “U.S. Nuclear Modernization Programs,” Arms Control Association, op. cit.

179 Kris Osborn, “B-2 Bomber Set to Receive Massive Upgrade,” DoD Buzz, June 25, 2014, <http://www.dodbuzz.com/2014/06/25/b-2-bomber-set-to-receive-massive-upgrade/>.

180 Kristensen and Morris, “U.S. Nuclear Forces, 2014,” op.cit., p. 88.

for the bomb has been pushed back from 2017 to 2020. After completion of the program, the U.S. will be able to retire the larger B-53 bomb and reduce the number of B61s. Some say equipping the B61-12 with a new tail kit would undercut Obama's promise not to develop new military capabilities while modernizing nuclear warheads.¹⁸¹

- F-35 Joint Strike Fighter: currently being built with a possible nuclear capability. At present, the program is \$167 billion over budget and seven years behind schedule. It is a \$398.6 billion weapons program that could end up costing more over its lifetime.¹⁸²
- Long Range Standoff Missile (LRSO): replacement of the current AGM-86 ALCM with a new LRSO. The 2015 budget request delayed the program for 3 years. Current estimates indicate the program will cost \$221 million over next 5 years, in contrast to the \$1.04 billion planned before the delay.¹⁸³
- New Long Range Strategic Bomber: plans to start development of 80-100 new bombers in 2018 at a cost of \$550 million per bomber (\$36 billion-\$56 billion in total) and an estimated \$20-45 billion for research and development.¹⁸⁴ The new bombers would be deployed in 2025.

NATO Modernizations. NATO has approved modernization of the non-strategic nuclear weapons in Europe. The U.S. currently spends about \$100 million per year to deploy nuclear weapons in the five NATO countries.¹⁸⁵ Decisions

181 Woolf, U.S. Strategic Nuclear Forces, op.cit., p. 26.

182 Jeremy Bender, "Why The US Is Spending Up To \$1 Trillion On The F-35 Joint Strike Fighter," Business Insider: Australia, May 1, 2014, <http://www.businessinsider.com.au/lockheed-martin-f-35-guide-2014-4#the-f-35-developed-by-lockheed-martin-is-meant-to-replace-a-range-of-fighter-strike-and-ground-attack-aircraft-1>.

183 Woolf, U.S. Strategic Nuclear Forces, op.cit., p. 29.

184 Ibid, p. 32.

185 Hans M. Kristensen, "NATO Nuclear Weapons Security Costs Expected to Double," Federation of American Scientists, March 11, 2014, <http://fas.org/blogs/security/2014/03/nato-nuclear-costs/>.

on the B61-12 and F-16/Tornado replacements by each individual country are as follows:

- Belgium: F-16 replacement not yet decided; B61-12 deployment after 2020.
- Germany: planning Tornado bomber life extension; B61-12 deployment after 2020.
- Netherlands: planning F-35 replacement of F-16; B61-12 deployment after 2020.
- Italy: planning F-35 replacement of Tornado; B61-12 deployment after 2020.
- Turkey: planning F-35 replacement of F-16; B61-12 deployment after 2020.¹⁸⁶

Infrastructure. The 2010 NNSA spending plan included two major construction projects: the Uranium Processing Facility (UPF) at Oakridge National Laboratory in Tennessee and the Chemistry and Metallurgy Research Replacement Nuclear Facility (CMRR-NF) at Los Alamos National Laboratory in New Mexico.

In 2012, construction of the CMRR-NF facility at Los Alamos National Laboratory was delayed by at least five years by the Obama administration due to questions about the necessity of the facility and the increasing costs of the B61 life extension program and plans for UPF construction.

Plans for UPF, or the Uranium Capabilities Replacement Project, are still underway to replace several operations facilities at Oakridge. The 2005 initial plan for the project projected the cost between \$600 million and \$1 billion with completion in 2018, but problems have caused delays and cost overruns. Now, the NNSA says some uranium operations could begin by 2025, but the facility will not be fully complete until 2038. The official estimated budget from the Department of Energy is between \$4.2 billion and \$6.5 billion, but the Army Corps of Engineers estimates that it will end up costing between \$6.5 billion and \$11.6 billion.¹⁸⁷

186 Kristensen, "Nuclear Weapon Modernization Programs," op.cit.

187 Lydia Dennett and Peter Stockton, "Uranium Processing Facility: When You're in a Hole, Just Stop Digging," Project on Government Oversight, September 25, 2013, <http://www.pogo.org/our-work/reports/2013/20130925-uranium-processing-facility.html#fn65>.

Other facility upgrades include a \$700 million National Security Campus at the Kansas City Nuclear Plant, which manufactures and modernizes non-nuclear components of the nuclear weapons. Officials say it will use half the energy of the old site saving \$150 million annually.¹⁸⁸ The federal plant is subsidized by Kansas City, MO municipal bonds and will be privately owned.

The National Ignition Facility at Lawrence Livermore National Laboratory was built to eventually produce controlled nuclear fusion that could emit huge amounts of energy. Some say the facility can aid the Stockpile Stewardship Program that maintains reliability of nuclear weapons. The deadline for achieving the “ignition” part of the reaction was September 2012, but it has not yet been achieved and money is still being funneled into the project. The facility costs about \$290 million per year.¹⁸⁹

Russia

Russia's nuclear arsenal is currently made up of an estimated 4,600 nuclear warheads, including approximately 1,900 deployed strategic weapons, 2,000 nonstrategic weapons and an additional 700 strategic warheads in storage. An average of 850 deployed warheads are on high alert. Another estimated 3,500 warheads are awaiting dismantlement. Russia maintains a strategic nuclear triad consisting of silo-based and road-mobile intercontinental ballistic missiles, submarine-launched ballistic missiles and bombers.

Under the New START agreement, Russia has committed to limiting the number of deployed warheads to 1,550 by 2018. Previously, Russia was already under the limit, however data from March 2015 showed a deployed warheads count of 1,582 meaning slight reductions in deployed warheads are part of Russia's future. Concurrently, Russia will continue work on upgrading its ageing nuclear arsenal in order

to improve the survivability of its missiles and their ability to evade missile defenses. This includes increasing the role of road-mobile missiles, increasing the share of land-based ballistic missiles that are equipped with multiple warheads, instituting a fleet of new Borei-class submarines, developing a new bomber, and upgrading nonstrategic nuclear missiles. Even as Russia undergoes hard economic times, the military budget has been shielded from spending cuts and has actually seen an increase of 33%.¹⁹⁰

188 William J. Broad and David E. Sanger, “U.S. Ramping Up Major Renewal in Nuclear Arms,” *New York Times*, September 21, 2014, <http://www.nytimes.com/2014/09/22/us/us-ramping-up-major-renewal-in-nuclear-arms.html>.

189 Eve Hunter, “Livermore Fails to See the Light,” *Nukes of Hazard* (blog), October 16, 2012, <http://www.nukesofhazardblog.com/story/2012/10/16/151918/76>.

190 Vladimir Isachenkov, “Putin Spending on Military Modernization Despite Russia's Economic Woes,” *The World Post*, February 4, 2015, http://www.huffingtonpost.com/2015/02/04/russia-military-modernization_n_6612418.html.

Current Nuclear Deployments

Nuclear Weapons Numbers by Types¹⁹¹

Type	Launchers	Total Warheads
Deployed Strategic Offensive Weapons		
ICBMS (both silo-based and road-mobile)	305	1,166
SLBMs	128	512
Bombers	66	~200
Subtotal		~1,900
Nonstrategic & Defensive Weapons		
ABM/Air/Costal Defense	~1102	~425
Land-based Air	~430	~730
Ground-Based (Short range ballistic missiles)	~170	~170
Naval		~700
Subtotal		~2,000
Storage		~700
Retired & Awaiting Dismantlement		~3,500
Total		~8,000

Russia has a total of 11 National Level storage sites, three possible Naval storage sites, 11 ICBMs sites, two Air bases, five interceptor sites, and two warhead production plants.

¹⁹¹ Data for Deployed Strategic Offensive Weapons is from Pavel Podvig, "Strategic Rocket Forces," Russian strategic nuclear forces, January 15, 2015, <http://russianforces.org/missiles/>; Pavel Podvig, "Strategic Fleet," Russian strategic nuclear forces, February 25, 2015, <http://russianforces.org/navy/>; Pavel Podvig, "Strategic Rocket Forces," Russian strategic nuclear forces, January 8, 2015, <http://russianforces.org/aviation/>. Other data is from Hans M. Kristensen and Robert S. Norris, "Russian Nuclear Forces, 2014," Bulletin of the Atomic Scientists, Vol. 70: 85, January 2014, p. 77.

Locations of Bases and Operating Areas¹⁹²

Region	Base/Location	Weapons System
Altai Krai	Barnaul Missile Division	SS-25 ICBMs; warheads for 36 ICBMs
Amurskaya	Ukrainka AB	AS-15 ASM, bombs; for Tu-95 Bear Bombers; Storage facility nearby
Belgorod	Golovchino (Belgorod-22)	National-Level Weapons storage site
Bryansk	Rzhanitsa (Bryansk-18)	National-Level Weapons storage site
Chelyabinsk	Karabask (Chelyabinsk-115)	Possible national-level weapons storage site for adjacent Chelyabinsk-70
Chelyabinsk	Snezhinsk (Chelyabinsk-70)	Nuclear warhead design laboratory and national-level weapons storage site
Chelyabinsk	Trekhgornyy (Zlatoust-36)	Various; One of Russia's two warhead production plants; Storage facility nearby
Irkutsk	Irkutsk Missile Division	SS-25 (RS-26 Planned); Warheads for 18 ICBMs
Ivanovo	Teykovo Missile Division	SS-27 ICBMs; Warheads for 18 ICBMs
Kaluga	Kozelsk Missile Division	SS-19 ICBMs (RS024 Upgrade); Warheads for 20 ICBMs
Kamchatka	Rybachiy Naval Base	SS-N-18 SLBMs; Warheads for Delta III-class SSBNs
Kamchatka	Vilyuchinsk Weapon Storage Facility	SS-N-18 SLBMs; for Delta-III SSBNs
Khabarovsk	Korfovskiy (Khabarovsk-27)	National-level weapons storage site
Khabarovsk	Selikhino (Komsomolsk-31)	National-level weapons storage site.
Kola	Nerpichya (Zaozyorsk) Weapons Storage Facility	Possible Storage facilities for naval weapons, including for nearby Bolshaya Lopatka Naval Base
Kola	Oklnaya (Severomorsk) Weapons Storage Facility	Possible storage facility for SLBMs and other naval weapons
Kola	Ramozero (Olenegorsk-2)	National-level storage sites
Kola	Shchukozero	Weapons storage site
Kola	Yagelnaya (Gadzhiev) NB	SS-N-23 SLBMs (Upgrade); for Delta IV-Class SSBNs and Borei-Class SSBNs in future. Weapons Storage east of Base.
Krasnoyarsk	Dodonovo (Krasnoyarsk-26, sometimes referred to as Shivera)	National-level weapons storage site
Krasnoyarsk	Uzhur Missile Division	SS-18 ICBMs; Warheads for 28 ICBMs
Mari El	Yoshkar-Ola Missile Division	SS-25 ICBMs; Warheads for 18 ICBMs
Moscow	Korolev (Moscow)	Gazelle ABMs; Warheads for 12 interceptors
Moscow	Lytkarino	Gazelle ABMs; Warheads for 16 interceptors
Moscow	Mozhaysk-10	National-Level weapons storage site

¹⁹² Hans M. Kristensen and Robert S. Morris, "Worldwide deployments of nuclear weapons, 2014," Bulletin of the Atomic Scientists, Vol. 70, no. 5, September/October 2014, pp. 100-01.

Moscow	Skhodnya	Gazelle ABMs; Warheads for 16 interceptors
Moscow	Sofrino (Moscow)	Gazelle ABMs; Warheads for 12 interceptors
Moscow	Vnukovo (Moscow)	Gazelle ABMs; Warheads for 12 interceptors
Novgorod/ Tver	Vypolzovo Missile Division	SS-25 ICBMs; Warheads for 18 ICBMs
Novosibirsk	Novosibirsk Missile Division	SS-25 ICBMs, RS-24 Upgrade; Warheads for 27 ICBMs
Orenburg	Dombarovsky Missile Division	SS-18 ICBMs; Warheads for 18 ICBMs
Primorsky	Chazma (Abrek) Bay SLBM Storage Facility	SLBMs/SLCMs/ASWs; storage site of warheads for SLBMs and other naval weapons
Saratov	Engels AB	AS-15 ASM, bombs; For TU-160 Blackjack and TU-95 Bear bombers. Weapons storage nearby.
Saratov	Krasnoarmeyskoye (Saratov-63)	National-Level weapons storage site
Saratov	Tatishchevo Missile Division	SS-27 ICBMs; Warheads for 60 ICBMs
Sverdlovsk		One of Russia's two warhead production plants. Sverdlovsk-16 is a national-level weapons storage site 8 KM west of the plant
Severodvinsk	Nizhniy Tagil Missile Division	SS-25 ICBMs, RS-24 upgrade; Warheads for 27 ICBMs
Transbaikal	Zalari (Irkutsk-45)	Various - National-Level Warhead Storage Site
Vologda	Chebsara (Vologda-20)	National-level weapons storage site
Voronezh	Borisoglebsk (Voronezh-45);	National-level weapons storage site

Stockpiles Changes

New START numbers from March 1, 2015 shows Russia has 515 deployed launchers, 1,582 deployed warheads and 890 total launchers.¹⁹³ In March 2014, the number of Russian deployed nuclear warheads was already below New START requirements (limit of 1,550 deployed nuclear warheads), but the latest data shows a slight increase in deployed nuclear forces pushing the number of deployed nuclear warheads just above the New START limits. These relatively slight changes are due to a slow down in the rate of retirement for missile launchers (from about 50 missiles per year before New START to about 22 missiles per year after) coupled with an increased introduction rate of new land-based missiles (from about 9 missiles per year to about 18).¹⁹⁴

¹⁹³ U.S. Department of State, "New START Aggregate Numbers," 2015, op.cit.

¹⁹⁴ See Hans M. Kristensen, "New START: Russia and the United States Increase Deployed Nuclear Arsenals, FAS: Strategic Security, October 2, 2014, <http://fas.org/blogs/security/2014/10/newstart2014/>.

Warhead Capacity and Yields of Current Delivery Vehicles¹⁹⁵

Type	Russian Designation	Warhead x Yield (kilotons)
ICBM		
SS-27 Mod. 1 (Topol-M)	RS-12M1 (mobile)	
RS-12M2 (silo)	1 x 800	
SS-27 Mod 2	RS-24 (Yars)	4 x 100?
SS-18M6 Satan	RS-20V	10 x 500/800
SS-19 M3 Stiletto	RS-18	6 x 400
SS-25 Sickle	RS-12M	1 x 800
SLBM		
SS-N-18 M1 Stingray	RSM-50	3 x 50
SS-N-23 M1	RSM-54 (Sineva)	4 x 100
SS-N-32	RSM-56 (Bulava)	6 x 100
Bombers		
Bear-H6	Tu-95 MS6	6 x AS-15A ALCMs, bombs
Bear-H16	Tu-95 MS16	16 x AS-15A ALCMs, bombs
Blackjack	Tu-160	12 x AS-15B ALCMs or AS-16 SRAMs, bombs
Nonstrategic and defensive		
Air/Coastal		
S-300 (SA-10/12/20)		1 x low
53T6 Gazelle		1 x 10
SSC-1B Sepal		1 x 350
Land-based air		
Tu-22M3/Su-24M/Su-34		ASM, bombs
Ground-based		
SRBM: SS-21/SS-26		1 x ?

Deployments currently being introduced:

- SS-27 Mod 2 (RS-24) ICBM
 - a) Carries an estimated 4 warheads each.
 - b) Will gradually replace the SS-19 M3s, which carry 6 warheads each.¹⁹⁶
- Borei-class ballistic missile submarines
 - a) First two boats entered service in late 2013, but are without their SS-N-32 Bulava missiles due to failed test-launches.

¹⁹⁵ Kristensen and Norris, "Russian Nuclear Forces, 2014," op.cit, p. 77.

¹⁹⁶ Vincent C. Fournier and Ulrich Kuhn, "Russia's Nuclear Posture: Modernization and the State of Arms Control," Deep Cuts Issue Brief #1, December 2014, http://deepcuts.org/files/pdf/Deep_Cuts_Issue_Brief1_Russias_Nuclear_Posture.pdf.

Nuclear Weapons Related Spending

Information on nuclear weapons spending is difficult to verify. In 2011, Russia's first deputy minister of defense told reporters Russia would spend \$70 billion over the next decade on developing strategic forces.¹⁹⁷

Taking the \$70 billion spending into account, the Global Zero nuclear weapons spending study estimated that Russia would spend \$9.8 billion on core nuclear weapons costs in 2011.¹⁹⁸ When considering conservative estimates of costs for environmental and health costs, nuclear threat reduction and incident management, spending increased to an estimated \$18.5 billion. This indicates that Russia is well on its way to spending over \$90 billion on core nuclear weapons costs over the next decade.

In 2012 the head of the State Duma Defense Committee said Russia planned to spend 101.15 billion rubles (approximately \$1.6 billion) on "The Nuclear Weapons Complex" from 2013-2015.¹⁹⁹ More recently, dropping oil prices and Western economic sanctions have hurt Russia's economy, but the overall military budget has actually increased by 33% to around \$50 billion²⁰⁰ and President Putin plans to spend \$700 billion in military equipment upgrades through 2025.²⁰¹

197 Pavel Podvig, "Russia to Spend \$70 billion on Strategic Forces by 2020," Russian Strategic Nuclear Forces (blog), http://russianforces.org/blog/2011/02/russia_to_spend_70_billion_on.shtml.

198 Core costs refer to researching, developing, procuring, testing, operating, maintaining, and upgrading the nuclear arsenal (weapons and their delivery vehicles) and its key nuclear command-control-communications and early warning infrastructure. Bruce G. Blair and Matthew A. Brown, Nuclear Weapons Cost Study, Global Zero Technical Report, June 2011.

199 "Russia to spend over 100 billion on nuclear weapons," [Pravda.ru](http://english.pravda.ru/news/russia/18-10-2012/122499-russia_nuclear_weapons-0/), October 18, 2012, http://english.pravda.ru/news/russia/18-10-2012/122499-russia_nuclear_weapons-0/.

200 Isachenkov, "Putin Spending on Military Modernization," [op.cit.](#)

201 Ivana Kottasova, "Russia is buying weapons – a lot of them," CNN Money, December 14, 2014, <http://money.cnn.com/2014/12/14/news/economy/russia-weapons-trade/>.

Modernization Plans

In modernizing, Russia's goal is to improve the survivability of its missiles and their ability to evade missile defenses. As a result, Russia is developing more survivable systems, such as road-mobile ICBMs and new-generation nuclear-powered ballistic missile submarines and SLBMs; testing ICBM payloads designed to penetrate missile defenses; and developing a new heavy ICBM.

Land-Based Ballistic Missiles:

- The RS-20V, RS-18 and RS-12M Topol missiles will be retired by 2024
- By the early 2020s, mobile missiles with multiple independently targetable reentry vehicle (MIRV) capabilities will carry a greater portion of the ICBM warheads (before 2010, all road-mobile missiles carried a single-warhead)
 - a) The road-mobile version of RS-24 introduction to the force is currently underway
- The new Sarmat liquid-fuelled, silo-based, MIRVed missile is intended for deployment beginning in 2020
- Russia is working on a plan for a rail-mobile missile with MIRV, but no decision has been made
- Russia plans to increase – from 35% to 70% by 2022 – the share of the ICBM force equipped with multiple warheads²⁰²

Sea-Launched Ballistic Missiles and SSBNs:

- Russia is currently building eight Borei-class SSBNs intended to replace the Delta III and Typhoon-class submarines. The first was delivered in January 2013, the second in December 2013 and the third is undergoing sea trials. The project is intended for completion in 2015
 - a) Total of 8 new SSBNs are planned with 16 missiles each and each missile carrying 6 warheads (comparatively, current SLBMs usually carry 16 missileseachwitheachmissilecarrying3-4warheads)

202 Hans M. Kristensen and Robert S. Norris, "Russian Nuclear Forces, 2014," Bulletin of Atomic Scientists, Vol. 70, no. 2, March/April 2014, p.76.

b) Problems with the RSM-56 Bulava-30 SLBM have delayed operational service of the Borei-class SSBNs

Strategic Bombers:

- At least 10 Tu-160 bombers will be modernized by 2020, which will include adding a conventional weapon capability
- Russia is developing a new bomber – PAK-DA – that will begin replacing Tu-160 and Tu-95 in the mid-2020s

Nonstrategic Weapons:

- The Iskander M SRBM is currently replacing the Tochka SRBM
- Russia has introduced the new Su-34 fighter-bomber in western military districts with the rest scheduled for introduction by 2015. It will replace the Su-24M.
- An improved version of the Project 885M Yasen-class attack submarine – thought to be equipped with a new long-range, possible nuclear capable sea-launched cruise missile, the Kalibr – is under construction with the first slated for deployment in 2016. The improved version has better sensors and weapons systems and will likely be quieter than the original.²⁰³ Six boats are planned by 2020.

China

China recently began deploying strategic submarines to round out a nuclear triad whose strongest leg consists of a new family of land-based mobile strategic missiles. Some experts estimate that China has 250 warheads in its stockpile. Global Zero estimated 190 warheads in 2010 and projected growth to upwards of 250-300 over the next 10 years.²⁰⁴ Warheads are normally kept at a single central storage facility at Taibai. A few may be forward deployed to the six bases of China's land-based rocket forces, and in the future some

may be forward deployed to Qingdao, home of the submarine fleet, but the most credible public sources indicate that China's land-, air-, and sea-based missiles do not carry nuclear weapons in peacetime.

While concrete information on China's nuclear weapons spending is difficult to ascertain, China does possess the second largest defense budget and is undergoing programs to develop more nuclear weapons capabilities. These efforts include the development of a road-mobile missile with possible multiple independently targetable re-entry vehicle (MIRV) carrying capability and development of new ballistic missile submarines.

Current Nuclear Deployments

Global Zero estimated that China had 190 nuclear warheads in 2010 and would grow to 250-350 warheads over the next ten years. China's current land-based and bomber/cruise missile capabilities are presented in the chart below.

203 Dave Majumdar, "Improved Russian Nuclear Attack Submarine Kazan to Deliver in 2016," USNI News, October 29, 2014, <http://news.usni.org/2014/10/29/improved-russian-nuclear-attack-submarine-kazan-deliver-2016>.

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

Range and Payload of Operational Nuclear Weapons by

Types²⁰⁵

Type	Range (km)	Payload (kg)
Land-based Ballistic Missiles*		
DF-5A ICBM (silo based)	13,000	1 x 4-5 Mt
DF-31 ICBM (road-mobile)	7,200+	1 x 200-300 kt (?)
DF-31A ICBM (road-mobile)	11,200+	1 x 200-300 kt (?)
DF-4 ICBM	5,500	1 x 3.3 Mt
DF-3A MRBM	3,100	1 x 3.3 Mt
DF-21A/21C/21D MRBMs (road-mobile)	1,500+	1 x 200-300 kt
Sea-based Missiles**		
JL-2	7,400+	1 x 200-300 kt (?)
Bombers/Cruise Missiles		
H-6 medium range bomber	3,100	capable of delivering a gravity bomb
H6-K bomber (CJ-10A cruise missile)	4,000-5,000***	Carries 6 ALCMs
Donghai-10 cruise missile ****	1,500+	?

*China possesses dual-capable short-range ballistic missiles, but they are unlikely to be equipped with nuclear warheads.

**China's sea-based nuclear capabilities have advanced significantly over the last few years. Currently, the Navy possesses at least three operational Jin-class submarines, which a U.S. Navy official said is now patrolling with nuclear-armed JL-2 SLBM.

*** "Chinese Air Force Gets More H-6K Strategic Bombers," Defense Update, June 25, 2013, http://defense-update.com/20130625_h-6k-bombers-delivered-to-pla-air-force.html#.VPCVvMZb4IM

**** Donghai-10 cruise missile may have a nuclear capability. See Ian Easton, "Assassin Under the Radar: China's DH-10 Cruise Missile Program," Project 2049, October 1, 2009,

The secrecy surrounding China's nuclear weapons storage sites makes it difficult to estimate where they store their nuclear arsenals. Experts "cautiously estimate" the locations noted below have a nuclear weapons-related role.

205 Information for "Land-based Missiles" and "Ballistic Missile Submarines" from Annual Report to Congress: Military and Security Developments Involving the People's Republic of China 2014, Office of the Secretary of Defense, 2014, http://www.defense.gov/pubs/2014_DoD_China_Report.pdf; and Philip Schell and Hans Kristensen, "China Nuclear Forces," in SIPRI Yearbook 2013: Armaments, Disarmament and International Security, (Oxford: Oxford University Press, 2013), p. 306.

Locations of Bases and Operating Areas²⁰⁶

Region	Base	Weapons Systems
Taibai County, Shaanxi	22 Base (Taibai County); 22 Base Headquarters (City of Baoji)	Central warhead storage; independent organization overseeing nuclear warhead stockpile
Taiyuan	Taiyuan Space Launch Center	Test site for DF-31/31A; possible test site of JL-1/JL-2
Liaoning and Shandong	51 Base (Shenyang area)	Regional storage site: DF-21 and DF-31 SSMs
Anhui, Jiangxi, Zhejiang	52 Base (Huangshan and Tunxi areas)	Regional warhead storage site: DF-15 and DF-21 SSMs
Yunnan, Guangxi	53 Base (Kunming and Liuzhou areas)	Regional warhead storage site: DF-21 SSMs
Henan	54 Base (Luoyang area)	Regional warhead storage site: DF-4/DF-5A and DF-31 SSMs
Hunan	55 Base (Huaihua area)	Regional warhead storage site: DF-5A, DF-31A SSMs
Gansu and Qinghai	56 Base (Xining area)	Regional storage site: DF-21, DF-31/31A SSMs
Shandong	Jianggezhuang NSB area	Possible warhead storage site: JL-1, JL-2 SLBMs
Sichuan	Mianyang	Warhead design
Sichuan	Pingtung area	Nuclear weapons fabrication; possible deep underground storage site
Hainan	Longpo (Yulin) NSB area	Possible warhead storage site: JL-2 SLBMs
Dalian	Xiaopingdao NSB	Test site for JL-1/JL-2
Sichuan	Zitong area	Warhead assembly, disassembly and dismantlement

Nuclear Weapons Related Spending

China has the world's second largest military budget, but real numbers on nuclear weapons spending are scarce. SIPRI estimated China's defense budget in 2013 at \$188 billion dollars – about 9% of global military spending.²⁰⁷

Using SIPRI's estimate and the reasoning used in the Global Zero spending report (based on Brigadier (Ret.) Vijai K. Nair's article which found China's nuclear weapons budget has consistently been 5% of overall defense spending through 2004), the core costs of nuclear weapons for 2013 can be estimated at \$9.4 billion.²⁰⁸

206 Information gathered from Hans M. Kristensen and Robert S. Morris, "Worldwide deployments of nuclear weapons, 2014," *Bulletin of the Atomic Scientists*, Vol. 70, no. 5, September/October 2014, p. 98; Jeffrey Lewis, "Taiyuan Space Launch Center," *Arms Control Wonk* (blog), September 10, 2006, <http://lewis.armscontrolwonk.com/archive/1193/taiyuan-space-launch-center>; Mark A. Stokes, *China's Nuclear Warhead Storage and Handling System*, Project 2049 Institute, March 12, 2010, http://project2049.net/documents/chinas_nuclear_warhead_storage_and_handling_system.pdf; Paton, Podvig and Schell, "China," in *A New START Model for Transparency in Nuclear Disarmament*, op.cit, p. 16.

207 "Military spending continues to fall in the West but rises everywhere else, says SIPRI," *Stockholm International Peace Research Institute press release*, April 14, 2014, http://www.sipri.org/media/pressreleases/2014/Milex_April_2014.

208 Blair and Brown, *Nuclear Weapons Cost Study*, op.cit. based on Nair's estimates found in Brigadier Vijai K Nair, "China's Nuclear Strategy and Its Implications For Asian Security," *China Brief*, Vol 4, Issue 3, February 4, 2004; http://www.jamestown.org/single/?no_cache=1&tx_ttnews%5Btt

Modernization Plans

- Land-based ballistic missiles:
 - a) The U.S. DOD believes China may be developing a new road-mobile ICBM – DF-41 – with possible multiple independently targetable re-entry vehicle (MIRV) carrying capability²⁰⁹
- Sea-based deterrent:
 - a) At least three Type 094 SSBNs are in operational service currently without missiles and China is thought to be constructing two more.²¹⁰
- U.S. Navy leaders report China is currently developing a modernized SSBN and a long-range missile, the JL-3.²¹¹
 - a) An unconfirmed media report claims a sea-launched version of the Donghai (DH-10) appears to be under development, but, again, its nuclear capability is questionable.²¹²
- Bombers
 - a) Upgrades to the H-6 bomber include integration of new stand-off weapons.²¹³

United Kingdom

The U.K. maintains a strategic monad, of four Vanguard-class nuclear powered submarines armed with American-made Trident D-5 missiles and U.K. warheads. At least one submarine is on patrol at any one time in order

[news%5D=26259](#). Nair's estimate is repeated elsewhere in astute scholarly analyses, for instance James Rickard, "Sun Tzu, Nuclear Weapons and China's Grand Strategy", Strategic Insights, Vol. VII, Issue 3 (July 2008);

209 Annual Report to Congress, op.cit., p. 7.

210 Ridzwan Rahmat, "PACOM chief says China will deploy long-range nuclear missiles on subs this year," IHS Jane's 360, <http://www.janes.com/article/35965/pacom-chief-says-china-will-deploy-long-range-nuclear-missiles-on-subs-this-year>.

211 Osborn, "Admiral Says China Outnumbers U.S. in Attack Submarines," [op.cit.](#)

212 J. Michael Cole, "China's Growing Long-Range Strike Capability," The Diplomat, August 13, 2012, <http://thediplomat.com/2012/08/china-growing-long-range-strike-capability/>.

213 Annual Report to Congress, op.cit., p. 9

to ensure a continuous-at-sea deterrent. These submarines carry 48 nuclear warheads on submarine-launched ballistic missiles that are de-targeted and on a low level of alert. It is estimated that there are 225 nuclear warheads in the country's total stockpile. Spending to maintain the current arsenal is estimated \$4.5 billion annually.²¹⁴

Plans for a new fleet of ballistic missile submarines set to be introduced in mid-2020 have been put forward, but there has been no decision made on the estimated £22 billion program (\$35.6 billion).²¹⁵ The government also has a decision to make on warheads – commission development of a replacement or refurbish the existing warheads, which are expected to remain reliable until the late 2030s. Decisions on the future of the nuclear arsenal have been pushed back to 2016 and 2019, respectively.

Current Nuclear Deployments

Nuclear Weapons Numbers by Type²¹⁶

Type	Deployed Warheads	Operational-ly Available Warheads	Total Warheads Stockpile
Trident II D-5 SLBMs	48	<160	~225

At any one time one submarine is on patrol carrying 16 Trident II missiles with up to 48 warheads on "reduced alert" and in "detargeted" mode;²¹⁷ two remain in port and can be

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

215 Paul Ingram, "Measuring the Financial Costs," in Trident Commission Report: Background papers to the Concluding Report, British American Security Information Council, July 2014, http://www.basicint.org/sites/default/files/trident_commission_background_papers.pdf, p. 20.

216 Shannon N. Kile and Hans M. Kristensen, "British Nuclear Forces," in SIPRI Yearbook 2013: Armaments, Disarmament and International Security, (Oxford: Oxford University Press, 2013), pp. 300-301.

217 It is unclear exactly what is meant by de-targeting submarine missiles because they are normally dormant in their tubes with their guidance gyroscopes turned off even during periods of high alert sea

quickly deployed; and the fourth is in overhaul. The U.K. currently leases the Trident II D-5 missiles from the United States under “mingled asset” ownership, a system wherein the U.S. randomly selects missiles from the stockpile in Kings Bay, Georgia and transports them to the Royal Navy Base in Scotland where they are fitted with UK-designed and manufactured warheads (similar to the US W76).²¹⁸

Location of Bases and Operating Areas²¹⁹

Region	Base	Weapons Systems
England	Aldermaston Atomic Weapons Establishment	Warhead design; possible few warheads
Berkshire, England	Burghfield Atomic Weapons Establishment	Warhead assembly, disassembly and dismantlement
Scotland	Coulport Royal Navy Ammunition Depot	National-level warhead storage site
Scotland	Faslane Royal Navy Base	Warheads and Trident II D-5 SLBMs on deployed Vanguard-class SSBNs

Nuclear Weapons Related Spending

The Global Zero nuclear weapons cost study estimated core spending on nuclear weapons for the United Kingdom at

patrol. Once they receive orders to fire, the gyros can be spun up and targeting data fed into the computers in 12 minutes and then firing can commence immediately.

218 United Kingdom Ministry of Defence and the Foreign & Commonwealth Office, “Fact Sheet 4: The Current System,” <http://fas.org/nuke/guide/uk/doctrine/sdr06/FactSheet4.pdf>.

219 Hans M. Kristensen and Robert S. Morris, “Worldwide deployments of nuclear weapons, 2014,” *Bulletin of the Atomic Scientists*, Vol. 70, no. 5, September/October 2014, p. 98.

\$4.5 billion in 2011.²²⁰ Decisions on modernization programs were postponed to 2016 (see below) making nuclear weapons spending up to the present relatively stable. Annual spending should increase starting in 2016 and potentially lasting into the mid-2020s as decisions on a Trident submarine successor program and nuclear warheads replacement are made.

A report by the British American Security Information Council (BASIC) estimates the annual cost to maintain the current system and construct four replacement submarines from 2016-2062 at 9% of the defense budget, or £2.9 billion (\$4.7 billion). At its peak in the mid-2020s, the U.K. will spend around £4 billion (\$6.5 billion) per year.²²¹

Estimates for individual modernization programs are included below.

Stockpile Changes

The U.K.’s stockpile is scheduled to decrease to approximately 180 warheads by the mid-2020s.²²² The number of operationally available warheads will be reduced to around 120 and each deployed submarine will only carry 8 operational missiles (down from 16) and a total of 40 warheads. The average number of warheads on each missile will most likely increase from three to five.²²³

Modernization Plans

The U.K. government proposed a plan for replacing the Vanguard-class submarines with a new fleet of three or four subs scheduled for introduction in 2028 with a lifespan to carry

220 Blair and Brown, *Nuclear Weapons Cost Study*, op.cit.

221 Ingram, “Measuring the Financial Costs,” op.cit., p. 23.

222 Ministry of Defense and The Rt. Hon. Michael Fallon MP, “Working towards nuclear disarmament,” U.K. Ministry of Defense, December 12, 2012, <https://www.gov.uk/government/policies/working-towards-nuclear-disarmament>.

223 Hans M. Kristensen and Robert S. Norris, “British Nuclear Forces, 2011,” *Bulletin of Atomic Scientists*, vol. 67, issue 5, September/October 2011, pp. 90-91.

it through to 2058. The government has debated over various issues concerning a new fleet including the number of nuclear submarines to build and whether or not even having nuclear submarines is necessary. The BASIC report conservatively estimated the total cost of the plan at £22 billion (about \$35.6 billion).²²⁴ A recent government report states current projected costs are still within estimates from the 2006 White Paper – £15-20 billion (\$23-31 billion) in which the program was initially proposed.²²⁵ The government confirmed costs to maintain the fleet once in service will be 5-6% of the defense budget, similar to the current level of maintenance.²²⁶

The Trident nuclear warhead is expected to remain reliable up to the late 2030s, so the government has time to explore options. There are two main options: refurbish the existing warheads or develop a replacement. Because the US supplies the U.K. with most of the non-nuclear components needed for the arsenal and the U.K. nuclear warhead is a copy of the U.S. equivalent, the future of the UK's warhead plans is partly dependent on the U.S.'s plans for modernization. The U.K. bought into the U.S. life-extension plan for the Trident D-5 missile, which would maintain the missiles up to 2042, at £250 million (approximately \$390 million).²²⁷ Cost estimates for refurbishing or replacing the warheads are between £2.3 billion and £3.5 billion (\$3.7 billion and \$5.7 billion).²²⁸

224 Ingram, "Measuring the Financial Costs," op.cit., p. 20.

225 Claire Mills and Louisa Brooke-Holland, *The Trident Successor Program: An Update*, U.K. House of Commons Library, Standard Note SN06526, January 15, 2015, p. 9.

226 David Cameron, "David Cameron: We need a nuclear deterrent more than ever," *The Telegraph*, April 3, 2013, <http://www.telegraph.co.uk/news/politics/david-cameron/9969596/David-Cameron-We-need-a-nuclear-deterrent-more-than-ever.html>.

227 Dr. Kate Hudson, "The Government Is Sidestepping Parliament in a Push for Trident Replacement," *Huffington Post Politics*, January 21, 2014, http://www.huffingtonpost.co.uk/dr-kate-hudson/trident-replacement_b_6197760.html.

228 "Trident Nuclear Weapon Submarines in the United Kingdom and the United States," *British American Security Information Council Brief*, November 2013, http://www.basicint.org/sites/default/files/basic_trident_briefing_nov2013.pdf.

A final decision on whether or not to move forward with the main investment in the new nuclear submarine program has been pushed back to 2016 after the next general election. The final decision on the nuclear warheads has been pushed back until 2019.

Infrastructure

In November 2010, France and the United Kingdom signed the Teutates agreement, which committed them to investing in a new joint warhead simulation facility at Valduc scheduled to open in 2015.²²⁹ The facility will be used to verify performance and analyze new nuclear warhead designs through hydrodynamic tests. A joint Technology Development Centre at Aldermaston in the U.K. will also be built under the agreement in order to develop simulation technology for Valduc.

France

France maintains a nuclear dyad of submarines and aircraft with its fleet of submarines serving as the backbone of the arsenal. Its stockpile consists of fewer than 300 operational nuclear warheads, some of which are on a low level of alert. All are said to be "de-targeted." There are no weapons in reserve. France is modernizing its forces and changing their composition, but not their size. It's outfitting the submarine fleet with new missiles and a new warhead, and replacing the last of its aging Mirage aircraft. France's arsenal has plateaued in size; no further reductions in the number of warheads are expected anytime soon.²³⁰ Spending was estimated by Global Zero to be \$4.7 billion in 2011 and is not expected to differ much from year to year.²³¹

229 "UK-France Summit 2010 Declaration on Defence and Security Co-operation," Prime Minister's Office, November 10, 2010, <https://www.gov.uk/government/news/uk-france-summit-2010-declaration-on-defence-and-security-co-operation>.

230 Hans Kristensen, "France," in *Assuring Destruction Forever: Nuclear Weapon Modernization Around the World*, ed. Ray Acheson, Reaching Critical Will of the Women's International League for Peace and Freedom, 2012, http://fas.org/programs/ssp/nukes/publications1/Article2012_France.pdf.

231 Bruce G. Blair and Matthew A. Brown, *Nuclear Weapons Cost*

Current Nuclear Deployments

France maintains four ballistic missile nuclear submarines, in order to maintain one of them at sea on patrol at all times. A second sub is able to be surged to sea within a day or so. The subs can carry up to 16 M51.1 SLBMs, which are replacing all remaining M45 SLBMs by 2018. The air-based leg of the nuclear dyad is made up of Mirage 2000N and Rafale aircraft carrying medium range air-to-surface missiles

Nuclear Weapons Numbers by Type (2013)²³²

Type	Deployed	Warheads
Mirage 2000N land-based aircraft	~20	~20
Rafale F3 land-based aircraft	~20	~20
Rafale M F3 land-based aircraft	~10	~10
M45 SLBM	32	160
M51.1 SLBM	16	80
Total		~290

Locations of Bases and Operating Areas²³³

Region	Base	Weapons Systems
Centre	Avord AB	TNAs, ASMPAs, ALCM
Bourgogne	Centre d'Etudes de Valduc (Lery, north of Dijon)	TN75, TNAs, TNOs
Bretagne	Ile Longue NSB	4 SSBNs, TN75, TNO (from 2015), M45 and M51 SLBMs

Study, Global Zero Technical Report, June 2011.

232 Philip Schell and Hans M. Kristensen, "French Nuclear Forces," in SIPRI Yearbook 2013: Armaments, Disarmament and International Security, (Oxford: Oxford University Press, 2013), p. 304.

233 Kristensen and Morris, "Worldwide deployments of nuclear weapons, 2014," pp. 98-99.

Provence	Istres AB	TNAs, ASMPAs, ALCMs
Champagne-Ardenne	Saint-Dizier AB	TNAs, ASMPAs, ALCMs
Bretagne	Saint-Jean, south of Ile Longue	TN75 (TNO from 2015)
North of Dijon	Valduc Center for Nuclear Studies	warhead production and maintenance

Stockpile Changes

In 2008, France announced a one-third reduction of its airborne nuclear warheads. That reduction dropped the number of nuclear weapons to less than 300.²³⁴ France remains committed to maintaining a strategic dyad of SLBMs and air-to-surface missiles in order to ensure a credible minimum deterrent.

Nuclear Weapons Related Spending

The 2011 Global Zero study projected France would spend \$4.7 billion on core nuclear costs in 2011.²³⁵ French nuclear expert Bruno Tertrais reports that costs for maintenance and modernization of the nuclear deterrent are about 10 percent of the country's total defense budget, which has been more than \$40 billion in recent years.²³⁶

Modernization Plans

France is in the final phase of modernizing its nuclear forces, which is intended to extend the arsenal into the 2050s.

Submarine-Launched Ballistic Missiles. France is current-

234 "France to reduce nuclear warheads," BBC News, March 21, 2008, <http://news.bbc.co.uk/2/hi/europe/7308563.stm>.

235 Blair and Brown, Nuclear Weapons Cost Study, op.cit.

236 Bruno Tertrais, "Strategic Posture Review: France," World Politics Review, July 16, 2013, <http://www.worldpoliticsreview.com/articles/13091/strategic-posture-review-france>.

ly replacing the M-45 missile with the new M-51.1 SLBM, which has greater range, accuracy and payload capacity. As of 2013, two of the country's submarines – Le Terrible and Le Vigilant – were equipped with up to 16 M-51.1 SLBMs.

A second version – the M51.2 – is being developed and is planned for induction into service starting in 2015. The M51.2 will carry the new TNO (Tête Nucléaire Océanique) warhead replacing the current TN75 warhead. The overhaul of all four submarines is scheduled for completion by 2018.

There is also mention of development of the M51.3 in an official parliamentary document for commissioning in 2020.²³⁷

French SSBN missile and warhead modernization²³⁸

SSBN Name	2008 Missile/Warhead	2015 Missile/Warhead	2018 Missile/Warhead
Le Triomphant	M45/TN75	M51.1/TN75	M51.2/TNO
Le Vigilant	M45/TN75	M51.2/TNO	M51.2/TNO
Le Terrible	M51.1/TN75	M51.1/TN75	M51.2/TNO
Le Téméraire	M45/TN75	M45/TN75	M51.2/TNO

Aircraft. The French will replace the Mirage 2000Ns with Rafales in 2018. All the aircraft will continue to be equipped with Air-Sol Moyenne Portée Amélioré (ASMP-A, Medium-Range Air-to-Surface-Improved) missile armed with TNA, a thermonuclear warhead.

Infrastructure. In November 2010, France and the United Kingdom signed the Teutates agreement, which committed

237 Jean-Marie Collin, “The M51 Missile Failure: Where Does This Leave French Nuclear Modernization?,” British American Security Information Council (blog), June 27, 2013, <http://www.basicint.org/blogs/2013/06/m51-missile-failure-where-does-leave-french-nuclear-modernization>.

238 Kristensen, “France,” op.cit.; Collin, “The M51 Missile Failure: Where Does This Leave French Nuclear Modernization?,” op.cit.

them to investing in a new joint warhead simulation facility at Valduc scheduled to open in 2015. The facility will be used to study performance of new warhead designs to “ensure long-term viability, security and safety.”²³⁹ A joint Technology Development Centre at Aldermaston in the U.K. will also be built under the agreement in order to develop simulation technology for Valduc.

Pakistan

Pakistan operates a strategic nuclear dyad of land-based missiles and nuclear-capable fighter jets. Pakistan has 125 nuclear weapons, which are stored in a de-mated state (delivery vehicles kept separate from nuclear warheads).

Pakistan continues to grow its nuclear weapons arsenal and is considered by U.S. officials to have the fastest growing nuclear weapons program.²⁴⁰ Global Zero estimates that over the next 5-10 years, the Pakistani nuclear arsenal will grow to 250-350 weapons.²⁴¹ Pakistan is developing and plans to build an arsenal of short-range ballistic missiles that can be used on the battlefield. There are also reports of Pakistani development of a sea-launched cruise missile, but there is no indication of work on developing ballistic missiles submarines. Pakistan is also investing in expanding its plutonium production. These programs indicate a willingness to spend a significant amount of Pakistan's limited resources on nuclear weapons-related programs.

239 “UK-France Summit 2010 Declaration on Defence and Security Co-operation,” Prime Minister's Office, November 10, 2010, <https://www.gov.uk/government/news/uk-france-summit-2010-declaration-on-defence-and-security-co-operation>.

240 David Albright, Paul Brannan, and Robert Kelley, “Pakistan Expanding Dera Ghazi Khan Nuclear Site: Time for U.S. to Call for Limits,” ISIS Imagery Brief, Institute for Science and International Security, May 19, 2009; <http://www.isis-online.org/publications/southasia/PakistanExpandingCPC.pdf>.

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

Current Nuclear Deployments

Pakistan currently has 125 nuclear weapons in its arsenal.²⁴² Fissile material estimates indicate Pakistan has about 2,600 kilograms of highly enriched uranium – enough for 160-240 nuclear warheads.²⁴³

Range and Payload of Nuclear Weapons by Types²⁴⁴

Type	Range (km)	Payload (kg)
Shaheen I SRBMs	650	750-1,000
Ghaznavi SRBMs	290	500
Ghauri MRBMs	>1,200	700-1,000
F-16A/B Aircraft	1,600	4,500
Mirage V Aircraft (possibly nuclear-capable)	2,100	4,000

Location of Bases and Operating Areas²⁴⁵

Region	Base	Weapons Systems
Balochistan	Khuzdar Depot	Potential underground nuclear warhead storage
Khyber Pakhtunkhwa	Tarbala Underground Complex	Potential underground nuclear warhead storage
Punjab	National Defense Complex (Fatehjang)	SSM launcher assembly and potential nuclear warhead storage
	Sargodha Depot	Potential storage site of bombs for F-16s and warheads for SSMs
	Shanka Dara Missile Complex	SSM development and potential nuclear warhead storage
	Wah Ordnance Facility	Potential warhead production, disassembly and dismantlement facility
Sindh	Masroor Depot (Karrachi)	Potential storage site of bombs for Mirage Vs and warheads for SSMs

²⁴² Ibid.

²⁴³ Hans M. Kristensen and Robert S. Morris, "Pakistan's Nuclear Forces, 2011," *Bulletin of Atomic Scientists*, July/August 2011, vol. 67, no. 4, p. 91.

²⁴⁴ Philip Schell and Hans Kristensen, "Pakistani Nuclear Forces," in *SIPRI Yearbook 2013: Armaments, Disarmament and International Security*, (Oxford: Oxford University Press, 2013), p. 318.

²⁴⁵ Hans M. Kristensen and Robert S. Morris, "Worldwide deployments of nuclear weapons, 2014," *Bulletin of the Atomic Scientists*, Vol. 70, no. 5, September/October 2014, pp. 98-99.

Nuclear Weapons Related Spending

Pakistan's nuclear weapons budget is kept secret from the public. Expert analysis determined that Pakistan spends approximately 10% of its defense budget on its nuclear forces.²⁴⁶ According to the Global Zero Nuclear Weapons Cost Study, this would place the estimated core costs of Pakistan's nuclear weapons at \$800 million and full costs at \$2 billion for 2011.²⁴⁷

Stockpile Changes and Modernization Plans

Pakistan continues to grow and develop its nuclear weapons arsenal investing in new missiles including tactical nuclear missiles, and upgrades to nuclear-capable aircraft.

Land-Based Missiles. Pakistan is developing tactical nuclear weapons for use in the battlefield. Battlefield nuclear weapons require local commanders to have authority and capability to arm and launch nuclear weapons, however Pakistan continues to maintain that launch authority will remain in the hands of officials at the highest level.²⁴⁸

Type	Range (km)	Payload (kg)	Last Test Launch
Shaheen II	2,500	~1,000	November 13, 2014
Sheehan III	2,750	n/a	March 9, 2015
Abdali	~180	200-400	February 15, 2013
Nasr*	~60	n/a	September 26, 2014
Babur cruise missile**	600	400-500	September 17, 2012

*The Nasr is intended for use before a strategic nuclear exchange²⁴⁹

246 Ansar Abbasi, "Real figure of defense budget", Pakistan Defense, June 12, 2010; <http://www.defence.pk/forums/economy-development/61520-real-figure-defence-budget-675-bn.html>; Gregory S. Jones, "Pakistan's 'Minimum Deterrent' Nuclear Force Requirements", in Pakistan's Nuclear Future: Worries Beyond War, ed. Henry D. Sokolski, Strategic Studies Institute, January, 2008.

247 Core costs refer to researching, developing, procuring, testing, operating, maintaining, and upgrading the nuclear arsenal (weapons and their delivery vehicles) and its key nuclear command-control-communications and early warning infrastructure; full costs add unpaid/deferred environmental and health costs, missile defenses assigned to defend against nuclear weapons., nuclear threat reduction and incident management. Bruce G. Blair and Matthew A. Brown, Nuclear Weapons Cost Study, Global Zero Technical Report, June 2011.

248 Elaine M. Grossman, "Pakistani Leaders to Retain Nuclear-Arms Authority in Crises: Senior Official," Global Security Newswire, February 27, 2014, <http://www.nti.org/gsn/article/pakistani-leaders-retain-nuclear-arms-authority-crises-senior-official/>.

249 Hans M. Kristensen "Nuclear Weapons Modernization: A Threat to the NPT?" Arms Control Today, May 2014, http://armscontrol.org/act/2014_05/Nuclear-Weapons-Modernization-A-Threat-to-the-NPT.

**Sea and air-launched versions reportedly under-development²⁵⁰

Aircraft. The F-16A/B combat aircraft is thought to have previously had a nuclear capable role, but whether or not it currently holds this role is unclear. These aircraft recently went through a mid-life upgrade with Turkish Aerospace Industries delivering the last batch of upgraded F-16s to Pakistan in early September 2014. The U.S. earmarked \$477 million of the Foreign Military Financing for Pakistan for up to 60 mid-life update kits valued at \$897 million.²⁵¹ The remaining balance came from Pakistan national funding.

Pakistan is also developing an air-launched cruise missile, the Ra'ad, with a range of 350 kilometers. The most recent test launch was February 2, 2015.

Sea-Launched Ballistic Missiles. In May 2012, Pakistan announced the establishment of the Headquarters of the Naval Strategic Force Command stating that it will play a key role in providing Pakistan with a second-strike capability.²⁵² Aside from expert assessments that Pakistan is developing a sea-launched version of the Babur cruise missile, there is little information on specific plans for a sea-based deterrent.

In April 2015, Prime Minister Sharif announced the approval of a deal to buy eight submarines that could be fitted with nuclear missiles. The deal is estimated to cost \$4-5 billion.²⁵³

Infrastructure. Experts believe that highly enriched uranium

250 Usman Ansari, "Experts Wary of Pakistan Nuke Claims," *Defense News.com*, May 26, 2012, <http://archive.defensenews.com/article/20120526/DEFREG03/305260001/Experts-Wary-Pakistan-Nuke-Claims>.

251 Congressional Research Service, "Major U.S. Arms Sales and Grants to Pakistan Since 2001," March 26, 2014, <http://fas.org/sgp/crs/row/pakarms.pdf>.

252 "Naval Chief Inaugurates Naval Strategic Force Headquarters," *Inter Services Public Relations Press Release*, May 19, 2012, https://www.ispr.gov.pk/front/main.asp?o=t-press_release&date=2012/5/19.

253 "Pakistan PM approves deal to buy eight Chinese submarines – official," *Reuters*, April 2, 2015, <http://in.reuters.com/article/2015/04/02/china-pakistan-idINKBN0MT06120150402>.

is used in current warhead designs, but Pakistan is reportedly expanding its plutonium production capabilities. The plutonium production complex at Khushab, Punjab currently contains four heavy water reactors, the last of which reportedly became operational in early 2015.²⁵⁴ Pakistan is also working on upgrades of their uranium-enrichment and spent fuel-reprocessing facilities.

India

India is close to acquiring a fully operational nuclear triad consisting of land-based missiles, sea-launched missiles, and fighter aircraft. The indigenously developed ballistic missile submarine is now undergoing sea-trials and is scheduled for active duty in 2016. Nuclear weapons are currently stored in a de-mated state, but some are "near-mated" and have the ability to be assembled quickly if needed. Some experts estimate that India has between 90 and 110 nuclear warheads, but this may be an overestimate that reflects the uncertainties that surround India's program.

India is currently increasing their nuclear stockpiles and developing more sophisticated nuclear systems, including the aforementioned submarine, new land-based ballistic missiles with increased range and increased payload capacity, and new fighter jets. As a result, India planned to increase their defense budget proposing a 10% increase in spending in 2014.²⁵⁵

Current Nuclear Deployments

Experts estimate that India has produced 520 kilograms of weapons-grade plutonium – enough for 100-130 nuclear warheads – but not all has been converted to nuclear war-

254 David Albright and Serena Kelleher-Vergantini, "Pakistan's Fourth Reactor at Khushab Now Appears Operational," *Institute for Science and International Security*, January 16, 2015. http://isis-online.org/uploads/isis-reports/documents/Khushab_January_2015_reactor_four_operational_FINAL.pdf.

255 Vivek Raghuvanshi, "India Proposes 10% Budget Increase; 3.3% Boost for Procurement," *Defense News*, February 17, 2014 <http://www.defensenews.com/article/20140217/DEFREG03/302170025/India-Proposes-10-Budget-Increase-3-3-Boost-Procurement>.

heads.²⁵⁶ India stores its nuclear weapons with the fissile core separate from the warhead package.

Nuclear Weapons Yield and Payload by Type²⁵⁷

Type	Range (km)	Payload (kg)
Mirage 2000H Fighter Bomber	1,850	6,300
Jaguar IS/IB	1,600	4,775
Prithvi I/II	150/350	800/500
Agni I	~700	1,000
Agni II	2,000	1,000

Location of Bases and Operating Areas²⁵⁸

Region	Base	Weapons Systems
Punjab	Chandigarh Plant	Potential warhead production
Rajasthan	Jodhpur facility	Potential Prithvi and Agni SSM and warhead storage site
Unknown	Unknown Air Force storage facility	Potential use by Jaguar IA and Mirage 2000H
Unknown	Unknown Army storage facility	Potential use by Prithvi and Agni
Unknown	Unknown Navy storage facility	Potential use by Dhanush ship-launched SSMs

256 Hans M. Kristensen and Robert S. Norris, "Indian Nuclear Forces, 2012," *Bulletin of Atomic Scientists*, Vol. 68, No. 4, July/August 2012, p. 96.

257 Shannon N. Kile and Hans Kristensen, "Indian Nuclear Forces," in *SIPRI Yearbook 2013: Armaments, Disarmament and International Security*, (Oxford: Oxford University Press, 2013), p. 311.

258 Hans M. Kristensen and Robert S. Morris, "Worldwide deployments of nuclear weapons, 2014," *Bulletin of the Atomic Scientists*, Vol. 70, no. 5, September/October 2014, p. 99.

Nuclear Weapons Related Spending

The Global Zero 2011 cost study estimated India's nuclear weapons budget would be \$3.8 for core costs, and \$4.9 billion for full costs based on the assumption that India's nuclear spending would not exceed 10 percent of its defense budget.²⁵⁹

In 2014, India proposed a 10% increase in defense spending for the year and a 3.28% boost in new weapon spending. Reports cite the increase in India's overall defense spending as indication of its growing nuclear weapons arsenal and probable growing nuclear weapons budget.²⁶⁰

Stockpile Changes and Modernization Plans

India is currently increasing its nuclear stockpiles and developing more sophisticated nuclear systems. They are getting closer to fielding a full nuclear triad with the incorporation of an indigenously made nuclear submarine.

Land-Based Missiles. India has several land-based missiles in development with longer ranges that will enable India to reach cities in eastern China for the first time.²⁶¹

259 Core costs refer to researching, developing, procuring, testing, operating, maintaining, and upgrading the nuclear arsenal (weapons and their delivery vehicles) and its key nuclear command-control-communications and early warning infrastructure; full costs add unpaid/deferred environmental and health costs, missile defenses assigned to defend against nuclear weapons, nuclear threat reduction and incident management. Bruce G. Blair and Matthew A. Brown, *Nuclear Weapons Cost Study*, Global Zero Technical Report, June 2011.

260 Raghuvanshi, "India Proposes 10% Budget Increase; 3.3% Boost for Procurement," op.cit.

261 Zachary Keck, "India's Agni-V ICBM to Carry Multiple Nuclear Warheads," *The Diplomat*, May 31, 2013, <http://thediplomat.com/2013/05/indias-agni-v-icbm-to-carry-multiple-nuclear-warheads/>.

Type	Range (km)	Payload (kg)	Last Test Launch
Agni III*	~3,000	1,500	Sep 21, 2012; reports of test fire in April 2015**
Agni IV	~4,000	1,000	Dec 2, 2014
Agni V	>5,000	?	January 31, 2015
Agni VI***	>6,000	?	still in development

*Inducted into service, but not yet fully operational.

** Hemant Kumar Rout, "India to Test Fire Three Missiles This Month," The New Indian Express, April 2, 2015, <http://www.newindianexpress.com/nation/India-to-Test-Fire-Three-Missiles-This-Month/2015/04/04/article2747203.ece>.

***Reportedly a multiple independently targetable re-entry vehicles (MIRV) that would be able to carry 4-6 warheads.²⁶²

Sea-Launched Missiles and Nuclear Submarines. India is poised to complete its nuclear triad by deploying its home-made nuclear submarine – the INS Arihant – that can purportedly hold four K-4 missiles or 12 K-15 missiles. The submarine is currently undergoing sea trials and is scheduled to go into active duty in 2016. Recently, the government approved plans to build 13 new ships including 6 new nuclear submarines, at a total cost of \$16 billion.²⁶³ Plans indicate that the ships will come into service in the 2020s. Missiles are also being developed.

Type	Range (km)	Payload (kg)	Last Test Launch
Dhanush	350	500	April 9, 2015

262 T.S. Subramanian, "Agni-VI all set to take shape," The Hindu, February 4, 2013 <http://www.thehindu.com/news/national/agnivi-all-set-to-take-shape/article4379416.ece>

263 Akhilesh Pillalamarri, "Watch Out, China: India Is Building 6 Nuclear Attack Submarines," The National Interest, February 18, 2015, <http://nationalinterest.org/blog/the-buzz/watch-out-china-india-building-6-nuclear-attack-submarines-12276>.

Sagari-ka/K-15*	700	700	Jan 27, 2013
Nirbhay**	1,000	?	Oct 17, 2014
K-4	>3,000	?	March 24, 2014

*Slated to be integrated with INS Arihant; will undergo sea-launched tests after Arihant is operational

**Possible nuclear capability reported by news media²⁶⁴

Aircraft. India's Mirage 2000H force is currently undergoing an upgrade scheduled for completion in 2021 at the cost of \$2.2 billion for 49 aircraft.²⁶⁵ The Jaguar IA/IB forces are also undergoing upgrades scheduled for completion in December 2017.

India also has plans to buy 126 Rafale fighter jets from France, who uses them in a nuclear strike capacity. Contract negotiations have been marred with missed deadlines, but are still in progress with total costs estimated at \$12 billion (with some media reports posting it as \$15-20 billion).²⁶⁶

Infrastructure. India plans to expand the Rare Materials Plan in Karnataka where it enriches uranium. Plans are also in motion for a second uranium enrichment facility and two plutonium production reactors.²⁶⁷ One will be housed at the new Bhabha Atomic Research Centre near Visakhapatnam

264 Shannon N. Kile and Hans M. Kristensen, "Indian Nuclear Forces," [op.cit.](http://op.cit), p. 322.

265 Neelam Mathews, "Indian Air Force Mirage 2000 Upgrade Progresses Despite Groundings," AIN online, September 19, 2014, <http://www.ainonline.com/aviation-news/defense/2014-09-19/indian-air-force-mirage-2000-upgrade-progresses-despite-groundings>.

266 Agence France-Presse, "India Talks to Buy French Fighter Jets Still On, Minister Says," Defense News, August 13, 2014, <http://www.defensenews.com/article/20140813/DEFREG01/308130021/India-Talks-Buy-French-Fighter-Jets-Still-Minister-Says>; "India, France once again try to clear hurdles in path of Rafale deal," The Times of India, February 25, 2015, <http://timesofindia.indiatimes.com/india/India-France-once-again-try-to-clear-hurdles-in-path-of-Rafale-deal/articleshow/46363653.cms>.

267 Sanjay Jog, "Priority is to remove irrational fears about radiation: Ratan Kumar Sinha," Business Standard, May 10, 2012, http://www.business-standard.com/article/economy-policy/priority-is-to-remove-irrational-fears-about-radiation-ratan-kumar-sinha-112051002008_1.html.

on the east coast.

Israel

Israel maintains a policy of nuclear opacity and has neither confirmed nor denied possession of a nuclear weapons arsenal. Based on unofficial data from open sources, Israel is estimated to have approximately 80 non-deployed atomic and hydrogen nuclear warheads with enough fissile material for 100-200 more. Israel reportedly maintains a nuclear dyad of ground-launched ballistic missiles and bombers. There is speculation that Israel has modified anti-ship missiles to carry nuclear warheads.

Current Nuclear Deployments

Nuclear Weapons by Type²⁶⁸

Type	Range (km)	Payload (kg)
Jericho II MRBMs	1,500-1,800	750-1,000
F-16 A/B/C/D/I Falcon	1,600	5,400
Harpoon cruise missile*	?	?

*There is speculation that Israel might have modified the Harpoon anti-ship missiles to carry a nuclear warhead.²⁶⁹

268 Philip Schell and Hans Kristensen, "Israeli Nuclear Forces," in SIPRI Yearbook 2013: Armaments, Disarmament and International Security, (Oxford: Oxford University Press, 2013), p. 322.

269 Robert S. Norris, William M. Arkin, Hans M. Kristensen and Joshua Handler, "Israeli Nuclear Forces, 2002," Bulletin of Atomic Scientists, Vol. 58, No. 5, September 2002, p. 75.

Location of Bases and Operating Areas ²⁷⁰

Region	Base	Weapons Systems
Unknown	Sdot Micha missile base	25-50 Jericho II SSMs
Unknown	Nevatim AB	Gravity bombs potentially at base or at remote depot; F-16A/B fighter-bombs stationed
Unknown	Tel Nof AB	Gravity bombs potentially at base or at remote depot; F-16 I and F-15 I fighter-bombers stationed
Unknown	Dimona site	Negev Nuclear Research Center; Plutonium, tritium and warhead production

Nuclear Weapons Related Spending

Reports on Israeli nuclear weapons spending refer to Global Zero's study, which places the number at \$1.9 billion for 2010 and 2011 (est.).²⁷¹

Some of the cost of Israel's nuclear arsenal is covered under foreign aid including the cost to buy 19 F-35s, which are nuclear capable. The deal with the U.S. was set at \$2.75 billion, however it will be paid in whole using U.S. Foreign Military Financing.²⁷²

Stockpile Changes and Modernization Plans

Israel is generally thought to be increasing their stockpile. Reported Israeli nuclear weapons modernization plans include:

- Planning for the Jericho III, a long-range ballistic missile
 - a) Test-launched in January 2008, but current status unknown²⁷³
- Nuclear capable F-35 Joint Strike Fighters: Israel has ordered 19 F-35 Joint Strike Fighter from the U.S. and plans to order up to 75 more; the F-35s are scheduled to be delivered between 2016-2017²⁷⁴
- Israeli Dolphin-class submarines may have been modified to carry nuclear armed cruise missiles (as a result some experts claim that Israel has a full nuclear triad)
- a) Fielding Submarine-Launched Cruise Missiles – Popeye Turbo or Harpoon missiles; media outlets report on this, but officials have denied it²⁷⁵

²⁷⁰ Hans M. Kristensen and Robert S. Morris, "Worldwide deployments of nuclear weapons, 2014," Bulletin of the Atomic Scientists, Vol. 70, no. 5, September/October 2014, p. 99.

²⁷¹ Bruce G. Blair and Matthew A. Brown, Nuclear Weapons Cost Study, Global Zero Technical Report, June 2011.

²⁷² Jeremy M. Sharp, "U.S. Foreign Aid to Israel," Congressional Research Service, April 11, 2014, p. 7.

²⁷³ Philip Schell and Hans Kristensen, "Israeli Nuclear Forces," [opt.cit.](#)

²⁷⁴ "Factbox: the 11 countries expected to buy F-35 fighter jet," Reuters, June 5, 2014 <http://www.reuters.com/article/2014/06/05/us-lockheed-martin-canada-f35-orders-idUSKBN0EG2XD20140605>.

²⁷⁵ Hans M. Kristensen, "Nuclear Weapon Modernization Programs of Nuclear-Armed States," (Federation of American Scientists Presentation to Side Event on Nuclear Weapon Modernizations, Third Preparatory Committee Meeting for the Nuclear Non-Proliferation Treaty. United Nations, New York, May 1, 2014), http://fas.org/programs/ssp/nukes/publications1/Brief2014_PREPCOM1.pdf.

North Korea

North Korea operates a highly secretive nuclear weapons program. Recent expert analysis places North Korea's nuclear weapons stockpile at 10-16 weapons and its ballistic missile force at 1,000 missiles. Over the past five years, North Korea is believed to have made some significant advances including the reported miniaturization of a nuclear warhead and possible work on sea-based ballistic missiles. There are, however, still questions as to the operational capabilities of some classes of missiles, specifically the longer-range classes. With a military budget of 25 percent of its GDP, it is clear North Korea places priority on defense spending. Global Zero estimated the small, impoverished country would spend \$400 million on its nuclear weapons program in 2011.²⁷⁶

New reports by the US-Korea Institute project that if North Korea increases its current rate of development of nuclear weapons over the next five to ten years, its stockpile could swell to 100 weapons by 2020 and the average yield of these weapons could increase to 20 or more kilotons with an ever-increasing number possessing a yield of 50 kilotons.²⁷⁷ These improvements in warhead numbers and capacity could be coupled with substantial advances that would allow for the deployment of battlefield and tactical weapons.

Progress 2009-2014. North Korea has made some significant progress in their nuclear weapons program over the past five years not just in developing nuclear warheads, but also in developing delivery vehicles including initial work on road-mobile intercontinental ballistic missiles and possibly sea-based cruise and ballistic missiles. Expansion and modernization of their infrastructure has also led to improvements in fissile material production.

Successful missile and weapons tests are advertised by the North Korean government as proof of its developing nuclear weapons program, but not all missiles in its nuclear force have been proven to possess the operational capabilities necessary for deployment, specifically the longer-range missiles. The successful test of the Unha-3 SLV three-stage rocket in December 2012 showed that Pyongyang was capable of developing an operational long-range missile, which uses technology similar to that of Unha-3 SLV. Ultimately, the missile test program has yet to prove the successful development of a fully operational long-range missile.

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

277 Joel S. Wit and Sun Young Ahn, North Korea's Nuclear Futures: Technology and Strategy, US-Korea Institute at SAIS, 2015, <http://38north.org/wp-content/uploads/2015/02/NKNF-NK-Nuclear-Futures-Wit-0215.pdf>, p. 8.

Nuclear Weapons-Related Tests, 2009-2014²⁷⁸

Date	Test	Notes
April 5, 2009	Unha-2 SLV, three-stage rocket	Failed; First stage lands in the Sea of Japan, last two stages and payload fall into Pacific Ocean
May 2009	2nd Nuclear Test	Estimated yield of 2-8 kilotons
July 2009	Nodong	Launched into Sea of Japan
April 2012	Unha-2 SLV	Failed to reach orbit
December 12, 2012	Unha-3 SLV, three-stage rocket	Successful, may have placed satellite into orbit
February 12, 2013	3rd Nuclear Test	Initial estimated yield of 6-7 kilotons
May 2013	KN-02 SRBM	6 rockets tested off the east coast
March 21, 2014	KN-02 SRBM	30 rockets tested of the east coast
March 26, 2014	Nodong MRBM	2 missiles tested; fall into Sea of Japan

Current Nuclear Force

North Korea is estimated to have between 10-16 weapons, including 6-8 devices fashioned from plutonium and 4-8 from highly enriched uranium. Since information on the nuclear weapons program including the exact make up of the infrastructure used to produce fissile material, is kept from the public, numbers are based on expert analysis of satellite photos, senior official statements and intelligence gathering. Siegfried Hecker, an expert on North Korea's nuclear weapons program, believes the country has approximately 12 nuclear weapons with the current capacity to make four to six new bombs annually.²⁷⁹

North Korea's possess a force of 1,000 ballistic missiles the backbone of which is the mobile Nodong MRBM.²⁸⁰ North Korea also has SCUD ballistic missiles, the SRBM KN-02 Toksa and a small force of light bombers.

278 Information gathered from "Chronology of U.S.-North Korean Nuclear and Missile Diplomacy," Arms Control Association, last updated February 2015, <http://www.armscontrol.org/factsheets/dprkchron>; Duyeon Kim, "FactSheet: North Korea's Nuclear and Ballistic Missile Programs," The Center for Arms Control and Non-Proliferation, last updated July 2013, http://armscontrolcenter.org/publications/factsheets/fact_sheet_north_korea_nuclear_and_missile_programs/; Sangwon Yoon and Sungwoo Park, "North Korea Test Fires Six Missiles in Three Days Off Coast," May 20, 2013, <http://www.bloomberg.com/news/articles/2013-05-19/north-korea-test-fires-four-short-range-missiles-in-two-days>.

279 Siegfried S. Hecker, "The real threat from North Korea is the nuclear arsenal build over the last decade," Bulletin of Atomic Scientists, January 7, 2015, <http://thebulletin.org/real-threat-north-korea-nuclear-arsenal-built-over-last-decade7883>.

280 Wit and Ahn, North Korea's Nuclear Futures, op.cit., p. 8

Nuclear Missile Range and Yield by Type²⁸¹

Type	Range	Payload	Status
KN-02 SRBM	120 km	485 kg	Deployed
SCUD-D	700 km	500 kg	Deployed
Nodong	1,250 km	700 kg	Deployed
	2,500-4,000 km	?	Possibly deployed
	2,200 km	?	Testing, possibly deployed
	5,000-6,000 km	?	R&D, testing

One of the biggest hurdles for North Korea is the miniaturization of warheads for mating to a delivery vehicle. In an October 2014 press briefing, Commander of U.S. Forces Korea General Curtis Scaparrotti told reporters, "...I believe (North Korea has) the capability to have miniaturized a device at this point, and they have the technology to potentially actually deliver what they say they have. We have not seen it tested. And I don't think as a commander we can afford the luxury of believing perhaps they haven't gotten there."²⁸²

²⁸¹ Information gathered from "Crises Guide: The Korean Peninsula," Council on Foreign Relations, <http://www.cfr.org/north-korea/crisis-guide-korean-peninsula/p11954>; National Air and Space Intelligence Center, Ballistic and Cruise Missile Threat, Wright-Patterson Air Force Base, NASIC-1031-0985-13, 2013 <http://www.25af.af.mil/shared/media/document/AFD-130710-054.pdf>.

²⁸² General Curtis Scaparrotti and Rear Admiral John Kirby, "Department of Defense Press Briefing," (Press Conference, Pentagon Briefing Room, October 24, 2014), <http://www.defense.gov/Transcripts/Transcript.aspx?TranscriptID=5525>.

Locations of Bases and Operating Areas²⁸³

Facility Name	Description
Musudan-ri	Main Musudan-ri testing range; missile assembly, control buildings and launch pad
P'unggye-yok	Nuclear test site
Pakchon	Uranium mining/milling facility
Pyongsan	Uranium mining/milling facility
Pyongyang	Nuclear facility; location of laboratory-scale processing equipment
Sangnam-ri	Reported location of underground missile launching site
Sinpo	Suspended production of two light-water reactors in 2003
Sunchon	Uranium mining/milling facility
Taecheon	NK suspended production of reactor in 1994
Yongbyon	Location of most of NK's plutonium-based nuclear installations; centrifuges for uranium enrichment revealed in 2010
Yong-jo ri	Reported location of underground missile launching site
Youngdoktong	Reported location of testing site for nuclear weapons-related high explosives

²⁸³ Information gathered from "Crises Guide: The Korean Peninsula," op.cit.; and Niksch, "North Korea's Nuclear Weapons Program," op.cit

Nuclear Weapons-Related Spending

North Korea's nuclear weapons budget, like the program, is shrouded in secrecy. The Global Zero cost study estimated North Korea's core nuclear costs at \$500 million and full costs at \$700 million in 2011.²⁸⁴ For a small, isolated, poor country, that is a significant amount of money. Its military budget makes up 25 percent of its total GDP, or about \$10 million in 2013.²⁸⁵

Current Developments

Sea-Based Missiles. Experts believe that North Korea is developing a sea-based cruise missile for possible deployment under the nuclear weapons program. The media recently reported on a test of an ejection launcher for submarine-fired missiles on January 23, 2015.²⁸⁶ This comes after the launch of a new submarine in 2014 and a possible flight test of a SLBM last month.

ICBMs. North Korea is determined to develop a long-range nuclear-armed missile capable of reaching the United States. A U.S. report states that North Korea has likely taken the first steps toward fielding the KN08 road-mobile ICBM although it has not yet been flight-tested.²⁸⁷ There is no evidence in the public domain to indicate the KN08 is operational.

Infrastructure. The U.S. report also states that North Korea has likely restarted its nuclear facilities at Yongbyon, which includes an expanded uranium enrichment facility and a graphite-moderated plutonium production reactor.²⁸⁸ The reactor was initially shut down in 2007. Analysis from the

National Committee on North Korea showed renovations occurring at the gas centrifuge building at Yongbyon in mid-2013.²⁸⁹

Future Developments

New reports from the US-Korea Institute projected the growth of North Korea's nuclear force over the next 5-10 years using three possible scenarios: minimal growth and modernization, moderate/steady growth and modernization, and rapid growth and modernization.²⁹⁰

Minimal growth and modernization²⁹¹:

- Increase in nuclear weapons from 10 to 20 by 2020.
- Explosive yield of 10 kilotons.
- Deployment of short-range, sea-launched cruise and ballistic missiles.
- Possible deployment of the Musudan IRBM.

Moderate/Stable growth and modernization²⁹²:

- Increase of nuclear weapons to 50 by 2020.
- Ability to mount warheads on new road-mobile IRBMs, ICBMs and SRBMs.
- Achievement of 50 kt yields resulting from new plutonium and uranium warhead designs.
- Possibility of the development and partial test of an advance single-stage thermonuclear design warhead.
- Deployment of a greater number of sea-based systems and possible development of an emergency operational ballistic missile submarine.
- Operationalization of the Musudan IRBM.
- Movement toward operationalization of the KN-08

284 Blair and Brown, Nuclear Weapons Cost Study, op.cit.

285 David Francis, "How North Korea Starved Its People for a Nuke," The Fiscal Times, April 9, 2013, <http://www.thefiscaltimes.com/Articles/2013/04/09/How-North-Korea-Starved-Its-People-for-a-Nuke>.

286 "N. Korea conducts submarine missile ejection test: sources," Yonhap News Agency, February 20, 2015, <http://english.yonhapnews.co.kr/national/2015/02/20/47/0301000000AEN20150220001900315F.html>.

287 Clapper, Statement for the Record: Worldwide Threat Assessment of the US Intelligence Community, op.cit.

288 Ibid.

289 "North Korea's Nuclear Weapons Program," NCNK Issue Brief, last updated April 24, 2014, <http://www.ncnk.org/resources/publications/DPRK-Nuclear-Weapons-Issue-Brief/>.

290 The following is a summary of the findings in Wit and Ahn, North Korea's Nuclear Futures, op.cit., pp. 8, 18-19; and David Albright, Future Directions In The DPRK's Nuclear Weapons Program: Three Scenarios For 2020, US-Korea Institute at SAIS, 2015, <http://38north.org/wp-content/uploads/2015/02/NKNF-Future-Directions-2020-Albright-0215.pdf>, p. 22.

291 Ibid, Wit and Ahn pp. 8, 18-19; Albright, p. 22.

292 Ibid, Wit and Ahn, pp. 8, 19-20; Albright, p. 25.

ICBM which would be available on an emergency basis in the meantime.

- Possible deployment of the Taepodong in hardened missile silos.

Rapid growth and modernization²⁹³:

- Increase to 100 weapons by 2020.
- Deployment of battlefield and tactical weapons.
- Increase in the average yield to 20+ kt with an increasing number of warheads with a yield of 50 kt.
- Possible testing of a one-stage thermonuclear device with 100 kt yield.
- Possible work started on a two-stage thermonuclear device.
- Greater deployments of the Musudan IRBM.
- Replacement of SCUD missiles with more reliable and accurate 300 km missiles.
- Possible deployment of the first SSBN.
- Deployment of an operational KN-08 road-mobile ICBM in ever-increasing numbers.

A fourth scenario in which North Korea ends nuclear testing, but continues with fissile material production could result in a stockpile of 100 weapons capable of arming certain delivery vehicles.²⁹⁴

293 Ibid, Wit and Ahn, pp. 8, 20-21; Albright, p. 2.

294 Ibid, Wit and Ahn, pp. 8, 22; Albright, pp. 27-28.



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