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Beyond the Nuclear Shadow

*A Phased Approach for Improving Nuclear Safety
and U.S.–Russian Relations*

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PREFACE

The past eighteen months have seen remarkable changes in both U.S.-Russian relations and the planned nuclear postures of the two countries. The Bush administration came into office in 2001 with plans to radically remake U.S. relations with Russia in both the political and nuclear arenas, and so far it has made real progress. It has succeeded in negotiating an arms control agreement that promises to cut nuclear forces below today's levels without getting tied up in the usual complications of specified force structures and verification agreements that often take on a life of their own. The very existence of this agreement suggests that relations have improved between the United States and Russia and, perhaps more important, that the Cold War's long shadow of nuclear confrontation is beginning to recede.

Despite those changes, however, the risk of accidental and unauthorized use of nuclear weapons remains. Both countries continue to keep their nuclear forces ready to launch within minutes, the only explanation for which is that they continue, either by habit or design, to view each other in nuclear terms and to posture themselves to respond to attack by the other. Russia's economic difficulties over the past decade have made the situation worse: Russia's early-warning system is in tatters, and its military has suffered both morale and discipline problems.

The report explores a wide range of approaches by which the United States and Russia could improve nuclear safety. The authors argue that U.S.-Russian relations and nuclear safety are integrally linked and should not be viewed in isolation—improvements in one will lead to improvements in the other. Consequently, they recommend

that the two countries take a phased approach to the problem, one that starts with immediate U.S. unilateral actions and commitments designed to demonstrate that the United States is serious about improving relations and nuclear safety. The authors also suggest specific actions that can be taken in the near and medium term as U.S.-Russian relations improve. The long-term goal of this process is to eliminate the nuclear element of the relationship altogether.

This research was made possible by a grant from the Nuclear Threat Initiative. The report is intended for those concerned with nuclear issues, arms control, or U.S.-Russian relations more broadly.

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SUMMARY

The last decade has brought significant changes in the relations between the United States and Russia. At the political level, these changes have most recently been demonstrated, in extraordinary fashion, by Russia's providing active assistance in the war on terrorism, even helping the United States establish basing rights in Central Asia. Changes at the nuclear level have also been notable, as evidenced by the May 2002 signing of the Moscow Treaty statements in which Presidents George W. Bush and Vladimir Putin each agreed to reduce long-range nuclear forces to 2,200–1,700 over the next 10 years, down from more than 10,000 each in 1990.

Many of the nuclear dangers that characterized the Cold War—a surprise nuclear attack or a crisis in Europe or Asia that could lead to nuclear war—have receded. Now that there is no longer an ideological conflict as motivation or armies poised in Central Europe to spark a crisis, neither country views nuclear war with the other as likely.

Yet despite the steps taken by both countries to put Cold War hostilities behind them, an important nuclear risk remains—specifically, that of accidental and unauthorized use of nuclear weapons. This risk persists for three reasons. First, although both countries have significantly reduced their nuclear forces, they still retain nuclear postures and deterrence doctrines formulated when tension between them was much higher than it is today. Inherent in these nuclear postures, which are based on rapid delivery of a massive nuclear retaliatory strike, are concerns about the potential for an accidental or unauthorized launch.

Second, Russia's economic and social troubles have created a new set of problems that contribute to the continuing risk of accidental and unauthorized use. Russia's resource shortages have caused its survivable nuclear forces to plummet in both size and readiness. Its fleet of ballistic missile submarines has been decimated; most of them are decommissioned or rusting in port, and only one or two are at sea at any time. Few of its mobile missiles are deployed in the field, and many of its intercontinental ballistic missiles (ICBMs) are well beyond their planned service lives. In a severe crisis, these vulnerabilities may push Russia toward a strategy of launching its forces quickly, at the first signs of attack, to ensure their survival—a posture leaving little time for decisions and possibly leading to accidental use of nuclear weapons. This state of affairs is further complicated by an early-warning system in serious disrepair and by Russia's increasing reliance on nuclear weapons to compensate for its atrophying conventional forces. Moreover, the risk of unauthorized launch has been heightened by personnel reliability problems arising from the social and economic upheavals Russia has experienced over the past decade, as well as by endemic problems with organized crime and its ties to separatist groups.

Third, Russia's vulnerabilities are accentuated by the design of U.S. forces, which were built to destroy Russia's silo-based missiles. The Trident submarine, with its accurate missiles and powerful warheads, has allowed the United States to make a significant portion of those Russian forces vulnerable. As long as Russia could deploy survivable ballistic missile submarines and road-mobile and rail-based ICBMs—which it could in the 1980s—it ensured that enough of its forces would survive to retaliate against a U.S. strike. Now, however, with only a few of Russia's survivable forces able to leave their bases, the United States is closer to being able to destroy Russia's forces than ever before. This situation may make Russia feel even more vulnerable in a crisis and may heighten its incentives to launch its nuclear forces quickly if it fears a nuclear attack.

Clearly, the improved political climate between the United States and Russia somewhat mitigates this risk of nuclear use, making it less dangerous than it might have been during the Cold War. Yet the improved environment also highlights the fact that both countries' nuclear postures do not reflect post-Cold War realities. The world is rapidly approaching a time when any risk of accidental or unautho-

rized nuclear use that does remain will be considered an unacceptable anachronism.

Our study focused on today's remaining risk of accidental and unauthorized use of U.S. and Russian nuclear weapons, examining in detail a number of steps the United States and Russia could take (both unilaterally and cooperatively) to reduce the risk and to bring their nuclear postures more in line with current political realities.¹ We found that while several promising steps could be taken, no single one will eliminate the risk that lingers. Furthermore, since some of the steps require the upending of years of orthodoxy about deterrence and the way that nuclear forces are postured and operated, we concluded that a phased approach is likely to be the most productive way to improve nuclear safety. Perhaps our most important finding, however, is that nuclear safety and U.S.-Russian relations are inextricably linked. Nothing will do more to improve nuclear safety than improved U.S. relations with Russia, and because the nuclear dimension still looms large in the U.S.-Russian relationship, steps to improve nuclear safety can lead to a relationship defined less and less by nuclear weapons. And because of the challenges of developing and implementing actions that will improve nuclear safety and U.S.-Russian relations, we believe success requires strong Presidential leadership and commitment.

Scenarios for Nuclear Use

To determine the underlying causes of possible accidental or unauthorized nuclear use, we carefully examined the types of scenarios in which such use could occur. Our analysis suggests that there are three basic types, as shown in Figure S.1. The first is an intentional unauthorized launch. Such scenarios, brought about by a terrorist or a rogue commander (a commander who takes control of the nuclear forces he commands), have always been a concern, and both the

¹Another set of nuclear risks has been created by the Soviet Union's dissolution and Russia's economic difficulties: the danger that nuclear weapons, materials, and know-how could spread to countries that want to develop nuclear weapons. This problem is very serious and could have long-term implications for U.S. security, but it was beyond the scope of our analysis. We did, however, keep it in mind, designing the options we examined to ensure they did not exacerbate the problem of proliferation from Russia and, perhaps, might even improve the situation.

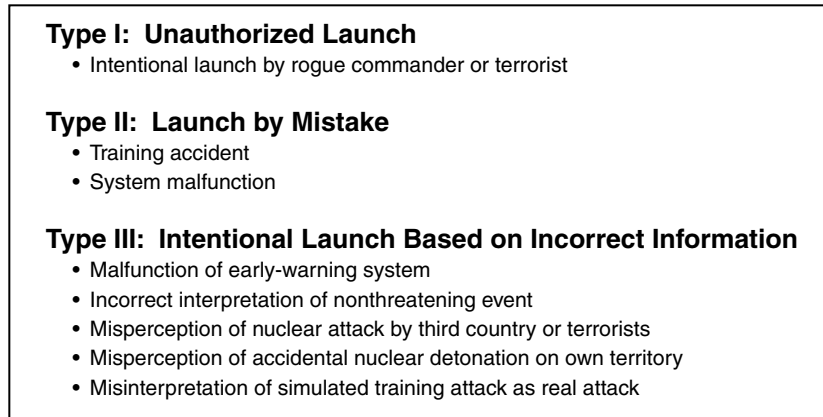


Figure S.1—Possible Scenarios for Accidental or Unauthorized Nuclear Use, by Type

United States and Russia went to extraordinary lengths during the Cold War to ensure they did not happen. The breakdown of order in Russia, the economic difficulties and low morale of its military personnel, and the rise in organized crime and separatist violence have increased concern about the security of its nuclear forces.

In the second type of scenario, a missile is launched by mistake. In this case, the country that launches the missile has no intention of doing so; the launching occurs through a malfunction in a weapons system or during a training accident. In the past, both Russia and the United States made great efforts to guard against such accidents, and most, if not all, of the safeguard systems and procedures that were put into place remain in place today. The United States has even enhanced the safeguards in recent years for its ballistic missile submarines. Nevertheless, the probability of a mistaken launch has never been zero, and the economic and social problems in Russia have heightened concerns in the West about this problem.

In the third type of scenario, nuclear weapons are launched intentionally but based on incorrect or incomplete information. Such a scenario can occur in different ways. For example, early-warning systems might malfunction, indicating that an attack was under way when in fact it was not; or a nonthreatening event might be mis-

interpreted as an attack. These two types of events happened during the Cold War to the United States and Russia (although, in each case, the error or malfunction was discovered before weapons were launched), and each country developed a two-tiered early-warning system (radar on land and infrared sensors in space) in part to guard against such events. But Russia's space-based system is now essentially out of order, leaving Russia with only one type of early-warning system and greatly increasing the chance that an erroneous indication of attack could be mistaken as real. Similarly, lacking high-quality early-warning information, Russia could interpret a nuclear accident or an attack by a third country as an attack by the United States. The chances of this type of event occurring, however, are somewhat mitigated by the overall positive relations between the United States and Russia. Because the likelihood of nuclear conflict is much lower than it was during the Cold War, both nations' leaders are far less likely to believe a nuclear attack has been launched against them than they were during the tense periods of the 1960s and 1970s.

Factors Contributing to Nuclear Use

Using our set of possible scenarios (see Figure S.1), we tried to determine the underlying factors that might cause any one of them to occur. We identified seven such factors, which are listed here in no particular order:

- Nuclear forces kept at high day-to-day launch readiness
- Perceived vulnerability of nuclear forces or command and control systems
- Inadequate early-warning information
- Short decision times
- Deterrence doctrine or posture reliant on launch on warning or launch under attack
- Inadequate security and control of nuclear forces and weapons
- Inadequate training precautions

In our estimation, nuclear use is likely to result only from a combination of these factors—e.g., a launch-on-warning doctrine plus in-

adequate early-warning information—rather than from any single one. We mapped these contributing factors to each type of scenario for accidental or unauthorized use of nuclear weapons before we began devising measures that might reduce the risk of such use occurring, which was the primary focus of our analysis.

Possible Options for Reducing Risk

A wide variety of solutions have been proposed as ways to reduce the risk of accidental or unauthorized use of nuclear weapons. Some are relatively straightforward extensions of current policies; others require fundamentally new approaches to how both the United States and Russia operate and think about nuclear weapons.

We considered and analyzed many possible actions that attempt to address one or more of the underlying factors for accidental or unauthorized nuclear use. They can be distilled into 16 general approaches, each of which can be implemented in many ways. From the list of 16, we chose for detailed analysis those that we believe show promise or that have been proposed by others. We arrived at the following 10 approaches, or options:

1. Provide assistance for improving Russia's early-warning radars or satellites.
2. Establish a joint, redundant early-warning system by placing sensors outside U.S. and Russian missile silos.
3. Immediately stand down all nuclear forces to be eliminated under the 2002 Moscow Treaty.
4. Pull U.S. strategic ballistic missile submarines away from Russia.
5. Keep U.S. attack submarines away from Russia.
6. Remove W-88 warheads from Trident missiles.
7. Reduce day-to-day launch readiness of 150 ICBMs in silos.
8. Reduce day-to-day launch readiness of all nuclear forces.
9. Install destruct-after-launch (DAL) mechanisms on ballistic missiles.
10. Deploy limited U.S. missile defenses.

An additional advantage of these 10 options is that each one is a possible solution for more than one of the contributing factors.

We assessed each option against a set of criteria reflecting the degree to which it could contribute to nuclear safety; its effect on current U.S. strategies, targeting plans, and stability; and the degree to which it could be implemented easily, monitored reliably, advance or hinder U.S. nonproliferation objectives, and improve U.S.-Russian relations.

Our goal was to be as specific as possible about the measures that would be taken in each option, the reason being simply that the details of an option's construction often determine how effective and successful the option can be. For example, placing sensors outside U.S. missile silos to detect launches would improve Russia's access to reliable early-warning information. It would add 20 minutes or so to decision time, extra time important for determining whether an attack is real. Perhaps most important, it would tell Russia that an attack is not under way by showing the status of each individual silo, something that space-based systems could not accomplish. Yet such a system is worse than nothing at all if it is not highly reliable and designed to be resistant to generating false alarms every time a mouse chews a cable, a thunderstorm passes through, or the power goes out. A system that issues frequent false alarms will be ignored; a system that is vulnerable to large systemic errors can lead to an accidental use of nuclear weapons—the very problem the option is intended to avoid. So we specified as carefully as we could how such a system might be designed to avoid these problems—for instance, by having backup power sources, using redundant communication modes, and using different sensors that measure different physical phenomena.

General Conclusions

Our analysis led to five general conclusions about improving nuclear safety:

- The risk of accidental or unauthorized nuclear use is too high given the markedly improved relationship between the United

States and Russia. This is in part because nuclear weapons now play a role out of proportion to other aspects of the relationship.

- Although several options we examined show promise for reducing the risk of accidental or unauthorized use of nuclear weapons, no single approach will eliminate the risk by itself. In fact, even a combination of fairly radical options will not entirely eliminate the two fundamental issues giving rise to that risk: the asymmetries in U.S. and Russian force postures and the fact that each country continues to believe it needs a credible deterrent against the other. Nevertheless, both nations can take important steps to minimize the nuclear use risk that remains today.
- Nuclear safety and U.S.-Russian relations are closely intertwined. The more each country views the other as a threat, the more difficult it will be to reduce the risk of accidental or unauthorized use of nuclear weapons. Conversely, the better the relations are, the more likely that nuclear weapons will recede as an important factor in the relationship and the easier it will be to take significant steps to improve nuclear safety.
- A successful strategy for limiting nuclear dangers should, therefore, seek operational changes in the U.S. and Russian nuclear postures, as well as improvements in the trust and cooperation between the two nations. This should be a mutually reinforcing process in which near-term improvements in nuclear safety build confidence and trust between Russia and the United States, thereby enabling more-extensive steps in the medium and long term.
- Direct Presidential involvement is required to adequately address the nuclear use risk. The issues are too fundamental, affect too many policies, and cross too many departments, services, and agencies for an uncoordinated approach to succeed. The effort must start with strong Presidential leadership and commitment. The goals should be to improve nuclear safety, to improve U.S.-Russian relations, and to preserve a survivable deterrent. Essential to this effort is close military-to-military cooperation between the two nations, both for devising options that make operational sense and for implementing them.

Specific Recommendations: A Phased Approach for Improving Nuclear Safety

To address the lingering risk of accidental and unauthorized use of nuclear weapons, we recommend that the United States and Russia establish a “Nuclear Safety Initiative.” And because the task of improving nuclear safety is likely to be a challenging and dynamic process, we recommend that the initiative use a phased approach, as illustrated in Figure S.2. The objective of the first, immediate steps (six months to one year) is to improve nuclear safety while simultaneously improving the climate between the two countries. If these steps are successful, they will create opportunities for more involved steps in the near term (the next two to three years). Success in the near term will then make other, more-difficult steps possible in the medium term (five to seven years). The timeline illustrated here is intended to reflect what we think may be possible from today’s vantage point. The timing could be quicker if conditions and leadership allow.

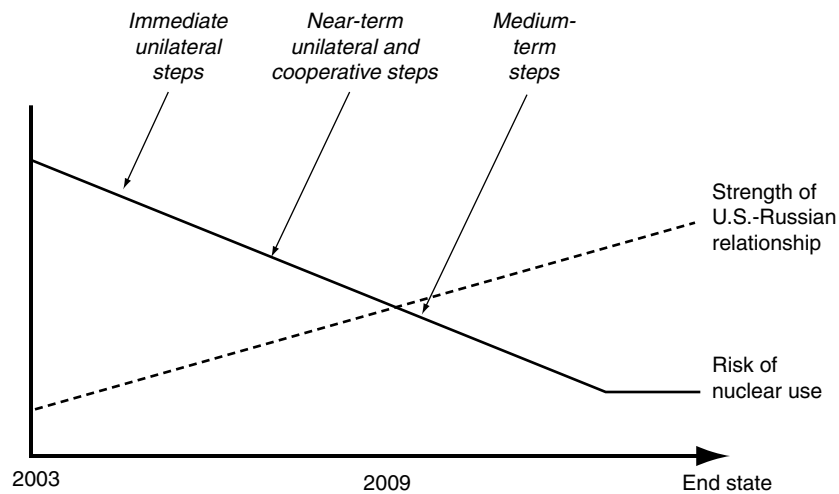


Figure S.2—Phased Approach for Improving Nuclear Safety and U.S.-Russian Relations

A central reason for the phased approach is that some options for improving safety would push too far beyond current deterrence practices and orthodoxies to be acceptable. Since changes in thinking and nuclear culture will be required, these options are more likely to be successful once success is achieved in other areas and the importance of nuclear weapons in the U.S.-Russian relationship has receded somewhat. As a result, immediate steps to improve the climate between the two countries should be pursued even if they will have only a small effect on safety.

Figure S.3 lists the immediate, near-term, and medium-term steps we believe could start the process of improving nuclear safety (and U.S.-Russian relations). As shown, the United States could immediately take several steps: standing down all forces to be deactivated under the Moscow Treaty, pulling ballistic missile submarines and attack submarines away from Russia, and reducing the launch readiness of one-third of its ICBMs. These actions could be implemented within six months to one year. Also shown are several steps the United States could commit to at this time. These steps, aimed at helping Russia improve its access to reliable, high-quality early-warning information, would take more time to implement, in part because they would require consultations.

The hope is that Russia will respond with its own unilateral measures, standing down the forces that it will eliminate under the Moscow Treaty, keeping its submarines away from U.S. coasts, and committing to cooperate with the United States on improving access to early-warning information. However, the unilateral U.S. actions during this first phase should not presume or depend on Russian reciprocation. The goal of these steps is to reduce the risk of nuclear use and to demonstrate that nuclear weapons are becoming less important in U.S. relations with Russia.

In the near term, the United States could eliminate the forces it had stood down during the first phase (as could Russia if it had followed suit) and begin implementing steps to improve early-warning information. The United States and Russia could also begin consultations on more difficult issues, including steps to reduce the launch readiness of nuclear forces and to install destruct-after-launch (DAL) mechanisms on ballistic missiles. In the medium term, possible steps include installing sensors on ICBM silos to monitor reduced launch

The phased approach to our recommended Nuclear Safety Initiative is based on the premise that nuclear safety, U.S.-Russian relations, and U.S. security more broadly are inextricably linked. Progress in one area can improve the situation in another. Our approach represents the best path for addressing the risk of nuclear use and at the same time allowing Russia and the United States to maintain nuclear forces that are sized and postured appropriately for each stage of their improving relations. Ultimately, however, the nuclear safety problem can be fully addressed only when nuclear weapons are no longer a factor in U.S.-Russian relations, much like they are not a factor in relations between Britain and France.

Given the improving relations between the United States and Russia and the emerging U.S. security context, the current moment offers a historic opportunity to address one of the more vexing problems left from the Cold War: how to reduce the risk of accidental or unauthorized nuclear use to as close to zero as possible. Only a sustained, coordinated effort can solve this problem, and such an effort must start with Presidential leadership and commitment.

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ABBREVIATIONS

ABM	anti-ballistic missile
BMDO	Ballistic Missile Defense Organization
CBO	Congressional Budget Office
DAL	destruct after launch
DALcc	DAL control center
DoD	Department of Defense
DSP	Defense Support Program
GPALS	Global Protection Against Limited Strikes
GPS	global positioning system
ICBM	intercontinental ballistic missile
IFT	integrated flight test
LPAR	large phased-array radar
NASA	National Aeronautics and Space Administration
NSC	National Security Council
PD	Presidential Directive
RAMOS	Russian-American Observational Satellite
SBIRS	Space-Based Infrared System
SDI	Strategic Defense Initiative
SIOP	Single Integrated Operational Plan

SLBM	submarine-launched ballistic missile
SORT	Strategic Offensive Reductions Treaty
SSBN	ballistic missile submarine
START	Strategic Arms Reduction Treaty