

BREAK-UP OF THE U.S.S.R.:

Whither Nuclear Control?

*by Bruce G. Blair**

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*Bruce Blair is a Senior Fellow in the Foreign Policy Studies Program at the Brookings Institution. He was awarded a Ph.D. in Operations Research by Yale University. Blair was formerly a Project Director at the Office of Technology Assessment, U.S. Congress, and served as a missile launch officer in the Strategic Air Command. While at Brookings, he has been a visiting professor at Princeton and Yale Universities.

Blair has written many books and articles on U.S. defense policy. He has testified numerous times before Congress on the U.S. and Soviet nuclear command systems and safeguards. His testimony and forthcoming book *THE LOGIC OF ACCIDENTAL NUCLEAR WAR*, are based partly on extensive interviews with former officers in the Soviet Strategic Rocket Forces. In 1991, he and a Russian colleague, formerly an SRF officer, prepared joint testimony on Soviet nuclear safeguards during the abortive coup of August 1991.

I. INTRODUCTION: THE THREAT OF NUCLEAR ANARCHY

A year ago, the Soviet Union appeared to be fertile ground for nuclear anarchy. A host of threats to nuclear control had emerged. One of them was the potential birth of multiple nuclear successor states: the unraveling of the Soviet Union clearly boded ill for preserving a single nuclear weapon state within its former borders. Nuclear weapons were believed to have been deployed on the territory of about ten of the Soviet republics, four of which were home to various units of the strategic nuclear forces.¹ The ingredients for instant nuclear proliferation were available, if the governments of these newly sovereign states inherited the nuclear weapons deployed in their territory. Ukraine, in particular, was tempted to keep them. Nuclear weapons were valued as sources of international prestige, bargaining leverage, and money (especially from the potential sale of uranium extracted from dismantled weapons), and as military counterbalance to Russian hegemony. The specter of proliferation loomed ever larger as Ukraine and Kazakhstan started haggling with Russia over their roles in governing such forces.² That multiple nuclear successor states would emerge was practically a foregone conclusion to many Western observers, notably the neo-realists who saw this as a classic case of states in search of security in an anarchic situation. This drive to seek security, together with other incentives, portended not only a custody fight, but worse, one with the potential to become violent.

Another "loose nukes" scenario that emerged from the Soviet breakup was a simple breakdown of operational control. Whichever state or states inherited the weapons, operational control over them might degenerate, allowing irresponsible parties to gain control over some portion of the arsenal. That control could include capture, theft, purchase, or other appropriation of nuclear weapons by "renegades" within the former Soviet Union, who might then try to sell nuclear weapons on an international black market. This danger seemed especially acute because large numbers of tactical nuclear weapons were being relocated at the time.³ Literally thousands of small nuclear warheads were being packed up and shipped back to

1. See Russell Watson, *Nukes on the Loose*, NEWSWEEK, Dec. 16, 1992, at 32; *A Nice Red Afterglow*, ECONOMIST, Mar. 14, 1992, at 45. The Soviets had repatriated the last of their nuclear weapons located outside of Soviet territory in August 1991 with the return of those based in Eastern Europe, namely East Germany. Michael Arndt, *U.S. Worries Over Who Controls Soviet Tactical Nuclear Arms*, CHI. TRIB., Dec. 11, 1991, at C4.

2. See *id.* at 32.

3. See Watson, *supra* note 1, at 32-33.

Russia, a process that exposed them to diversion from within or interdiction from without.⁴ Another scenario was inspired by the attempted coup in August 1991; many fear a second coup could make nuclear weapons pawns in a power struggle; put the weapons under the control of international despots; weaken civilian control over the military; and generally confuse the nuclear chain of command from top to bottom. That weapons might even be used in such circumstances became a genuine concern to many. The breakdown of morale, discipline, and loyalty might have resulted, for instance, in the accidental or unauthorized use of weapons; perhaps the worst-case scenario was the unauthorized launch of strategic nuclear weapons by disaffected low-level crews within the nuclear chain of command.

The third prevalent fear of "loose nukes" stemmed from doubt about the virtue of the broader nuclear establishment in the former Soviet Union—nuclear weapons design laboratories, research and production facilities for fissile materials and other bomb components, the civilian nuclear power industry, and so forth. Social upheaval and severe economic austerity could erode the safeguards in place to prevent sensitive nuclear technology, fissile material, or expertise from leaking out to a proliferating state. There are many thousands of nuclear scientists, engineers, and technicians who could offer very useful assistance to countries like Iran, Iraq, and Libya in developing nuclear weapons. Given the growing ease of emigration and the economic hardship facing many of these individuals, the prospect that some could be lured into supporting would-be proliferators became a major concern. As for sensitive technologies like nuclear detonators ("triggers") leaking out, that likelihood also seemed greater as the military-industrial sector decentralized, pursued profits, and sought new customers.

A year ago, none of these gloomy scenarios seemed fanciful. The question was whether nuclear safeguards and lines of nuclear authority would remain clear, intact, and stable, as powerful centrifugal forces tore apart the Soviet Union and its traditional institutions. Given the level of distress—political, social, and economic—few observers dismissed the notion that, even without the additional strains of widespread civil war, the command system could lose control over at least some portion of the roughly 27,000 weapons scattered across the vast expanse of the country.⁵

4. *Id.* See also Paola Messana, *Ex-Soviet Military Target of Extremists*, Agence France Presse, Mar 12, 1992, available in LEXIS, Nexis Library, Omni File; Claudine Canetti, *Russia Aims to be Sole CIS Nuclear State*, Agence France Presse, Jan. 23, 1992, available in LEXIS, Nexis Library, Omni File.

5. See Watson, *supra* note 1, at 32; *Shrinksmanship: President George Bush's Call for Nuclear Disarmament*, NATION, Oct. 21, 1991, at 467.

II. SOVIET NUCLEAR SAFEGUARDS

The Soviet system of nuclear safeguards, however, remained intact and effective during and after the breakup. Imbued with a long-standing and deep-seated obsession with controlling nuclear weapons, the Soviet government historically went to extraordinary lengths to ensure tight central control of nuclear weapons. Although unforeseen loopholes lurk in any system, Soviet safeguards were more stringent than those of any other nuclear power including the United States. These safeguards were carried over to the post-Soviet nuclear command and control system, and should have been credited with the ability to deal effectively with aberrant behavior within the chain of command and with most threats stemming from social upheaval within the former Soviet Union. The new commonwealth command system, under the *de facto* leadership of Russia, paid serious attention to these threats. For instance, it redoubled the effort to round up nuclear weapons from the non-Russian republics and place them in depots inside Russia.

An appreciation of the stringency of these safeguards begins with knowing that they embody a core value of Russian political culture: collective decision-making and centralized control. No single individual, regardless of rank or position, had the right to employ nuclear weapons. Soviet designers subscribed to the principle that, the higher the level of nuclear command, the stricter the safeguards against improper exercise of nuclear control. The reasoning behind this principle was that, while the unauthorized use of even a single weapon by low-level commanders certainly could cause an unprecedented disaster, the consequences of illicit action at the top of the hierarchy could be truly apocalyptic.

The checks and balances at the control system's apex consisted mainly of the separation of rights and authority to issue nuclear orders. No one individual or organizational entity was physically able to disseminate the series of codes required to effect the use of nuclear forces. Except under certain extreme wartime conditions, the unanimous consent and active participation of numerous senior officials—notably the President, Defense Minister, Chief of the General Staff, and the Commanders-in-Chief of the nuclear forces—were required to use nuclear weapons.

There is obviously a limit to the effectiveness of safeguards at the control system's apex when there is extensive collusion among persons in key positions. No system of safeguards can reliably guard against widespread malfeasance at the very top of government. In the final analysis, nuclear safety depends on the competence, virtue, and rationality of the nation's leaders. The coup attempt in 1991 raised serious doubts on these scores, but the command system, though compromised and degraded, still preserved strict negative

control over nuclear weapons throughout the coup attempt.

Below the control apex, the Soviet government instituted a wide range of technical and organizational measures to prevent the unsanctioned use of nuclear weapons. The main Soviet safeguards were: (1) the division of the command-control structure into two distinct types of organizations with separate chains of command: one responsible for managing the nuclear warheads and related technical systems of nuclear forces, and one for providing military direction to the combat units; (2) the standard practice of keeping tactical nuclear warheads apart from their delivery units; (3) the utilization of elaborate feedback loops that enabled higher authorities to monitor closely subordinate units; (4) the extensive use of electronic systems that enabled higher echelons quickly to disable missile launchers and subordinate command posts; and (5) the extensive use of blocking devices designed to impede physically the unauthorized use of weapons.

A detailed description of these safeguards is beyond the scope of this paper.⁶ Special weapons custodians existed that stood apart from the regular military chain of command, and there was extensive use of electro-mechanical blocking devices. A corp of elite volunteers, assigned to the Soviet military general staff and subordinated directly to the Defense Ministry, served as the custodians for nuclear munitions in storage. For armed strategic weapons on combat alert, this warhead custodianship was replaced by automated control systems, particularly the electronic blocking systems that provided for extreme *physical* concentration of nuclear weapons control at the highest levels of the hierarchy. The general staff possessed the unlock codes for the blocking devices that physically prevented the illicit firing of strategic nuclear weapons. Upon the direction of the Defense Minister, who in turn received direction from the President, the general staff was to release the codes to the firing units in the field.

For all its sophistication and stringency, however, the Soviet nuclear command system was not immune to stress. Western observers were reasonable to doubt whether safeguards would function dependably under some extreme conditions such as a full-blown civil war, a military overthrow of the government, or an all-out effort by the former republics to seize nuclear weapons on their territory. No nuclear command system can be designed to deal effectively with internecine violence of such magnitude. Although the Soviet system did not fall apart during the attempted coup in 1991 and the successor system could weather far greater turbulence than

6. For a more detailed description of the safeguards, see BRUCE G. BLAIR, *THE LOGIC OF ACCIDENTAL NUCLEAR WAR* (forthcoming 1993). This book is being published by the Brookings Institution.

that, there surely was (and is) a point at which a catastrophic breakdown would occur, a threshold at which the current command system would cease to function as a coherent, effective organization. At the moment of organizational breakdown, technical safeguards would begin to lose effectiveness. Such measures were designed to foil attempts at circumvention for only a finite length of time. In due time, virtually any safeguard can be bypassed. If military organizations lose coherence and cannot regain control within a fairly short time span, the technical safeguards could be defeated and the perpetrators could acquire a useable weapon. In the context of rapid disintegration of the social fabric, such breaches of nuclear security might involve the complicity of military units themselves.

III. THE THREAT OF "LOOSE NUKES" AND WESTERN REACTION

Western reaction to the specter of "loose nukes" has taken the form of several major policy initiatives linked to the general issue of nuclear control in the former Soviet Union. Among its effects on U.S. policy, the possibility of unauthorized or accidental use of long-range ballistic missiles gave fresh impetus to the missile defense program of the Strategic Defense Initiative Organization. It boosted support for the proposal to amend the ABM treaty and deploy some variant of the anti-missile system called Global Protection Against Limited Strikes (GPALS). A consensus within the U.S. Congress to back this gelled in 1991, and the program's budget grew significantly.

A more preventive approach to the threat of nuclear inadvertence and proliferation was taken by Presidents Bush and Gorbachev in the wake of the failed coup, just prior to the dissolution of the Soviet Union. In September and October 1991, they announced plans for drastic reduction of the tactical nuclear arsenals, removing the vast majority from far-flung combat units and consolidating them in central storage depots.⁷ They also declared that the combat readiness of hundreds of strategic nuclear formations would be lowered, effective immediately. All long-range bombers were taken off alert, as were about five hundred ICBMs on each side. Although they did not say explicitly that these actions were intended to enhance weapons security at home, the most important effect was to alleviate the danger of illicit seizure of some portion of the far-flung Soviet arsenal.

A preventive approach was also promoted by advocates of Western economic assistance to the former Soviet Union. They argued that without a substantial infusion of aid, the emerging Commonwealth would slide deeper into chaos and in the process

7. See Rae Correlli, *Disarming Diplomacy*, *MACLEAN'S*, Oct. 14, 1991, at 33.

lose control over nuclear forces.⁸ On these plausible grounds, the U.S. Congress earmarked \$800 million of the defense budget for use, at the president's discretion, in assisting the Soviets in dismantling nuclear warheads and providing humanitarian aid.⁹

International assistance in converting the military-industrial sector to non-military pursuits includes the financial support of joint projects to divert the work of nuclear weapons scientists into such areas as nuclear weapons destruction, design and safety of civilian nuclear reactors, and controlled fusion research. In this vein, the United States, the European Community, Japan, and other participating governments have pledged about \$75 million for an international science and technology center based in Moscow for the C.I.S. (plus Georgia) and in Kiev for Ukraine.¹⁰ These funds will support weapons scientists who agree to work on non-military scientific and commercial projects. Such subsidies are intended to help keep weapons scientists gainfully employed inside the former Soviet Union.

The United States will also donate hundreds of millions of dollars to assist the former Soviet Union in eliminating the thousands of nuclear weapons slated for deactivation under the various arms control agreements currently in force.¹¹ The bulk of the assistance is likely to support construction of a facility to store plutonium extracted from the weapons. Unless this bottleneck is removed, a backlog of weapons awaiting dismantling will remain exposed to potential diversion. The highly enriched uranium extracted from the weapons—about 500 metric tons valued at more than \$5 billion—will be sold to the United States for dilution and use as fuel in commercial nuclear reactors. Russia has promised to share the proceeds with Ukraine and others.

U.S. diplomacy also took a preventive approach to deal with the threat of proliferation in the former Soviet republics on whose territory nuclear weapons were stationed. Crafted to ensure that a single nuclear successor state (Russia) emerged in place of its predecessor (the Soviet Union), diplomatic relations and financial

8. Hobart Rowen, *Missing a Chance to be a Global Leader*, WASH. POST, Feb. 20, 1992, at A25; James W. Canan, *Aspin's Agenda*, AIR FORCE MAG., Mar. 1992, at 13, 13-15.

9. See Patrick Worsnip, *Fate of Soviet Nuclear Stockpile Worries the West*, Reuter Library Report, Jan. 19, 1992, available in LEXIS, Nexis Library, Omni File.

10. *Funds Pledged to Russian Scientists*, CHI. TRIB., May 25, 1992, at C4.

11. For an excellent review that is rich in information and insight on this a related topics, see NUCLEAR WARHEAD ELIMINATION AND NONPROLIFERATION, REPORT ON THE FOURTH INTERNATIONAL WORKSHOP (Christopher Paine & Frank von Hippel eds., 1992). This report was sponsored by the Federation of American Scientists and the Natural Resources Defense Council.

assistance were linked, in part, on the willingness of the other states to accede to the NPT Treaty¹² as non-nuclear weapon states, and to forswear an independent launch capability for any nuclear weapons remaining on their soil. At the same time, several of these former republics, those with strategic forces on their territory, came under strong U.S. diplomatic pressure to abide by the terms and help carry out the obligations of the START I agreement.

Lastly, the issue of nuclear control rapidly gained influence in the arena of U.S.-Russian arms control negotiations. In June 1992, Presidents Bush and Yeltsin announced further cuts in strategic arms beyond START I, cuts whose effect was to ensure the eventual elimination of strategic missile forces from the territories of Ukraine and Kazakhstan.¹³ The key provision is the elimination of all multiple-warhead intercontinental ballistic missiles (ICBMs), which covers all missile fields in those regions. Also, under the rubric of "operational arms control," the United States and Russia plan to discuss additional steps for improving warning, nuclear safety and security, and other aspects of command-control in order to help prevent an unintended nuclear catastrophe.¹⁴ Establishment of a joint early warning center is likely to occur in the future.

IV. THE NUCLEAR SITUATION TODAY

The current situation in the former Soviet Union is less bleak than it was in 1991. The threats of inadvertent nuclear use and nuclear proliferation have receded. The risk that nuclear successor states would proliferate after the break-up of the Soviet Union has proven more manageable than was generally expected. All tactical nuclear weapons had been removed from non-Russian territory by July 1992. Strategic nuclear missile forces remain in Ukraine (along with 600 bomber nuclear warheads), Belarus, and Kazakhstan, but all have been taken off combat alert. Furthermore, all three of these states signed a START I Protocol¹⁵ with the United States in which they agreed to adhere to the NPT as non-nuclear states in the shortest possible time; to keep nuclear weapons under a single unified authority; and to implement the limits and restrictions of

12. Treaty on Non-Proliferation of Nuclear Weapons, July 1, 1968, 21 U.S.T. 483.

13. Protocol to the Treaty on the Reduction and Limitation of Strategic Offensive Arms, May 23, 1992, U.S.-C.I.S., art. I, S. TREATY DOC. NO. 102-32, 102d Cong., 2d Sess. 9 (1992) [hereinafter START I Protocol]; see also *Joint Understanding on Reductions in Strategic Offensive Arms*, 3 DEP'T. ST. DISPATCH 492, 493 (1992).

14. *A Charter for American-Russian Partnership and Friendship*, 3 DEP'T. ST. DISPATCH 490, 491 (1992).

15. START I Protocol, *supra* note 13.

START I.¹⁶ In separate letters, the leaders of all three pledged to eliminate all nuclear weapons from their territory within the seven year period provided by the START Treaty.¹⁷

The language of these commitments is sufficiently vague and the seven-year time span for implementation is sufficiently long, however, for nuclear gamesmanship to give birth to more nuclear successor states. Ukraine in particular seeks greater control over the nuclear weapons on its soil. It is paying the salaries and controlling the promotions of SRF support personnel and requiring them to swear allegiance to Ukraine. It is also performing some maintenance and supply functions for the missile and bomber bases, while insisting on the "right to control over the non-use of nuclear weapons deployed in its territory."¹⁸ Ukraine recently acquired a primitive physical veto over the launch of strategic missiles on its soil. President Kravchuk now evidently possesses the ability to sever the communications at a key "choke point" (the 43rd Strategic Rocket Army Headquarters at Vinnitsa) through which orders would normally flow from Moscow to the Ukrainian missile fields. This veto power is undermined, however, by Moscow's ability to bypass the retransmission point in question during an emergency.

Ukraine's inroads into the strategic command and controls system confer significant indirect control over strategic weapons. Whether it will seek an independent launch capability remains unclear, but there is growing Western suspicion that Ukraine harbors nuclear aspirations. This aim is consistent with strong sentiment in the Ukrainian parliament to reject START, refuse to join the NPT, and retain the strategic warheads on its territory unless it receives adequate economic assistance and international security guarantees.

For now, operational launch control over all strategic forces in the former Soviet Union undoubtedly resides in the hands of Russian President Yeltsin, the Russian Minister of Defense, the chief of the Russian general staff, and the commanders of the Russian strategic rocket forces. Yeltsin has agreed to consult the other states of the Commonwealth, and to obtain permission from the leaders of Ukraine, Belarus, and Kazakhstan prior to launching any nuclear forces.¹⁹ Nevertheless, Russia physically controls the nuclear launch button.

16. *Id.* art. V.

17. *Id.* art. I.

18. See *Letter to President Bush from Ukrainian President Leonid Kravchuk*, ARMS CONTROL TODAY, June 1992, at 35 (1992).

19. *Id.*

Russia deserves credit for a flawless performance in maintaining nuclear safety and security during the past year. Gloomy predictions of nuclear accidents, thefts, and even unauthorized use during the mass relocation of nuclear weapons from the outlying former republics to Russia never materialized. Not even one incident of loss of control is reported to have occurred. Control over the strategic nuclear forces also remains strict.

Social, economic, and political turmoil has not resulted in any known leakage of nuclear expertise or technology to the fledgling nuclear states. During the past year, the West has enjoyed extensive contact with the directors and staff of the former Soviet nuclear weapons laboratories, missile design bureaus, ministry of atomic energy, organizations responsible for safeguarding fissile materials, and related agencies. These officials have substantially allayed many Western fears about nuclear leakage. Ex-Soviet officials and scientists are not any less motivated than their Western counterparts to prevent the spread of nuclear weapons; they understand that nuclear proliferation indeed poses a more immediate and direct threat to the former Soviet Union than it does to the United States.

This reassuring overall record mainly reflects the Russian penchant for tight central control over the entire life cycle of nuclear weapons—from design research to combat alert operations to dismantlement. The West also deserves some credit, especially for its role in persuading the non-Russian republics not to seek nuclear status. U.S. diplomatic pressure may have been critical in getting Ukraine and Kazakhstan to sign the START I protocol, pledge to join the NPT as non-nuclear states, and cooperate with Russia in removing strategic and tactical nuclear weapons from their territories.

V. RESIDUAL DANGERS AND OPPORTUNITIES

The danger of nuclear anarchy in the former Soviet Union can be alleviated through international cooperation on a range of issues. Progress depends on a correct diagnosis of the real threats of nuclear inadvertence and proliferation. The policy proposals discussed next begin with the question of whether missile defenses are needed to protect the United States from “loose nukes” in the former Soviet Union.

A. Preserve the Status Quo for Strategic Missile Defense

The argument for deploying ballistic missile defenses depends on the belief that two types of non-deterrable threats need to be

neutralized. The first such threat is an accidental or unauthorized missile attack by an established nuclear power such as Russia. The second is forecast to materialize in the distant future: intentional strikes by third-world countries that acquire long-range ballistic missiles armed with conventional or nuclear warheads. These two supposedly non-deterrable threats provide the basic rationale for deploying a fairly extensive anti-ballistic missile system capable of defending the population of the target countries. To accommodate such a system the ABM Treaty must be significantly revised.

Scenarios involving nuclear-armed ballistic missiles fired by accident or without proper authority are imaginable, but the magnitude of the danger is less than commonly portrayed. With respect to the threat to the United States posed by the former Soviet Union—a favorite scenario of missile defense proponents—the preponderance of evidence suggests that safeguards are strict enough to prevent the accidental, unauthorized firing of one or more intercontinental ballistic missiles. At issue is the alleged threat of: (1) accidental launch of either a single SS-18 land-based missile carrying ten warheads, or a single SS-N-20 sea-based missile carrying ten warheads; (2) an unauthorized launch of a group of ten SS-18 missiles carrying a total of 100 warheads, or a boatload of twenty SS-N-20 missiles carrying a total of 200 warheads. The “worst-case” threat is therefore either an unauthorized 100-warhead ICBM attack or an unauthorized 200-warhead ballistic missile submarine (SSBN) attack.

The ICBM scenario assumes an illicit launch of ten SS-18 ICBMs by the two-man combat crew that normally controls them. However, numerous stringent safeguards stand in the way of such an act. The silo-based ICBM force, particularly modern forces like the SS-18s, are under an extremely strict regime of technical safeguards from the top to the bottom of the Russian nuclear chain of command. This scenario is fanciful and certainly ought not to be the basis of a missile defense program. It is also important to note that the SS-18 force along with the rest of the multiple-warhead ICBMs in the Russian strategic arsenal are slated for elimination in accordance with the START II agreement negotiated during the summer 1992 Bush-Yeltsin summit in Washington.²⁰

The alleged submarine threat is less fanciful, but the safeguards regime must still be considered strict for them. The threat of unauthorized attack by a Russian strategic submarine is almost certainly too small to warrant deploying missile defenses against it. The Russian strategic forces with the poorest technical safeguards

20. See *Bush-Yeltsin Summit Brings Deep New Strategic Arms Cuts*, ARMS CONTROL TODAY, June 1992, at 17; *The Bush-Yeltsin Summit: Bringing Reality to the Nuclear Balance*, ARMS CONTROL TODAY, July/Aug. 1992, at 18.

are the long-range cruise missiles, but ballistic missile defenses obviously would not provide any protection against their illicit firing.

The deployment of extensive missile defenses is not only unnecessary at the present time, but it also would inhibit further reductions of the very forces presumed to pose hypothetical threats of accidental, unauthorized, or deliberate nuclear attack. Deploying defenses is incompatible with the next logical phase of strategic arms control—lowering the ceiling on warheads to 1,000 or less.

B. Elimination of the Day-to-Day Wartime Mission

With the end of the cold war, it is reasonable to question whether nuclear war plans should continue to require strategic forces to be continuously on alert in peacetime. Is it really necessary to be able to launch thousands of nuclear warheads at a moment's notice? Operating forces on so short a fuse continuously during peacetime, as is the current practice, presents a massive technical threat that continues to produce significant tension between the strategic establishments. Mere capabilities do matter even if aggressive intentions are gone. The peacetime postures run counter to the goal of relaxing nuclear tensions and of introducing measures designed to eliminate the danger of accidental or unauthorized use. The continuing nuclear vigil also perpetuates a hair-trigger mentality that is susceptible to discharge on false warning, and generally sets a bad example for the rest of the world.

The goal of eliminating the threat of nuclear inadvertence can be advanced through negotiable constraints on operational activities. Among the recommended constraints, current levels of combat readiness for strategic nuclear forces remain too high despite the cessation of alert activities by long-range bombers and recent reductions in alert rates for ICBM forces.

All of these threatening forces could be taken off combat alert in stages. In the first stage, all strategic forces slated for elimination under START I and START II should be deactivated immediately. The ICBMs should be "stood down" in the same manner that the 450 Minuteman II and 503 Soviet ICBM forces were "stood down" in accordance with the Bush-Gorbachev initiatives of September and October 1991.²¹ In addition, warheads for the strategic forces can be removed to extend the time required for returning them to combat status. The benefits of START, including the complete deactivation of missile forces outside Russia, will thus be realized in a few days instead of seven to ten years.

21. See *Bush's Arms Plan*, N.Y. TIMES, Sept. 28, 1991, at A4; *Gorbachev's Remarks on Arms Cuts*, N.Y. TIMES, Oct. 6, 1991, at A12.

All of the submarine forces should adopt “modified” alert status, and confine themselves whenever possible to ocean areas that put them out of range of their targets.²² Submarines on “modified” alert require a minimum of eighteen hours after leaving port to complete the complex mobilization procedures that enable them to assume a launch-ready disposition. An example is the removal of flood plates from the launch tubes and the installation of vital electronic components into the fire control system. Submarines on “modified” alert will remain invulnerable to attack, but if the mobilization procedures are not performed they cannot mount a strike for at least eighteen hours. This time constraint could be substantially extended if warheads also were taken off the missiles and located on shore or ship tenders.

In stage two, all strategic forces should be taken off alert. This would entail reciprocal steps by all the declared nuclear weapons states. Compliance with such multilateral restrictions on alert levels involves feasible means of verification, especially if warheads are removed from missiles. For ICBMs, verification should involve on-site inspection as well as national technical means. To this end, inspectors might be placed inside certain launch control centers for prolonged periods. For SSBNs on permanent “modified” alert with warheads onboard, verification can be facilitated by cutting back to a single crew concept and operating the SSBNs in a manner similar to that in which attack submarines (SSNs) are operated.²³ If warheads are removed from the SSBNs, verification methods involving on-site inspection of SSBNs and national technical means may be devised. The key technical challenge is to devise a means of timely verification that prevents any possibility of gaining a decisive head start in reconstituting capability by breaking out of the agreement. Verification would have to be intrusive; continuous on-site inspection of warhead stockpiles would be necessary.

C. Reduction of Reliance on Launch-on-Warning and Improve Warning Performance

Despite obvious dangers, nuclear reaction times grew shorter and shorter during the cold war. The command systems geared themselves to launch on warning—that is, to disseminating launch authorization after detecting the apparent launch of enemy missiles, but prior to arrival of the missiles. Retaliation was otherwise problematic. As a practical matter, the susceptibility of command

22. “Modified alert” is the normal alert status for half of the U.S. SSBN force at sea at any given time in peacetime.

23. That is, making numerous port calls and reducing the time spent at sea from two-thirds to one-third.

systems to disruption, and the mutual vulnerability of each side's silo-based forces, created a strong bias on both sides for extremely rapid reaction to evidence of impending attack, in effect a launch-on-warning posture for both sides.

Although both sides came to depend on rapid reaction postures during the cold war, they assumed a significant risk of nuclear inadvertence in the process. The difficulties of providing reliable warning of actual attack while guarding against false alarms were substantial. They were compounded by the deployment of stealth weapons such as long-range cruise missiles, and aggravated by the break-up of the Soviet Union. Many of the ground radar installations that provided missile attack early warning were situated outside Russia. At least eight such installations were located on the territory of five former republics, not counting Russia, and several important ones were shut down by the new governments.

Warning issues aside, the acceptability of any option that permits decision makers only five or ten minutes to decide whether to order the launch of strategic forces is questionable. Time is obviously too short to permit any deep deliberations about the military, much less the political or moral repercussions of alternative responses. It instead dictates a quick, almost automatic decision that increases the risk of accidental war.

Because these rapid reaction postures were carried over into the post-cold-war era, they pose a hazard despite the easing of nuclear tensions. Lengthening the required reaction times of the command systems will be promoted if the day-to-day alert levels are lowered and brought under the operational constraints discussed above. In a serious crisis, however, the command systems are prone to shorten the reaction time. Nuclear forces will be generated to launch-ready status and the command systems on both sides will prepare to fire them on tactical warning. This residual danger should gradually diminish as relations continue to improve, but meanwhile, it can be mitigated by improving the performance of early warning systems. Emphasis should not be put on improving positive detection of a massive deliberate attack—a cold war function of warning systems designed to support rapid reaction or literal launch on warning—but rather on, in descending order of priority: (1) reducing the chances of false alarms, thereby providing extra assurance that an attack is *not* underway; (2) ensuring that a small-scale accidental or unauthorized attack is detected and identified as such should it occur; and (3) helping to monitor the launch activities of third world countries that are developing or deploying ballistic missiles. This proliferation has growing potential to pose a direct threat to the nuclear superpowers and also to strain their early warning systems. It might also increase the risk of false alarms and thus aggravate the problem of nuclear inadvertence.

Cooperation to improve early warning performance would be beneficial. Among other ideas, some combination of acoustic, infrared and optical sensors could be placed in both sides' ICBM fields, with the processed signals sent simultaneously to the early warning centers on both sides, in order to provide mutual reassurance that each sides' ICBMs remain in their silos.²⁴ A direct communications link could also be established between the North American Air Defense Command headquarters and the Russian counterpart (the VPVO Center for Analysis of Space and Missile Situation) so that the key military officials responsible for early warning and attack assessment may confer to clarify ambiguous situations in a timely fashion. At present, the two sides have *no* capability to establish a channel of communications and exchange information within a short period of time, certainly not within the thirty-minute flight time of an intercontinental missile. As discussed below, a joint early warning center also has much to recommend it.

The deployment of stealth technology, designed to confuse opposing warning systems, should be very strictly controlled at very small levels of deployment. Also, the patrol zones of ballistic missile submarines could be circumscribed in ways that increase attack early warning performance. For instance, submarines could be excluded from patrol areas that are poorly covered by existing warning systems—notably, far northern arctic waters for Soviet SSBNs and certain Pacific ocean zones for U.S. SSBNs.

Warning system assets should be the focus of greater investment and explicit arrangements should be made for mutual protection of these assets, most notably, an agreement prohibiting the testing or deployment of dedicated antisatellite ASAT weapons, banning all space weapons. Since ASATs are not high priorities in current defense programs the time is ripe to end all activity in this area.

D. Establish a Joint Early Warning Center

The United States, Russia, and affiliated nations should establish a joint early warning center to improve missile and space monitoring. The basic mission of such a center should be to detect every ballistic missile launch that occurs anywhere in the world, and to provide to the key command posts of the participating nations, as rapidly as possible, a report that identifies: (1) the time of launch; (2) launch site and country of origin; (3) missile type; (4) trajectory; and (5) point of impact. The center could also monitor and report on

24. *Strategic Nuclear Reduction in a Post-Cold War World: National Security Issues, 1992: Hearings on the START Treaty Before the Senate Comm. on Foreign Relations, 102d Cong., 2d Sess. 126 (1992)* (statement of Richard L. Garwin). Garwin was the seminal proponent of this idea.

events in outer space that might present a danger to a member state by being connected to space- and ground-based sensors. Some data can be received directly from them, and other data can be obtained from the major early warning processing centers, particularly NORAD in the United States and the Center for Analysis of Space and Missile Situation in Russia. Communications linking the duty staffs of the center with those major national facilities should be established to provide a means of clarifying ambiguous events.

Among its tasks, the joint center should monitor not only launches of ballistic missiles by the established nuclear powers, but also those of proliferating states whose programs pose direct threats to U.S. allies, U.S. forces overseas, and territory of the former Soviet Union. Cooperative warning is valuable for monitoring and responding to the combat use as well as the developmental testing of these missiles. Of particular value in this regard are radar sites that monitor the Middle East and China. The Lyaki radar in Azerbaijan, for instance, detected SCUD missiles fired by Iraq toward Israel during the Gulf War, and real-time access to this data might have provided the United States with better SCUD launch detection and impact point predictions than it was able to produce on its own.

The main purpose for such joint monitoring of ballistic missile launches wherever they occur is to alleviate the danger that erroneous early warning might trigger the launch of U.S. or Russian missile forces. The object is to prevent false alarms and increase mutual assurance that a nuclear missile attack is not underway. Joint operations that combine the surveillance assets of the participants, and accumulate data and experience, promise to serve this goal better than any individual operation could.²⁵

25. Which nations should staff the center? In principle, it seems appropriate to invite the participation of states that are already partners in existing missile early warning operations. Those states that participate in actual operations—as in the case of Canada, a full partner in NORAD—should be invited to join, as should states that permit early warning systems to operate on their territory—as in the case of the United Kingdom, the host nation for a Ballistic Missile Early Warning radar tied to NORAD. Under this principle, quite a few states from the former Soviet Union could become members, along with the United States, Canada, the United Kingdom, Australia, and Denmark. In addition, it seems reasonable to bring in all states that currently possess nuclear armed missiles, and perhaps the members of the Missile Technology Control Regime as well, and members of C.S.C.E., which produced the recent “open skies” agreement.

E. Destroy Nuclear Weapons that Lack Modern PALs

An important safeguard against unauthorized use of nuclear weapons are “permissive action links” (PALs) or their functional equivalents. These locks provide a vital physical barrier to accidental or unauthorized launch because they require a code to be inserted before a warhead can be released or detonated.²⁶ In many cases the lock is part of the warhead itself. In other cases, such as bombers and missiles, similar devices known as coded switch systems are employed on the launcher or delivery vehicle. Such systems prevent, for instance, the bomb racks from dispensing their stores or the beginning of a missile’s terminal countdown to launch.

Most Russian nuclear forces—all strategic weapons and most tactical weapons—must receive these codes from higher authority, without which the weapons cannot physically be dispatched, detonated, or both. Many strategic weapons such as air- and sea-launched cruise missiles and most tactical weapons lack sufficient PAL protection, however. In these cases the primary safeguard is on the container or launcher rather than the weapon itself.

All nuclear weapons that remain in the active inventory should be equipped with PALs that are integral to each warhead whenever possible, and all others should have at least the protection of modern coded switch devices for the launcher. Without exception, all other nuclear weapons should be retired and dismantled. The Bush-Gorbachev initiatives of the fall of 1991 earmarked for destruction most of the weapons that lack modern safeguards of these types.²⁷ The residual weapons that lack the safety devices should either be equipped with them or destroyed. Parties need to exchange information on the status of their respective inventories and establish standards with which to evaluate the effectiveness of existing technical safeguards. Weapons that fail to meet the requisite standards should, by mutual agreement, be inactivated and slated for destruction.

26. For useful background information on PALs, see PETER STEIN & PETER FEAVER, *ASSURING CONTROL OF NUCLEAR WEAPONS* (1987); Donald R. Cotter, *Peacetime Operations: Safety and Security*, in *MANAGING NUCLEAR OPERATIONS* (Ashton B. Carter et al. eds., 1987); Dan Caldwell, *Permissive Action Links*, *SURVIVAL*, May-June 1987, at 17.

27. See Robert C. Toth, *Arms Reduction: Where the U.S. and Soviets Stand*, *L.A. TIMES*, Oct. 26, 1991, at A3.

F. Employment Measures for the Emergency Disabling of Weapons

Nuclear weapons, launchers, delivery vehicles, and storage facilities can be rigged in a manner that allows them to be quickly disabled in emergencies, such as terrorist assaults. Nuclear weapons states should have technical discussions about feasible options and agree to implement them on a comprehensive basis. Certain devices could even be jointly developed and produced. Among the desirable options is one permitting higher-ranking authorities to disable weapons systems by remote radio control in the event that local custodians are overpowered and unable to perform the task. In a similar vein, special counter-terrorist response teams composed of U.S. and Russian troops might be formed and trained to conduct joint operations if either requests assistance. Efforts along these lines could be further facilitated by sharing intelligence on threats to the nuclear systems posed by terrorist-like groups.

G. Research and Development of "Command-Destruct" Devices

If all other measures fail to prevent the inadvertent employment of one or more nuclear weapons, steps can be devised to mitigate the consequences. Apart from reducing the number of warheads carried by each delivery vehicle, measures may be developed to disable weapons before they reach their destination.

The Accidents Agreement signed by the Soviet Union and the United States in 1971 actually obliges each side to develop such measures.²⁸ It not only requires each side to notify the other in the event of an unintentional act that might ignite a nuclear war, but also to take steps that protect the other side from damage. The second sentence of Article 2 states: "In the event of such an accident, the Party whose nuclear weapon is involved will immediately make every effort to take necessary measures to render harmless or destroy such weapon without its causing damage."²⁹

A command destruct system offers a solution. Almost the only practical means of effectively coping with a missile launch after it has occurred is for the country of origin to destroy its own missiles or warheads prior to impact and detonation. The United States has not developed this capability for nuclear-armed strategic weapons, but it is technically feasible to provide it using *active* command-destruct systems similar to those used by range safety officers to destroy

28. Agreement on Measures to Reduce the Risk of Outbreak of Nuclear War, Sept. 30, 1971, U.S.-U.S.S.R., *reprinted in* 10 I.L.M. 1172. I thank Professor Sherman Frankel for pointing this out to me.

29. *Id.* art. 2.

errant test missiles, or using *passive* systems that would energize a self-destruction mechanism onboard a missile a few seconds after launch if that missile had not previously received an appropriate coded signal allowing it to fire. The passive system might be readily incorporated into Russian missiles, because a sizable portion of their combat-ready strategic missile forces is already equipped with onboard sensors and an explosive charge designed to blow up the missiles automatically if they stray from their proper trajectory during an authorized strike. Such a system could be modified to deal with unauthorized or accidental launches.³⁰

H. Reinvigoration of Non-Proliferation Efforts

The danger that Ukraine and possibly Kazakhstan will reverse course and reject START, the NPT, or both, should be counteracted by Western diplomatic pressure, economic incentives, and security assurances. Relatively small amounts of foreign aid could exert considerable leverage on the problem of Ukrainian recalcitrance. A U.N. Security Council Resolution similar to Resolution 255³¹ could provide a basis for security assurance against the threat of nuclear attack on Ukraine. Such rewards should be strictly predicated on Ukraine's accession to the NPT and START ratification. Although Western diplomacy must be firm on this issue, it also needs to show greater appreciation for Ukraine's genuine security needs, and pursue a policy of linkage that shows proper respect for Ukrainian sovereignty. Ukraine's security ultimately depends on bolder reciprocal steps toward nuclear disarmament by Russia, the United States, and the other nuclear powers.

The United States should redouble its efforts to get the Nunn-Lugar initiative and other related projects under way. The most important projects are devoted to facilitating the dismantlement of warheads and the disposal of fissile materials, and to strengthening export controls and safeguarding fissile materials against theft and sale on the black market.

Russia's export control commission, which coordinates nuclear export regulations for eight of the former Soviet republics, faces a daunting challenge. The West should offer more assistance in strengthening its efforts and in getting Ukraine, Kazakhstan, and Estonia to join the Nuclear Suppliers Group.

30. See Sherman Frankel, *Aborting Unauthorized Launches of Nuclear-Armed Missiles Through Post-Launch Destruction*, 2 *SCI. & GLOBAL SECURITY* 1 (1990).

31. S.C. Res. 255, U.N. SCOR, 23rd Sess., 1433rd mtg., Jan.-June 1968, at 13, U.N. Doc. S/Supplements (1968).

The United States should also focus immediate attention on the hundreds of bomber nuclear warheads still stored in Ukraine. These weapons pose a greater threat than the warheads on ICBMs because their technical safeguards are weaker and they could be used more flexibly against Russia if Ukraine inherits them. Russia has disabled them at the field storage locations, but Ukraine could possibly rebuild them in time. Unlike the ICBM warheads, the rapid removal of bomber warheads to Russia presents no safety hazard or technical complications. Ukraine should follow Kazakstan's lead and allow Russia to repatriate the warheads on a fast schedule. The West should encourage this step toward Ukrainian fulfillment of its START obligations.

VI. CONCLUSION

The threat of nuclear anarchy in the former Soviet Union has replaced the cold war threat of deliberate nuclear attack. This reordering of policy concerns is appropriate in the post-cold-war era. Although the danger is often exaggerated, strengthening nuclear safeguards against accidental or unauthorized use, and preventing nuclear proliferation, deserve their high positions on the agenda of international security policy. It should be recognized that these problems are rooted in the cold war forces, doctrines, and operational postures that have been carried over into the new era. Operational arms control measures offer an especially instrumental means of reducing the danger of nuclear anarchy and mitigating its consequences.