



A WORLD FREE
OF
NUCLEAR WEAPONS





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About This Issue

“I state clearly and with conviction America’s commitment to seek the peace and security of a world without nuclear weapons. I’m not naive. This goal will not be reached quickly — perhaps not in my lifetime. It will take patience and persistence...”

—U.S. President Barack Obama, April 5, 2009

In 1931, Albert Einstein described himself as “not only a pacifist but a militant pacifist.” Eight years later Einstein wrote President Franklin D. Roosevelt that “it may be possible to set up a nuclear chain reaction in a large mass of uranium, by which vast amounts of power and large quantities of new radium-like elements would be generated ... it is conceivable — though much less certain — that extremely powerful bombs of this type may thus be constructed.” Einstein warned the president that Nazi Germany already had prohibited the export of uranium, and he suggested that the U.S. government speed up atomic research.

Roosevelt launched the Manhattan Project, the top secret U.S.-U.K.-Canada crash effort that produced the world’s first atomic bomb. When it detonated, on July 16, 1945, at Alamogordo Test Range in New Mexico, the project’s scientific director, Robert Oppenheimer, recalled the words of the *Bhagavad Gita*: “Now I am become death, the destroyer of worlds.” Oppenheimer later would oppose, unsuccessfully, development of the still more fearsome hydrogen bomb.

Speaking last year in Prague, President Barack Obama offered a U.S. commitment to seek a world without nuclear weapons. But he also acknowledged that the objective might not be achieved in his lifetime. How that goal might be attained, and why getting there is so difficult, is the subject of this *eJournal USA*.

Our contributors approach the issue from every angle. Most agree with President Obama’s objective, although one, a former U.S. national security adviser, argues

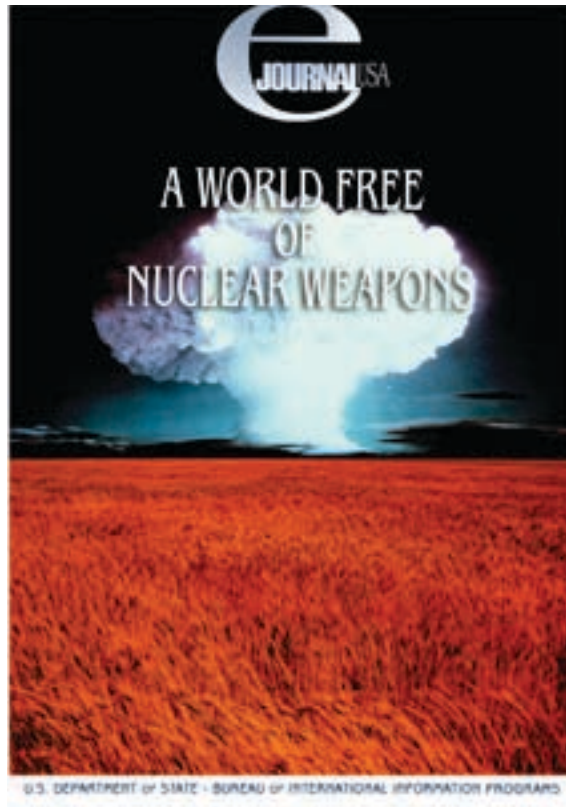
that the world may be safer with a few acknowledged nuclear weapons than with promises that all have been foresworn. Feature essays explore thoroughly the existing Nuclear Non-Proliferation Treaty and the obstacles to its

extension. We review Obama administration policy, and also how the issues look from the Russian vantage point, and from the perspective of nations that choose not to proliferate. We outline past arms control efforts — some produced better results than others. We ask the question: Why did some nations build thousands of nuclear weapons? And we profile a program that already has eliminated some 15,000 nuclear warheads.

When a leading pacifist calls for an atomic bomb and the man most responsible for producing it opposes its growing destructiveness, we know that the issues are tangled. When the leader of the United States of America sets a goal and in the next sentence suggests it may not be fully

achieved in his lifetime, we know the issues are difficult. We hope readers of this *eJournal* come to appreciate just how difficult and, most importantly, leave us this month determined along with President Obama to build a safe and peaceful world, no matter how long it takes.

—The Editors





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Obama's Commitment

Ellen O. Tauscher

Other people have talked about achieving a world without nuclear weapons. President Obama is trying to make it happen. Ellen O. Tauscher is under secretary of state for arms control and international security.

In Prague last April, President Obama set forth an ambitious and bold agenda: to achieve the peace and security of a world without nuclear weapons. Other presidents have articulated that goal, but President Obama has made clear that he will aggressively work toward it.

Achieving a nuclear-free world, the president said, would take patience and persistence and might not happen in his lifetime. The journey, however, can be as important as the destination. Concrete steps we take now will make us safer and more secure by enhancing international security and stability and will help build a foundation for future steps.

As one of the two nations with the most nuclear weapons, we — the United States — acknowledge and embrace our responsibility to lead the way in reducing the numbers and salience of nuclear weapons.

Meanwhile, we will maintain a safe, secure, and reliable nuclear arsenal. We will never waver in our commitment to defend ourselves, our allies, and our interests, and any adversary should know we will defend ourselves and punish aggression.

As Secretary of State Hillary Clinton has said, clinging to nuclear weapons in excess of our security needs does not make the United States safer. Holding onto unnecessary weapons does not make us more secure. It makes others feel insecure. It could give some countries an excuse to pursue nuclear weapons, and it makes it tougher for us to convince others to join us in preventing that.

U.S. AND RUSSIA

Our journey toward a world free of nuclear weapons already has begun. The United States and Russia — the two countries with the largest nuclear weapons arsenals — are working to negotiate a legally binding agreement



In Prague President Obama affirmed his determination to work toward the elimination of nuclear weapons.

to succeed the bilateral 1991 START Treaty. That agreement, which capped the number of those weapons, expired in December 2009.

The new treaty will enhance our mutual security and international stability by mandating lower, verifiable levels of nuclear forces.

The Obama administration also will ask the Senate to ratify the 1996 Comprehensive Nuclear Test Ban Treaty (CTBT). We do so because the CTBT can make us safer and more secure. We know this because our superb scientists working in the Stockpile Stewardship Program have honed their technological skills to the

point that we no longer need to test nuclear weapons.

In addition, President Obama said that the United States will pursue negotiation of a verifiable Fissile Material Cutoff Treaty. The world already has a surplus of nuclear bomb-making materials — we don't need more that we have to worry about protecting from terrorists.

In May, the Nuclear Nonproliferation Treaty (NPT) Review Conference will seek a consensus among NPT parties to revitalize and strengthen the nonproliferation regime. In plain language that means that every nation — nuclear power or not — must play an important role in curbing the spread of dangerous technologies and standing united against those who violate international norms and agreements.

President Obama is taking action to focus attention on nuclear terrorism. He has called for an international effort to secure all vulnerable nuclear material within four years by breaking up black markets, detecting and intercepting materials in transit, and using financial tools to disrupt illicit trade.

NUCLEAR SUMMIT

In September 2009, President Obama chaired a special session of the United Nations Security Council. It adopted U.N. Resolution 1887, outlining comprehensive steps to strengthen the nuclear nonproliferation regime. The president also announced that he would host a Nuclear Security Summit in April 2010 to reach a common understanding of the threat posed by nuclear terrorism.

Meanwhile, we are conducting a Nuclear Posture Review of our strategic forces. It will fundamentally reassess the role of nuclear weapons in deterring today's

security threats. It can be the document that ends Cold War thinking.

To enhance our own national security, the review should chart a course that reduces the role of nuclear weapons in our military and diplomatic strategies while maintaining an effective deterrent as long as these weapons exist.

There are times when proliferation looks inevitable, when it seems that cascades of countries and non-state actors might acquire nuclear weapons or material. Yet proliferation can be curbed and stopped.

We have had significant success. More than 180 countries have foresworn nuclear weapons. More countries have given up or been denied nuclear weapons programs than have acquired them over the past 40 years.

But we also know that the consequences of another state or of terrorists acquiring these horribly destructive weapons are severe and that we cannot let down our guard. That's why nonproliferation, nuclear security, and arms control are at the top of the Obama administration's national security agenda. ■

See also *Remarks by President Barack Obama, Hradcany Square, Prague, Czech Republic* [http://www.whitehouse.gov/the_press_office/Remarks-By-President-Barack-Obama-In-Prague-As-Delivered] and *U.N. Security Council Resolution 1887* [<http://www.america.gov/st/texttrans-english/2009/September/20090924173226ihecuor0.5509411.html>].

The Transformation of U.S. Nuclear Policy

Joseph Cirincione



© AP Images/S.S. Hecker, HO

Two workers stand by bricks and sand used in furnaces to make uranium, a reminder of North Korea's accelerating nuclear program.

President Obama has aimed U.S. policy at eventual elimination of the world's nuclear weapons. He faces plenty of obstacles, especially cynicism. Joseph Cirincione is president of the Ploughshares Fund, a public grant-making foundation focused on nuclear weapons policy and conflict resolution.

President Barack Obama pledged in Prague on April 5, 2009, to pursue “the peace and security of a world without nuclear weapons.” Key treaties, negotiations, and conferences in 2010 will demonstrate whether he can deliver on his pledge to develop a new U.S. strategy to reduce rising nuclear dangers.

TODAY'S THREATS

The people of the world confront four types of nuclear threats. The first is the possibility of a terrorist group getting a nuclear weapon and detonating it in a major city. The second is the danger of an accidental,

unauthorized, or intentional use of one of the existing 23,000 nuclear weapons held by nine nations today. The third is the emergence of new nuclear-armed nations: North Korea today, perhaps Iran tomorrow, and others to follow. The last is the possible collapse of the interlocking network of treaties and controls that has slowed, if not altogether prevented, the spread of nuclear weapons.

During the 1990s, smart policies reduced these threats:

- The United States and Russia, who together have 96 percent of the world's nuclear weapons, negotiated treaties that drastically cut their arsenals.
- Many states gave up nuclear weapons and weapon programs, including Ukraine, Belarus, Kazakhstan, Iraq, and South Africa.
- The United States, Russia, and other nations began programs to secure and reduce stocks of nuclear bomb materials, decreasing the risk that terrorists could get or make a bomb.

- Dozens of nations joined the Non-Proliferation Treaty and worked together to strengthen and extend its global restraints to almost every nation in the world.

There were serious setbacks, however, including nuclear tests by India and Pakistan and developing programs in North Korea and Iran. In 2001, the administration of President George W. Bush adopted a strategy emphasizing U.S. military action to eliminate foreign regimes that it considered hostile and that might get nuclear weapons. This doctrine guided and supplied the justification for the war in Iraq.

The strategy failed. During the 2000s, the threats grew dramatically worse:

- Al-Qaida-style terrorist groups spread while programs to secure nuclear materials failed to keep pace — raising the risk of nuclear terrorism.
- The United States stopped negotiating reductions with Russia, and both nations drafted policies for using nuclear weapons against conventional targets, including underground bunkers.
- The nuclear programs in North Korea and Iran accelerated, advancing more in the past five years than they had in the previous 15.
- The nonproliferation regime weakened, with many fearing its collapse and the start of nuclear weapon programs in many new states.

New York Times reporter David Sanger wrote recently that, after it became clear Iraq had no weapons of mass destruction, “Mr. Bush’s theory lost so much credibility that he stopped talking about what constituted an imminent or severe enough threat for America to act alone.”

NEW POLICY

The Obama administration has a new strategic approach, one less unilateral than the Bush administration’s and more comprehensive than the Clinton administration’s.

It starts with a recognition that nuclear threats are connected. For example, failure to enforce nonproliferation treaty rules expands the probability of additional states developing nuclear weapons. This



Presidents Obama and Medvedev focus on U.S. and Russian obligations.

increases, in turn, the number of sites from which terrorists might get weapons. The reverse is also true: Large decreases in global nuclear arsenals could help generate the international cooperation needed to secure and eliminate nuclear materials, making it less likely terrorists could steal or build a bomb.

The Obama strategy recognizes the central role of U.S. nuclear policy in reducing the threats. “As the only nuclear power to have used a nuclear weapon, the United States has a moral responsibility to act,” the president said in Prague. “We cannot succeed in this endeavor alone, but we can lead it.”

Obama joined with Russian President Dmitry Medvedev to negotiate new reductions in both nations’ weapons. While earlier U.S.–Russia joint statements often focused on the threat of other nations’ weapons, Obama and Medvedev on April 1, 2009, focused instead on their own weapons and their own obligations. They said:

“We committed our two countries to achieving a nuclear-free world, while recognizing that this long-term goal will require a new emphasis on arms control and conflict resolution measures, and their full implementation by all concerned nations.”

The emerging plan can be summarized as reduce, secure, and prevent. Work on all three levels would proceed simultaneously:

- Reduce the number of nuclear weapons in the world and their role in national security strategies — beginning with the United States and Russia but eventually including all nuclear-armed states.
- Secure all stockpiles of nuclear weapons materials,

preventing nuclear terrorism and building international cooperation.

- Prevent the emergence of new nuclear states through a combination of tough sanctions to penalize states that violate their treaty obligations and realistic engagement to offer these states a more secure non-nuclear future.

Tying these practical steps together is the vision of a world without nuclear weapons. Once considered a utopian ideal, the elimination of nuclear weapons is now embraced by a bipartisan alliance among many of America's leading national security thinkers. Since their January 2007 joint op-ed piece in the *Wall Street Journal*, Republicans George Shultz and Henry Kissinger (both former secretaries of state) and Democrats William Perry (former secretary of defense) and Sam Nunn (former U.S. senator) have led a campaign for global nuclear weapons abolition and for practical steps — such as those in the Obama plan — for moving towards that goal.

Two-thirds of the living former national security advisers and secretaries of state and defense, including James Baker, Colin Powell, Melvin Laird, Frank Carlucci, Warren Christopher, and Madeleine Albright, have endorsed their vision. Dozens of organizations and research institutes now promote this vision and these steps. The Obama plan thus represents a broad consensus of leading American security experts and former officials.

TROUBLE AHEAD

However logical on paper, the Obama strategy must overcome formidable political and practical obstacles.

Most visible is the opposition of nuclear weapons proponents. Editorials in some conservative publications denounce the administration's approach as weak and naïve. This argument is sustained by some conservative commentators and think tanks who uphold Cold War assumptions about the deterrent value of a large nuclear arsenal, do not trust verification regimes, or simply reject arms control as an approach to international security.

But true nuclear hawks are few in number, "clinging," as Secretary of State Hillary Clinton says, to nuclear weapons and the failed policies of the past century.

Perhaps a more critical obstacle is the competition for the president's time and energy from other pressing crises. Rarely in American history has a new president inherited such a broad array of problems, including two wars, a worldwide recession, a health care crisis, an energy crisis, a deeply divided political system, and the global unpopularity of some recent U.S. policies. Though

nuclear policy is an important and personal priority for President Obama, it must compete with other issues for his sustained attention.

The president has identified another obstacle: a cynicism that spans the political spectrum. "Such fatalism," he argues, "is our deadly adversary." One sees this fatalism in the thought of those who believe that security in a world with fewer or without nuclear weapons would be unverifiable. Or in those who argue that nuclear disarmament is desirable but unachievable, not worth wasted effort. And in those who think it both desirable and achievable, but not by this administration.

Obama addressed all these critics when he told his Prague audience: "There are those who hear talk of a world without nuclear weapons and doubt whether it's worth setting a goal that seems impossible to achieve. ... We know where that road leads. ... When we fail to pursue peace, then it stays forever beyond our grasp."

Obama's success can be measured by his ability to meet a number of goals he has set for his administration:

- Senate approval of a new nuclear reduction treaty with the Russians.
- A new declaratory posture that reduces the role of nuclear weapons and opens the door to deeper negotiated cuts.
- Agreement on a joint plan at the president's Nuclear Security Summit this April to secure all nuclear weapon materials in four years.
- A Non-Proliferation Treaty review conference in May that unites nations around real enforcement of treaty rules.
- Senate approval of the 1996 nuclear test ban treaty.

Those deeds would turn the promise of Prague into the genuine transformation of U.S. nuclear policy. ■

The opinions expressed in this article do not necessarily reflect the views or policies of the U.S. government.

Playing Percentages

An Interview With Brent Scowcroft



© AP Images/ISNA, Mehdi Ghaseini

Technicians work at Bushehr nuclear power plant in Iran, a country that continues to enrich uranium that could be used for making bombs.

Brent Scowcroft served as U.S. national security adviser 1974-1977 under President Gerald Ford and 1989-1993 under President George H.W. Bush and has served other Republican presidents from Richard Nixon to George W. Bush. Scowcroft sees potential dangers in any attempt to achieve a world without nuclear weapons. He asserts that a better strategy would be to try to shape the world's nuclear arsenals in a way that discourages their ever being used. Now president of the Scowcroft Group international business consulting firm in Washington, Scowcroft spoke to eJournal USA managing editor Bruce Odessey.

Question: Why did the Americans and Soviets build up such huge stockpiles of nuclear weapons in the first place?

Scowcroft: Basically, our notion of nuclear weapons, that is, the value of nuclear weapons, was to make up for an imbalance compared to the Soviet Union in conventional forces. We hoped to make up for that deficit by the awesome potential of nuclear weapons.

And when the Soviets developed nuclear weapons in order to offset that advantage, I think we thought we had to in order to maintain an edge — in terms of quantity and quality — and that turned into vigorous competition.

Then we developed various devices to deal with that competition, such as the concept of mutual assured destruction, which emphasized the awesomeness of nuclear weapons, and that once you had destroyed the opponent as a viable society you didn't need any additional weapons.

All of these facets got mixed together into what became the Cold War competition in nuclear arms.

Q: Now President Obama has reiterated the goal of a world without nuclear weapons. Still, some people in this country think this is a bad idea. What do you think?

Scowcroft: I think the concept has several serious flaws. First of all I think it's unlikely that we could ever achieve

it. Even trying to achieve it, I think, may get in the way of doing some more practical things to improve the stability of the nuclear world and to achieve a goal which I think is perhaps possible, and therefore may be more desirable, and that is to insure that nuclear weapons are never used.

In addition, while I don't think we could ever get to zero, if we somehow did, and nothing else changed in the world, it could be a very perilous, unstable world. We cannot erase the knowledge of how to build nuclear weapons and, in a world of zero, just a few nuclear weapons could make a tremendous difference. Therefore, I think it would be an extremely unstable world.

So I would instead focus on changing the character of the nuclear arsenals in a manner that would make it most unlikely that there would ever be a resort to nuclear weapons in a crisis. One of the fears in a crisis, for example, is that he who strikes first can destroy enough of the opponents' weapons that he can survive a retaliatory strike. The character of the arsenals on each side can be constructed so that would be unlikely or impossible.

Q: Explain that.

Scowcroft: Let me illustrate. Let's suppose that our nuclear arsenal was composed of 10 submarines with 200 weapons on each submarine. If you catch eight of those in port and can destroy them all with a few weapons, that could be a pretty attractive option. On the other hand, let's say each side had a thousand single-warhead ICBMs, which means that it would take more than that to destroy them. So you would be worse off after a first strike rather than better off.

That is just an illustration of the kind of calculation that I think we ought to make in discussing the issue with the Soviet Union — developing a mutual nuclear force structure such that these weapons are never likely to be used.

Q: Aside from the United States and Russia, there are other nuclear-armed countries. So how would your strategy apply to those countries?

Scowcroft: I would first start with the U.S. and the Russian nuclear arsenals and later include the lesser nuclear powers. I would hope that there would be strong protocols in association with the reductions of the major powers, resisting the acquisition of nuclear weapons by new nations.

Q: There are existing protocols aimed to discourage the spread of nuclear weapons, but ...

Scowcroft: To me it is all playing percentages. Whether our goal is zero nuclear weapons or nuclear weapons that are never going to be fired, the result would be the same: that nuclear weapons are not used. It just seems to me that measures designed that they're never used are easier to deal with than zero.

Q: Whether it's your strategy or the strategy of the Obama administration to have a world free of nuclear weapons, both require political will by a lot of countries. Where's the political will?

Scowcroft: Nations acquire nuclear weapons for a variety of reasons. For deterrence, prestige, perhaps to threaten or coerce. And one has to accompany reductions or attempted elimination with elimination of the reasons that they are attractive to possess.

It's not, I think, an accident that in the Non-Proliferation Treaty, the exhortation to go to zero is accompanied by a similar exhortation of complete and universal disarmament. Now if one could get to complete and universal disarmament, *ipso facto* you would have zero nuclear weapons.

One of the things I worry about with zero as a policy goal is that you maybe skip over some of the things you can do to reduce the likelihood in the interim of making steps that will help reduce the possibility of nuclear war. Because the tendency is likely to be that if the goal is zero, we should try to get there directly and as quickly as possible. And if your process is simply one of reducing numbers, you could get to a point where you have a very unstable world, where the incentive in a crisis to strike first could be powerful.

Those are the kinds of things that make me lean toward a more cautious approach to the problem.

Q: How would any reduction or elimination be verified and enforced?

Scowcroft: It would have to be, especially at the beginning, quite intrusive. There's no question about that. But if it's intrusive at the margins, it is more likely to be able to be accommodated by the major powers than if it's intrusive to the point that deception could yield critical advantage.

It would not be easy, no question about that. But we have counting rules now. And we have ways — they're

not perfect — we have ways to verify that each side has done what they commit to do. We can improve that, and we should.

Q: Isn't zero nuclear weapons easier to enforce than some small number of nuclear weapons?

Scowcroft: Not necessarily. But you're not going to go to zero at once, anyway. So even if you're on your way to zero, you've got to verify that your measures to reduce have been carried out. And then even if you've reached zero, how do you police zero?

Policing zero may be easier than policing numbers, but not necessarily. The whole verification issue is a problem regardless of the route you travel.

Q: We've been talking about states having nuclear weapons. What's the safest way to prevent terrorists from getting their hands on nuclear weapons?

Scowcroft: I think as a practical matter we need to keep them out of the hands of terrorists long before we go to zero. That is an immediate problem, a problem where it is in the interests of the vast majority of countries to cooperate. Not everyone, certainly. But most. So there is a common incentive to keep nuclear weapons from spreading.

Q: Are you optimistic that the world can avoid nuclear war?

Scowcroft: Right now I am. I think the chances of a major nuclear attack are down dramatically. But that's less because of the weapons themselves than the change in relationships among the powers that have nuclear weapons. I think that nonuse in itself creates barriers to use that help reinforce it. There is much we can do to induce countries that think they need nuclear weapons — like Iran, like North Korea, and others — to convince



Soldiers and citizens in Pyongyang celebrate a North Korea nuclear test.

© AP Images/Kyodo, File

them that they don't need nuclear weapons to feel secure.

I think we've made some progress on that. If you look back 20 years, there were many more countries aspiring to be nuclear powers than there are at present. We're not out of the woods at all, and, if we fail in Iran, we have a huge problem. Because if Iran succeeds in saying it has the right to enrich uranium, then the result could be a stream of countries that don't necessarily want nuclear weapons but want to be ready if they need them to deal with Iran — like Egypt, Saudi Arabia, Turkey in the region — and others elsewhere. We would then have a much more difficult world.

Q: How do you persuade Iran and North Korea that they don't need nuclear weapons?

Scowcroft: I think the more dangerous case is Iran because of the nature of the region in which it is located. We must convince them that continuing to enrich uranium domestically, whether or not their goal is a nuclear weapon capability, will decrease, not increase their security. That is because other countries in the region would be likely to follow suit, with the result being a more threatening environment in that part of the world.

We should also offer, perhaps together with Russia, that we are prepared to work out a system where the IAEA [International Atomic Energy Agency] would

guarantee a supply of enriched uranium for fuel for power reactors without the right of a national veto as long as Iran meets the IAEA rules. That enriched uranium could be provided at prices Iran could not possibly match through domestic enrichment. And the IAEA would take back the spent fuel.

We have not yet gotten quite that far. We and the Russians are part way toward proposing such a deal. But for a country that isn't determined for other reasons to have an enrichment capability, that would be a powerful argument.

Those are the kinds of things I would do. For North Korea, I would declare that we are prepared, if the DPRK would forgo nuclear weapons, to offer normal relations and provide, in conjunction with the Chinese and other powers, a security framework in which it can feel safe and unthreatened by the United States. It might not work. But I think it's worth a try. ■

The opinions expressed in this interview do not necessarily reflect the views or policies of the U.S. government.

Nuclear Tipping Point



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At the White House in May 2009, (from left) Kissinger, Shultz, Nunn, and Perry press their campaign for abolishing nuclear weapons.

Many former U.S. national security officials — Republicans and Democrats — now advocate elimination of nuclear weapons. At the forefront are Henry Kissinger and George Shultz, former secretaries of state under Republican presidents; William Perry, former secretary of defense under a Democratic president, and Sam Nunn, former Democratic U.S. senator who chaired the Senate Armed Services Committee. These four men co-wrote two important opinion pieces published a year apart in the *Wall Street Journal*: “A World Free of Nuclear Weapons,” January 4, 2007, and “Toward a Nuclear-Free World,” January 15, 2008. [http://www.online.wsj.com/public/article_print/SB120036422673589947.html] A documentary film, *Nuclear Tipping Point*, including interviews with the four men has been released; a Web site about the film at <http://nucleartippingpoint.org/home.html> includes background material and offers a free DVD on request.

Nonproliferation's Contribution

George Perkovich and Deepti Choubey

More than ever, preventing nuclear weapons proliferation requires cooperation among the United States, Russia, and China plus emerging powers. To achieve this cooperation, measures must be crafted to uphold the bargain between disarmament and nonproliferation. George Perkovich is vice president for studies and director of the Nuclear Policy Program at the Carnegie Endowment for International Peace; Deepti Choubey is the deputy director.

The great destructive power of the first atomic bomb persuaded many leaders of the need to constrain that power. Thus was born the goal of nonproliferation and the search for a nonproliferation regime: a set of norms, rules, institutions, and practices to prevent both the spread of nuclear weapons and the material and know-how necessary to acquire them.

The Nuclear Non-Proliferation Treaty (NPT) of 1968 established such a regime, but today's challenges threaten its stability and effectiveness. Only measures to reinforce the relationship between verifiable disarmament by the existing nuclear powers and nonproliferation by non-nuclear states can strengthen cooperation and make us all more secure.

The United States alone could not stop the spread of nuclear weapons. Once the Soviet Union acquired the bomb in 1949 and others prepared to follow, nonproliferation became feasible only through cooperation. This was not simple. Not only would geopolitical adversaries have to agree, but states that possessed nuclear weapons would need to find common ground with the vast majority of nations that did not.

The former group could not be forced to give up their weapons just as the latter could not be forced to give up the right to build their own. Only a regime of mutually agreed-upon nonproliferation rules could do that. These rules had to satisfy the core interests of the "have-not" states while tolerating, at least temporarily, the possession of nuclear weapons by the states that already had them.

After a series of false starts, the United States and the Soviet Union joined the multilateral negotiation that produced a draft of what became the NPT. The two superpowers shared an interest in preventing others from acquiring nuclear weapons. Each also served as protective



Egypt maintains this nuclear research center at Inshas and resists efforts to give the IAEA authority to conduct more effective inspections.

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patron for many non-nuclear nations. These states could eschew building their own nuclear weapons if they were certain "their" superpower would protect them from a threat by the other.

NPT BARGAIN

The NPT entered into force March 5, 1970. It comprises a set of bargains. The nuclear weapon states agree to work in good faith toward nuclear disarmament, to transfer neither nuclear weapons nor the wherewithal to make them to non-nuclear weapon states, and to recognize the "inalienable right" of non-nuclear weapon

states to access nuclear energy for peaceful uses. In return, non-nuclear weapon states promise not to acquire nuclear weapons.

Under the NPT, disarmament and nonproliferation should be mutually reinforcing. As more states adhere to the NPT, each nation should gain confidence that its neighbor or adversary is not developing nuclear weapons and so be more secure in its decision not to proliferate. Existing nuclear states similarly should feel able gradually to reduce their stockpiles with an eye toward full nuclear disarmament.

This nonproliferation regime has been remarkably successful, if imperfect. The NPT is among the most universal of treaties: All nations except India, Israel, and Pakistan have joined. North Korea joined but subsequently withdrew and has tested a nuclear device, becoming the only state to develop nuclear weapons despite its NPT obligation not to do so.

Many states have abandoned or reversed clandestine efforts to acquire nuclear weapons. Iraq was pursuing such a program at the time of the 1990-1991 Gulf War. Fearing isolation and outside coercion, Libya ended its effort in 2003 and instead sought international cooperation. Taiwan and South Korea stopped nuclear weapons work under secret pressure from the United States and after extracting reaffirmation of U.S. guarantees of their security. Belarus, Kazakhstan, and Ukraine agreed to join the NPT in the early 1990s as the United States and Russia reduced their nuclear arsenals and cultivated a climate hospitable for nuclear disarmament. Argentina and Brazil shut down their nascent nuclear weapons programs, and South Africa relinquished a secret nuclear weapons stockpile — largely for domestic reasons — but no doubt post-Cold War nuclear arms reductions created norms that pulled them in that direction.

Since 2001, the nonproliferation regime has adapted to address the previously unimaginable threat of nuclear terrorism. Initiatives to keep nuclear fuel and technology away from terrorists include:

- bilateral cooperation between the United States and Russia;
- multilateral commitments from the Group of Eight major industrialized countries;
- a nuclear terrorism convention;



Minister Roberto Amaral points to map showing uranium mines in Brazil, one of the key states likely to resist stronger nonproliferation rules.

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- the Proliferation Security Initiative;
- the Global Initiative to Combat Nuclear Terrorism;
- U.N. Security Council Resolution 1540, requiring all U.N. members to take and enforce measures against the proliferation of weapons of mass destruction, their means of delivery, and related materials.

RISKS REMAIN

Despite these successes, real risks remain. One is that the mutually reinforcing relationship between disarmament and nonproliferation may be weakening. If Iran ignores a U.N. Security Council prohibition against acquiring nuclear weapons capabilities, and if North Korea maintains its nuclear weapons, further proliferation among their neighbors becomes more likely as confidence in the nonproliferation regime weakens.

Skeptics in nuclear-armed nations, including the United States, argue that neither nuclear arms reductions nor measures like the global ban on all nuclear tests — the Comprehensive Test Ban Treaty (CTBT) — will discourage rule-violators like Iran from seeking nuclear weapons. Nor, these critics argue, will they persuade leading non-nuclear weapon states such as Brazil and South Africa to cooperate in enforcing nonproliferation rules. History suggests this view is too cynical.

Means exist to buttress confidence. If all states will agree to accept what is called the Additional Protocol to the NPT, the International Atomic Energy Agency (IAEA) would have the means to undertake more

effective inspections to ensure that nuclear materials and facilities are not being diverted from peaceful purposes. This would be especially important in Iran. Through the IAEA, states also could negotiate new rules to prevent the further spread of those uranium enrichment and plutonium-reprocessing capabilities that heighten proliferation risks. But key non-nuclear weapon states such as Brazil, South Africa, and Egypt now block efforts to make the Additional Protocol universal and to shift from national to international mechanisms for supplying nuclear fuel, in part because they do not believe the established nuclear powers are doing enough to make the nuclear order more equitable.

Past successes demonstrate how to meet these challenges. Great power cooperation lies behind those successes. If today's major global powers disagree on how to address changing technology and new threats, proliferation becomes more likely.

The Iranian crisis shows most vividly that cooperation among the United States, Russia, and China is required to mobilize the U.N. Security Council's legitimate enforcement authority. The Russians and Chinese are more reluctant than the Americans to pursue sanctions and other coercive tactics against noncompliant states. Among their reasons is a sense that the United States seeks military superiority over them. By addressing these concerns, the U.S.-Russian nuclear arms reduction process and strategic dialogue can augment cooperation and build consensus for a stronger stand against suspected proliferators. The United States and China are beginning a similar process that could lead to cooperation in preventing nuclear competition and instability in Asia.

Similarly, cooperation among the United States, Russia, and China will be necessary to bring the CTBT into force and to negotiate a ban on further production of fissile materials for nuclear weapons.

DISARMAMENT, NONPROLIFERATION

The relationship between disarmament and nonproliferation remains crucial. If existing nuclear weapon states do not reduce their arsenals, key non-nuclear weapon states will likely resist stronger nonproliferation rules. If these weapons remain the currency of great power, emerging powers such as Brazil, Egypt, South Africa, and Iran might oppose further limits on acquiring them. Even if the security advantages of nuclear proliferation are debatable (Is a nuclear power more secure if its neighbors feel threatened and themselves build nuclear arsenals?), considerations of

perceived justice and national pride may prove politically more compelling.

Multilateral nuclear arsenal reductions may require first ending both nuclear tests and all production of fissile material for weapons. Treaties achieving these objectives may be the most feasible ways to bring India, Pakistan, and Israel into the disarmament process, and therefore closer to the nonproliferation regime.

Tension over the trade-offs among nonproliferation, disarmament, and of a third factor — nuclear energy trade — impedes progress on the specific steps that would advance each objective, leaving the world less secure and prosperous than it could otherwise be. No longer can one or two superpowers impose rules. The number of states that must now cooperate — a number that only begins with the United States, Russia, and China — means that a satisfactory outcome cannot be grounded in double standards. As long as a small number of states have advantages that they would deny others, the others will resist.

President Obama has recognized this problem and concluded that the most effective way to deter nuclear weapons use is to stop proliferation and that the only sustainable way to prevent proliferation is to motivate all states to live without nuclear weapons, however long it takes to achieve this ultimate goal. As the president put it in his April 2009 speech in Prague:

Some argue that the spread of these weapons cannot be stopped, cannot be checked — that we are destined to live in a world where more nations and more people possess the ultimate tools of destruction. Such fatalism is a deadly adversary, for if we believe that the spread of nuclear weapons is inevitable, then in some way we are admitting to ourselves that the use of nuclear weapons is inevitable.

To prevent this terror, Obama expressed “America’s commitment to seek the peace and security of a world without nuclear weapons.” ■

See also *Proliferation Security Initiative* [<http://www.state.gov/t/isn/c10390.htm>], *The Global Initiative to Combat Nuclear Terrorism* [<http://www.state.gov/t/isn/c18406.htm>], and *U.N. Security Council Resolution 1540* [<http://www.un.org/News/Press/docs/2004/sc8076.doc.htm>].

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Fission, Fusion



Nuclear weapons achieve exponentially increasing nuclear chain reactions by different designs, fission and fusion.

Fission bombs, often called atomic bombs, detonate when neutrons bombard the fissile material, uranium or plutonium isotopes, splitting the atoms into lighter elements and releasing vast amounts of energy in the process.

There are two types of fission bombs. One type, a gun-assembly device, uses an explosive propellant to shoot one mass of fissile material into another; the bomb dropped on Hiroshima during World War II was of this type. The other type, an implosion device, uses a chemical explosive to compress plutonium into a critical density to create the chain reaction; the bomb dropped on Nagasaki was of this type.

Fission bombs can release an amount of energy up to the equivalent of about 500,000 tons of the explosive chemical TNT. The fission bomb that destroyed Hiroshima had the power of an estimated 15,000 tons of TNT.

The destructive power of fusion bombs, also known as thermonuclear devices and hydrogen bombs, vastly exceeds that of fission bombs. The United States first exploded an "H-Bomb" in 1952; the Soviet Union, in 1953. The biggest fusion bomb ever detonated — the Soviet Union's Tsar Bomba, tested in 1961 — released energy equivalent to an estimated 50,000,000 tons of TNT.

Fusion bombs actually work by both fission and fusion. In a typical two-stage weapon, the fissile materials detonate first to compress and heat the fusion fuels, such as hydrogen isotopes tritium and deuterium, to tens of millions of degrees. Just as in the sun, the chain reaction in the second stage fuses the hydrogen atoms into heavier helium atoms and releases vast amounts of energy in the process. ■

Beyond Existing Treaties

Rebecca Johnson

In addition to agreeing on next steps for nuclear disarmament, the 2010 review conference on nuclear nonproliferation should start laying the groundwork for a treaty abolishing nuclear weapons. Rebecca Johnson is executive director of the Acronym Institute for Disarmament Diplomacy in England.

While the current nuclear weapons nonproliferation regime should be supported and strengthened, the existing Treaty on the Non-Proliferation of Nuclear Weapons (NPT) does not have the right mix of obligations and powers to bring about a world free of nuclear weapons.

Achieving that goal requires a universal nuclear weapons abolition treaty. As agreement on and ratification of such a treaty will not happen soon, the 2010 NPT Review Conference, scheduled for May in New York, should establish nuclear abolition as the objective of future nonproliferation efforts. The conference should also commit to the next interim steps on reducing the role of nuclear weapons in security doctrines and the numbers in existing arsenals, while laying the groundwork to make the world free of nuclear weapons.

U.S. CAN LEAD WAY

Much of the world reacted with relief and excitement when, in an April 2009 speech in Prague, President Barack Obama stated “with conviction America’s commitment to seek the peace and security of a world free of nuclear weapons.”

The president clearly understood the challenges he would face in achieving that goal. He addressed the need to reduce the role of nuclear weapons in national security strategies, to pursue further concrete disarmament steps, and to undertake a global effort on nuclear security, including strengthening the practical application of regulations to stop dangerous materials and technologies from falling into the hands of people that might want to use nuclear weapons to threaten or attack others.



The 2005 NPT review conference was unable to adopt any agreements.

The importance of the Prague speech lies in two core themes: 1) recognition that nonproliferation and disarmament become sustainable only when nuclear weapons lose (and are perceived to have lost) their military, political, and security value; and 2) the importance of civil society. “We are here today because enough people ignored the voices who told them that the world could not change,” Obama said. “We are here today because of the courage of those who stood up and took risks.”

If Obama can follow up with practical policies and measures to reduce both the perceived value and the numbers of nuclear weapons, the United States could lead other key states to break through the nuclear impasse.

NPT'S MIXED RECORD

The NPT (agreed 1968, came into force 1970), as extended and updated by the 1995 and 2000 review conferences, is the cornerstone of the nonproliferation regime born after the 1962 Cuban Missile Crisis. It obligates non-nuclear states to forgo development of nuclear weapons and requires nuclear states to move toward disarmament.

It also permits the transfer of nuclear technology to states pursuing nuclear energy programs for medical, energy, and other non-military purposes.

With 189 states as parties, the NPT has enormous normative influence, but its Cold War genesis has left it with weaknesses that make it difficult to strengthen the NPT's structure and implement powers sufficiently to prevent the spread of nuclear weapons and materials to governments and terrorists that are determined to have them.

Review conferences take place every five years, and the record is decidedly mixed. In 1990, the conference ended in deadlock after the United States refused to commit to negotiating a Comprehensive Test Ban Treaty (CTBT), despite that objective being endorsed in the NPT. Subsequently, the exposure of clandestine nuclear programs in Iraq and North Korea revealed the inadequacy of NPT safeguards and other compliance mechanisms. As a consequence, the International Atomic Energy Agency (IAEA) developed the Additional Protocol to strengthen its inspection powers and supplement the safeguards required of non-nuclear weapon states.

By 1995, the United States was leading the way in multilateral negotiations on a CTBT in Geneva. In accordance with the original treaty, which set an initial 25-year duration for the NPT, the 1995 conference required a decision to be taken on whether and for how long to extend the treaty.

The tough diplomatic negotiations over four weeks resulted in the 1995 conference deciding to extend the NPT indefinitely after strengthening treaty review processes and adopting a number of principles and



Residents of Hiroshima and Nagasaki in 2005 showed the NPT parties meeting in New York their support for nuclear nonproliferation.

resolutions crafted “to move with determination towards the full realization and effective implementation” of the treaty provisions. Among these principles was the setting of universal adherence to the treaty as an urgent priority and a call for establishment of internationally recognized nuclear-free zones, “especially in regions of tension, such as in the Middle East.”

The disarmament section of the Principles and Objectives comprised three basic elements: conclusion of a CTBT, a treaty to cap the military production of fissile material such as plutonium and highly enriched uranium, and the “determined pursuit ... of systematic and progressive efforts to reduce nuclear weapons globally, with the ultimate goal of eliminating those weapons.” CTBT negotiations concluded successfully with a treaty in 1996, but negotiations on a Fissile Material Cutoff Treaty (FMCT) failed to get under way.

The 2000 NPT Review Conference took place in even more contentious conditions. India and then Pakistan had conducted several nuclear explosions each in May 1998. In October 1999, the U.S. Senate declined to ratify the CTBT.

Despite these obstacles, a coalition of seven non-nuclear weapon states negotiated directly with the five declared nuclear weapon states on a program of action on nuclear disarmament that led the 2000 conference to consensus on the most substantial final document ever. Participants strengthened the language on nuclear disarmament, IAEA inspections, universal NPT adherence, and safety and security.

When NPT parties met again in May 2005,

though, the review conference was unable to adopt any agreements at all. The United States repudiated its earlier disarmament commitments and wanted to focus only on noncompliance by countries such as Iran and North Korea. Non-nuclear weapon states criticized insufficient progress toward disarmament by the nuclear weapon states. The Arab countries wanted more progress towards achieving their objective to make the Middle East a zone free of nuclear and all weapons of mass destruction, while Iran refused to accept any criticism of its own nuclear program, which many feared could be used to produce nuclear weapons in the future. The differences proved too great to bridge.

TODAY'S NEEDS

For any chance of a successful review conference in 2010, the parties must not only heed warnings from past conferences but also rethink today's requirements for achieving nuclear security, nonproliferation, and disarmament.

A number of signs suggest that the 2010 conference will meet with greater success than its immediate predecessor. The CTBT is unlikely to be a major stumbling block this time. More than 150 of the 180 signatory states now have ratified the test ban treaty. While it still lacks nine of the required ratifications to enter into force, both the United States and China say that they intend to pursue ratification and work to ensure that other countries do so as well. While the U.S. Senate rejected the CTBT in 1999, President Obama has pledged an aggressive new effort to win its approval.

A Preparatory Committee for the 2010 review conference has endorsed a number of measures, including:

- universal NPT participation;
- strengthened safeguards against proliferation, including enhanced inspections of nuclear facilities;
- guarantees of the right to peaceful uses of nuclear energy as long as programs conform to nonproliferation requirements;
- commitments to improve the safety and security of national programs and the transporting of nuclear materials;
- support for negotiations on further nuclear weapon-free zones, with a specific eye on regional nonproliferation and disarmament in the Middle East;
- measures to address treaty withdrawal (to prevent others emulating North Korea);

- the importance of civil society engagement, including disarmament and nonproliferation education.

More fundamentally, 21st-century nuclear security and proliferation challenges require moving beyond the NPT. President Obama's Prague speech reinforces the growing understanding that true security requires not just the reduction and management of nuclear arms but their elimination. The 2010 disarmament talks should aim to transform the Cold War nonproliferation regime into a nuclear abolition regime for security in the 21st century and beyond.

Leaders who want peace and security in a nuclear weapons-free world must lay the foundations now. They must render nuclear weapons less valuable by defining and enacting rigorous legal, technical, safety, and verification requirements. They must also create the ethical understandings, political commitments, cooperative international security arrangements, practical controls, and verification institutions necessary to make nations feel secure without nuclear weapons.

Another step is to stigmatize nuclear weapons as inhumane and unusable for everyone. Before the treaties prohibiting the production and possession of biological and chemical weapons were agreed (in 1972 and 1993, respectively), nations took the important first step of declaring that the use of such inhumane weapons would be considered a crime against humanity. If a similar step were taken now to ban the use of nuclear weapons, it would greatly strengthen nonproliferation and disarmament efforts.

Nuclear weapons abolition has been discussed in the United Nations for decades and promoted by a number of governments. In October 2008, U.N. Secretary-General Ban Ki-Moon outlined a five-point disarmament plan and suggested work begin on a framework of separate, mutually reinforcing instruments or "a nuclear weapons convention, backed by a strong system of verification, as has long been proposed at the United Nations."

In 2010, generalized concerns and exhortations will not suffice. If that is all that the conference can achieve, then the ink will barely be dry before cracks in the nonproliferation regime begin to reappear and widen. Far better for nations to move boldly ahead to assure a future free from the threat or use of nuclear weapons. ■

The opinions expressed in this article do not necessarily reflect the views or policies of the U.S. government.

Successes and Failures

Jeremi Suri



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The 1921-22 Washington Naval Arms Conference produced three major treaties.

The 20th century had some successes and some failures in arms control. Jeremi Suri is E. Gordon Fox professor of history at the University of Wisconsin-Madison.

WASHINGTON NAVAL ARMS CONFERENCE

The Washington Naval Arms Conference, in session from November 12, 1921, to February 6, 1922, produced the first major international disarmament agreements since the Congress of Vienna in 1815. The conference also marked the emergence of the United States as a major diplomatic actor, despite the country's rejection of the Treaty of Versailles at the end of the First World War.

Led by U.S. Secretary of State Charles Evans Hughes, the Washington Conference produced three major treaties. These aimed to stabilize the international balance of power. In addition, they embodied popular hopes around the world for disarmament and peaceful cooperation among major states.

The **Five Power Naval Limitation Treaty** — signed on February 6, 1922, by the United States, the

United Kingdom, Japan, France, and Italy — restricted the signatories to a fixed ratio of battleships and battle cruisers (“capital ships”). The signatories also agreed to an unprecedented 10-year holiday in the construction of new capital ships. For every five capital ships maintained by the United States and the United Kingdom, Japan would now maintain three, and France and Italy would maintain 1.75.

In practice, this meant a reduction in the size of each nation's post-World War I navy. The ship ratios favored the United States and the United Kingdom, but the Japanese received many benefits in the northern Pacific, their primary area of naval operations. As part of the treaty, the United States pledged not to expand its naval facilities in the Philippines, Guam, Wake Island, or the Aleutians. The British pledged not to expand their facilities in Hong Kong.

A **Four Power Pact** — signed by the United States, the United Kingdom, Japan, and France on December 13, 1921 — accompanied the Five Power Treaty. The Four Power Pact terminated the Anglo-Japanese

Alliance of 1902 and created protected spheres of interest in the Pacific for each of the signatories. Each pledged to settle future disputes through arbitration, not war.

The conference closed with a lofty **Nine-Power Treaty** — signed by the United States, the United Kingdom, Japan, France, Italy, China, Belgium, the Netherlands, and Portugal — on February 6, 1922. This treaty defended the “principles

of the Open Door” in China, first articulated by former U.S. Secretary of State John Hay in 1899. The nine powers agreed to respect the territorial integrity of post-imperial China and to take no actions to limit access to the region. Each signatory would have the right to trade in the vast China market.

The Washington Naval Arms Conference pointed to an optimistic future for cooperation among the major military powers following the devastation of the First World War. It set a precedent for future arms control negotiations, particularly in the second half of the Cold War. Unfortunately, the treaties signed in 1921 and 1922 lacked firm verification and enforcement mechanisms. Many of the signatories, particularly Japan, violated the treaties in the next decade. These violations contributed to the outbreak of the Second World War in the Pacific.

THE BARUCH PLAN

The Baruch Plan was the first major proposal for the international regulation of atomic energy, presented to the United Nations Atomic Energy Commission by the United States on June 14, 1946.

The Baruch Plan emerged from the deliberations of an American committee chaired by Under Secretary of State Dean Acheson and David Lilienthal, the chairman of the Tennessee Valley Authority — one of the largest power utilities in the world.



Bernard Baruch presented the U.S. proposal for atomic energy regulation at the United Nations in June 1946.

Working closely with scientists, Acheson and Lilienthal had proposed the creation of an Atomic Development Authority, under United Nations auspices, to oversee the distribution of nuclear fissile materials and the operation of facilities that were capable of producing nuclear weapons.

Acheson and Lilienthal also sought to create a licensing procedure for countries seeking peaceful nuclear energy capabilities. Licensing would, they hoped, encourage the civilian use of nuclear energy and help ensure its non-weapons purposes.

President Harry Truman chose Bernard Baruch, the distinguished businessman and White House adviser, to present the plan to the United Nations. Controversially, Baruch revised Acheson’s and Lilienthal’s proposal. Baruch would have required more rigorous and intrusive regulation of all nuclear energy research and production — civilian and military — through an Atomic Development Authority.

Baruch also called for prohibiting any state from developing a new nuclear weapons capability. The Atomic Development Authority would be empowered to seize national facilities and resources, and the United Nations Security Council stripped of the power to veto sanctions against violators of the nuclear weapons prohibition. If adopted, Baruch’s proposal would have essentially frozen the U.S. nuclear monopoly and prevented the development of a Soviet capability.

The Soviet Union rejected the Baruch Plan.

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Attending the Geneva summit were (from left) Bulganin, Eisenhower, Faure, and Eden.

Historians have debated whether the original Acheson-Lilienthal proposal would have made more progress. That appears unlikely, as the Soviets had already embarked on their own major nuclear weapons development project. Nonetheless, the Baruch Plan and its Acheson-Lilienthal predecessor began the international discussion about the regulation of nuclear weapons that produced the Nuclear Non-Proliferation Treaty in 1968.

OPEN SKIES

On July 18, 1955, Geneva, Switzerland, hosted the first summit of the most powerful world leaders since the Potsdam Conference 10 years earlier. The 1955 meeting included U.S. President Dwight Eisenhower, British Prime Minister Anthony Eden, French Prime Minister Edgar Faure, and two Soviet leaders: Nikolai Bulganin and Nikita Khrushchev. In the two years since

Josef Stalin's death in 1953, it remained unclear who would lead the Soviet Union.

On July 21, 1955, Eisenhower made a dramatic proposal to the assembled leaders, calling for an agreement on what he called "Open Skies" between the major powers. According to this proposal, the major Cold War states would allow each other to conduct open aerial surveillance of their territory. Free "flyovers" by aircraft and, eventually, satellites would allow for increased transparency.

Eisenhower believed that transparency would reduce irrational and exaggerated fears about enemy intentions and therefore stabilize international relations. He also understood that the Soviet Union benefited from the greater secrecy imposed on its closed society — it could posture, bluff, and conspire inside its territory more easily than the open democracies in Western Europe and the United States.



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Nixon and Brezhnev sign the SALT I agreement in Moscow in May 1972.

Unwilling to reduce the secrecy in their society, the Soviet leaders quickly rejected “Open Skies.” Nonetheless, military aircraft reconnaissance and satellite programs later in the decade made overhead transparency a practical reality. Still later, U.S. and Soviet and then Russian leaders would return to Eisenhower’s call for enhanced overhead transparency in pursuit of international stability.

STRATEGIC ARMS LIMITATION TREATY

The Strategic Arms Limitation Treaty (SALT I), signed by U.S. President Richard Nixon and Soviet leader Leonid Brezhnev in Moscow on May 26, 1972, was the first arms control treaty that expressly limited the construction of new nuclear weapons.

According to the treaty, the two superpowers pledged not to expand their already-bloated intercontinental ballistic nuclear missile arsenals for five years. They also pledged not to build new submarine-launched nuclear missile platforms without retiring an equivalent number of old intercontinental or submarine-launched missiles.

The Anti-Ballistic Missile Treaty (ABM Treaty) accompanied SALT I. This treaty limited the superpowers to no more than two antiballistic missile

sites in their respective countries. This treaty aimed to assure that neither side could hope to protect the majority of its population from a nuclear attack. According to the logic of nuclear deterrence, the prospect of mutually assured destruction would encourage continued caution and war avoidance by Cold War leaders.

SALT I began a process of serious and sustained arms control discussions between the United States and the Soviet Union. It became a centerpiece of a 1970s détente that featured greater East-West scientific, economic, and cultural cooperation.

On June 18, 1979, U.S. President Jimmy Carter and Brezhnev signed a second, expanded Strategic Arms Limitation Treaty (SALT II), but after the Soviet invasion of Afghanistan later that year the U.S. Senate never ratified the agreement. Nonetheless, Carter’s successor, President Ronald Reagan, continued to abide by the unratified SALT II pledges. The negotiations surrounding SALT I and SALT II provided a foundation for Reagan’s far-reaching arms control agreements with Soviet leader Mikhail Gorbachev in the last years of the Cold War.



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The last U.S. Minuteman II missile silo is imploded in December 1997 in accordance with START.

STRATEGIC ARMS REDUCTION TREATY

The Strategic Arms Reduction Treaty (START), signed on July 31, 1991, by U.S. President George H.W. Bush and Soviet leader Mikhail Gorbachev, marked the end of the Cold War. For the first time, the two superpowers agreed to equalize the size of their nuclear arsenals and undertake serious reductions in existing nuclear weapons and delivery systems. The 1972 Strategic Arms Limitation Treaty (SALT I) had only limited future weapons construction. START cut deeply into existing stockpiles.

According to START, both the United States and the Soviet Union would maintain no more than 1,600 strategic nuclear delivery systems. They would reduce their respective nuclear arsenals to 6,000 strategic

warheads each, no more than 4,900 of which could be placed on ballistic missiles. This represented a 30-40 percent reduction in each nation's overall strategic nuclear forces. On May 23, 1992, the successor nuclear states to the Soviet Union — Russia, Ukraine, Kazakhstan, and Belarus — signed the Lisbon Protocol to START. The latter three nations gave up the nuclear weapons on their territory, and Russia assumed all of the inherited Soviet obligations under START. Officially ratified on December 5, 1994, START had an initial duration of 15 years, with possible five-year extensions after that. ■

The opinions expressed in this article do not necessarily reflect the views or policies of the U.S. government.

Why the Stockpiles?

Jonathan Reed Winkler

Maintaining huge and expensive nuclear warhead stockpiles was the cost of peace during the Cold War. Jonathan Reed Winkler is an associate professor of history at Wright State University in Ohio.

At the height of the Cold War, the United States and the Soviet Union had between them tens of thousands of nuclear warheads. Ultimately, none were ever used in anger. Why did these two superpowers build up such colossal stockpiles of nuclear weapons, particularly if both sides hoped never to use them? The answer is complex.

Should war have ever broken out during the Cold War, both the United States and Soviet Union intended to use nuclear weapons against opposing military forces, industrial targets, and urban centers.

Each side came to see early on that a nuclear war would be enormously destructive to itself, to its opponent, and, indeed, to the rest of the world. As a result, both superpowers came to view nuclear weapons principally as a deterrent that would give each side second thoughts about going to war.

After the utter devastation of the Second World War, few wished a conflict that promised to be even more destructive. In the end, the expense of maintaining enormous stockpiles of nuclear warheads was the cost of peace between the two superpowers for more than 50 years.

The United States concluded in the late 1940s that it needed a large number of nuclear weapons for several reasons. Because surprise attacks, such as the one at Pearl Harbor, might well occur at the outset of future wars, the United States would build an arsenal so large that its ability to retaliate would survive any attack.

COLD WAR

These ideas developed even before the United States fully identified the Soviet Union as its chief rival. As the Cold War unfolded, it was clear the Soviets had a strong

numerical advantage in conventional forces. Should war break out, the Soviets could easily overwhelm U.S. and NATO armies in the opening weeks. The United States concluded that only atomic weapons could offset that advantage.

After the Soviets detonated their own atomic bomb in 1949, negating the U.S. advantage, and gained an ally in the People's Republic of China, U.S. officials ultimately chose to build the more powerful hydrogen bomb and to implement a major conventional and nuclear buildup to meet the Soviet threat.

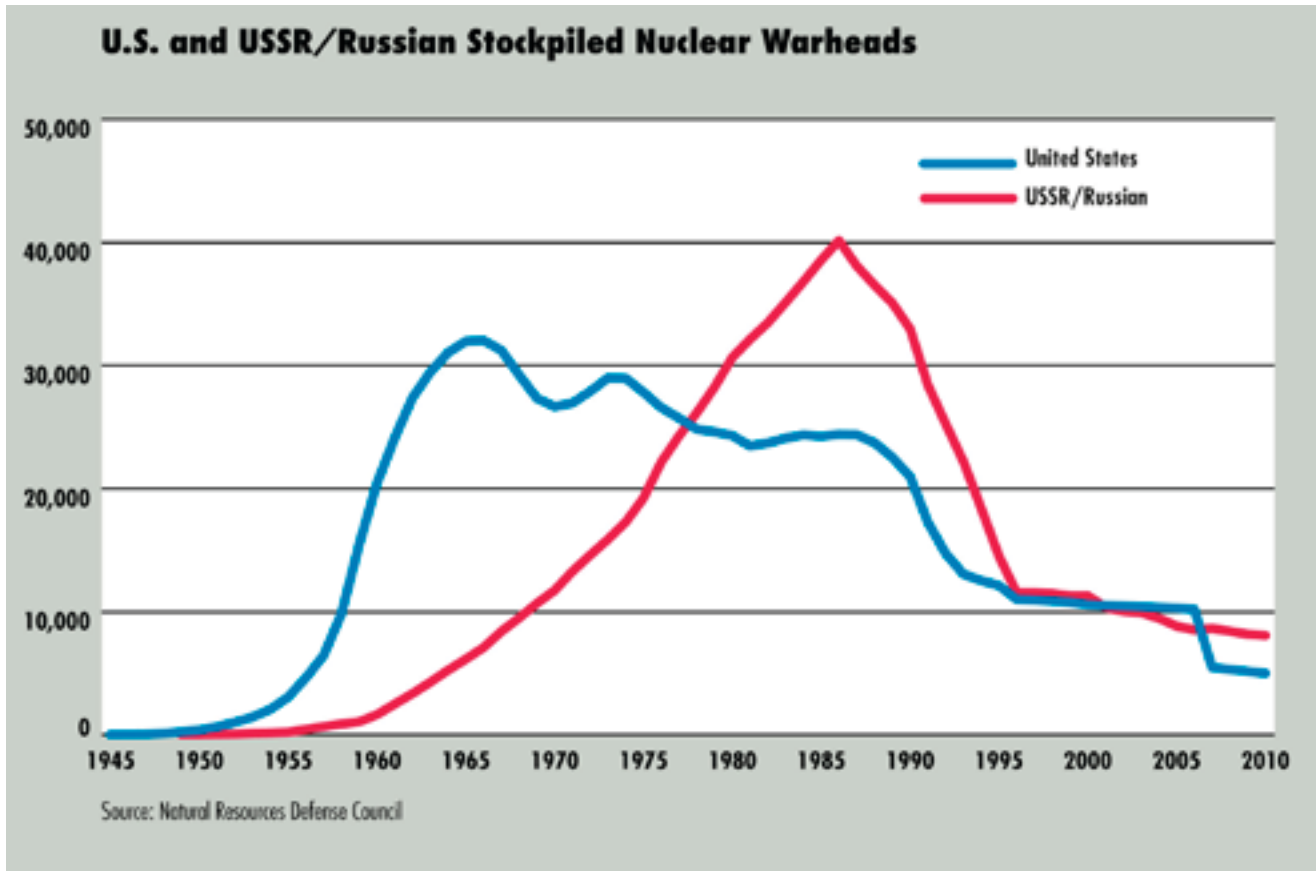
By the early 1950s, the United States was on its way to having a major nuclear arsenal. It fielded some 1,600 medium- and long-range bombers to the Soviets' 200. Both sides built up tactical weapons as well, including, for example, atomic field artillery and nuclear depth charges.

A number of reasons accounted for the scale of the U.S. nuclear buildup from 1948 until the middle 1960s.

First, the United States had until the early 1960s imperfect information about the Soviet Union's true military strength (high-altitude reconnaissance aircraft and satellites began to provide better information). As a result, it wildly overestimated Soviet industrial capacity.

Second, the United States continued to fear Soviet conventional superiority in Europe. Tactical atomic weapons were viewed as the counter. The massive Red Army could gain little by overrunning European territory were it then subject to a devastating nuclear counterattack.

Third, President Dwight Eisenhower sought to use a massive nuclear buildup as a way to preserve peace. Such an arsenal would be comparatively cheaper and less disruptive to the U.S. economy than a sustained peacetime conventional buildup to match the numerically superior Soviet forces. Eisenhower's threat to escalate any conflict to a full-out nuclear war — "massive retaliation" — would deter the Soviet Union while also restraining U.S. allies and even the United States itself.



Vincent Hughes

PEAK STOCKPILE

The nuclear stockpile had to be high, however, to ensure that U.S. nuclear forces could still carry out wartime missions despite accidents, effective Soviet defenses, and losses to any Soviet first strike. At its peak in 1966-1967, the U.S. nuclear warhead stockpile amounted to 31,000, with some 2,200 strategic bombers and missiles to carry them.

Fears of surprise attack abated in the 1960s with the adoption of submarine-launched ballistic missiles. It was nearly impossible to know where all nuclear-powered submarines were at any one time under the ocean. As a result, both sides could be confident that the other could not launch a surprise attack and escape retaliation.

The Soviet and U.S. reliance on a triad of strategic nuclear forces — manned bombers, land-based missiles, and submarine-launched missiles — meant mutually assured destruction (MAD). The idea of MAD confirmed that nuclear war would be unwinnable and helped to stabilize the Cold War.

Despite this concept of MAD, the Soviet Union embarked on a substantial nuclear weapons buildup

through the second half of the Cold War to catch up and in some areas surpass the United States, while the United States focused instead on Southeast Asia. At its peak in 1986, the Soviet nuclear warhead stockpile is understood to have exceeded 40,000. Soviet strategic delivery systems peaked at approximately 2,500 bombers, submarine-launched missiles, and land-based missiles in 1979.

Though the marginal utility of the additional nuclear weapons built in the later Cold War was small, their presence made the idea of nuclear war so unthinkable that it was avoided. Though expensive, that was the price for averting catastrophe. ■

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U.S.-Russia Balancing Act

Dmitri Trenin



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Russia relies on nuclear deterrence because of relatively weak conventional forces.

Russian leaders publicly support the idea of a world free of nuclear weapons but lack a clear strategy to advance this vision. Dmitri Trenin is director of the Carnegie Moscow Center.

In 1986, Soviet leader Mikhail Gorbachev offered his vision of a nuclear-free world. Gorbachev's "new thinking" helped reverse the nuclear arms race and spark a series of agreements reducing strategic arsenals.

Nearly a quarter-century later, the Russian leadership has returned to reliance upon the doctrine of nuclear deterrence. While Russian leaders do not challenge President Obama's long-term vision of a world free of nuclear weapons, and Russia continues to negotiate new agreements to reduce nuclear weapons stockpiles, nuclear deterrence is even more entrenched in the thinking of the Russian security community today than during the Cold War. There are at least two reasons for this.

First, Russia is a relatively weak conventional military power. In Gorbachev's days, the Soviet Union deployed more tanks than the rest of the world's countries combined and kept half a million men in a high state of readiness in Eastern Europe. A decade later, when Russian leader Vladimir Putin wished to suppress Chechen separatism, he found amid a million-strong military that the genuinely capable force numbered only about 65,000. Since the end of the Soviet Union, China has been buying many more Russian combat aircraft than Russia's own air force.

Russia's current military reform is far more successful at dismantling the existing military organization than at building its 21st-century successor. For the first time ever, Russia is a conventional military underdog on both of its strategic flanks, in Europe and Asia. Nuclear deterrence is Moscow's answer to that strategic dilemma.

Second, Russia insists on retaining the strategic independence that characterizes a great power. This requires

a rough equality between U.S. and Russian nuclear arsenals. Absent nuclear weapons, the Russo-American military equation becomes heavily skewed in favor of the United States.

To put it differently: If other factors remain unchanged, a world free of nuclear weapons is a world safe for U.S. conventional military hegemony. Less obvious but equally true, Russia's nuclear advantage over its Chinese neighbor balances China's increasing conventional strength. The price of "great-powerdom," for Russia, is dependence on nuclear weapons, acceptance of the inherent insecurity they bring, and reliance upon nuclear deterrence. But advances in military technology hold the potential to upset this equation.

Russia therefore links its endorsement of strategic arms reductions to constraints on new technologies such as missile defenses and what it calls "weaponization of space." Both are areas where the United States is perceived as holding the advantage. Russia also advocates expanding the U.S.-Russian strategic dialogue to include China.

A crucial step here would be to link U.S. and Russian missile defenses in a joint system. This would obviate reliance on mutually assured destruction. Deterrence would, at last, become a thing of the past. In principle, the Russian government favors cooperation toward this goal. For the moment, however, it lacks a clear strategy of reaching the new strategic world.

A world free from nuclear weapons would be a world transformed. Such a world would require mutual trust among the major powers (above all, the United States,



Russia's nuclear arsenal balances China's conventional strength; this Chinese soldier participates in a 2009 China-Russia military exercise.

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Russia, and China), cooperation on strategic defenses, and a wide-ranging security collaboration among them that would consign conventional military balances (and imbalances) to history.

This is a tall order by any standard. Yet without it a world free from nuclear weapons will remain a dream — or a nightmare. ■

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Megatons to Megawatts

Andrew Newman



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A worker blends down highly enriched uranium pellets.

Thanks to the Megatons to Megawatts program, half of U.S. nuclear energy comes from dismantled Russian nuclear warheads. Andrew Newman is a Harvard University research associate with the Project on Managing the Atom.

Nuclear power provides 20 percent of U.S. electricity, and roughly half of that total is generated by nuclear reactors fueled by uranium that came from a Russian nuclear weapon. The Megatons to Megawatts program is responsible for this remarkable achievement.

Established by the 1993 U.S.-Russia Highly Enriched Uranium Agreement, the Megatons to Megawatts program will by 2013 have converted 500 metric tons of highly enriched uranium (HEU) from dismantled Russian nuclear warheads into low-enriched uranium (LEU) suitable for U.S. commercial reactors. As of

December 31, 2009, 382 metric tons of HEU had been recycled into 11,047 metric tons of LEU, equivalent to more than 15,000 nuclear warheads eliminated.

How Does It Work?

When a nuclear warhead is disassembled, the HEU metal is separated from the rest of the weapon, chopped up into shavings, purified, converted into a gas, and mixed with uranium containing mostly an isotope that cannot sustain an explosive chain reaction — a process called down-blending.

Conversion and dilution of the HEU takes place in Russia, and the resulting LEU is shipped to USEC facilities in the United States to be fabricated into reactor fuel. USEC was formerly the United States Enrichment

Corporation, part of the Department of Energy until privatized in 1998.

USEC pays *Tekhsnabeksport* (TENEX), the executive agent for Russia, the market price less a modest discount for the LEU. USEC also replaces the amount of natural uranium displaced by the down-blended LEU. USEC then sells the LEU to U.S. energy utilities as fuel.

WHO BENEFITS?

Megatons to Megawatts provides financial incentives to dismantle thousands of warheads, destroys hundreds of tons of weapons-grade material, and employs thousands of Russian nuclear workers all at very modest cost to the U.S. taxpayer. Without this deal, the proliferation risks from Russia's nuclear complex during the 1990s would have been far greater.

BEYOND 2013

While Megatons to Megawatts is a nonproliferation success story, it will come to an end in 2013, and Russia still has hundreds of tons of HEU beyond the stocks needed for its military program. Rosatom (the Russian government's Atomic Energy Corporation) is not interested in extending the agreement. Rosatom officials complain that the United States and USEC (as the sole executive agent) use their economic leverage unfairly, pointing to the below-market price USEC pays for down-blended Russian LEU and to a 1992 antidumping duty imposed on U.S. imports of Russian enrichment products. The U.S. fear was that Russia would flood the U.S. market with cheap uranium, but the duty is supposed to be phased out beginning in 2011.

Russia, for its part, has had on occasion a somewhat unrealistic approach to the commercial nuclear market — for example, setting a “floor” price for selling uranium well above world market prices.

Another reason the current deal will end is that down-blending HEU is less lucrative than enriching



USEC plant in Kentucky that processes low-enriched uranium for energy.

© AP Images

uranium, and Rosatom expects to sign deals supplying enriched uranium to U.S. utilities directly in 2010.

There are, however, ways to restructure the agreement that would allow Russia to make billions of dollars in profit and support its strategic objectives of expanding nuclear power and nuclear exports by blending down more of its excess HEU. Ultimately, both Russia and the United States should declare all HEU — beyond the stocks needed to support small future nuclear weapon stockpiles and their naval programs — to be excess, down-blend it to reactor fuel, and keep the material in monitored storage until the commercial market is ready to absorb it. ■

See also *U.S.-Russia Highly Enriched Uranium Agreement* [<http://www.nti.org/db/nisprofs/russia/fulltext/heudeal/heufull.htm>].

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Young People to the Fore

Johan Bergenäs

Progress toward a world rid of nuclear weapons depends on the world's young people. Johan Bergenäs, 28, is a research associate in Washington, D.C., for the James Martin Center for Nonproliferation Studies at the Monterey Institute of International Studies and is a former reporter and current freelance writer for newspapers in Sweden and the United States.

Today's world leaders have ceded to the next generation the goal of achieving a nuclear weapons-free world. In the past, young people around the world have often driven political, cultural, social, and intellectual movements, achieving progress that older generations had discarded as illusions. To meet the challenge of eliminating nuclear weapons, youth's contributions must yet again go beyond mere idealism. But how?

First, rising leaders must, through education and collaboration with foreign peers, seek to understand the world as it is and not as it was. The Cold War paradigm and obsolete arguments about the utility of nuclear deterrence continue to poison the debate. If the next generation of decision makers does not reevaluate the relevance of nuclear weapons in combating contemporary threats, it will be equipped with 20th-century tools to fight 21st-century security problems. Before we can substantively reduce warheads on the ground, we must first reduce their value in our minds.

Second, since all humanity has a stake in abolishing nuclear weapons, today's youth must emerge to identify

themselves not only as citizens of nations but as members of a global community. Disarmament will require trust, and this will be hard to achieve if national partisanship is the sole guiding principle in international politics. We cannot allow our forefathers' conflicts and prejudices to defeat the goal of a nuclear weapons-free world. The destruction of the last nuclear warhead will coincide

with the age of greater global solidarity.

Third, when arguing the merits of completely abolishing global nuclear arsenals, youth should refrain from demonizing those who disagree. Differences over the end goal of eliminating nuclear weapons must not prevent us from working first to significantly reduce their numbers. Let's talk about the right issues at the right time.

Being the only group with a chance to create conditions for a world free of nuclear weapons is both an inspiring and daunting realization. Even if today's young people do not eliminate nuclear weapons within our lifetimes, let it not be because of timidity or passivity in confronting this great threat. Our example must encourage those who come

after us to continue the endeavor that began at the dawn of the 21st century. It falls to us to create the conditions for a world without nuclear arms. If we do, our mark on history will be everlasting. ■



As here in China in 1995, young people are still leaders in the campaign against nuclear weapons.

© AP Images/Greg Baker

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A Safer World for All

Jayantha Dhanapala

A verifiable global agreement on eliminating nuclear weapons would make all the world's people safer equally. Jayantha Dhanapala is a former ambassador of Sri Lanka and a former U.N. under-secretary-general for disarmament affairs. He is currently president of the Nobel Peace Prize-winning Pugwash Conferences on Science and World Affairs.

The nuclear weapon is the most destructive instrument of violence and terror ever invented by humans. A nuclear war will not only kill millions of people, destroying entire cities, but also devastate our life-supporting ecology, inflicting genetic consequences on future generations. No nation's security justifies the retention of such a weapon, let alone its use.

In 2010, the *hibakusha*, survivors of the first and, so far, only use of nuclear weapons — by the United States in Hiroshima and Nagasaki at the end the Second World War in 1945 — testify graphically to their experience, including continuing radiation effects.

Today nine states with nuclear weapons — five participants in the nuclear Non-Proliferation Treaty (NPT) and four nonparticipants — have 23,300 nuclear weapons, more than 8,000 of them deployed and ready to be fired within minutes. We can never be certain that they will not be used again — whether through hostile intent or careless accident, whether by a state or by a non-state terrorist group. This last possibility may be all too real. Huge stocks of highly enriched uranium and separated plutonium, the fissile material of nuclear weapons, lie around the world, all too often in deplorably insecure conditions.

Nor are the consequences of nuclear weapons use limited to death, destruction, and radiation poisoning.



Protesters rally in New York during the 2000 NPT Review Conference.

© Doug Kanter/AFP/Getty Images

Scientific research says that using even 0.03 percent of the global nuclear arsenal can cause catastrophic climate change.

Governments, especially Non-Aligned Movement members, and civil society groups, such as Pugwash Conferences on Science and World Affairs, have long urged a convention outlawing nuclear weapons. Opinion pieces by eminent elder statesmen have recently appeared in the United States and other countries calling for a nuclear weapons-free world.

President Barack Obama in his April 2009 Prague speech identified global elimination of nuclear weapons as a policy objective. Many governments and civil

society groups have endorsed his goals.

The Non-Proliferation Treaty and the nuclear weapon-free zones one finds mainly in the Southern Hemisphere have reduced the scale of proliferation. Yet some nations argue the NPT has failed to deliver on its promised central bargain: disarmament by the nuclear weapons states in exchange for nonproliferation by the non-nuclear weapons states.

This situation cannot be sustained indefinitely. As long as some states have nuclear weapons, others will inevitably aspire to possess them for national security, as status symbols, or for terrorist uses. Only in a world verifiably free of nuclear weapons will there be no proliferation. That will be a safer world and a better world for all — equally. ■

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The Commitment of Non-Nuclear Weapon States

Irma Argüello



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Foreign ministers meet in Thailand in July 2009 for the Southeast Asian Nuclear-Weapons-Free Zone Treaty Commission.

Nuclear disarmament and nonproliferation are mutually dependent. To advance both goals, all countries must learn that abolishing nuclear weapons will enhance the security of all countries. Irma Argüello of Argentina is founder and chair of the Nonproliferation for Global Security Foundation.

Nuclear disarmament depends upon cooperation between nations possessing nuclear weapons and those without them.

The need to eliminate nuclear weapons is clear: not only because of the devastation they cause, but also because of the resources they drain away from a quality of life already minimal in some nuclear-armed states.

As long as nuclear weapons remain a symbol of power, prestige, and political status, or are viewed as

necessary for national security, nations will resist giving them up. It is, therefore, crucial to devalue the perceived benefits of possessing nuclear weapons.

Nuclear weapons are a trap, not a gift. Both Cold War superpowers fell into the trap by increasing their arsenals to tens of thousands of warheads, and other states followed them at a smaller scale. Was that enormous number crucial to deterrence, knowing that it was many times what is required for mutually assured destruction?

Difficult and expensive to build, nuclear weapons are far more difficult and expensive to dismantle and destroy. Paradoxically, nuclear-armed states face today more severe nuclear dangers as a result of their weapons than states that do not possess them.

Nuclear weapons need to be monitored, contained, and permanently watched: They represent an enormous

liability to the state that owns them. Risks of technical failure, accident, or miscalculated use under stressing conditions are always present. Furthermore, possessors are the preferred targets for terrorism and theft.

President Obama's April speech in Prague showed his determination to lead the way toward a world free of nuclear weapons. Other leaders have declared their support for this vision. The adoption in September of U.N. Security Council Resolution 1887 aimed at reinvigorating efforts to end nuclear weapons proliferation is a promising step.

Now it is necessary to go beyond statements and take action.

Disarmament by nuclear-armed states and nonproliferation in other states require reciprocity. The May 2010 Review Conference for the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) brings the opportunity to advance these goals in tandem along a path of clearly defined milestones, while protecting the right of every state to peaceful uses of nuclear energy.

The NPT should be enhanced in the short term, but reducing nuclear weapons to zero requires a new instrument, able to get universal acceptance and to define clear responsibilities for all states.

States that deliberately chose not to build nuclear weapons deserve praise, but it is essential that they take further steps. They should play an active role in helping



Yoriko Kawaguchi of Japan (left) and Gareth Evans of Australia chair a 2008 meeting of the International Commission on Nuclear Nonproliferation and Disarmament.

nuclear-armed states disarm. There are many ways for them to collaborate:

- Sponsoring initiatives to explore practical solutions to key disarmament issues. The International Commission on Nuclear Nonproliferation and Disarmament, supported by the Australian and Japanese governments, for example, has produced research such as the report *Eliminating Nuclear Threats*.

- Promoting transparency about nuclear arsenals and jointly developing ways to verify dismantlement and destruction, without spreading weapons technology. It will be difficult for a nation to give up its weapons unless it is certain its adversaries have done the same. The United Kingdom-Norway Initiative on Nuclear Warhead Dismantlement Verification illustrates how transparency can be achieved through multilateral programs.

- Promoting informal negotiations where nuclear weapons states that are not party to the NPT can feel comfortable participating.

- Prohibiting deployment and stationing of nuclear weapons on their national territories.

- Reconsidering the need of nuclear weapons in their requests for extended deterrence. In fact, many states rely on “nuclear umbrellas” provided by their allied nuclear-armed states. Today, however, it is difficult to define any security threat that could require a nuclear response.

- Working on conflict reduction and confidence building within their regions, as well as promoting stronger and more reliable institutions in all states, proven keys to reduce risks of proliferation.

- Promoting the extension of nuclear weapons-free zones to new regions or groups of countries, sharing their experiences and models.

- Educating leaders and populations on disarmament and nonproliferation as a long-term effort that pays off, as it is appropriately requested by the United Nations General Assembly Resolution A/57/124, 2002.

Nuclear disarmament and nonproliferation are critical for the future of all nations. Not just the nuclear-armed states need to commit to the effort. Non-nuclear weapon states can and should commit to it as well. Cooperation among countries and regions is the engine that will power the achievement of a nuclear weapons-free world. ■

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By the Numbers

Date of Einstein letter to President Roosevelt: August 2, 1939

Date of first self-sustained, controlled nuclear chain reaction initiated by humans, in Chicago:
December 2, 1942

July 16, 1945: Date of first explosion of nuclear fission bomb, or atomic bomb, in New Mexico

August 6, 1945: Date of nuclear fission bomb detonation over Hiroshima

Estimated number of people killed immediately or shortly after from Hiroshima nuclear blast: 70,000

Estimated number of deaths in the Battle of Okinawa, April 1-June 21, 1945: 219,000

Explosive power of nuclear fission bomb dropped on Hiroshima: 15,000 tons of TNT

Explosive power of the largest nuclear fusion bomb, tested in 1961: 50,000,000 tons of TNT

Year Treaty on the Non-Proliferation of Nuclear Weapons (NPT) was open for signature: 1968

Year NPT took effect: 1970

Year NPT extended indefinitely: 1995

Number of countries that are party to the NPT: 189

Number of countries party to the NPT that have nuclear weapons: 5 (United States, Russia,
United Kingdom, France, China)

Number of countries that are not party to the NPT: 4 (Israel, India, Pakistan, North Korea)

Year Strategic Arms Limitation Treaty (SALT I) signed by United States and Soviet Union: 1972

Year Strategic Arms Reduction Treaty (START) signed by United States and Soviet Union: 1991

Year START expired: 2009

Estimated peak number of U.S. stockpiled nuclear warheads: 32,040 in 1966

Estimated peak number of Soviet stockpiled nuclear warheads: 40,159 in 1986

Year Megatons to Megawatts program started dismantling Russian nuclear warheads for recycling uranium
to U.S. electric energy plants: 1994

Estimated number of Russian nuclear warheads eliminated by Megatons to Megawatts: 15,000

Additional Resources

Books, articles, Web sites, and films on nuclear nonproliferation and disarmament

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INTERNET RESOURCES

U.S. Government

U.S. Department of Defense

National Defense University

The Center for the Study of Weapons of Mass Destruction

The Center for the Study of Weapons of Mass Destruction (WMD) facilitates a greater understanding of the challenges presented by nuclear, biological, and chemical weapons to U.S. security interests through research, education, and outreach. The center is the focal point for professional military education on combating WMD.

<http://www.ndu.edu/WMDCenter/index.cfm?pageID=1&type=page>

U.S. Department of Defense

Office of the Deputy Assistant to the Secretary of Defense for Nuclear Matters (ODATSD(NM))

The ODATSD(NM) oversees and develops the plans for nuclear weapons safety, security, and survivability, as well as the survivability of material and systems relative to nuclear effects.

<http://www.acq.osd.mil/ncbdp/nml>

Office of the Director of National Intelligence National Counterproliferation Center (NCPC)

The NCPC was formally established by the Office of the Director of National Intelligence (ODNI) on November 21, 2005, as the primary organization within the intelligence community for managing, coordinating, and integrating planning, collection, exploitation, analysis, interdiction, and other activities relating to weapons of mass destruction, related delivery systems, materials and technologies, and intelligence support to U.S. government efforts and policies to impede such proliferation.

<http://www.counterwmd.gov/>

U.S. Department of Energy

National Nuclear Security Administration (NNSA)

NNSA, through its Office of Defense Nuclear Nonproliferation, works closely with a wide range of international partners, key U.S. federal agencies, the U.S. national laboratories, and the private sector to detect, secure, and dispose of dangerous nuclear and radiological material and related WMD technology and expertise.

http://www.nnsa.energy.gov/nuclear_nonproliferation/

U.S. Department of Energy

Initiatives for Proliferation Prevention (IPP)

IPP, part of the Global Initiatives for Proliferation Prevention, engages scientists, engineers, and technicians who formerly worked in Soviet weapons facilities to redirect their expertise to peaceful, civilian work through long-term business partnerships with U.S. companies.

<http://www.y12.doe.gov/missions/nonproliferation/imp/gipp/initiativesprevention.php>

U.S. Department of State

Bureau of International Security and Nonproliferation (ISN)

The ISN Bureau spearheads efforts to promote international consensus on WMD proliferation through bilateral and multilateral diplomacy; leads the development of diplomatic responses to specific bilateral and regional WMD proliferation challenges, including today's threats posed by Iran, North Korea, and Syria; and develops and supports strategic dialogues with India, Pakistan, China, and other key states or groups of states.

<http://www.state.gov/t/isn/>

U.S. Department of State

Bureau of Verification, Compliance and Implementation (VCI)

VCI's core mission is to ensure that appropriate verification requirements and capabilities are fully considered and properly integrated throughout the development, negotiation, and implementation of arms control, nonproliferation, and disarmament agreements and commitments.

<http://www.state.gov/t/vci/>

International

International Atomic Energy Agency (IAEA)

The IAEA is the world's nuclear inspectorate, with more than four decades of verification experience. Inspectors work to verify that safeguarded nuclear material and activities are not used for military purposes.

<http://www.iaea.org/OurWork/SV/index.html>

Nuclear Suppliers Group (NSG)

The NSG is a group of nuclear supplier countries that seeks to contribute to the nonproliferation of nuclear weapons through the implementation of guidelines for nuclear exports and nuclear-related exports.

<http://www.nuclearsuppliersgroup.org/Leng/default.htm>

Union of Concerned Scientists

Nuclear Weapons and Global Security

The union of scientists and policy experts works to reduce some of the biggest security threats facing the world today, including the risks posed by nuclear weapons, nuclear terrorism, and space weapons.

http://www.ucsusa.org/nuclear_weapons_and_global_security/

United Nations

Office for Disarmament Affairs

The Department of Disarmament Affairs was established in January 1998 as part of the secretary-general's program for reform in accordance with his report A/51/950 to the General Assembly. In 2007 it was changed to the United Nations Office for Disarmament Affairs (UNODA).

<http://www.un.org/disarmament/>

Academic and Research

Center for Strategic and International Studies

Project on Nuclear Issues

This blog pushes the nuclear debate forward with daily posts, original contributions by members, and guest commentary from senior experts.

<http://csis.org/program/poni-debates-issues>

Federation of American Scientists

A World Free of Nuclear Weapons

The Federation of American Scientists (FAS) was founded in 1945 by scientists who had worked on the Manhattan Project to develop the first atomic bombs.

http://www.fas.org/press/statements/new_nuclear_policy.html

Harvard University

Belfer Center for Science and International Affairs: Managing the Atom

The Belfer Center is the hub of the Kennedy School's research, teaching, and training in international security affairs, environmental and resource issues, and science and technology policy.

http://belfercenter.ksg.harvard.edu/project/3/managing_the_atom.html

International Science and Technology Center (ISTC)

ISTC is an intergovernmental organization connecting scientists from Russia, Georgia, and other countries of the Commonwealth of Independent States (CIS) with their peers and research organizations in Canada, the European Union, Japan, the Republic of Korea, Norway, and the United States.

<http://www.istc.ru/>

Monterey Institute of International Studies James Martin Center for Nonproliferation Studies (CNS)

CNS strives to combat the spread of weapons of mass destruction by training the next generation of nonproliferation specialists and disseminating timely information and analysis.

<http://cns.miis.edu/index.htm>

Princeton University Program on Science and Global Security

The Program on Science and Global Security, a research group at Princeton University since 1975, became a unit of the Woodrow Wilson School in July 2001. The program seeks to provide the technical basis for policy initiatives in nuclear arms control, disarmament, and nonproliferation.

<http://www.princeton.edu/~globsec/>

Stanford University Center for International Security and Cooperation (CISAC)

Preventing Nuclear Proliferation and Terrorism

CISAC explores the means to reduce the threat represented by weapons of mass destruction, a primary objective of their research.

http://cisac.stanford.edu/research/preventing_nuclear_proliferation_and_terrorism/

Organizations

Carnegie Endowment for International Peace Nuclear Policy Program

As interest in nuclear power grows around the world, efforts to build a sustainable nuclear order increasingly will depend on engaging the nuclear industry, updating strategies of deterrence and security, and making progress towards the abolition of nuclear weapons.

<http://www.carnegieendowment.org/npp/>

Nuclear Threat Initiative (NTI)

NTI is a nonprofit organization with a mission to strengthen global security by reducing the risk of use and preventing the spread of nuclear, biological, and chemical weapons, and to work to build the trust, transparency, and security that are preconditions to the ultimate fulfillment of the Non-Proliferation Treaty's goals and ambitions.

<http://www.nti.org/index.php>

Ploughshares Fund

The Ploughshares Fund is engaged in an aggressive strategy to seize the unprecedented opportunities before us to achieve a safe, secure, nuclear weapon-free world. Combining high-level advocacy, an enhanced grantmaking capacity, and their own expertise, they are helping to fundamentally change nuclear weapons policy.

<http://www.ploughshares.org/about-us>

USEC Inc.

Megatons to Megawatts Program

The Megatons to Megawatts Program is a unique, commercially financed government-industry partnership in which bomb-grade uranium from dismantled Russian nuclear warheads is being recycled into low-enriched uranium (LEU) used to produce fuel for American nuclear power plants.

<http://www.usec.com/megatonstomegawatts.htm>

FILMOGRAPHY

Documentaries

Atomic Café (1982)

<http://www.imdb.com/title/tt0083590/>

Running Time: 88 minutes

Director: Kevin Rafferty

Synopsis: Compilation of U.S. government and "educational" propaganda shows how 1950s Americans learned to "stop worrying and love the bomb."

Atomic Journeys: Welcome to Ground Zero (1999)

<http://www.imdb.com/title/tt0205754/>

Running Time: 52 minutes

Director: Peter Kuran

Synopsis: A tour of U.S. atomic test sites in Nevada, New Mexico, Colorado, Mississippi, and Alaska.

The Day After Trinity (1981)

<http://www.imdb.com/title/tt0080594/>

Running Time: 89 minutes

Director: Jon Else

Synopsis: Scientists and witnesses involved in the creation and testing of the first atomic bomb reflect on the Manhattan Project and its fascinating leader, J. Robert Oppenheimer, who upon completion of his wonderful and horrible invention became a powerful spokesperson against the nuclear arms race.

The War Game (1965)

<http://www.imdb.com/title/tt0059894/>

Running Time: 48 minutes

Director: Peter Watkins

Synopsis: Simulated documentary about the aftermath of a nuclear holocaust. Originally produced for British TV, it was released theatrically and won a Best Documentary Oscar.

Non-Documentaries

The Day After (1983)

<http://www.imdb.com/title/tt0085404/>

Running Time: 127 minutes

Producer: ABC Circle Films/MGM

Synopsis: When Cold War tensions reach the ultimate boiling point, the inhabitants of a small Kansas town learn, along with the rest of America, that they have less than 30 minutes before 300 Soviet warheads begin to appear overhead.

Day One (1989 TV)

<http://www.imdb.com/title/tt0097159/>

Running Time: 141 minutes

Director: Joseph Sargent

Synopsis: Hungarian physicist Leo Szilard leaves Europe, eventually arriving in the United States. With the help of Albert Einstein, he persuades the government to build an atomic bomb. The project is given to no-nonsense General Leslie Groves, who selects physicist J. Robert Oppenheimer to head the Los Alamos Laboratory in New Mexico, where the bomb is built. As World War II draws to a close, Szilard has second thoughts about atomic weapons, and policy makers debate how and when to use the bomb.

Dr. Strangelove or How I Learned to Stop Worrying and Love the Bomb (1964)

<http://www.imdb.com/title/tt0057012/>

Running Time: 93 minutes

Director: Stanley Kubrick

Synopsis: Nuclear war is launched by a crazed American general, Jack D. Ripper, worried about a "Commie plot" to put fluoride in the drinking water and cause the loss of his bodily essences.

Fail Safe (1964)

<http://www.imdb.com/title/tt0058083/>

Running Time: 111 minutes

Director: Sidney Lumet

Synopsis: An American president, confronted with an accidental attack on the Soviet Union, decides to drop an atomic bomb on New York in compensation for the annihilation of Moscow.

Fat Man and Little Boy (1989)

<http://www.imdb.com/title/tt0097336/>

Running Time: 126 minutes

Director: Roland Joffe

Synopsis: Story about the Manhattan Project and the development of the atomic bomb, focusing on General Leslie Groves, the leader of the project, and J. Robert Oppenheimer, the scientist who put together the brain trust that created it.

On the Beach (1959)

<http://www.imdb.com/title/tt0053137/>

Running Time: 134 minutes

Director: Stanley Kramer

Synopsis: Effects of radiation as the planet slowly died in the aftermath of a nuclear exchange between the superpowers.

The Peacemaker (1997)

<http://www.imdb.com/title/tt0119874/>

Time: 123 minutes

Director: Mimi Leder

Synopsis: Russian nuclear warheads are stolen and a weaponized backpack eventually ends up in the hands of a Bosnian Serb terrorist determined to destroy Manhattan.

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<http://america.gov/publications/ejournalusa.html>

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