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The Newsletter of FPRI's Wachman Center

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Teaching the Nuclear Age: A History Institute for Teachers

By Trudy Kuehner, Reporter

April 2009
Vol 14 No 5

On March 28-29, 2009, FPRI's **Wachman Center** hosted 43 teachers from across the country for a weekend of discussion on teaching the nuclear age. The Institute was cosponsored by the American Academy of Diplomacy and cosponsored and hosted by the Atomic Testing Museum in Las Vegas, Nevada. See **www.fpri.org/education/nuclearage** for videofiles, texts of lectures, and classroom lessons.

The **History Institute for Teachers** is co-chaired by **David Eisenhower** and **Walter A. McDougall**.Core support is provided by the Annenberg Foundation and Mr. H.F. Lenfest.

Welcoming Remarks

Walter A. McDougall, Co-Chair of FPRI's History Institute and professor of history and international relations at the University of Pennsylvania, remarked that his December 1946 birth date coincided with Andrei Gromyko's veto of the U.S. plan for UN control of atomic energy. The plan called for nations to share their atomic secrets and fissionable material under inspection by a UN agency, to ensure that atomic power would be used for peaceful purposes. The Soviets insisted that the U.S. unilaterally disarm first and refused to permit inspections. The nuclear arms race was on.

For those whose lives coincided with the Cold War, the hope was that someday all nuclear weapons would disappear. The Cold War ended and the Soviet Union is gone, but the nukes are still with us. So even though students today are not made to crawl under their desks in air raid drills, we still need to rear a nuclear-literate generation.

Nuclear Weapons

Jeremy Bernstein, professor emeritus at the Stevens Institute of Technology and author of *Nuclear Weapons: What You Need to Know*, recounted the story of nuclear weapon testing, which began July 16, 1945, when "Gadget" was exploded in a New Mexico desert, part of the Manhattan Project. Robert Oppenheimer called the test Trinity, after John Donne's Holy Sonnet XIV ("Batter my heart, three person'd God"). Physicist I.I. Rabi wrote, "A new thing had just been born; a new control, a new understanding of man, which man had acquired over nature."

On August 6, 1945, Little Boy was dropped on Hiroshima, a uranium fission bomb of an untested design. On August 9 Fat Man—a plutonium fission bomb like Gadget—was dropped on Nagasaki. These were the only nuclear weapons to have been used in combat. But testing of new and improved nuclear weapons soon began. These tests were above ground; the fission bomb tests were done at the Nevada Test Site and the fusion bomb tests—the hydrogen bombs—in the South Pacific.

The "Bravo" hydrogen bomb tested in March 1954 on Bikini Island was three times more powerful than its designers had predicted and about 1,000 times more powerful than Little Boy. It produced a fireball that, within seconds, was three miles wide. Men on a Japanese fishing boat 80 miles away suffered radiation sickness. This incident caused a worldwide protest against atmospheric tests, but we and the Russians continued for another eight years. The British stopped in 1958 and the French in 1974. The Chinese were the last to stop, in 1980. Since then several countries have tested underground.

Even before President Truman ordered a crash program to make a hydrogen bomb in January 1950, physicists were

debating whether such a device should be made at all. Scientist Robert Oppenheimer was opposed, for reasons including that the targets were too small. If the Hiroshima and Nagasaki bombs brought two cities-and a country to their knees, what would a hydrogen bomb do? Bernstein conceded the argument for the use of atomic bombs during WWII, but not for making the hydrogen bomb. Having attended an above-ground nuclear test in 1947, Bernstein understood why Oppenheimer quoted the Bhagavad-Gita after the Trinity test: "I am become Death, The shatterer of Worlds." The boosted weapons he has seen tested are much more powerful than a pure fission bomb like Gadget, and he believes it is time to get rid of many of them.

Nuclear Weapons in International Politics

Andrew L. Ross of the University of New Mexico noted that the Nuclear Revolution is much more than just a revolution in military affairs. From the start, nuclear weapons were regarded as so different that they rendered everything that came before "conventional." One ICBM warhead today possesses the equivalent of the explosive power used in all of WWII.

The nuclear revolution was driven by technology. Certainly, we wanted to obtain the weapons before the Germans did, but we didn't have a specific strategy—that came later. Our technological race with the Germans prefigured the subsequent U.S.-Soviet competition. New doctrine and strategy had to be developed.

Nuclear weapons emerged during a conflict, but they have not been used in war since. The nuclear revolution is about deterrence rather than war-fighting. Some argue that nuclear weapons are responsible for what historian John Lewis Gaddis called the "long peace" of the Cold War. Already in 1946, Bernard Brodie observed that "thus far the chief purpose of our military establishment has been to win wars. From now on its chief purpose must be to avert them."

Deterrence includes both fundamental deterrence of threats against the U.S. homeland and extended deterrence of threats against our allies and friends. We deter a threat by persuading potential aggressors that the costs of aggression will exceed the benefits. It's clear when deterrence has failed—if the Soviets had invaded Western Europe, deterrence would have failed. But one cannot know when deterrence is working. Did the Soviet Union ever intend to invade Western Europe?

Throughout the Cold War, it was thought there were two ways to deter a potential adversary: the threat of punishment and the denial of objectives. These two alternatives continue to frame post-Cold War debates. Threat of punishment requires relatively low-cost, finite capabilities. It tries to identify how much is enough. It came to be known as Assured Destruction or, when both sides have it, Mutual Assured Destruction (MAD). Denial of Objectives/Flexible Response requires a broader range of offensive and defensive capabilities. It costs a great deal more and emphasizes relative rather than absolute capabilities. Superiority matters, and is open-ended—one can never have enough superiority. We've gone back and forth between the two.

For some states, nuclear weapons are a status symbol, an indicator of major power status. The countries that have developed nuclear weapons are the U.S., Russia, Britain, France, China, Israel, India and Pakistan, DPRK, and we're concerned about Iran now. The five permanent members of the UN Security Council were the first five nuclear powers, and they're also the five nuclear weapon states that were recognized by the Nonproliferation Treaty of 1968 that permitted them to have these weapons.

Nuclear weapons have played a role as an equalizer, offsetting the conventional advantage of others. In the 1950s, we used them to offset Soviet and Warsaw Pact conventional capabilities. Today, it's the U.S. that possesses the enormous conventional advantage, and Russia relies on its nuclear capabilities. Ross believes other nuclear aspirants may want to go nuclear to offset the enormous U.S. conventional capabilities and how we use them.

The Decision to Drop the Bomb

Richard B. Frank, author of *Downfall: The End of the Imperial Japanese Empire*, noted that in the postwar years, a broad national consensus formed that the use of nuclear weapons was justified, had ended the war, and was morally justified as saving more lives than they cost. Beginning in the mid-1960s, critics challenged this, observing that Japan's situation in Summer 1945 was hopeless; its leaders recognized this and were seeking to surrender; and American leaders knew this. The critics charge that the real target of the weapons was the USSR. In the 1990s, newly available sources

furthered our understanding of all the parties' decision-making.

From 1943, the American war aim was the unconditional surrender of the Axis Powers. The Joint Chiefs of Staff were to devise a strategy to achieve this, but the navy had become convinced that we could never overwhelm the Japanese, while the army advocated invading the Japanese Home Islands. The Chiefs noted that Japan had never surrendered to a foreign power, nor had any Japanese military unit surrendered in the Pacific war. In April 1945, the two agreed that the ongoing bombardment and blockade strategy would continue until November 1945, at which point there would be a two-phase *initial* invasion of Japan aimed first at Southern Kyushu and later at the Tokyo region.

The debate over potential casualties to end the war is thus misplaced. There was no predictable endpoint. If there was no surrender, Allied casualties could run from the hundreds of thousands to more than a million, and the U.S. could face campaigns outside the Home Islands with similar casualties. There was no validated method of projecting casualties, but by August 1945 potential casualties just in the initial invasion appeared unacceptable.

In 1945, Japanese leaders devised the Ketsu Go ("Operation Decisive") strategy. By defeating or inflicting high casualties on the initial invasion of the Home Islands, they felt they could break American morale and secure a negotiated end of the war. They had deduced where the U.S. invasion would occur and concentrated their units to meet an invasion in southern Kyushu and around Tokyo—the two initial American invasion targets.

In the spring, Japan implemented national mobilization. Its military leaders also knew that the nation's desperate food situation by 1946 would kill vast numbers of people. Ketsu Go obliterated distinctions between combatants and noncombatants and contemplated stupendous numbers of Japanese casualties in battle and from starvation.

Three days after the August 6 Hiroshima bombing, the Soviet Union entered the war with a massive offensive in Manchuria. A few hours later a second atomic bomb inflicted tremendous damage on Nagasaki. Japanese militarists had claimed that whatever struck Hiroshima, it was not an atomic bomb; and even if it was, the difficulty of manufacturing fissionable material meant the U.S. could not have that many bombs, but the Nagasaki bombing struck down that argument.

The debate over the causes of the Japanese surrender pits the atomic bombs against Soviet entry, but there was more involved. Japan's leaders feared that the deteriorating situation brought on by blockade and bombing could trigger a revolt that would topple Hirohito.

Meanwhile, in China, the total number of war dead numbered at least 10-15 million, at least 80 percent of them civilians. or 3,000-4,500+ deaths per day. Enormous numbers of other Asians were likewise dying. Allied civilian internees and POWs were at risk from abuse and starvation. In any debate over the morality of the use of atomic weapons to obtain Japan's surrender, all the noncombatant deaths must be considered.

The Nevada Test Site

Troy E. Wade II, chairman of the Nevada Test Site Historical Foundation, related how the first Soviet test, in August 1949 ("Joe I"), was expected but came at least five years earlier than predicted. That test made understanding the effects of nuclear weapons very important. In December 1950, President Truman authorized the Nevada Proving Ground, which became the NTS; the first test was conducted in January 1951.

In the 1950s, numerous atmospheric tests were conducted. However, there was already evidence of worldwide fallout, and so planning began for underground testing. In 1958, the U.S. announced a unilateral moratorium on testing, with the understanding that the USSR would do the same. It also stopped preparing for underground testing. Then in September 1961 the USSR resumed testing with vigor; we then resumed testing. In 1963 the Limited Test Ban Treaty (LTBT) was signed, which prohibited testing underwater, in the atmosphere, or in space. That moved testing underground.

The 1960s saw the beginning of the Assured Destruction policy. Livermore, Los Alamos, and Sandia were tasked to develop an array of nuclear weapons to fit all the various delivery systems. In the 1970s, the Test Site was asked to do a high-yield test, part of the ABM system being developed. The Spartan warhead was tested at full yield, about five megatons, at Amchitka Island in the Aleutians. That test led towards the July 1974 Threshold Test Ban Treaty, which prohibited underground nuclear tests of greater than 150 kilotons.

The 1980s saw another build-up at NTS with President Reagan's Strategic Defense Initiative (SDI), which also led to a joint verification experiment with the Soviets. President Reagan stated that as a matter of policy the U.S. should be looking towards a global Comprehensive Nuclear Test Ban Treaty (CNTBT), but to have such a treaty, you needed better means of verification. We agreed that the Soviets would come and measure one of our tests in Nevada, and we would measure a Soviet test in Semipalatinsk, Kazakstan. These occurred in August and September 1988.

With the end of the Cold War, President George H.W. Bush too moved toward the CNTBT. The last underground test in Nevada was fired in September 1992. President Clinton submitted the CNTBT to Senate, but it was never ratified. The U.S. has continued to adhere to the treaty, but it isn't law. President Obama has indicated that he will seek Senate ratification of the CNTBT, probably in the next year or so.

Though NTS no longer tests nuclear weapons, it is still charged with keeping the nuclear deterrent safe and reliable. It uses material science and computer models to try to predict weapon failures before they occur. Since the weapons in the U.S. arsenal are some thirty years old, these subcritical tests are vital.

The Atomic Test Museum opened its exhibits in 2005. Already about 170,000 people have visited; class trips are encouraged and supported.

The Nuclear Age in the Classroom

Paul Dickler, Senior Fellow, FPRI's Wachman Center, gave an overview of all the types of uses of nuclear research—from weapons, to energy, to medical research, to geology, etc.—and reviewed techniques for teaching about nuclear history. Linda Miller, a trustee of the Nevada Test Site Historical Foundation, led a discussion about the lunch session with atomic test site workers.

Cold War Arms Ccontrol

Hon. **Avis Bohlen**, former Assistant Secretary of State for Arms Control, observed that the Cold War was largely about nuclear weapons. Every U.S. president since the Cold War began has sought to control nuclear weapons, usually while building up our nuclear arsenal.

The first nuclear arms control proposal was the 1946 Baruch plan to create a global Atomic Development Agency to oversee the whole field. But the Russians were even then at work on their own nuclear weapons, so the plan went nowhere. The invention of thermonuclear weapons provided the impetus for the first real arms control agreement, the LTBT. Public concern over the fallout from testing had intensified with tests of these vastly more destructive weapons. But it took eight years of difficult negotiations before it was concluded in 1963, after we had gone eyeball-to-eyeball with the Soviets during the Cuban Missile Crisis. The LTBT showed that we and the Soviets could find common ground on nuclear issues despite our larger political hostility, but it did not slow the increase in weapons on both sides or constrain testing, which simply went underground.

By the late 1960s the Soviets had built up their ICBM arsenal to levels approaching ours. People worried that they would soon outpace us. Out of this concern were born the Strategic Arms Limitation Talks (SALT), which produced two agreements, SALT I and SALT II. SALT I, signed in 1972, included the ABM Treaty and the Interim Agreement. Under the ABM Treaty, with the exception of two ABM sites each, the U.S. and USSR renounced building nationwide defenses against nuclear attack. The Treaty, which embodied MAD, was elevated into a cornerstone of strategic stability. The Interim Agreement froze ICBMs and submarine-launched ballistic missiles at existing levels, high as they were, and at higher levels for the Soviets than the U.S. It failed to limit the growth of Soviet heavy missiles or constrain multiple independently targetable reentry vehicles (MIRVs).

SALT II, completed at the end of the Carter administration, provided for equal levels between the two sides and dealt with heavy missiles and MIRVs. However, it capped weapons at levels far above existing ones. Criticism of it reflected the radical shift in the political climate since 1972. By 1979, the Kissinger-Nixon détente was discredited, and it was felt that the Soviets were on the march everywhere, while we were in retreat in Vietnam and elsewhere. President Carter withdrew the treaty; arms control negotiations only got going again with Gorbachev's ascendance.

Arms control during this period did not end or even slow the arms race or reduce defense spending, but the very fact of

the U.S.-Soviet dialogue was reassuring to publics and perhaps to the participants themselves. Moreover, it yielded the terms, definitions, and "counting rules" that provided the foundation for the more lasting agreements of the Reagan-Gorbachev era.

President Reagan genuinely abhorred nuclear weapons. He insisted that arms control must produce real reductions, yet his vision of a missile shield that would render nuclear weapons obsolete, the SDI, was manipulated by arms control opponents to block any arms control agreement at all. But when Gorbachev arrived on the scene and sought to redirect Russia's relations with the world and reduce Russia's military expenditures, he found in Reagan a supportive interlocutor.

At the Reykjavik meeting of October 1986, agreement was reached on a series of proposals including eliminating all nuclear weapons, only to fall apart over SDI. In the end, only the Intermediate Nuclear Forces (INF) Agreement survived, eliminating the intermediate-range class of weapons. It was not until the George H.W. Bush administration that we closed the deal on the really important strategic weapons, long-range missiles.

START I was signed in 1991, beginning a ten-year process of reductions that resulted in the destruction of tens of thousands of nuclear weapons. START II, signed in the closing days of the G.H.W. Bush administration, achieved deep reductions. But by then the USSR had ceased to exist. START I was ratified only in 1994; START II was never ratified. Real arms control seemingly became possible only when it was no longer necessary.

Nuclear Weapons Post-Cold War

Former arms control negotiator Amb. **James Goodby** explained that he borrowed the title of his book *At the Borderline of Armageddon: How American Presidents Managed the Atom Bomb* (2006) from Henry Kissinger, who wrote in his memoirs that "No previous generation of statesmen has had to conduct policy in so unknown an environment at the border line of Armageddon."

The term "arms control" was essentially invented in 1960. That year, the Summer Study of the American Academy of Arts & Sciences, which included such distinguished scholars as Thomas Schelling and policymakers like Morton Halperin, concluded that nuclear disarmament was going nowhere. Stability seemed to them what we should be after.

The Academy made a useful distinction between conventional and nuclear weapons and contributed the thought that it might not a good idea to encourage first strikes by having offensive forces that could eliminate launches on the other side. On the other hand, this thinking led to concerns about protracted nuclear war.

A 2006 Hoover conference led by former Secretary of State George Shultz produced an op-ed published in the *Wall Street Journal* in January 2007, signed by Shultz, Henry Kissinger, former Secretary of Defense William Perry, and Sam Nunn, former chair of the Senate Armed Services Committee. They wrote that nuclear deterrence was no longer the kind of deterrence that had helped so much during the Cold War. There were new threats, including terrorism. They were also concerned that the nuclear proliferation threat was not being dealt with adequately. They recommended reviving the Reykjavik idea of eliminating nuclear weapons over time. Another Hoover conference in 2007 identified a series of first steps that could be taken. The op-ed coming out of this conference was endorsed by Colin Powell and James Baker, among other former secretaries of state and defense. President Obama has endorsed this, as well.

But it is very hard to do these things. The START treaty runs out on December 5, 2009. If it's not extended or replaced, all its verification apparatus would disappear. There is still the Strategic Offensive Reductions Treaty (SORT), the Treaty of Moscow signed by Presidents Bush and Putin in Moscow in May 2002. In contrast to the lengthy START Treaty, this one is less than two pages long. It aims at a ceiling of 1,700-2,200 warheads by the end of 2012 for the U.S. and Russia. Unfortunately, it does not define nuclear warhead or address the delivery vehicles themselves or excess or reserve warheads.

Both Russia and the U.S. favor negotiating a new treaty that would deal with both warheads and delivery vehicles, but there is little time to do this by December 5. Some would have us renew START now, to allow negotiating time for a new treaty. Others maintain that we can do a new treaty by December if we're serious about it, and if we don't succeed by December, then we can extend START. Either way, the question is whether we'll talk about 1,500 deployed nuclear warheads instead of 1,700 or a more ambitious number of 1,000-1,500.

With nuclear power plants becoming more popular as a way of generating energy, we need a place for all the spent fuel rods to go. One answer would be to find some interim above-ground storage site, possibly around the Nevada Test Site.

We also need to revive the NPT. Since we don't believe there's going to be nuclear disarmament, we need to get everyone to accept more rigorous safeguards. Recently, the non-nuclear weapon states have been increasingly vocal in their concern that not only can they not have nuclear weapons, they aren't even permitted civil nuclear power. The two-tier system was doomed to break down.

Finally, there's the CNTB Treaty, which remains unratified. A lot has been happening in the past ten years with respect to verification and the stockpile stewardship program, which aims to ensure that nuclear weapons remain safe and reliable, which might make it time for renewed efforts on this Treaty.

Does Nuclear Deterrence Apply in the Age of Terrorism?

Adam Garfinkle, editor of *The American Interest* noted that there have long been threats of terrorism of one kind or another—President McKinley was assassinated by an Anarchist in 1901—which tend to subside. Importantly, Al Qaeda is probably much weaker today than it was in 2001; chiliastic or apocalyptic terrorism, of which al Qaeda is an example, tend to burn out quickly.

There has long been concern that nuclear weapons powers would give fissile material or a bomb to terrorists who would then use it against a mutual adversary, with no fingerprints left. However, there's never been a real case of this. Indeed, it is extraordinarily improbable that terrorists could build or get their hands on a useable nuclear weapon. And no government would be likely to give terrorists a finished bomb, knowing that it might be used against them. More worrisome is the prospect of terrorists' getting their hands on biotoxins, the dark side of bioscience. Biotechnology is being conducted all around the world, but we have no database on this research or international agreement monitoring bioresearch. We need one.

Of course, nuclear deterrence still applies among nuclear weapon states. The Bush administration's September 2002 National Security Strategy never said that strategic deterrence was obsolete, only that it wasn't an adequate means of defending against non-state actors. The thinking was never either/or, but this plus that.

Does deterrence, nuclear or not, apply to terrorism? Deterrence is an old idea that goes back before the Nuclear Age. Bernard Brodie noted that in the pre-nuclear days, it was a good thing that deterrence occasionally failed. The idea was that limited war fought within a certain rule-bound framework was a lubricant to the international system. It allowed new social powers to express themselves boundaries to change, and was a way to adjust to new social forces. So it was possible in the pre-nuclear age to have too much deterrence. In the nuclear age, it is impossible to have anything but too little deterrence.

Deterrence is only one thing you can do with military power. One can also compel someone to do something that they wouldn't otherwise do (see Thomas Schelling for more on this) and reassure. The 7th Fleet floats around in the Pacific reassures everyone that no act of compellance is about to happen. Deterrence falls between compellance and assurance. It's getting someone to *not* do something that they otherwise might do.

In the logic of deterrence thinking, you go through a series of possibilities, a decision-tree approach as to what might happen. While you're doing this, your opponent is doing the same thing. When you make a move, you reveal some information about what you've been thinking; likewise for your opponent. Deterrence is such an assessment game. It's what the U.S.-Soviet deterrence relationship was like for some 40 years.

There are a couple of conditions that have to be in place in order for such a mutual assessment game to work. There has to be a mutual commitment to play, and we have to agree on the rules. With terrorists, unfortunately, you don't have an agreement on the rules, and you have no return address.

Many people have been thinking about these themes, especially since 9/11. Some solutions are obvious: hardening targets that terrorists might attack; changing intelligence protocols to focus more on cumulative intelligence rather than signal intelligence or photo reconnaissance; beefing up, without overdoing, airport security. But the only thing we can reliably do is to kill the terrorists before they can hurt us, and that is not easy.

One thing we can do here, for ourselves, is to better train our society not to be terrorized. The purpose of terrorism is to terrorize people. If we don't play our part, then the terrorists will lose interest over time. We need to stop taking overboard steps that show we're afraid.

Nuclear Weapons and the Cold War

Hans Mark, professor and chair in engineering, University of Texas at Austin, relayed his experience with nuclear tests. The Mike device was the first thermonuclear device—part of the energy came from the fusion of Deuterium and Tritium. The yield of a thermonuclear bomb comes from the blanket, which can be any heavy element. We use Uranium-238, but lead will do. These bombs were qualitatively different from the early bombs—now yields on the order of megatons could be produced.

In 1955, Mark went to work as a post-doc fellow for Edward Teller, who made two contributions to the Nuclear Age. He developed the hydrogen fusion bomb while others were still working on the fission bomb, and also championed defending against ballistic missiles. In January 2002, the Navy invited Mark to go along on the USS *Lake Erie* on a test that showed that you could actually shoot down a ballistic missile from a ship with an onboard control system. All that was needed was a satellite signal to get the first trajectories. In February 2008 the *Erie* shot down the dead satellite USA 193. We've now had about 25 successful tests of this system.

Teller had the notion that we would use such a system against the Russians, and Mark remembers arguing with him about that. Teller agreed that it would be difficult, but maintained "But if we're not going to work on it… No one will work on it unless we say we can, or that eventually we can."

In high altitude tests, "Nike" antiaircraft rockets were used to carry Xray detectors to altitudes above the atmosphere to measure the Xray output of nuclear detonations. "Teak" was detonated at an altitude of 47 miles. One question was whether there would be any release of these charged particles from a detonation at that height. The predictions said no, the experiment said yes, which illustrates the importance of experiments.

Did the existence of nuclear weapons prevent more large wars in the 20th century? After WWII, there were no larger wars, and Mark believes that we would have had a large war had it not been for nuclear weapons.

At present, 188 nations have signed the NPT, which was opened for signature on July 1, 1968. The treaty requires the five nuclear states to develop plans to reduce and eventually liquidate their nuclear stockpiles. The treaty also states that all nations have the right to develop nuclear energy for peaceful purposes under IAEA inspection rules. Mark believes we have to change the Treaty. No nuclear power is going to liquidate its nuclear stockpile. The real goal is reduction, which Mark would support. He would also support further development of nuclear energy.

Mark estimates Iran to be 3-5 years to device test and 8-10 to obtain military capability, missiles, and aircraft available. Saudi Arabia could be a proliferator in response to an Iranian bomb test. Nuclear capable nations, all of which have signed the NPT, are capable of developing weapons but don't do so because somebody else is who is protecting them. These include Japan, Germany, Italy, Sweden, Taiwan, Canada, South Korea, Brazil and Australia.

Mark advocates building and designing a new bomb that would (1) be militarily useful and compatible with our current delivery systems; (2) have a shelf life of at least 25 years; (3) have safety features superior to those of current weapons; and (4) be designed such that there is a very high degree of confidence that it will work without having to be tested. He also recommends developing capable defenses against aircraft and ballistic missiles and better inspection and detection methods at harbors and border crossings.

Site developed by **Argo Potomac**