Strategy Research Project

How Nuclear Weapons Testing Would Enhance U.S. Nuclear Security

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Class of 2014

REPORT DOCUMENTATION PAGE

Form Approved--OMB No. 0704-0188

1. REPORT DATE *(DD-MM-YYYY)*	**2. REPORT TYPE**	**3. DATES COVERED** *(From - To)*
15-04-2014	STRATEGY RESEARCH PROJECT	

4. TITLE AND SUBTITLE
How Nuclear Weapons Testing Would Enhance U.S. Nuclear Security

5a. CONTRACT NUMBER

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER

6. AUTHOR(S)
Colonel John W. Weidner
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5d. PROJECT NUMBER

5e. TASK NUMBER

5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
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Department of National Security and Strategy

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
U.S. Army War College, 122 Forbes Avenue, Carlisle, PA 17013

10. SPONSOR/MONITOR'S ACRONYM(S)

11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION / AVAILABILITY STATEMENT
Distribution A: Approved for Public Release. Distribution is Unlimited.

13. SUPPLEMENTARY NOTES
Word Count: 7738

14. ABSTRACT

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15. SUBJECT TERMS
Deterrence, Nonproliferation, Comprehensive Test Ban Treaty

16. SECURITY CLASSIFICATION OF:			**17. LIMITATION OF ABSTRACT**	**18. NUMBER OF PAGES**	**19a. NAME OF RESPONSIBLE PERSON**
a. REPORT	**b. ABSTRACT**	**c. THIS PAGE**			**19b. TELEPHONE NUMBER** *(w/ area code)*
UU	UU	UU	UU	40	

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This manuscript is submitted in partial fulfillment of the requirements of the Master of Strategic Studies Degree. The U.S. Army War College is accredited by the Commission on Higher Education of the Middle States Association of Colleges and Schools, 3624 Market Street, Philadelphia, PA 19104, (215) 662-5606. The Commission on Higher Education is an institutional accrediting agency recognized by the U.S. Secretary of Education and the Council for Higher Education Accreditation.

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Abstract

Title:	How Nuclear Weapons Testing Would Enhance U.S. Nuclear Security
Report Date:	15 April 2014
Page Count:	40
Word Count:	7738
Key Terms:	Deterrence, Nonproliferation, Comprehensive Test Ban Treaty
Classification:	Unclassified

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How Nuclear Weapons Testing Would Enhance U.S. Nuclear Security

Since the end of World War II, the United States has relied upon nuclear weapons as the ultimate deterrent to nations that sought to subjugate it. As the Cold War advanced from the 1950s through the 1980s, the United States created an entire nuclear weapons complex devoted to the design, manufacture, testing, security and disassembly of nuclear weapons and their components. One aspect of the nuclear weapons complex, nuclear testing, served not only scientific purposes but also visibly demonstrated U.S. resolve for the development, maintenance and, if necessary, use of nuclear weapons. From 1945 to 1992, the United States conducted 1,030 nuclear tests (compared to 715 tests by the USSR) in a variety of locations including the Pacific, south Atlantic, Nevada, New Mexico, Alaska, Colorado and Mississippi.[1]

The disintegration of the Soviet Union in 1991 abruptly ended the Cold War, eliminated the threat of global communist domination and greatly reduced the danger of a massive nuclear attack on the United States. In an emerging era in which the United States and Russia viewed each other more as global partners than as enemies, the importance of nuclear weapons to each country's national security quickly diminished. Both the United States and the Russian Federation dramatically reduced the number of weapons in their respective nuclear stockpiles and self-imposed moratoriums on nuclear testing. Scholars and politicians perceived an opportunity to permanently end the practice of nuclear testing. The United Nations (UN) created the Comprehensive Test Ban Treaty (CTBT) to achieve that purpose en route to global nuclear disarmament as envisioned by the Treaty on the Non-Proliferation of Nuclear Weapons (commonly referred to as the Non-Proliferation Treaty or NPT).

More than 17 years after the CTBT opened for signature, the United States and several other key countries have not ratified that treaty. President Bill Clinton, President Barack Obama and Secretary of State John Kerry are just a few of the many prominent U.S. politicians that have advocated for its ratification. They and other supporters argue that nuclear testing is no longer necessary and that U.S. ratification of the CTBT will strengthen international nonproliferation efforts.

This essay takes a counter view and advocates that the United States must not ratify the CTBT before validating the anticipated safety, security, reliability and effectiveness of U.S. nuclear weapons as predicted by the stockpile stewardship program (SSP). From this perspective, it is imperative for the United States to resume nuclear testing within 10 years. This essay will make the case for U.S. resumption of nuclear testing by first examining the two international treaties that frame the nuclear nonproliferation and disarmament discussion, the NPT and the CTBT. It will then identify the main reasons offered as to why the United States should ratify the CTBT, followed by a contrasting discussion of the many important reasons why the United States should resume nuclear testing. Finally, this essay will outline a potential strategy that the United States could employ to resume nuclear testing. This strategy would minimize international resentment towards the resumption of nuclear testing, would not generate a renewed nuclear arms race among the nuclear nations, and would enhance nuclear nonproliferation efforts.

Treaties Framing the Nuclear Testing Conversation

To properly assess the current political environment as it relates to nuclear nonproliferation and nuclear weapon testing, and before exploring if nuclear testing is necessary to maintain the U.S. nuclear stockpile, it is entirely appropriate to briefly

highlight the two treaties that dominate international nuclear nonproliferation efforts and nuclear weapon testing discussions: the NPT and the CTBT. Since the NPT predates the CTBT and sets the framework for nonproliferation efforts, it will be discussed first.

The NPT was opened for signature on July 1, 1968, entered into force on March 5, 1970 and was extended indefinitely on May 11, 1995.[2] To date, 93 countries have ratified the treaty including the United States, the USSR (now Russian Federation), the United Kingdom (UK), France and China. Iraq, Iran and Syria have also ratified the treaty. Notable exceptions include India, Pakistan and Israel. In addition, North Korea ratified the NPT in 1985 but withdrew in 2003. The overarching goals of the NPT are nuclear nonproliferation and global nuclear disarmament. The NPT attempts to accomplish the former of these two goals in many ways.

First, the NPT defines the nuclear weapon states (NWS) as those that have "manufactured and exploded a nuclear weapon or other nuclear explosive device prior to January 1, 1967."[3] In other words, the United States, the USSR, the UK, France and China are the recognized NWS. The clear implication is that the international community will not view any other country that develops nuclear weapons as a legitimate nuclear weapon state.

Second, the NPT forbids the nuclear weapon states from transferring nuclear weapons, nuclear explosive devices or control over such devices to any recipient. Moreover, the treaty prohibits NWS from assisting, encouraging or inducing non-nuclear weapon states (NNWS) in manufacturing or acquiring nuclear weapons or nuclear explosive devices. Third, the treaty prohibits NNWS from receiving nuclear weapons or explosive devices, or control over such devices, from any transferor. Non-nuclear

weapon states are also forbidden from manufacturing, and seeking or receiving assistance in the manufacture of, nuclear weapons or explosive devices.

In signing the NPT, NNWS agree not to develop or acquire nuclear weapons in exchange for two benefits. First, NNWS would no longer have to worry that NWS will assist adversarial NNWS in developing nuclear weapons. Given the enormous challenges of developing nuclear weapons without significant technical assistance from those countries with nuclear weapons, it would be very unlikely that the balance of power among NNWS would significantly change. Second, the NPT establishes the right of the NNWS that are party to the treaty to develop peaceful nuclear energy programs under the oversight of the International Atomic Energy Agency (IAEA). Nuclear weapon states agree to "facilitate…the fullest possible exchange of equipment, materials and scientific and technological information for the peaceful uses of nuclear energy."[4] Hence, foregoing a nuclear weapons program enables NNWS to reap the benefits of peaceful nuclear programs with direct technical assistance from NWS.

As mentioned, by signing the NPT the NWS commit themselves to a path of nuclear disarmament—the second overarching goal of the treaty. The NPT states, "Each of the Parties to the Treaty undertakes to pursue negotiations in good faith on effective measures relating to cessation of the nuclear arms race at an early date and to nuclear disarmament, and on a treaty on general and complete disarmament under strict and effective international control."[5] This commitment is meant not only to increase the world's security by eventually eliminating the possibility of nuclear war, but it is also serves as another incentive for NNWS to sign the NPT.[6]

The NPT serves as the cornerstone of nonproliferation efforts because it seeks to both contain the number of states that possess nuclear weapons and to achieve nuclear disarmament of all world actors while making peaceful nuclear programs available to all signatories. The prohibitions that the NPT places on its signatories are important to consider. For example, the NPT precludes the United States from encouraging South Korea and Japan to develop nuclear weapons as a counter to North Korea's nuclear program. Even if the United States did encourage those nations to develop nuclear weapons, the NPT forbids South Korea and Japan from manufacturing nuclear weapons. Moreover, if the international community could demonstrate that China assisted Pakistan in the development of its nuclear weapons program, then China would be in violation of the NPT.

Unfortunately, the NPT has been unsuccessful in achieving either of its two primary goals in the nearly 44 years since it entered into force. India, Pakistan, North Korea and presumably Israel have joined the exclusive "club" of nations possessing nuclear weapons, and Iran may soon become the newest member. In fact, a strong argument can be made that the international community has informally accepted India as a legitimate NWS.[7]

In addition to its failure to stop the spread of nuclear weapons, the NPT has not caused a single NWS to give up its nuclear weapons arsenal. The emerging post-Cold War geostrategic context suggests that nuclear weapons may assume greater, not lesser, importance. Some scholars, such as R. Craig Nation, argue that the configuration of global power has transitioned from a bipolar struggle of superpower competitors to a framework in which regional and sub-regional conflicts and instabilities

dominate security considerations.[8] In that geopolitical context, it is extremely unlikely that a state currently possessing nuclear weapons will renounce its nuclear arsenal in the coming decades. In fact, it is much more likely that the number of states possessing nuclear weapons will increase, especially if Iran develops such weapons. In light of these circumstances, one must conclude that international respect for the NPT has eroded. Perhaps no other issue reflects this reality as significantly as the status of the Comprehensive Test Ban Treaty.

The CTBT seeks to ban all military and peaceful nuclear explosions. The treaty opened for signature on September 24, 1996.[9] To date, 183 of the world's 196 nations have signed the treaty and 161 nations have ratified it. Despite overwhelming international support, the treaty has not yet entered into force. In order for the CTBT to enter into force, 44 nations specified in the treaty must ratify it. Currently, 8 of the 44 specified nations have not ratified the treaty. India, North Korea and Pakistan have not signed the treaty and China, Egypt, Iran, Israel, and the United States have signed but not ratified the treaty. It is widely believed that few if any of these nations will take steps towards ratification of the CTBT unless the United States does so first. Some anticipate that U.S. ratification of the CTBT would quickly cause the other seven nations to follow the American example, thereby causing the CTBT to come into force soon after U.S. ratification. It is unlikely, however, that U.S. ratification would cause India, Pakistan or North Korea to ratify the CTBT.

Like the NPT, the preamble of the CTBT expresses the intent of its signatories to eliminate nuclear weapons from the world's arsenals. It also conveys the strategy of the CTBT designed to achieve that goal. By ceasing all nuclear test explosions, nations

possessing nuclear weapons would be constrained in maintaining and improving existing nuclear weapon designs and precluded from developing new types of nuclear weapons.[10] In this way, nuclear weapon development would stagnate, nuclear arsenals would atrophy, nations would eventually dismantle their nuclear infrastructure, and eventually, eliminate their nuclear stockpiles.

Despite a self-imposed test moratorium since 1992, the international community has exerted significant pressure on the United States to ratify the CTBT.[11] In September 1997, President Bill Clinton submitted the signed treaty for ratification to the Republican-controlled Senate, where it languished in the Foreign Relations Committee for just over two years. Believing there were enough votes to ratify the treaty, the Democratic minority agreed to a truncated review process that the Republican leadership advocated. The resulting process yielded only eighteen hours of debate, during which it became clear that there would not be enough votes to achieve the required two-thirds majority for Senate ratification. The resulting Senate vote in October 1999 rejected the CTBT.[12]

The senators that voted to reject the CTBT have offered three primary reasons for their vote. Senator Jon Kyl, who led the effort to reject the CTBT in 1999, provides a comprehensive explanation of his opposition in a October 21, 2009 *Wall Street Journal* op-ed.[13] Kyl indicated that there was, and continues to be, widespread concern that adversaries could conduct clandestine nuclear tests incapable of detection by the CTBT Organization's International Monitoring System. In other words, the treaty was potentially unenforceable. He went on to state that, even if detected, the CTBT requires 30 of its 51 members, many of whom are not friendly to the United States, to agree that

a nuclear test was conducted in violation of the treaty. That same council would then have to agree to conduct inspections of the violating country, possibly in the face of the violating country not granting access to its sovereign territory, if inspections were needed to confirm that a test occurred. In Kyl's view, this multistep and politically-charged process simply offered too many holes for determined violators to slip through.

Another reason the Senate rejected the treaty, according to Kyl, was the concern that the United States might not be able to ensure the safety, security and reliability of its nuclear stockpile if it surrendered the right to conduct nuclear tests.[14] The stockpile stewardship program, the overarching effort to ensure the safety, security, reliability and effectiveness of the nuclear stockpile in the absence of testing, was immature when the Senate voted to reject the CTBT. At the time, former National Security Adviser Brent Scowcroft, former Secretary of State Henry Kissinger and former Deputy Secretary of Defense John Deutch argued that the SSP "is not sufficiently mature to evaluate the extent to which it can be a suitable alternative to testing."[15] Moreover, senators were concerned that allies would perceive a ban on nuclear testing as leading to an ineffective nuclear deterrent. Such a perspective could have nuclear proliferation consequences within the context of the nuclear umbrella that the United States extends to countries such as Japan, South Korea, Australia and many NATO allies.

A third reason the Senate rejected the CTBT was that the treaty failed to define what it banned (i.e., the treaty does not define nuclear explosion). The U.S. interprets the CTBT to ban hydronuclear tests, which are very small nuclear explosions that release very small amounts of nuclear energy, typically on the order of a few pounds of TNT or less. Senator Kyl and many of his colleagues noted that it would be possible for

Russia or other countries to conduct very small yet militarily useful hydronuclear explosions and still claim to be observing the CTBT. In particular, Senator Richard Shelby cited statements from the Russian First Deputy Minister of Atomic Energy that Russia "intends to continue to conduct low-yield hydronuclear tests and does not believe that these constitute nuclear tests prohibited by" the CTBT.[16]

The current argument for not ratifying the CTBT focuses on the treaties effect on nonproliferation efforts and disarmament. Opponents to the CTBT contend that a strong nuclear deterrent is a key aspect of nonproliferation efforts and that nonproliferation and disarmament are two separate and distinct issues. Furthermore, these critics highlight that the United States has taken significant steps on both issues and those measures have been generally ignored by the international community.[17] These measures include the Cooperative Threat Reduction program, the Global Threat Reduction Initiative, the Proliferation Security Initiative and the Additional Protocols as well as the Strategic Arms Limitation Treaty, the Threshold Test Ban Treaty, the Intermediate Range Nuclear Forces Treaty, the Strategic Arms Reduction Treaty (START), the Strategic Offensive Reduction Treaty, and New START.

The U.S. Senate has not taken up any serious effort to ratify the CTBT since 1999. Early in his first administration, President Barack Obama pledged to champion the ratification of the CTBT. As part of an April 2009 speech in Prague, he said, "To achieve a global ban on nuclear testing, my administration will immediately and aggressively pursue U.S. ratification of the Comprehensive Test Ban Treaty."[18] Despite having a filibuster-proof majority in the Senate in 2009 and 2010, the Democratic

leadership never felt that it could convince seven Republicans to vote with them to reach the votes necessary for ratification.

Arguments For and Against Testing

To be sure, there are many sound reasons for the United States to ratify the CTBT and indefinitely continue its moratorium on nuclear testing. Nuclear nonproliferation, disarmament and testing are complex issues. As such, there are no obvious solutions to questions that ask whether or not the United States should use nuclear testing to better manage its nuclear deterrent, or whether nuclear testing enhances or degrades nuclear nonproliferation efforts. Scholars, scientists and politicians have analyzed the body of technical evidence and assessed the geopolitical landscape as it relates to the impact of nuclear testing on nuclear nonproliferation and disarmament. Honorable and intelligent members of the same profession have come to different conclusions about the need for nuclear testing and the role it would play in the nonproliferation and disarmament debate. This is not surprising and does not degrade the importance of the conclusions reached or the ultimate decision on whether or not to test. In fact, it heightens the importance of the ultimate decision, for there can be no certainty that it is the correct decision.

Perhaps the most commonly cited reason against the need for nuclear testing is the success of the SSP. Established by Congress in the 1994 National Defense Authorization Act and by President Clinton in Presidential Decision Directive 15, the SSP is a comprehensive approach to maintaining U.S. nuclear capability in an era without nuclear testing. The law directs that the SSP be based upon advanced computational simulation and modeling, above-ground experimental programs such as hydrodynamic testing (explosive tests utilizing uranium and plutonium that do not

produce any nuclear yield), high-energy lasers and inertial confinement fusion, and the construction of experimental facilities such as the National Ignition Facility. The program also includes an expansive surveillance initiative that utilizes radiographic inspection and disassembly of weapons to identify physical defects. Additionally, the SSP requires the President to report to Congress annually any concerns with respect to the safety, security, reliability or effectiveness of the U.S. nuclear stockpile.[19]

Advocates of the CTBT rightly point out that the President's annual report to Congress has continually certified the U.S. nuclear stockpile's safety, security, reliability and effectiveness without the need for nuclear testing.[20] Those presidential reports are based upon annual assessments from the directors of each of the nation's three nuclear weapons labs (Los Alamos National Laboratory, Lawrence Livermore National Laboratory and Sandia National Laboratories), the Secretary of Energy and the Secretary of Defense.

Additionally, opponents to nuclear testing highlight the JASON report of 2007 wherein an advisory panel of independent scientists concluded that plutonium primaries have a life expectancy of 100 years.[21] Special nuclear material such as plutonium and highly enriched uranium are very susceptible to corrosion and the likelihood of corrosion increases with the age of the special nuclear material. Corrosion can significantly impair the performance of a nuclear weapon. Consequently, there has always been concern that as the special nuclear material within nuclear weapons exceeded their anticipated lifetime (typically about 20 years), the risk of the weapon not performing as designed could rise significantly. The JASON report contradicts that hypothesis. In other words, the effects of aging on plutonium pits (the first or "primary" fission-based component of a

two-stage thermonuclear weapon) are not a significant concern in weapon reliability. Critics of nuclear testing also emphasize the 2009 JASON report that found no evidence of an increased risk to certification of the contemporary U.S. stockpile due to the accumulation of changes from lifetime extension programs (LEP).[22]

Moreover, supporters of the CTBT emphasize that LEP have successfully modernized the W76 and W87 nuclear warheads, and that similar programs scheduled for the B61, W78 and W88 warheads will ensure their effectiveness for decades to come.[23] Advocates of the CTBT also suggest that the relatively recent addition of the Dual-Axis Radiographic Hydrodynamic Test (DARHT) facility at Los Alamos National Laboratory and the anticipated achievement of inertial confinement fusion at the National Ignition Facility will further negate the need for nuclear testing.[24]

A second argument against nuclear testing is that a test moratorium is necessary for nuclear nonproliferation efforts and eventual global disarmament. Many policymakers, such as Undersecretary of State for Arms Control and International Security Rose Gottemoeller, suggest that the United States must sign the CTBT to enhance the U.S. capability to detect nuclear tests in concert with an international monitoring regime.[25] If the CTBT were to enter into force, it would bring with it an international monitoring system that would include seismic monitoring stations that could be placed at locations unavailable to U.S. detection systems. The CTBT also offers, according to its proponents, the potential of on-site inspection of areas where nuclear tests may occur, something the United States almost certainly could not do alone.[26] Supporters of the CTBT contend that this combination of monitoring capabilities would be a more significant deterrent than a U.S. national system alone.[27]

CTBT supporters also advise that the treaty is a step towards global nuclear disarmament.[28] They point to the preamble of the CTBT, which states, “Recognizing that the cessation of all nuclear weapon test explosions and all other nuclear explosions, by constraining the development and qualitative improvement of nuclear weapons and ending the development of advanced new types of nuclear weapons, constitutes an effective measure of nuclear disarmament and non-proliferation in all its aspects.”

The language of the CTBT preamble clearly advocates global nuclear disarmament by atrophy of existing nuclear arsenals. The purpose of the SSP, however, is to prevent the atrophy of the U.S. nuclear stockpile. That purpose is in direct contradiction to the CTBT’s stated intent of achieving global nuclear disarmament by the anticipated atrophy of, and resulting lack of confidence in, nuclear stockpiles due to the absence of testing. Therefore, it is disingenuous for CTBT advocates to argue for U.S. ratification of the CTBT based upon the success of the SSP when the intent of the SSP contradicts the intent of the CTBT.

Yet another reason offered for CTBT ratification is that China and Russia would certainly begin testing if the United States conducted nuclear tests, and those tests would enable our adversaries to develop more advanced weapons. Having conducted only 45 nuclear tests, China would have the most to gain and could miniaturize their nuclear weapons in order to put multiple warheads onto a single intercontinental ballistic missile (ICBM). Other nations such as India, Pakistan and North Korea might also begin testing, potentially making significant gains in thermonuclear weapon development.[29]

Domestic and international public opposition to nuclear testing are a fourth, and perhaps the most significant, obstacle to nuclear testing. There is no doubt that there

would be substantial political, public and private resistance, both within the United States and around the world, if the United States resumed testing nuclear weapons. The United States has not conducted a nuclear test since September 23, 1992.[30] An entire generation has grown up without the experience of nuclear testing and is naturally concerned about the implications and effects of nuclear testing. Moreover, NNWS signed the NPT with the expectation that NWS would divest themselves of their nuclear weapons. NNWS could interpret a resumption of testing as a lack of commitment to the stated NPT goal.

Having acknowledged the arguments against nuclear testing, there are six important reasons why the United States should consider testing nuclear weapons. First and foremost, nuclear testing is the most effective means to ensure the safety, security, reliability and effectiveness of the current U.S. nuclear arsenal, especially given the stockpile's advanced age. That fact is indisputable as testing is the only method which can measure a weapon's actual performance.

Though very effective, the SSP has its limitations. The most effective way to ensure that a nuclear weapon will perform as expected is to explode one (or several for statistical analysis) and measure its outputs. The SSP does not *measure* weapon performance. Rather, it *predicts* weapon performance based on radiographic analysis, limited destructive and nondestructive testing of nuclear weapon components, hydrodynamic testing of weapons pits containing surrogate material, and advanced computer modeling and simulation. These predictions are then used to infer the safety, security and reliability of the current stockpile.

A second reason for the United States to resume nuclear testing is the increasing risk of certifying the U.S. nuclear stockpile due to the combination of incremental changes introduced to refurbished nuclear weapons and the effects of aging. As previously discussed, all nuclear weapons in the stockpile were designed with the assumption that they would have a limited lifetime of approximately 20 years. The United States has not constructed a new nuclear weapon for nearly 25 years and has no plans to do so in the near future.[31] Lifetime extension programs replace certain weapons components and materials with similar, but not exact, replicas in order to extend their lifetimes another couple of decades. No weapon that has experienced an LEP has ever been tested. Thus, the U.S. government's ability to simulate weapon performance incurs greater uncertainty with each lifetime extension program. As Secretary of Defense Robert Gates stated in 2008, "At a certain point, it will become impossible to keep extending the life of our arsenal, especially in light of our test moratorium." He went on to say, "To be blunt, there is absolutely no way we can maintain a credible deterrent and reduce the number of weapons in our stockpile without either resorting to testing our stockpile or pursuing a modernization program."[32]

Because components and material manufacturing processes cannot be duplicated exactly, each replaced component or material has the potential to behave just a little bit differently from the original. With each modification to these highly complex weapons, their overall compositions drift farther from their initial design parameters that served as the basis for current computer codes and simulations.[33] Furthermore, the aged pits and thermonuclear secondaries of refurbished weapons are reutilized despite the lack of significant nuclear test data on the performance of those

materials in excess of 20 years old. The sum of the individual performance variations caused by the combination of new components and aged special nuclear material could significantly degrade the overall performance of the weapon system.[34]

In addition to Secretary Gates, two other prominent U.S officials have emphasized the risks associated with certifying refurbished nuclear weapons in the absence of testing. In 2005, Ambassador Linton Brooks, then Administrator of the National Nuclear Security Administration, stated, “The evolution away from tested designs resulting from the inevitable accumulations of small changes over the extended lifetimes of these systems means that we can count on increasing uncertainty in the long-term certification of warheads in the stockpile.”[35] Administrator Brooks’ comments clearly represented the official NNSA position and those of the weapons labs that the NNSA administers. John Foster, former Director of Lawrence Livermore National Laboratory and former Director of Defense Research and Engineering in the Defense Department, expressed the same concern in 2007 when he said of LEPs, “This process introduces new materials and components into the warheads, which introduces the possibility of ‘birth defects’ that raise risks.”[36] These two expert opinions should not be casually dismissed.

The two aforementioned JASON reports indicate that there is no evidence that accumulated changes from aging and LEPs have increased the risk to the certification of currently deployed U.S. nuclear weapons. The absence of evidence, however, is not the same as evidence of absence. Just because the study found no evidence of increased risk does not mean that there is no increased risk. One might suspect that the advisory group that examined the issue was keenly aware of this fact and carefully

worded their findings because of the probability that there is an undiscovered increase in the risk associated with certification. That conclusion seems intuitively obvious, and prominent members of the scientific community have argued, that the cumulative effects of numerous small changes to a refurbished weapon will cause the weapon to perform abnormally or even fail.

If that possibility seems so unlikely as to be negligible, consider that the U.S. nuclear testing program has had several nuclear weapons designs and materials that did not perform as expected. Perhaps the most notable is the Castle Bravo test of 1954. Its 15-megaton yield was 250 percent larger than expected because of an unanticipated nuclear reaction. There were also several nuclear tests during the 1970s and 1980s, an era of relatively robust computational capability and design experience, that failed completely.[37] So, some weapon designs and materials have not performed as predicted and the difference between the predictions and the performance was only discovered through testing. This may very likely be the case with refurbished weapons utilizing relatively old special nuclear material.

A third reason for the United States to resume nuclear testing is to validate and enhance the capabilities of the SSP. Because the SSP came into being after the U.S. test moratorium of 1992, there has never been a nuclear test to validate a SSP prediction or certification. The only way to know if predictions are valid is to measure the characteristics of a nuclear explosion and compare the predictions to the real measurements. This is a fundamental principle in science and cannot be avoided.

Although computer simulations can replicate the performance of past nuclear tests, there is no evidence that those same models can accurately predict the

performance of a nuclear weapon with materials or components differing from those comprising previously tested weapons. At the December 2008 Nuclear Deterrence Summit, then Under Secretary of Energy for Nuclear Security and Administrator for the NNSA Thomas D'Agostino stated that "we must heed the technical concerns expressed by our laboratory directors regarding the risks in maintaining the aging Cold War stockpile over the long term without nuclear testing."[38]

The uncertainty caused by lifetime extension programs and aging will only increase with time. In order for the SSP to truly be the long-term answer to nuclear weapons management, computer simulations and hydrodynamic tests of pits using surrogate materials must be validated against test results. Some authorities, such as Kathleen Bailey, former Assistant Director for the Arms Control and Disarmament Agency, have argued that it is impossible to validate SSP tools such as computer models without new nuclear test data. In her view, certifications based upon invalidated SSP tools are invalid political statements.[39] Without validation, the SSP should not be the sole solution to the challenge of maintaining our aging stockpile unless the United States is willing to accept levels of risk and uncertainty currently viewed as unthinkable. Full validation of the SSP almost certainly requires testing.[40] With validation through appropriate nuclear testing, perhaps the SSP can eventually and confidently negate the need for further nuclear testing.

A fourth reason for the United States to resume nuclear testing is to improve the security of its nuclear weapons. Before continuing, it is important to emphasize that the U.S. nuclear stockpile is very secure. The physical security associated with denying access of unauthorized personnel to nuclear weapons is excellent, effective and has

evolved with the emerging threats. The intrinsic security aspects associated with each individual nuclear weapon—the design and engineering characteristics that prevent it from being detonated by an unauthorized individual—have not evolved, however, and are still based on threats and technology from the 1970s and 1980s.

Given the increased threat from, and sophistication of, terrorist organizations, as well as the increased information available to them from internet and foreign sources, it is prudent to ensure that U.S. nuclear weapons are as secure and invulnerable to unauthorized use as possible.[41] As Linton Brooks remarked in 2005, “We now must consider the distinct possibility of well-armed and competent terrorist suicide teams seeking to gain access to a warhead in order to detonate it in place.”[42] It follows that the United States should improve the intrinsic security of its nuclear weapons with state of the art technology and security engineering to prevent their unauthorized use. Because updated security components and engineering improvements could significantly modify the heart of a nuclear weapon—the high explosives and special nuclear material of the primary stage—the performance of the modified weapon must be validated. Given the limitations of the SSP and its lack of validation, the only method to validate the performance of a significantly modified weapon is through testing. In March 2007, Thomas D’Agostino testified to Congress that, “major enhancements in security are not readily available through system retrofits via the LEP approach.”[43] Therefore, a nuclear weapons testing program is necessary to significantly improve U.S. nuclear weapon security.

A fifth important argument for nuclear testing is the ability to test likely improvised nuclear device (IND) designs as well as the techniques that could be used to prevent

such designs from achieving nuclear yield. Perhaps the most significant threat that the United States now faces is a domestic nuclear explosion by violent extremist groups. Nuclear counterterror doctrine and techniques could be significantly enhanced by testing likely designs to determine with certainty if they would achieve nuclear yield, how much yield, the weapon's efficiency and other important safety and nuclear forensic characteristics. Moreover, experiments could be conducted to measure (rather than predict through computational simulation) if the defeat mechanisms actually prevent, or at least significantly reduce, the nuclear yield of such a device.

It is likely that the NNSA has developed computational simulations to predict the techniques needed to defeat improvised nuclear devices based upon assumed designs. It is almost impossible to overestimate the value of experimental test data on methods to defeat an improvised nuclear device if an IND were located, either within our boarders or abroad. No matter what the cost, the public would almost certainly believe that testing nuclear disablement techniques was worth the price if it prevented a major city from being destroyed by terrorists armed with an IND.

Developing and maintaining test-related competencies is a sixth reason for the United States to reinstitute a nuclear testing program. The instrumentation and diagnostics required to measure the outputs of a nuclear weapon is difficult, if not impossible, to simulate in the absence of nuclear testing. Moreover, the skills and experience necessary to contain nuclear explosion of various yields and buried at different depths are equally challenging to develop by simulation alone. Containment is a very difficult science as evidenced by the numerous and significant U.S. containment failures prior to 1972.[44] From 1972 to 1992, only two tests resulted in the unintentional

release of radioactivity to the atmosphere due to containment failure and only one of those resulted in radiation being detected outside of the boundary of the Nevada Test Site.[45] If the United States returns to nuclear testing, it must be able to contain every explosion successfully.

Further, consider the prophetic concerns of six former Secretaries of Defense in a letter to the Senate Armed Services Committee in 1999: “Another implication of a CTBT of unlimited duration is that over time we would gradually lose our pool of knowledgeable people with experience in nuclear weapons design and testing. Consider what would occur if the United States halted nuclear testing for 30 years. We would then be dependent on the judgment of personnel with no personal experience either in designing or testing nuclear weapons. In place of a learning curve, we would experience an extended unlearning curve.”[46]

The United States must also maintain the ability to employ all of the processes associated with nuclear forensics in order to properly determine yield and other critical explosion characteristics. The critical competencies that support the nuclear forensics process include drilling into the heart of a nuclear explosion shortly after the event, collecting highly radioactive samples, preparing those samples using radiochemistry, and measuring the radioactivity of very small radioactive samples. The nuclear forensic skills used to calculate the performance of a U.S. nuclear weapons test are the same skills that would be needed to evaluate and attribute a domestic IND attack. If such an attack occurred, the president would certainly demand to know the weapon’s origin. Without a limited nuclear weapons testing program, those skills are in danger of eroding away.

If the United States returns to a testing program within the next ten years, it would be possible to leverage the knowledge and experience of those experts who participated in the last tests. The number of people employed by the nuclear weapons complex, which reached a peak of nearly 58,000 in 1990, had fallen below 24,000 people by the end of the decade.[47] If the United States waits more than ten years before resuming testing, those who participated in the last U.S. nuclear test will be long into retirement and perhaps be physically unable to assist. The United States cannot afford the loss of these critical test-related skills that took decades and billions of dollars to develop.

Additionally, a 2003 NNSA report stated, “Over the past several years the NNSA conducted reviews of the 24- to 36-month test readiness posture that the NNSA has maintained since Fiscal Year 1996. ... From these reviews, NNSA concluded that because of a loss of expertise and degradation of some specific capabilities, the United States would more likely require about 36 months to test, with less confidence in being able to achieve the 24-month end of the range. Furthermore, as time passes without further action, the 36-month posture is viewed as increasingly at risk.”[48] Since it has been more than 20 years since the last U.S. nuclear test, it is very likely that it would take the United States three or more years, by the NNSA’s own estimates, to prepare for a meaningful nuclear test. Because the United States cannot return to a meaningful nuclear test program quickly, the U.S. government must plan and prepare for a return to testing well in advance of the need to do so.

Strategy for Resuming Nuclear Testing

The United States should begin laying the foundation for a return to nuclear testing now. This nuclear testing program should be based upon several elements. Most

importantly, the United States should seek to resume a nuclear testing program that is limited in purpose, time and number of tests and that conforms to all previous test ban treaties. The activities should focus on gathering the information necessary to validate the predictive capabilities of the SSP by ensuring that older and refurbished weapons perform as required. The program should also incorporate experiments to validate techniques to measure the performance of suspected improvised nuclear weapon designs that terrorists might use. Finally, the testing program should test procedures to defeat anticipate nuclear weapon designs that might be encountered domestically and internationally.

The number of tests that would be required to achieve these goals and the amount of time it would take to conduct those tests requires the insights and experience of the nuclear weapons design community and should be left to the NNSA to decide. It is very likely that tests would have to be sequenced and perhaps repeated to achieve the results and certainty needed to validate the SSP. The President of the United States must make it clear, however, that the nuclear testing program is intended to be limited in scope and duration. That message is as significant for the international audience as it is for the domestic audience.

The restrictions of a U.S. nuclear weapons testing program will be as important as its goals. The test program should not be used to improve the effectiveness of existing weapons or to develop new nuclear weapon designs or capabilities. The United States must be cognizant of the specified and implied intent of the NPT and the CTBT and live up to the spirit of those treaties to the extent possible. Many non-nuclear weapon states will suspect the United States of using the nuclear tests to develop new

and improved nuclear weapons. The United States must anticipate that mistrust and counter it with a clear strategic communications plan. The United States should also open its tests to international monitoring, within the limits of national security, to assure the international community and our adversaries that the program is not testing new or improved designs.

In addition, the United States should agree to similar limited test programs by the other NWS (Russia, the United Kingdom, France and China). To gain legitimacy for its limited test program, the United States must recognize the right of other NWS to conducted limited tests of their own to ensure the safety, security, reliability and effectiveness of their existing stockpiles. As with the U.S. program, the limited test programs of the other NWS must be open to international monitoring to ensure that their limited test programs do not include the improvement of existing weapon designs or the development of new designs. Furthermore, the United States should attempt to broker a treaty among the five NWS that clearly defines the purpose, goals and limitations of the test program. In negotiating such a treaty, the United States should not allow itself to be constrained from testing if such a treaty were unable to be achieved in a reasonable amount of time.

The United States should also offer to host underground nuclear tests at the Nevada National Security Site for other nuclear weapons states. The United States sponsored twenty four nuclear weapons tests for the United Kingdom at the Nevada site and should offer to do this for any of the NWS that which to utilize the site.[49] This would provide the greatest potential for transparency, oversight, compliance and international cooperation during the limited test program. Although it is doubtful that China and

Russia would wish to test their weapons in the United States, the United Kingdom and France may have no other alternative.

To legitimize a resumption of a limited nuclear test program, the United States must skillfully communicate a compelling argument as to why testing is the only way to accomplish the goals of a testing program. In support of that effort, the U.S. Departments of Energy, Defense and State must highlight to domestic and international audiences that the weapons in the U.S. nuclear arsenal were not designed to last indefinitely. The SSP has been adequate in ensuring their safety, security and effectiveness since 1992 and will continue to do so for the near term. Soon, all of the weapons systems will have experienced a modernization refurbishment. These refurbishments may cause the systems to drift from their original design parameters. In addition, the nuclear components are exceeding their intended lifetime and the United States has little testing data on the effects of aging. Consequently, nuclear testing is necessary to ensure their safety, security, reliability and effectiveness.

In addition, the United States should highlight that it imposed its moratorium on testing abruptly and without possessing all of the test data that was necessary to ensure the long-term effectiveness of the nuclear arsenal without further testing. A concentrated effort must be made to communicate that the United States, after obtaining the necessary data to validate the SSP, could be positioned to ratify the CTBT.

The U.S. government should also inform the public that an underground nuclear testing program will have no significant environmental effects. As it turns out, the Nevada National Security Site is an ideal location for underground nuclear testing. The

water table is thousands of feet deep and is well below the depth needed to conduct nuclear tests.[50] Moreover, the soil is generally well-suited to contain nuclear explosions if the borehole is properly sealed.

The last two decades of the U.S. nuclear testing program demonstrate its compatibility with the local environment. During the final 20 years of the U.S. nuclear test program, only 2 of 360 underground nuclear tests resulted in the unintentional release of radioactivity to the atmosphere due to containment failure. Only one of those tests resulted in radiation being detected outside of the boundary of the Nevada Test Site. In fact, according to a report published by the U.S. Congress, an unprotected person standing at the boundary of the Nevada Test Site in the location of maximum concentration of radioactivity from every nuclear test since 1971 would receive a radiation exposure equal to 32 minutes of normal environmental background exposure, or the equivalent of 1/1000 of a single chest X-ray.[51] That is much less radiation than a person living near a coal-fired electrical generation plant would receive annually from released fly-ash.[52]

Given the importance of containing underground nuclear explosions, it is imperative that the U.S. resume a nuclear testing program while there are still experienced people available to advise and assist with that procedure. The time horizon to leverage those experienced in containing underground nuclear explosions is likely about 10 years from now. If the United States fails to resume nuclear testing by the year 2025, 33 years after its last nuclear test, it is improbable that anyone with significant containment experience would be physically able to assist in a meaningful way.

Lastly, it is important to note that this essay does not advocate for an immediate return to nuclear testing. Indeed, the SSP has done an adequate job in managing the U.S. stockpile for more than twenty years, and it is capable of doing so for the next five or ten years. During those last viable years of the SSP, the United States would be well advised to begin technical preparations for a nuclear testing program and to conduct a coordinated strategic communications program to convince the national and international public that the responsible management of the U.S. nuclear stockpile requires some limited testing to ensure the long-term safety, security and reliability of those weapons.

Conclusion

The NPT and CTBT have failed to achieve their goals of nuclear nonproliferation, eliminating nuclear weapons testing and global nuclear disarmament. Moreover, nuclear weapons will continue to play a central role in regional disputes for decades if not centuries. To validate the safety, security, reliability and effectiveness of the U.S. nuclear arsenal as long as it is needed, the United States must resume a limited, narrowly focused nuclear testing program within the next ten years. There are certainly many reasonable considerations offered by those opposed to testing, including national and international political resistance, the theory that testing will encourage proliferation, and the belief that the SSP can continue to maintain the stockpile for another generation. Given these reasonable positions, it will be very challenging to convince the world community to support a resumption of testing. A strategic communication program that is credible, fact-based, truthful and enduring should assist a majority of U.S. citizens and nations in realizing that testing is an absolute requirement for the United States to maintain a safe, secure and reliable nuclear deterrent for the long term.

The SSP simply does not have the data and validation required to be the final answer to managing nuclear weapons for as long as the United States is likely to possess them. Given that nuclear proliferation has increased over the past two decades, and may accelerate if Iran or other states develop nuclear weapons, it is imperative that the United States incorporate the one process, testing, that would provide the information needed to verify with absolute certainty the safety, security and reliability of the U.S. nuclear stockpile.

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