Deadly Arsenals

NUCLEAR, BIOLOGICAL, AND CHEMICAL THREATS

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CHAPTER 10

The United States

Nuclear Weapons Capability

The United States was the first country to develop and test a nuclear weapon and is a recognized nuclear weapon state under the Non-Proliferation Treaty. The United States continues to maintain the world's largest force of deployed strategic nuclear weapons, although the arsenal is gradually being reduced in accordance with several arms control agreements with Russia (see table 10.1 at the end of the chapter).[1] Under the accounting rules of the Strategic Arms Reduction Treaty (START I), the United States maintains an accountable strategic nuclear force of 1,225 delivery vehicles with 5,966 associated warheads,[2] although the actual number of deployed strategic weapons is less. As of January 2005, the best independent estimate details 961 deployed delivery vehicles with 4,216 associated warheads.[3] The United States also has 780 operational nonstrategic warheads and approximately 5,000 additional intact warheads retained in reserve or inactive stockpiles, for a total of approximately 10,300 nuclear weapons. The United States plans to reduce this number by about 50 percent by 2012. The first U.S. nuclear test was conducted on July 16, 1945, after which the United States became the only country to use nuclear weapons in combat, on August 6 and 9, 1945. The last of its 1,030 nuclear weapons tests took place on September 23, 1992. The United States has signed but not ratified the Comprehensive Test Ban Treaty.

Aircraft and Missile Capability

The United States maintains a triad of nuclear forces on board land- and submarine-based missiles and a fleet of nuclear-capable long-range bomber aircraft. The United States deploys 10 MX/Peacekeeper intercontinental ballistic missiles (ICBMs) armed with ten warheads each and 500 Minuteman III ICBMs (50 armed with three warheads, 300 armed with two to three warheads, and 150 armed with one warhead each). The MX/Peacekeeper missiles are in the process of being retired, and will be completely phased out of service by October 2005. The missiles and their silos will be retained and most likely their warheads will be held in the reserve force.

In addition, Washington maintains 14 nuclear armed ballistic missile submarines. Two Ohio-class submarines are each equipped with 24 C-4 Trident I missiles, each of which is loaded with six warheads. Twelve additional Ohio-class submarines are armed with 24 D-5 Trident II missiles each, carrying six

warheads per missile. Four older submarines, which formerly carried 24 C-4 Trident I missiles each are being converted to non-nuclear operations although their former 96 total missiles, with 576 associated nuclear warheads, are still accountable under START I rules.

The U.S. nuclear bomber force consists of 115 planes of two different types, the B-52 and the B-2. The 94 B-52s in the U.S. nuclear arsenal are equipped to carry nuclear air-launched cruise missiles and gravity bombs. The 21 B-2s only carry gravity bombs.[4] The 81 B-1 bombers currently in service have been converted to conventional roles, but are still accountable under START I. The United States also maintains nuclear-equipped tactical aircraft.[5]

Biological and Chemical Capability

The United States does not have research or production programs for either chemical or biological offensive weapons. It ratified the Biological Weapons Convention in 1974 and the Chemical Weapons Convention in 1997. The United States has a vast stockpile of chemical weapons that are slated for destruction on its territory and has opened its related facilities for inspection. It unilaterally destroyed its formidable arsenal of biological weapons over several years, beginning in 1969.

The Strategic Context

The United States is the most advanced nuclear weapon state in the world. It maintains a diverse arsenal of strategic and tactical nuclear weapons, as well as large stocks of weapons-grade nuclear materials. After peaking in the mid-1980s, the U.S. nuclear arsenal has been shrinking as part of a negotiated arms reduction process with the Soviet Union and its successor, Russia. Dedicated to nuclear deterrence during most of its existence, the mission for U.S. nuclear weapons has become less clear with the demise of the Soviet Union and the emergence of the United States as the global superpower. The stated goal and developing mission of U.S. nuclear forces continues to evolve. This evolution was highlighted in the Nuclear Posture Review (NPR) that was released by the Department of Defense on January 9, 2002.[6]

At the broadest level, the review stated that nuclear weapons continue to "play a critical role in the defense capabilities of the United States, its allies and friends. They provide credible military options to deter a wide range of threats, including WMD and large-scale conventional military force." Thus, a decade after the collapse of the main nuclear challenger to the United States, U.S. nuclear weapons remained central to U.S. defense efforts.

The review, which was mandated by Congress, outlined plans to implement negotiated reductions in strategic forces, to retain and improve the ability to increase these forces if necessary, to accelerate efforts to develop antimissile systems (see chapter 5), and to begin the development of new, low-yield nuclear weapons. Though the NPR's commitment to deep cuts in the nuclear arsenal

was significant, it was basically a slower and less verifiable version of earlier U.S. plans, developed in the 1990s in START II and discussions for START III.

Under the Strategic Offensive Reductions Treaty (SORT) (the replacement for the STARTs, which U.S. president George W. Bush and Russian president Vladimir Putin signed in June 2002), the United States will field 1,700–2,200 operationally deployed strategic warheads by 2012. This agreement would leave both Russia and the United States with more weapons in the field than was envisioned in the arms reduction process pursued throughout the 1990s. In 1997, the United States and Russia agreed on a reduction goal of 2,000 to 2,500 deployed strategic warheads by the end of 2007 (see "The Effect of Arms Control," below). The lower number agreed to in SORT is derived by no longer counting the warheads on submarines or bombers in overhaul as being "operationally deployed." Two Trident submarines, with 192 warheads each, are usually in overhaul at any given time, as are several bombers capable of carrying dozens of weapons, thus accounting for lower numbers without changing existing nuclear force plans.

Under SORT, some warheads removed from delivery vehicles will be dismantled, but the removed systems could also be maintained in the active stockpile for potential return to delivery systems on short notice (weeks or months). This is a "responsive reserve" of warheads that can be redeployed should strategic conditions change for the worse. This position contradicts one advanced by the United States in the late 1990s, when the Bill Clinton administration, in the proposed START III, sought to require warhead dismantlement to make future reductions both transparent and irreversible. With the signing of SORT, the irreversibility of nuclear cuts is no longer a U.S. goal. According to U.S. officials, this approach provides the United States with the greatest amount of flexibility to reconfigure its nuclear forces in response to changes in the world, although it remains unclear exactly what projected developments might trigger the need for such flexibility.

In June 2004, the director of the National Nuclear Security Administration, (NNSA), Linton Brooks, announced that the United States would cut the stockpile of nuclear weapons "about in half" by 2012. The official plan is classified, but experts estimate that the current total arsenal of more than 10,000 warheads will be reduced to just under 6,000 warheads.[7] This plan reflects preexisting commitments to the retirements of certain components of most "reserve" and "inactive" warheads, many of which are already under way.

U.S. officials have noted that since the end of the Cold War, the United States has reduced its strategic nuclear systems by more than 50 percent, nonstrategic systems by more than 80 percent, and spending on strategic forces by almost 70 percent.[8] During the past ten years, the United States has:

- curtailed bomber and ICBM production;
- removed all sea-launched nuclear cruise missiles, bombs, and tactical nuclear weapons from ships and submarines;
- taken all bombers off day-to-day alert;

- eliminated the Minuteman II ICBM force;
- eliminated all nuclear short-range attack missiles from the bomber force;
- eliminated all ground-launched intermediate- and short-range nuclear weapons;
- canceled almost all new warhead research and development;
- halted underground nuclear testing;
- closed major portions of the nuclear weapons production complex; and
- converted the entire B-1 bomber force from nuclear to conventional missions.

Despite these development, the United States will retain for the foreseeable future robust, diverse, and highly capable nuclear forces. Sixty years after the invention of nuclear weapons, the role of these systems in U.S. defense policy is still hotly debated.

Some experts and former officials maintain that the new security environment—even one dominated by the war on terrorism—provides the United States and the other nuclear weapons states an opportunity to reduce their nuclear weapons and that doing so would diminish the perceived political and military utility of these weapons. Such a posture would reduce the risk that intact nuclear weapons could be acquired by terrorist groups or used without authorization and through miscalculation.[9] Reducing U.S. reliance on nuclear weapons for defense and security would also improve prospects for keeping new nations from developing or acquiring nuclear weapons. Former senator Sam Nunn argues that with the current nuclear policies, "the United States and Russia, whether they intend the message or not, are telling the world that conventional weapons are not enough to ensure security. Nuclear weapons—not only nuclear weapons but nuclear weapons ready for rapid launch—are essential."[10]

In the 2002 NPR, the George W. Bush administration concluded that there will be a need to maintain thousands of deployed nuclear weapons in a triad of bombers, submarines, and land-based missiles for the indefinite future. The diversity is required to "complicate any adversary's offensive and defense planning calculations while simultaneously providing protection against the failure of a single leg of the triad," according to the former commander-in-chief of the Strategic Command, Admiral Richard Mies. That is, U.S. forces must remain capable of withstanding a first strike and responding after the attack with an overwhelming and devastating nuclear counterattack. Mies explained the importance of each triad component:

> Intercontinental ballistic missiles continue to provide a reliable, low-cost, prompt response capability with a high readiness rate. They also promote stability by ensuring that a potential adversary takes their geographically dispersed capabilities into account if contemplating a disarming first strike. . . .
>
> The strategic submarine force is the most survivable leg of the triad, providing the United States with a powerful, assured response capability against

> any adversary. . . . The United States must preserve a sufficiently large strategic nuclear submarine force to enable two-ocean operations with sufficient assets to ensure an at-sea response force capable of deterring any adversary in a crisis. . . .
>
> Strategic bombers . . . allow force dispersal to improve survivability and aircraft recall during mission execution. The low-observable technology of the B-2 bomber enables it to penetrate heavily defended areas and hold high-value targets at risk deep inside an adversary's territory. . . . The B-52 bomber can be employed in a standoff role using long-range cruise missile to attack from outside enemy air defenses.[11]

The review also called for steps that make the use of nuclear weapons by the United States more likely, even in response to non-nuclear threats or attacks. The review stated that the United States would rely on nuclear weapons to deter and respond to threats from weapons of mass destruction, defined in the review to include not only nuclear weapons, but chemical and biological weapons and even conventional explosives. While the right to respond to chemical and biological weapons threats has been stated U.S. policy since the early 1990s, the NPR formulation was more explicit and also called for the development of new weapons to make the threat of such use more credible. Within the new nuclear use policy formulation, there are few if any military contingencies that would explicitly rule out a possible nuclear response by the United States.

Another important development in the NPR is the closer integration of conventional and nuclear force planning. The Pentagon states that by more closely linking intelligence, communication, and force operational planning for nuclear and conventional operations, conventional forces can more easily replace operations previously limited to nuclear options, making the use of nuclear weapons less likely. General James E. Cartwright, commander of the U.S. Strategic Command, testified on April 4, 2005, that "the Secretary of Defense recently assigned USSTRATCOM [the U.S. Strategic Command] responsibility for integrating and synchronizing DoD's [the Department of Defense's] efforts for combating weapons of mass destruction."[12] He continued, saying that the United States "will look at rationalizing our nuclear forces as an element of the overall force structure and the proper tailoring of nuclear effects as part of the broad spectrum of power. . . . For example, I intend to conduct experiments to better understand the value of weapons accuracy within a range of stressing environments. If modeling and testing confirm the value of such capability, this may lead to new thoughts on the balance between nuclear and conventional strike capabilities." This statement appears to suggest that nuclear and conventional weapons are increasingly seen as interchangeable, meaning that some current nuclear missions might be assigned to conventional weapons—but also opening up the alternative whereby nuclear weapons might be seen as credible replacements for conventional weapons.

These policies discussed in the NPR and implemented since raised two concerns. First, low-yield and "bunker buster" weapons, combined with greater operational integration, would contribute to lowering the nuclear threshold, making the use of nuclear weapons more acceptable. Second, by threatening the

use of nuclear weapons, even against conventionally armed adversaries, Washington is actually increasing the incentive for states to acquire nuclear weapons, if for no other reason than to deter the use of such weapons by the United States.

Congress reacted to these concerns by cutting funds for the programs in 2004. The Bush administration began preliminary work on new weapons designs at the time of the NPR. In 2003, Congress had modified the Spratt-Furse amendment of 1993 (which had prohibited the development of any new, low-yield nuclear weapon) and funded a research program for low-yield nuclear weapons, known as the Advanced Nuclear Weapons Concepts Initiative, and a second program to modify existing warheads to create a Robust Nuclear Earth Penetrator. Congress denied funding for these programs in the fiscal year 2005 defense appropriations, while also reducing funding for a new facility to produce plutonium "pits" or cores for nuclear weapons, and for a program to prepare for the rapid resumption of nuclear weapons tests if needed.

In April 2005, the Bush administration appeared to take a different approach to restarting the development of nuclear weapons in the United States. NNSA administrator Linton Brooks testified that the United States needs to resume researching and possibly developing new nuclear warheads to maintain the country's scientific and engineering base and to preserve the safety and reliability of its nuclear arsenal. The safety and reliability of the nuclear arsenal is already the focal point of the Science Based Stockpile Stewardship program, which is funded at just over $6 billion each year. Brooks noted, however, that "there is another reason why it is critical that we begin now to transform the stockpile. . . . We are losing expertise. We must train the next generation of nuclear weapon designers and engineers before the last generation, which honed its skills on nuclear testing, retires." He continued that the United States should "begin concept and feasibility studies on replacement warheads and warhead components that provide the same or comparable military capabilities to existing warheads on the stockpile."[13] Congress again eliminated funds for the "bunker buster" in 2005, but supported a study on a replacement warhead.

Nuclear Analysis

The U.S. nuclear arsenal has developed greatly since its inception in 1945. Different strategies have guided the formation of nuclear forces and their possible use as international circumstances and technologies have continued to evolve. This evolution has continued with the collapse of the Eastern bloc and the dissolution of the Soviet Union, America's Cold War nuclear adversary.

From its small-scale beginnings during the Manhattan Project in World War II, the United States constructed a massive nuclear weapons production complex. This system of national laboratories, nuclear material production, and weapon assembly sites also included a large and advanced complex for the production of ballistic missiles, nuclear submarines, and long-range strategic bombers. The cost of producing and maintaining this arsenal since 1940 has been estimated at almost $6 trillion.[14]

The U.S. strategic arsenal consists of just under 6,000 accountable nuclear weapons under the terms of START I. The actual deployed, operational strategic nuclear arsenal is just over 4,200 nuclear weapons. In addition to its deployed, strategic nuclear arsenal, the United States maintains a smaller number (approximately 780) of tactical nuclear weapons, including perhaps 480 deployed in Europe.[15] The United States also maintains a large reserve of nuclear weapons in storage and inactive reserve. While no official numbers have been released on the size of the total U.S. arsenal, reliable estimates put the stockpile at more than 10,300 weapons.[16]

To produce nuclear weapons, a country or group must possess special nuclear-weapons-usable materials. During the Cold War, the United States produced an extensive stockpile of weapons-grade uranium and plutonium, a stockpile surpassed only by that of the Soviet Union. The United States ceased its production of highly enriched uranium for weapons in 1964 and ended plutonium production for weapons in 1988.

A report released by the Department of Energy in 1996 documented the past U.S. production of plutonium. The report revealed that by 1988 the United States had produced or acquired from other sources 111.4 metric tons of plutonium. Of this amount, 3.4 metric tons had been used in nuclear weapons tests and in the nuclear weapons used at the end of World War II. Additional amounts were consumed as waste products, through radioactive decay, fission, and transmutation; through inventory differences; supplied to foreign countries; or were transferred to the U.S. civilian industry.[17] The United States has declared 50 metric tons of plutonium as excess to defense needs and has programs under way, in conjunction with similar efforts in Russia, to dispose of the material. Russia and the United States agreed in 2000 to pursue joint programs to dispose of 34 tons of high-purity plutonium each.

No official inventory is available on the total stockpile of highly enriched uranium (HEU) produced by the United States. In 1994, the Department of Energy released an estimate that the nuclear complex had produced 994 metric tons of HEU. It is not clear from this information how much material might have been consumed in nuclear tests or nuclear reactors. In addition, the United States has declared 174 metric tons of HEU to be in excess to defense needs. The material will be diluted and used as fuel for light-water reactors or disposed of as waste.

The Effect of Arms Control

The United States and Russia reached an important arms control milestone on December 5, 2001, when both sides completed reductions in their strategic nuclear arsenals. Each side reduced its arsenal to 6,000 accountable warheads as required by START I. These are substantial reductions from the nuclear arsenals that both countries deployed when the agreement was signed on July 31, 1991; they demonstrate the value of negotiated, verified arms reduction agreements in U.S. security policy.

Through an extensive set of verification and data exchange procedures, as well as the assistance that the United States has provided Russia in implementing cuts to its arsenal, the United States is confident that Russia has achieved START I reductions. Russia, too, is able to verify adequately that the United States has made reductions to the 6,000 warhead level, to treaty sublimits on strategic nuclear-delivery vehicles (missiles and bombers), and to a limit on the number of accountable warheads on ballistic missiles (land- and submarine-launched). START I does not provide a totally accurate picture of the numbers of nuclear weapons deployed by each side, however, since it attributes weapons to some systems that may not reflect actual loadings. The treaty also does not address substrategic (or tactical) nuclear weapons or nondeployed weapons in storage.

START II, which was signed by President George H. W. Bush and Russian president Boris Yeltsin in January 1993, was ratified by both nations but has never entered into force. The Russian Duma ratified the treaty with the qualification that the United States honor the 1972 Anti–Ballistic Missile (ABM) Treaty. When the U.S. pulled out of the ABM Treaty in 2002, START II effectively ceased to exist. That treaty required reductions to 3,000–3,500 strategic warheads for each nation and eliminated the most destabilizing strategic nuclear systems: multiple-warhead ICBMs. Both countries now plan to retain multiple warhead missiles after the demise of START II.

At a March 1997 meeting in Helsinki, Presidents Clinton and Yeltsin agreed in general to reduce to 2,000–2,500 deployed strategic warheads in a future START III, to talks on tactical nuclear weapons, and to increased transparency and irreversibility in the reduction process. The Joint Chiefs of Staff in the United States endorsed those reductions and began planning for a smaller force, including the elimination of the ten-warhead MX missile force. The Department of Defense also planned to implement the START II reductions by the end of 2007 and to deactivate by the end of 2003 all strategic nuclear-delivery vehicles planned for elimination, "providing the benefits of a reduced force structure four years prior to the agreed 2007 date for full elimination."[18]

Clinton administration plans for START III were abandoned by the Bush administration in 2002 when Presidents Bush and Putin made unilateral statements that each country would reduce their deployed strategic nuclear arsenals to between 1,700 and 2,200 weapons. These statements were followed, after several months of hesitation by administration officials, by the negotiation, signing, and ratification of SORT, culminating in May 2003 with the Duma's ratification, and its entry into force the following month.

SORT represents a significant departure from previous U.S.-Russian arms reduction treaties on two counts. First, it is not fully verifiable. There is no mechanism written into the treaty that permits each side to confirm the required reductions made by the other side, although the two sides will continue to use the verification terms of START I until it expires in December 2009. Second, the SORT agreement does not require the irreversible elimination of the delivery systems or of the warheads themselves. Instead, it simply calls for no more than 2,200 strategic warheads to be deployed by December 31, 2012, at which point the treaty expires. Thus, if the treaty is not extended prior to that date,

each side could choose to redeploy however many warheads it desired beginning January 1, 2013, creating instability in the strategic relationship between the two countries.

The Bush administration intends for SORT to be the last arms reduction treaty. Despite the impressive record of threat reduction achieved by these agreements, they are seen by the current administration as relics of the Cold War. The various agreements signed over the past three decades first regulated the arms race and then allowed Russia and the United States to make substantial progress in reducing arms from their Cold War peaks. (The Russian reductions are detailed in chapter 6.) In 1990, the United States had 10,563 START-accountable nuclear weapons on 2,246 missiles and bombers. As of January 2005, the United States had 5,966 START-accountable weapons on 1,225 launchers.[19] These numbers do not reflect the full extent of U.S. nuclear reductions, however. Although no official numbers have ever been provided, reliable estimates from nongovernmental organizations suggest that the United States had 7,657 tactical nuclear warheads in 1990, for a total stockpile of 21,000 warheads.[20] By 2005, the number of tactical weapons had dropped to an estimated 780 nuclear sea-launched cruise missiles and air-dropped bombs, with the number of deployed and stockpiled strategic and tactical weapons totaling about 10,300.[21]

Former Biological Weapons Programs

The U.S. biological warfare program was established during World War II under the direction of the War Reserve Service and the Army Chemical Warfare Service. The fledgling program was limited to research and development facilities at Camp Detrick, Maryland, testing facilities in Mississippi and Utah, and a production site in Terre Haute, Indiana. After 1945, research focused on the evaluation of such agents as anthrax, botulinum toxin, brucellosis, psittacosis, and tularemia. The Korean War (1950–1953) prompted an expansion of the program. Large-scale production began in 1954 with the advancement of fermentation, concentration, storage, and weaponization technologies. A biological weapons defense program was established in 1953 and included the development of vaccines and anti-sera to protect troops from biological attack.

Throughout the 1950s, other agents were added to the biological weapons research list: cholera, dengue fever, human glanders, plague, Q fever, shigellosis (dysentery), and Venezuelan equine encephalitis.[22] Efforts were made to develop more virulent and stable strains, agents that were easier and cheaper to produce and weaponize. The testing of agents involved both human and animal subjects. Large-scale open-air tests with live agents were performed on Johnston Atoll in the central Pacific Ocean from 1963 to 1969. American cities—Minneapolis, New York City, Saint Louis, San Francisco, and others—were also subjected to the clandestine testing of dispersal and aerosolization methods involving harmless bacterium.[23] Biological weapons facilities were expanded at Camp Detrick (renamed Fort Detrick in 1956), and in 1954 the army's main center for the production and stockpiling of biological weapons agents and munitions was opened in Pine Bluff, Arkansas.

By 1958 weaponization research yielded "the first missile to carry a BW warhead—the 762-mm Honest John rocket. With a 25-kilometer range, the warhead could deliver 356 4.5-inch (11.5-centimeter) spherical bomblets. By the early 1960s, the first long-range U.S. missile, the Sergeant, extended the warhead's reach to 120 kilometers and the payload up to 720 spherical bomblets."[24]

The U.S. biological weapons program also involved the development of antiplant and antianimal agricultural warfare agents. Bacterial pathogens, toxins, and fungal plant pathogens were developed, as well as herbicides to destroy food crops or defoliate trees, thereby depriving enemy forces of ground cover.

By 1969, the annual budget for chemical and biological warfare research was reported to be $300 million, with $5 million set aside for agricultural-agent development.[25] In November 1969, President Richard Nixon unilaterally and unconditionally renounced offensive biological weapons and ordered the destruction of all U.S. weapons stockpiles and the conversion of all production facilities to peaceful purposes. Biological research was reoriented to the development of defense measures such as vaccines and countermeasures against biological weapon attack. The destruction of the U.S. biological weapons arsenal took place between May 1971 and February 1973 at the Pine Bluff Arsenal, Rocky Mountain Arsenal, and Fort Detrick. The entire anticrop stockpile was also destroyed. The United States signed the Biological Weapons Convention in 1972.

The U.S. Army Medical Research Institute of Infectious Diseases was established in 1969 to continue research on medical defense against biological weapons. The institute's research includes the development of countermeasures, defense strategies, vaccines, and medical therapies. All the research is unclassified. After the September 11, 2001, terrorist attacks, the U.S. administration dramatically increased biodefense funding, and started construction on new defense laboratories capable of handling the most dangerous pathogens. Opponents worry that these new laboratories will unintentionally worsen the threat, both by becoming potential terrorist targets and by undermining attempts to limit or control other countries' research into biological agents.[26]

China, North Korea, and the Soviet Union accused the United States of using biological weapons during the Korean War against China and North Korea. The United States denied the allegations and asked for an impartial investigation. China and North Korea, however, rejected World Health Organization and International Red Cross efforts to intervene to mount an investigation. The allegations remain unsubstantiated.

Former Chemical Weapons Programs

The U.S. chemical warfare program was initiated with the establishment of the Chemical Warfare Service (CWS) in 1918. Early agent production focused on chlorine, chloropicrin, mustard gas, and phosgene. Throughout the 1920s and 1930s, the CWS stockpiled chemical shells, mortars, and portable cylinders. The service also began the production and weaponization of the chemical agents tabun and sarin. In 1925, the United States signed the Geneva Protocol, which

banned the use of chemical and biological warfare. The U.S. Senate, however, did not ratify the protocol until 1974.

The CWS expanded rapidly during World War II, as the United States deployed more than 400 chemical battalions and companies.[27] Production and storage facilities were also expanded in more than ten states. Between 1940 and 1945, the United States manufactured more than 146,000 metric tons of chemical agents, including cyanogen chloride, hydrogen cyanide, lewisite, and mustard gas.[28] Despite the growth of the U.S. chemical warfare program, President Franklin D. Roosevelt announced a no-first-use policy for chemical weapons. An official statement issued in 1943 declared, "We shall under no circumstances resort to the use of such [chemical] weapons unless they are first used by our enemies."[29]

With the onset of the Korean War the use of chemical weapons was seriously considered, particularly as a means to offset the enemy's superior numbers. Ultimately, the United States did not change its no-first-use policy, although riot control agents were used on prisoners of war. The development, production, and stockpiling of chemical agents continued. During the 1950s, the U.S. chemical warfare program concentrated on the weaponization of sarin. For air delivery, the 1,000-pound M-34 and M-34A1 cluster bombs were developed. Each cluster contained 76 M-125 or M-125A1 ten-pound bombs, each holding 2.6 pounds of sarin.[30] In addition, the Chemical Corps (the CWS was renamed in 1946) began the research and development of the V nerve agent (VX). The VX program reached its height in the 1960s with the weaponization of artillery, rockets, and other delivery systems.

In 1969, Public Law 19-121 imposed restrictions on the testing, transport, storage, and disposal of chemical warfare agents. Combined with President Nixon's reaffirmation of the no-first-use policy for chemical weapons and the resubmission of the Geneva Protocol for Senate ratification, the U.S. chemical weapons program was substantially slowed, though efforts to produce new "binary" weapons continued through the 1980s.

The U.S. arsenal currently consists of unitary lethal chemical munitions that contain blister agents and nerve agents. More than half of the stockpile is in bulk storage containers and the remainder is stored in obsolete munitions.[31] The arsenal is now stored at eight U.S. Army sites. Public Law 99-145, passed by Congress in 1985, requires the army to destroy all obsolete chemical agents and munitions. Under the auspices of the Army's Chemical Materials Agency, three programs, the Chemical Stockpile Disposal Program, the Alternative Technology and Approaches Program, and the Non-Stockpile Chemical Materiel Program all work to dispose of the materials.[32] In 2000, the Chemical Stockpile Disposal Program completed the destruction of 6.6 percent of the American chemical weapons stockpile at the Johnston Atoll facility, located 800 miles southwest of Hawaii. The facility was shut down at the end of 2004.[33] It is now for sale.

The United States signed the Chemical Weapons Convention in 1993, pledging to dispose of its entire unitary chemical weapons stockpile, binary chemical weapons, recovered chemical weapons, and former chemical weapons production

facilities by April 29, 2007. The process of destruction has been a slow one, however, due to the huge quantities of chemical weapons to be eliminated, and because of citizen concerns regarding the environmental effects of destroying the stockpiles through incineration. As a result, the United States has not met each of its incremental deadlines under the Chemical Weapons Convention, and the Organization for the Prohibition of Chemical Weapons extended the United States' deadline to destroy 45 percent of its stockpile to December 31, 2007, as well as its subsequent deadline to eliminate 100 percent of its chemical weapons by an undetermined date after December 31, 2007.[34]

NOTES

1. For further details, see Thomas B. Cochran, William M. Arkin, Milton Hoenig, *Nuclear Weapons Databook: U.S. Nuclear Forces and Capabilities* (Cambridge, Mass.: Ballinger, 1984); Steven Schwartz, ed., *Atomic Audit: The Costs and Consequences of U.S. Nuclear Weapons since 1940* (Washington, D.C.: Brookings Institution Press, 1998); and the web site of the *Bulletin of the Atomic Scientists*, www.thebulletin.org.
2. U.S. State Department, Bureau of Arms Control Fact Sheet, "START Aggregate Numbers of Strategic Offensive Arms," April 1, 2005 (for forces accountable as of January 31, 2005).
3. Robert S. Norris and Hans M. Kristensen, "NRDC Nuclear Notebook, U.S. Nuclear Forces, 2005," *Bulletin of the Atomic Scientists*, January/February 2005, pp. 73–75.
4. Ibid.
5. Ibid., pp. 74–75.
6. Excerpts from the Nuclear Posture Review can be found at www.globalsecurity.org/wmd/library/policy/dod/npr.htm.
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8. "Statement of Admiral Richard W. Mies, commander in chief, United States Strategic Command, before the Senate Armed Services Committee Strategic Subcommittee," Washington, D.C., July 11, 2001.
9. See George Perkovich, Jessica Mathews, Joseph Cirincione, Rose Gottemoeller, and Jon Wolfsthal, *Universal Compliance: A Strategy for Nuclear Security* (Washington, D.C.: Carnegie Endowment for International Peace, 2005), available at www.carnegieendowment.org/strategy.
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11. "Statement of Admiral Richard W. Mies."
12. General James Cartwright, testimony to the Senate Armed Services Committee Strategic Forces Subcommittee, April 4, 2005.
13. Ambassador Linton Brooks, testimony before the Senate Armed Services Committee, Strategic Forces Subcommittee, April 4, 2005.
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19. State Department, Bureau of Arms Control Fact Sheet, "START Aggregate Numbers of Strategic Offensive Arms," July 31, 2004.
20. Robert S. Norris and Thomas B. Cochran, *U.S.–USSR/Russian Strategic Offensive Nuclear Forces, 1945–1996* (Washington, D.C.: Natural Resources Defense Council, 1997), p. 54.

21. Norris and Kristensen, "NRDC Nuclear Notebook," pp. 73–75.
22. Tom Mangold and Jeff Goldberg, *Plague Wars: A True Story of Biological Warfare* (London: Macmillan, 2000), p. 34.
23. Judith Miller, Stephen Engelberg, and William Broad, *Germs: Biological Weapons and America's Secret War* (New York: Simon & Schuster, 2001), p. 42. In late 1950, public health concerns emerged following an experiment using *Serratia marcescens* in San Francisco. Investigation by the Centers for Disease Control and Prevention found no evidence that the experiments posed a public health risk.
24. Mangold and Goldberg, *Plague Wars*, pp. 37–38.
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