U.S. DILEMMAS IN MEETING THE CWC'S DESTRUCTION DEADLINE

by Cynthia Miller and Christina Larson

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On April 29, 1997, the United States committed itself to the goal of helping rid the world of chemical weapons (CW) by ratifying the Chemical Weapons Convention (CWC). According to this treaty, the United States must destroy its CW stockpile—totaling approximately 29,000 agent tons—before the deadline of 2007. There are essentially two main categories of agents that comprise the stockpile: the nerve agents VX and sarin (GB); and the mustard agents H, HD, and HT (see Figure 1).

The United States has a headstart in meeting the requirements of the CWC because of its existing chemical demilitarization program. According to current legislation, the stockpile of unitary munitions (those consisting of a single form of lethal chemical agent) is to be destroyed by the year 2004—three years prior to the international deadline. But, despite the solid intentions of the U.S. Army, which is responsible for destroying the stockpile, it has fallen short in the planning and imple-

Figure 1: Composition of U.S. Chemical Weapon Stockpile[1]

LOCATION	QUANTITY IN TONS	AGENT
Blue Grass, Kentucky	523	VX, GB, HD
Newport, Indiana	1,269	VX
Aberdeen, Maryland	1,625	HD
Anniston, Alabama	2,254	HD, HT, GB, VX
Pueblo, Colorado	2,611	HD
Umatilla, Oregon	3,717	GB, VX, HD
Pine Bluff, Arkansas	3,850	HD, HT, GB, VX
Johnston Island	651 remaining (orig. 2,030 tons)	GB, VX, HD
Tooele, Utah	12,979 remaining (orig. 13,616 tons)	HD, H, HT, GB, VX

mentation of a smooth and workable destruction program, as evidenced by rising costs and numerous delays in the disposal schedule. Controversy surrounding how the Army plans to destroy the stockpile, as well as environmental and safety issues, have also contributed to slippage in the schedule. For these reasons, it is highly unlikely that the United States will meet its own national deadline of 2004 to destroy the unitary CW stockpile. Based on current estimates, the goal of total stockpile elimination by 2007 will be difficult to achieve.

A national program to destroy CW has already been in operation for more than a decade. At the outset of the program in 1985,[2] it was envisaged that nine years would be needed to construct destruction facilities at the nine different sites where CW are stored and to accomplish the disposal itself. The original cost was estimated at $1.7 billion; at the time, the stockpile totaled some 31,000 agent tons.[3] An examination of the state of the program today reveals a much changed and acute situation. Since 1990, when the first destruction facility located on Johnston Island began operations, approximately seven percent of the CW stockpile has been destroyed at a cost of nearly $4 billion. Moreover, only two of the nine destruction facilities have been constructed and are operating. Other sites have encountered a host of public concerns over the safety of chosen destruction technologies and problems in obtaining the necessary environmental permits. Overall costs to destroy the stockpile have risen to $15.7 billion.[4]

Complicating matters further is the fact that the attention drawn to the 29,000 ton CW stockpile stored at nine U.S. sites has completely overshadowed the existence of "non-stockpile" chemical materiel,[5] which could take several years beyond the treaty deadline to recover and destroy.[6]

CHARACTERISTICS OF THE U.S. STOCKPILE

The condition of the U.S. stockpile and non-stockpile materiel is of particular concern to citizens who live near storage sites and to the Army, which is responsible for handling and ultimately disposing of the weapons. Over 60 percent of the chemical agents are stored in one-ton steel containers. The remaining agents are stored in munitions such as bombs, mines, mortar rounds, and rockets that rest on wooden crates or pallets.

The longer CW sit in storage, the greater the likelihood that a leak or explosion will occur. Chemical munitions stored in the United States are between 29 and 53 years old. The Army's M-55 rockets pose the greatest problem. Of the 2,115 reported leaks between the years 1983 and 1996, 1,312 came from M-55 rockets.[7] The M-55 rockets, which are located at five of the nine stockpile sites (see Figure 2), pose the greatest threat of leaks primarily because their casings are made of thin aluminum—unlike the casings of other munitions, which were constructed with heavier aluminum or steel.[8] Moreover, because of the acidic properties of sarin, munitions filled with it leak more often than those filled with the persistent nerve agent VX. Because of these leaks, M-55 rockets are more susceptible to exploding or self-igniting during handling.

Another concern over M-55 rockets has to do with the rather unstable rocket propellant. Propellant stabilizers that were configured in the munition to prevent spontaneous ignition have deteriorated over the years, increasing the risk of possible fires or explosions.[10] In addition, external factors such as lightning could also lead to stockpile emergencies. The Army has taken precautions to deal with the external threats, such as placing the rockets in igloos (concrete bunkers) surrounded by lightning rods.

Despite the aforementioned stockpile safety concerns, the Army has taken several initiatives to counter future safety risks.[11] They include:

- continuous monitoring for possible leaks and follow-up containment;
- developing contingency plans in case of emergency; and
- creating an Enhanced Stockpile Assessment Program to monitor degradation of the propellant stabilizers in response to exposure to agent.

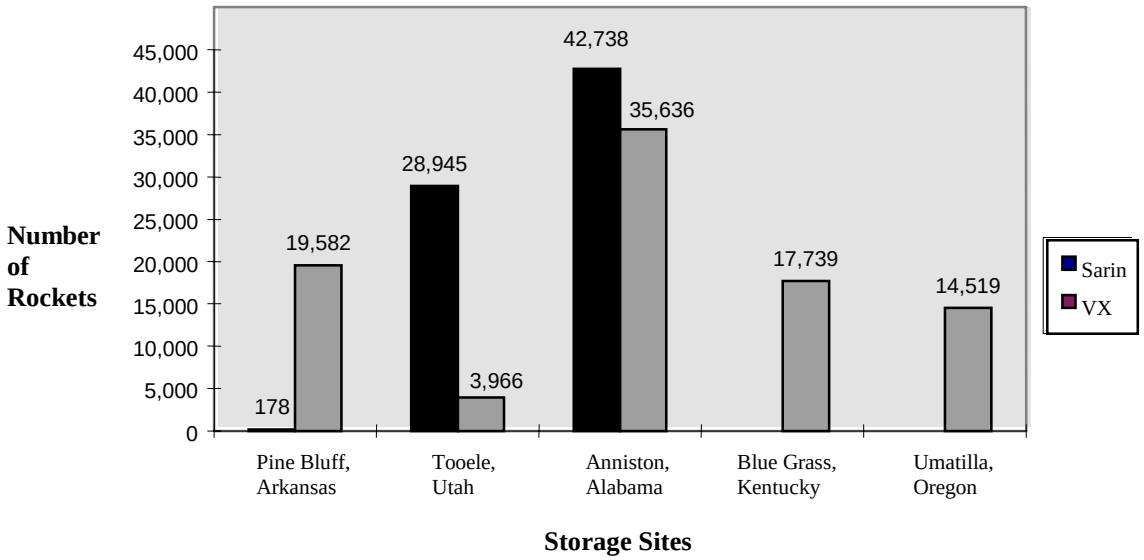
This combination of measures has led both the Army and General Accounting Office to conclude that stockpiled CW will be "reasonably stable through 2013."[12]

NON-STOCKPILE CHEMICAL WEAPONS

The elimination of non-stockpile chemical weapons—buried munitions in particular—remains a concern because of the extent of risk involved and the resources needed to locate and destroy them.[13] A preliminary scoping study revealed that buried CW may exist in as many as 64 sites in 31 states and the U.S. Virgin Islands.[14]

Minimizing the risks associated with buried CW is a difficult task because the majority of them have corroded,

Figure 2: Quantities and Contents of the U.S. M-55 Stockpile[9]



making their handling and identification an extremely slow and tedious process. Explosive components, which may still be incorporated, only compound the problem. Large numbers of these weapons were buried several decades ago in initial attempts to dispose of them, and few records remain that pinpoint their exact locations. For example, in the 1930s and up until the 1960s, over 100,000 Chemical Agent Identification Sets used to train soldiers to identify chemical agents were buried haphazardly throughout the United States. Many of these sets are still unaccounted for and could result in exposure of unwitting individuals to deadly chemicals.[15] These Identification Sets could be life-threatening if uncovered by children or other untrained individuals because most of them may contain vials or bottles of chemical agent. Given the unknown scope of the problem of buried CW, it is difficult to assess disposal costs.

MEETING TREATY REQUIREMENTS

Given that the CWC deadline for the destruction of the CW stockpile is 2007, the United States has a leeway of three years after the current Congressionally mandated deadline of 2004. The Convention also sets forth a timetable for destroying percentages of the stockpile. The first deadline the United States must meet comes in the year 2000, at which point one percent of the current stockpile should have been destroyed. The United States has already met this requirement.

Despite the U.S. Army's intention to eliminate the nation's CW stockpile over a period of 10 years, recent demilitarization efforts indicate that the process will take much longer. In the seven years since the first disposal facility entered into operation, only seven percent of the stockpile has been destroyed; the Army now has less than eight years remaining to destroy the other 93 percent. Consideration is currently being given to extending the national deadline for destruction beyond 2004; however, it cannot be pushed past 2007, since the CWC's 10-year deadline must be upheld. This very point has often been raised by critics of CWC ratification, who fear that, in the interest of meeting the treaty deadline, the safety of operations and efforts to seek out better technologies could be compromised.

If a state party is unable to complete CW disposal operations within the 10-year treaty deadline, it is possible to request an extension of up to five years, stretching the time limit to 2012. Under this scenario, however, legislators and Army officials might actually slow the progress of destruction rather than speed it up in order to take the time to evaluate the alternative technologies that critics of the present incineration-based program are so insistent upon. But, the importance of the United States' meeting the CWC deadline cannot be overstated, since a failure to do so could damage the overall cred-

ibility of the CWC and the ability of the United States to challenge any incidents of noncompliance by other countries.

Obligations to dispose of buried CW, which make up the largest portion of the non-stockpile materiel, differ from those applied to the stockpile. According to the CWC, the question of whether to retrieve CW buried prior to January 1, 1977, is left up to the discretion of the individual country. Once the weapons have been recovered, however, they must be destroyed. According to official reports by the U.S. General Accounting Office, all U.S. burial sites of CW materiel were closed prior to 1977.[16] Thus, the United States is not bound by international law to retrieve and destroy these weapons. On the other hand, officials favor recovering old and buried chemical materiel in order to ensure that the land areas in which they are located can be safely reused in the future.[17] The CWC provides some leeway in the destruction time limit for old CW. If it has been determined that the recovered CW was produced prior to 1946 and is no longer "usable" as a CW, then it can be processed as hazardous waste without any imposed time limit. However, if a recovered CW is known to have been produced after 1946, or produced between 1925 and 1946 but can still be used as a CW, then it must be destroyed prior to the final deadline of 2007. This destruction is subject to verification by the OPCW, as is the procedure for stockpile materiel. The percentages of CW that fall into one of these two categories are unknown, but some of the recovered materiel dates as far back as World War I.[18] (CW produced before 1925 can be destroyed as hazardous waste.)

Although the CWC leaves the decision as to which destruction technology to employ up to each state party, it bans unreliable and environmentally injurious methods such as open pit burning, dumping into bodies of water, and land burial. The CWC also assigns human safety and protection of the environment as priorities for any proposed CW destruction plan.[19]

DESTROYING THE STOCKPILE: THE DEBATE

The destruction of the U.S. CW stockpile is a complex issue. The debate has not been over whether or not the weapons should be destroyed, but *how* they should be destroyed. In 1988, the U.S. Army chose incineration as the method to dispose of CW. This decision was based on the 1984 recommendation of the National Research Council, which examined the pros and cons of incineration versus chemical neutralization. Incineration was selected because neutralization was more costly, and produced more waste.[20]

The decision to employ incineration as a disposal method created much controversy. The Army contends that incineration is the best method for disposal and points to the Johnston Atoll Chemical Agent Disposal System (JACADS)—a CW destruction facility located on a remote island in the Pacific Ocean. JACADS has been destroying chemical munitions, including M-55 rockets, since 1990 without major incident. As of October 1997, over 225,000 weapons had been destroyed there—over 70 percent of the stockpile stored on the island.[21]

Some view incineration as a particularly efficient disposal method because it is able to destroy all components of a munition including the agent, its casing, explosives, metal components, and packaging materials. As for environmental and safety concerns, the method of baseline incineration effectively filters and monitors for agent emissions. The Army is required to comply with a standard destruction and efficiency rate of 99.9999 percent when treating concentrated agents.[22] Each destruction site is also subject to rigorous equipment testing and safety evaluations before operations are permitted to begin. With these safety measures in place, the Army maintains that it is safer to destroy chemical munitions through incineration rather than keep them in storage where, with each passing day, they become less stable.

Opponents of incineration[23] argue that there is no guarantee that toxic chemicals will not accidentally leak into the atmosphere during the incineration process. This concern is not unfounded. In 1994, 11.6 milligrams of nerve agent were released into the atmosphere during maintenance operations on the liquid incinerator at JACADS, and in 1995, a monitor detected a trace level of nerve agent there. It is also known that during the testing phase, residual explosive material caught on fire, damaging equipment and forcing operations at JACADS to shut down.[24]

Although the danger in these few examples was minimal, the possibility of a future serious incident has many residents living close to a chemical stockpile worried. U.S. Congressman Peter DeFazio (Democrat-Oregon) summed up this concern by stating that:

> the incineration of poisonous chemical agents

> is an incredibly dangerous business. We should take every precaution and examine every environmental human safety concern before even considering the proposal [for incineration].[25]

There is no assurance that an accident or leak will not harm residents downwind from a chemical site. Concerned citizens would prefer that the Army wait until an alternative method is available for destroying the weapons than take the chance that something will go wrong.

In response to public concerns, Congress authorized the construction of pilot-scale facilities for alternative CW destruction technologies at the Aberdeen Proving Ground, Maryland, and the Newport Chemical Depot, Indiana, which are both low-volume, bulk-agent storage sites. Two other sites for which alternative technologies are currently being considered include Pueblo, Colorado, and Blue Grass, Kentucky. These two sites have agents that are contained in assembled munitions rather than in bulk containers. Construction of any destruction facility at these two sites is currently prohibited pending the results of alternative technology studies, which are still in the preliminary stages. Yet how safe and effective are these technologies, and would they enable the Army to meet its destruction deadline of 2004?

ALTERNATIVE TECHNOLOGIES

Because of public concerns over the safety of incineration, the Army is currently considering alternative technologies at some of the CW stockpile sites in the United States. In 1996, the National Research Council (NRC) recommended two neutralization methods for the destruction of chemical agents stored in bulk containers:[26]

- Aqueous neutralization (hydrolysis) of the mustard agent HD followed by biodegradation of the resulting water mixture "hydrolysate" at the Aberdeen Proving Ground in Maryland; and
- Neutralization with sodium hydroxide of the nerve agent VX, followed by mineralization of the hydrolysate[27] at the Newport Chemical Depot in Indiana.

According to the NRC, both of these neutralization processes can destroy the agents effectively with minimal environmental risk. Moreover, these methods are not new. Neutralization with sodium hydroxide was used in the 1970s to destroy sarin and biodegradation is presently used for sewage treatment in many U.S. cities.[28] Both types of neutralization use equipment similar to standard equipment in the chemical industry, thus increasing operational reliability.

Because the recommended neutralization technologies address many of the concerns voiced by those in the Newport and Aberdeen communities, it is expected that the technologies will be acceptable environmentally. Both processes would be contained and conducted at low temperatures and pressures, reducing the chance of explosions and fires. There is also minimal opportunity for complications because the procedures are relatively simple. One other critical requirement for gaining public acceptance of the chemical demilitarization program is that the destruction facility be constructed to destroy only the CW agents located at each site, and not other hazardous wastes. Because the neutralization process is specifically designed to destroy only certain CW agents, it reassures nearby citizens that the destruction facilities will not later be used for other purposes, but will be dismantled when CW destruction has been completed.

The Aberdeen Proving Ground and the Newport Chemical Depot have been identified as promising candidates for the alternative technology program because their stockpiles consist of a single agent in steel containers which are not configured together with explosives or propellants. Now that the selected neutralization processes are undergoing testing at the two locations, however, other affected communities are calling for expanded studies of alternative technologies at additional CW storage sites. The Confederated Tribes of the Umatilla Indian Reservation submitted a request to the U.S. Army in November 1996 that the M-55 rockets located at Umatilla Depot be "reconfigured."[29] This means that the rockets would be dismantled and drained and their agents contained. Several grassroots organizations support dismantlement of the M-55 rockets, both for safety reasons and the opportunity to use alternative technologies to destroy the CW agents. If the rockets were reconfigured, activists argue that all sites could be classified as bulk-only sites, and, therefore, alternative technologies could be applied.[30] However, dismantlement of the rockets would be slow, costly, and dangerous, because of the need to handle unstable munitions.

A review of alternative disposal technologies for assembled chemical weapons is also presently underway. As stipulated by law, the National Research Council (NRC) will be evaluating not less than two technologies other than baseline incineration in the coming year and will submit its findings to Congress in early 1999.[31] Currently demilitarization activities are on hold at Blue

Grass, Kentucky, and Pueblo, Colorado, pending a possible decision by Congress to pursue one of the alternative technologies. But, for the moment, baseline incineration is still the only proven technology capable of destroying the entire munition, including the explosive.

DEADLINES AND COST

Many factors are involved in determining the cost and schedules of CW destruction. Both public acceptance and the need to obtain state and federal permits for the construction of a CW destruction plant have greatly contributed to destruction delays. Persistent protests against the use of incineration by communities near chemical sites have prompted the study of alternative technologies and have slowed down the permitting process for CW destruction plants.

Although the U.S. Army has received the proper permits and has begun building CW destruction facilities at Anniston and Umatilla, other sites—such as Pueblo Chemical Depot and the Blue Grass Army Depot—will not grant permits until the NRC's alternative technology study has been completed in 1999. One reason for this uncertainty is the fact that states have different environmental laws that the Army must comply with when designing and operating CW destruction facilities.

Gilbert Decker, former U.S. Army assistant secretary for research, said at a hearing before a House National Security sub-committee that the Department of Defense will probably increase its estimated funding for CW destruction and noted that these new estimates would be "less reliable than the current cost projection."[32] This uncertainty results from the difficulty of obtaining permits and of predicting the actual start times for destruction operations. In essence, delays cost money.

By ratifying the CWC, the United States has committed itself to destroy all of its CW by 2007. The next few years are a critical time for the U.S. destruction program. Congress, in coordination with the Department of Defense, needs to carefully weigh the destruction options, select one or more methods, and then ensure that needless delays are avoided in the course of the destruction period.

No matter which technology is chosen, there will always be financial risks and uncertainty associated with the destruction schedule. Alternative technologies may not reduce the cost or even shorten the length of time needed to destroy CW, but if they are more acceptable to the public and prove to be safer, then perhaps it is worth adjusting the deadlines to study them. A significant amount of research and testing still needs to be done before all U.S. CW can be destroyed, meaning that the goal of destroying all of the stockpiled weapons by 2004 is unlikely to be achieved. Given all the obstacles, meeting the CWC deadline of 2007 will be a major test of the U.S. commitment to the treaty and will require a better and more workable plan than exists today.

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[1] Department of the Army, Program Manager for Chemical Demilitarization, *National Chemical Stockpile Distribution by Storage Location* (Edgewood, MD: PRES668-1-09/26/97).

[2] Already, the first Congressionally mandated deadline for disposing of the U.S. chemical weapon stockpile by September 1994 has slipped 10 years to 2004.

[3] United States General Accounting Office, *Chemical Weapons and Material: Key Factors Affecting the Disposal Costs and Schedule* (Washington, D.C.: Government Accounting Office (GAO)/NSIAD 97-18, February 1997), p. 7.

[4] Harold Smith, "DOD Chemical Demilitarization Program," presentation delivered at the Fall Meeting of the Board on Army Science and Technology of the National Research Council, November 18, 1997.

[5] The U.S. Army has defined the category of "non-stockpile" materiel to include: 1) binary CW; 2) miscellaneous chemical warfare materiel; 3) recovered CW; 4) former CW production facilities; and 5) buried chemical warfare materiel. See United States General Accounting Office, *Chemical Weapons Disposal: Plans for Nonstockpile Chemical Warfare Materiel Can Be Improved* (Washington, D.C.: GAO/NSIAD-95-55, December 20, 1994).

[6] *Ibid.*

[7] Henry L. Stimson Center, "Leaking Chemical Munitions from 1983-1996," *The CBW Chronicle*, Vol. II (January 1996) (http://www.stimson.org/cwc/leakers.htm).

[8] The U.S. Army believed that these rockets would one day be used and therefore did not account for long-term storage when designing the cases. Authors' discussions with Army Chemical Corps Officers, March, 1997.

[9] United States Army, Program Manager for Chemical Demilitarization, "The Chemical Stockpile," 1997 (http://www-pmcd.apgea.army.mil/csdp/declas.html).

[10] See National Research Council, *Alternative Technologies for the Destruction of Chemical Agents and Munitions* (Washington, D.C.: National Academy Press, 1993), p. 48.

[11] United States General Accounting Office, *Chemical Weapons and Material: Key Factors Affecting the Disposal Costs and Schedule*, p. 44.

[12] *Ibid.*, p. 43.

[13] Note: Under *Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on Their Destruction*, Article IV, Paragraph 17, January 13, 1993, chemical warfare materiel buried before 1977 is exempt from disposal if it continues to be buried.

[14] United States General Accounting Office, *Chemical Weapons and Material: Key Factors Affecting the Disposal Costs and Schedule*, p. 42.

[15] *Ibid.*, p. 45.

[16] United States General Accounting Office, *Chemical Weapons Disposal: Plans for Nonstockpile Chemical Warfare Materiel Can Be Improved.*
[17] *Ibid.*
[18] Bonn International Center for Conversion, "Chemical Weapons Disposal: Challenges for the Countdown to Zero," in *Conversion Survey 1997: Global Disarmament and Disposal of Surplus Weapons* (New York: Oxford University Press, 1997), p. 190.
[19] *Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on Their Destruction*, Article IV, Paragraph 10, January 13, 1993.
[20] United States General Accounting Office, *Chemical Weapons and Materiel: Key Factors Affecting Disposal Costs and Schedule*, pp. 4, 18.
[21] See Program Manager for Chemical Demilitarization (http://www-pmcd.apgea.army.mil).
[22] Office of the Assistant to the Secretary of Defense, Chemical & Biological Matter, *Environmental Permitting of Chemical Stockpile Disposal Facilities* (unpublished report, February 1997), pp. 26-27.
[23] Opponents of incineration include, Greenpeace, Citizens Against Incineration in Newport (CAIN) and the Chemical Weapons Working Group (CWWG).
[24] United States General Accounting Office, *Chemical Weapons and Materiel: Key Factors Affecting Disposal Costs and Schedule*, pp. 64-65.
[25] Kentucky Environmental Foundation for the Chemical Weapons Working Group, "Site Updates," *Common Sense* (May 1996), p. 5.
[26] National Research Council, *Review and Evaluation of Alternative Chemical Disposal Technologies* (Washington, D.C.: National Academy Press, 1996), p. 4.
[27] Mineralization refers to the process whereby the hydrolysate is diluted with water, mixed with oxygen and then heated to form water with a high salt content. The water is then evaporated, leaving behind the common salts.
[28] *Ibid*, p. 147.
[29] Confederated Tribes of the Umatilla Indian Reservation, "Tribe Submits Recommendation for Chemical Weapons Disposal," *News Releases*, November 14, 1996, p. 1.
[30] Kentucky Environmental Foundation for the Chemical Weapons Working Group, "Slow but Significant Progress Toward Alternatives to Incineration," *Common Sense* (May 1996), p. 1.
[31] Robert Burns, "Chemical Weapons Disposal Cost Up," *Associated Press Wire*, March 11, 1997.
[32] *Ibid.*