LOOKING BACK: The Continuing Legacy of Old and Abandoned Chemical Weapons

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I hear a dull thud. A blue mist comes floating across the frosty fields. In the field behind the cemetery, the DOVO, the Belgian War Munition Demolition Service, has blown up another heap of First World War ammunition. They do it twice a day, one and a half tons a year. When the farmers find grenades, they leave them at the base of the utility masts, and the miners collect them. And so it goes on here. Generation after generation, this soil continues to vomit up grenades, buttons, buckles, knives, skulls, bottles, rifles, sometimes even a whole tank. The Great War never ends.[1]

Nearly 66 million artillery shells containing chemical weapons were fired during World War I. At least 40 different compounds were weaponized for use on the battlefield.[2] Now, nearly a century later, hundreds of World War I- and World War II-era shells are recovered annually from the European battlefields, mostly in Belgium and France.[3] Nor is the concrete legacy of chemical warfare confined to Europe. Such aged chemical weapons affect countries as far as China.

The 1993 Chemical Weapons Convention (CWC) requires that chemical-weapon possessors meet the treaty’s overall deadline for destruction: April 29, 2012. However, the treaty established particular definitions for such “old” and “abandoned” chemical weapons as well as different destruction and financing requirements. With the treaty’s second review conference scheduled to meet in The Hague in April, states-parties should assess how well the verification of the destruction of such obsolete chemical arms is proceeding.

**Treaty Requirements**

The CWC classifies as old chemical weapons (OCW) those produced before 1925 or those produced between 1925 and January 1, 1946, that have “deteriorated to such [an] extent that they can no longer be used as chemical weapons.” The convention defines abandoned chemical weapons (ACW) as “chemical weapons, including old chemical weapons, abandoned by a State after 1 January 1925 on the territory of another State without the consent of the latter.”[4]

A state-party is required to declare OCW or ACW found on its territory no later than 30 days after the CWC enters into force for it. States-parties are to submit “all available relevant” information, including, to the extent possible, their location, type, quantity, and present condition. States-parties that discover OCW after the CWC enters into force for them are required to provide the above information to the Organization for the Prohibition of Chemical Weapons (OPCW) Technical Secretariat no later than 180 days after such a discovery. OCW produced prior to 1925 are to be treated as “toxic waste” and as such are subject to the lowest level of verification.

A state-party that has ACW on the territory of another state-party is required to declare this to the OPCW within 30 days of the CWC’s entering into force for it. The cost of the destruction of ACW is to be met by the abandoning state-party, if its identity is known.[5]

**Who Has What**

As of December 2007, three states declared that chemical weapons had been abandoned on their territory, and 13 declared possession of OCW.[6] Destruction operations are underway in most of
these states. By comparison, six states said they possessed post-World War II chemical weapons stockpiles.\[7\]

Some of the OCW possessor states have been recovering and destroying OCW as they find them in the field. During 2005-2006, for example, Austria uncovered three such weapons, which posed no immediate danger to the environment. In 2007 the OPCW approved a proposal to destroy these munitions in Germany, at Munster, partly on the condition that they remain under the ownership and control of Austria.\[8\] During 2006-2007, Australia recovered a number of empty, corroded shells in New South Wales and Queensland. Australia considered the munitions to be already destroyed because of their deteriorated condition and declared them as OCW.\[9\] In March 2007, the United Kingdom completed the destruction of all its OCW, totalling 3,812 munitions, at a cost of approximately $20 million.\[10\] There is also periodic recovery of old munitions from the territory of the former Soviet Union. For example, in 2004 a number of World War I-era artillery shells, some of which were reportedly filled with chlorine, were uncovered in the village of Toporivka in the Chernovsti region of Ukraine.\[11\]

It is reasonable to assume that other successor states may face similar challenges. All told, as of December 31, 2006, countries had declared 50,700 OCW produced before 1925 and 66,700 OCW produced between 1925 and 1946. As of the same date, approximately 37,600 munitions had been declared as ACW.\[12\] Belgium, China, Germany, and Japan have significant destruction efforts.

**Belgium**

Following the end of World War I, it was common for scrap collectors to recover spent artillery shells and other scrap metal from the former battlefields, including those in Belgium. The copper driving bands on shells were of particular interest. In the 1920s, Belgian authorities let contracts to collect the war material systematically. The volume was so great that a decision was taken to dump the munitions or scuttle them on ships. Much of this dumping occurred in shallow water in an area called Horse Market (Paardenmarkt).\[13\] Belgium began to assess chemical weapons destruction technologies in the early 1980s, and a destruction facility at Poelkapelle, near Ypres, began operating in the late 1990s. Ypres is the site where German forces released approximately 160 tons of chloride in April 1915. It was also where Germany first used sulfur mustard, also called Yperite, in July 1917. Key combatants in the war used chemical weapons.

More than 12,000 shells have been destroyed at the Poelkapelle facility, and as of 2007, close to 50,000 shells have been examined using X-rays and neutron activation analysis. This is carried out partly to determine whether the shell is a conventional explosive or is a chemical round. It also assists with determining where the shell should be drilled or cut to avoid touching the burster well. Some shells, particularly 7.7 cm artillery rounds, contain glass bottles to prevent the chemical fill (usually Clark I) from mixing with the explosive components of the munition. These bottles tend to break over time and contaminate the explosive components with chemical-weapon agent. In such cases, additional safety and environmental precautions must be taken because it is impossible to separate the agent from the explosives. Currently, the facility receives about 10,000 items (approximately 200 metric tons) per year. At least one-third are immediately identified as being conventional rounds. Typically, approximately 5-10 percent of the total have been found to be chemical weapons munitions.\[14\]

**China**

Japan’s World War II-era occupation of China has left a large legacy of chemical weapons. In 1991 the first joint Chinese-Japanese investigation of a site containing chemical weapons was conducted in an effort to determine the scope of the problem. Since then, the two countries have jointly conducted approximately 75 fact-finding missions or site investigations of suspected ACW sites. Since 2000, they have executed 16 excavation and recovery operations.\[15\]

These activities provided evidence for the presence of approximately 350,000 chemical weapons munitions, 90 percent of which are located in Haerbaling in Jilin Province in northeastern China. In 1992 the Chinese delegation to the Geneva-based Conference on Disarmament introduced a paper estimating that approximately two million chemical weapons had been abandoned on its territory.
This initial estimate was revised downward as a result of subsequent joint Chinese-Japanese investigation and field visits. In 1999 the two governments signed a memorandum of understanding in which Japan formally acknowledged the presence of large numbers of chemical weapons it abandoned on Chinese territory. In the agreement, Japan promised to provide “all necessary financial, technical, expert, facility as well as other resources” for the purposes of destroying the ACW. In 2006, Japan sent four investigation teams and five excavation and recovery teams to China, where more than 1,700 projectiles were recovered.

In 2007, Japan announced its intention to introduce a mobile destruction system (apparently a detonation chamber system) to complement the planned construction of a fixed, incineration-based chemical weapons destruction facility in Haerba-ling. Approximately 38,000 of the estimated 300,000 or more ACW located in the region have been recovered and are awaiting destruction.

Although destruction operations of ACW in China have not yet begun, the country faces a number of challenges. These include the difficulty in locating all ACW sites, the presence in some cases of conventional munitions with fuses that might trigger the munitions while they are being handled or while in storage, and possible corruption. In 2007 a former president of a Japanese contractor and other parties were reported to have been arrested for illegally diverting destruction assistance funds. It is estimated that the total cost for Japanese destruction assistance could exceed 1 trillion yen (approximately $9 billion).

Nonetheless, destruction operations in China should be simpler than for most other states because it only has two basic types of chemical fills, requiring only two different types of destruction methods. The fact that one of the technologies is expected to employ explosive charges does mean that there is some concern about how long this process will take. Generally, it is more difficult with this method to achieve the necessary throughput in order to destroy large numbers of munitions in a timely manner because attaching the charges lengthens the destruction process.

China and Japan are considering using different destruction technologies at the main destruction facility at Haerba-ling. For red munitions containing Clark I (diphenylchloroarsine) or Clark II (diphenylcyanoarsine), a destruction technology using donor charges is being debated. For the yellow munitions, a 50-50 mixture of lewisite and sulfur mustard, using a static detonation technology is being considered. For this, a temperature of approximately 550 degrees Celsius will be sufficient to destroy the munitions, including the chemical warfare agent. A mobile destruction plant is currently under consideration and should begin operation by late spring 2009. It will be used to destroy small caches of weapons, including some outside Jilin province.

Germany

Beginning in World War I, the military training ground at Munster was the principal experimental and training area for Germany’s chemical weapons efforts. The site has hundreds of thousands of World War I- and World War II-era conventional and chemical weapon munitions. In 1919, approximately 1 million chemical weapon shells were scattered about the site when a train carrying munitions exploded, after which the area had the appearance of a moonscape. The British military also used Munster for some field testing of chemical weapons munitions after World War II. Most of the munitions at Munster are German, but it also houses significant quantities of munitions produced by other countries during both world wars. The soil is also contaminated with metals, most notably arsenic, and one can readily uncover munitions in almost any given area on the facility grounds.

Currently, the chemical weapons destruction facility consists of three different plants. Munster I is used primarily to treat material that results from the dismantling of old chemical weapons munitions. Munster II is primarily used to clean soil, and Munster III is a static detonation chamber into which munitions are directly fed without disassembly. In Munster II, arsenic is removed from the soil by a soil-washing process, and then the remaining material that has a high concentration of arsenic is placed into a plasma-furnace system, which operates at a temperature of 1,200-1,500 degrees Celsius. Some arsenic is trapped in a nonleaching crystalline structure of vitrified glass slag and the rest is precipitated as arsenate (a salt) from the off-gas scrubber system.

Japan
Japan continues to uncover and destroy OCW dating from the Second World War. At the end of the war, stocks of Japanese weapons included yellow and red munitions, green agent (chloroacetophenone), blue agent (phosgene), brown agent (hydrogen cyanide), and white agent (trichlorarsine). Japan produced 75-millimeter, 90-millimeter, 105-millimeter, and 150-millimeter artillery shells; 15-kilogram and 50-kilogram bombs; and various canisters and drum containers. One of the first authoritative public disclosures by Japan in the English language of the nature and type of their known or probable locations was published in 1980. It stated that, since the end of the war, 102 accidents had occurred during destruction operations, resulting in 127 casualties and four deaths.[21]

A national survey carried out by Japan of OCW in the country in 1973 identified 18 sites that were presumed to have OCW at the end of World War II. OCW were also known to have been dumped in eight locations in the waters off the coast of Japan. In 2002 and 2003, construction workers were exposed to OCW in Samukawa Town and Hiratsuka City. Authorities also found arsenic in organic form in groundwater at Kamisu City. In 2003, Japan’s Ministry of the Environment undertook an effort to identify the scope of the problem and began recovery and destruction operations. The survey identified 114 sites on Japanese territory where the existence of OCW is known or suspected. Of these sites, the presence of OCW and their location are confirmed for four sites: Hiratsuka City, Kamisu City, Samukawa Town, and Narashino City. Narashino City is the site of a former school of the Japanese Imperial Army.[22]

A major recovery operation of munitions involving the use of magnetometers and divers has also been carried out since 2004 at Kanda Port in southwestern Japan, where dredging operations are underway to assist with the construction of an airport. Phase two of the operation involved the recovery of 100 50-kilogram yellow bombs and 500 15-kilogram red bombs. More than 1,200 chemical munitions have been destroyed since 2004, including 1,043 red bombs and 211 yellow bombs. The munitions are detonated in an explosive containment chamber that can be readily dismantled for use elsewhere. Particular attention has been devoted to ensuring the safe disposal of arsenic residues from the interior of the explosive containment chamber and the remnants of the munition bodies.[23]

CWC Requirements and Implementation Practice

The states-parties to the CWC have not been able to reach consensus on a number of implementation issues concerning OCW and ACW. None of these issues fundamentally undermine the efficacy of the CWC’s verification regime, but some of them may be taken up at the review conference. In particular, the states-parties still need to agree on guidelines for determining the usability of chemical weapons produced between 1925 and 1946, appropriate formats for declaring OCW and ACW, and who should pay for the inspection costs of OCW.

There is a lack of consensus on what constitutes usability. Some contend that both the munition body and chemical need be usable for the weapon to be considered as such. Others say that only either the munition body or the chemical need be usable to meet this standard. Usability guidelines are currently implemented according to two secretariat papers from 2000 on a case-by-case basis.[24]

The principal difficulty associated with agreeing on the declaration format for OCW and ACW was that states-parties felt that a weapon’s age and condition would make it difficult to provide detailed information because either it was not available or would be too dangerous for munition-disposal experts to try to obtain.[25] States-parties have periodically considered whether information is “available” or “relevant.” Some of the parties have also expressed a reluctance to engage in “historical research” projects. They typically express the wish only to declare the weapons and destroy them, thereby keeping to a minimum the financial and administrative burden required for effective OPCW verification.

Finally, states-parties have never formally agreed on whether the CWC requires that possessors of OCW should bear the full “direct costs”[26] of verification of destruction, although in practice they do. Instances may also occur where it is unclear whether a chemical weapon was produced before or
after January 1, 1946. It is politically more acceptable to declare OCW than to declare the possession of chemical weapons and thus be labeled publicly as a chemical weapons possessor.

Conclusions

OCW and ACW will continue to pose a potential danger to humans and the environment for the foreseeable future. The fate of the arsenic in the destruction by-products of some of the chemical warfare agents has been a long-standing concern and technical challenge. There is also great uncertainty in the case of ACW in China on the difficulties associated with longer-term storage of possibly unstable munitions under conditions that cannot be fully analyzed in the abstract. Meeting these and other challenges will require continued cooperation and information sharing, including within the framework of the OPCW.[27]

Moreover, given the fact that chemical weapons produced before January 1, 1946, will continue to be recovered, an OPCW working group has suggested that the second review conference might consider the practicality of setting a deadline for the destruction of such weapons as they are recovered over the coming decades.

Technical and political expertise on old and abandoned chemical weapons (OACW) issues will be affected also by generational changes as munitions specialists retire or change fields. Here too the OPCW could help to serve as a mechanism to facilitate the transfer of relevant knowledge and expertise among the states-parties as they deal with this problem.

Finally, it is sometimes difficult to determine how the higher-level diplomatic statements of the states-parties relate to CWC implementation practice and what role the sending of signals to each other is playing within the broader political context. It is therefore important for outside observers to try to obtain a better understanding of the operational-level activities of CWC implementation and how they relate to the states-parties’ broader political interests and concerns. Although not all OACW implementation issues have been formally resolved, they are dealt with on an interim but fair basis that poses no serious challenge to the fundamental object and purpose of the CWC.

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ENDNOTES


3. Between 3,500 and 4,000 shells are recovered annually, of which approximately 10-20 percent are chemical weapons.


5. CWC, “Annex on Implementation and Verification,” Part IV (B), paras. 3, 4, 9, 10.
6. China, Italy, and Panama have declared ACW. Australia, Austria, Belgium, Canada, France, Germany, Italy, Japan, Russia, Slovenia, Solomon Islands, the United Kingdom, and the United States have declared OCW.

7. These six are Albania, India, Libya, Russia, South Korea, and the United States. South Korea is generally understood to be the sixth possessor but has asked that it not be officially identified by the OPCW as such at the present time. Albania has completed the destruction of its stockpile.


17. See CWC, “Annex on Implementation and Verification,” Part IV (B), para.15 (language agreed to by virtue of the fact that both governments are states-parties to the CWC).


26. These costs are incurred as a result of the inspection, as opposed to other costs that are incurred regardless of whether the inspection has taken place. The parties agreed to this understanding in order to avoid having the membership as a whole effectively subsidize the cost of verification of destruction of weapons possessed by a relatively small number of the states.


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