CHEMICAL WEAPONS DESTRUCTION EXPERTISE

Decades of CBRNE Experience Proves Valuable in Syrian Mission

Research and development from former binary chemical weapons destruction mission provided the technological advantage necessary to construct the Field Deployable Hydrolysis System (FDHS) within six months.

A project completed eight years ago benefited the timely development of the system used to destroy declared Syrian chemical warfare materiel in 2014. Extensive research, testing, and development of the hydrolysis process for neutralizing chemical warfare materiel by the Non-Stockpile Chemical Materiel Project (NSCMP), now Recovered Chemical Materiel Directorate (RCMD), enabled a team of experts to develop and deploy the FDHS quickly and safely.

The 2014 mission to neutralize Syrian chemical weapons materiel aboard the MV Cape Ray had its roots in a technology used to destroy U.S. binary chemical weapons. RCMD, part of the U.S. Army Chemical Materials Activity (CMA), provided historical data and technical knowledge developed during that mission to streamline development of the FDHS. While they took place years apart, the binary and the Syrian destruction missions shared a major goal — neutralizing methylphosphonic difluoride, or DF, a chemical used to make nerve agent.

Decades of chemical weapons destruction experience

In the early 1980s, the U.S. Army developed binary chemical weapons to modernize its aging chemical weapons stockpile. Binary chemical weapons were designed to mix two non-lethal chemicals while in flight to a target to form a chemical agent. One such weapon used DF that combined with isopropyl alcohol and isopropylamine during the in-flight spin of a specially designed projectile formed the nerve agent GB.

U.S. binary chemical weapons development led to the signing of a bilateral arms reduction agreement between the United States and Soviet Union, which led to the Chemical Weapons Convention (CWC), an international treaty mandating the elimination of chemical warfare materiel and chemical warfare production facilities. The Department of Defense (DoD) tasked NSCMP, now RCMD, with destroying existing stores of chemicals designed for use in binary chemical munitions, including DF and QL (diisopropyl aminoethylmethyl phosphonite), a chemical precursor used to make the nerve agent VX.

Water chemistry was selected as the binary chemical destruction method, as it produces a liquid byproduct as opposed to a precipitate or solid byproduct. When NSCMP's binary destruction mission was completed in April 2006, all chemical precursors used in the binary program had been destroyed.

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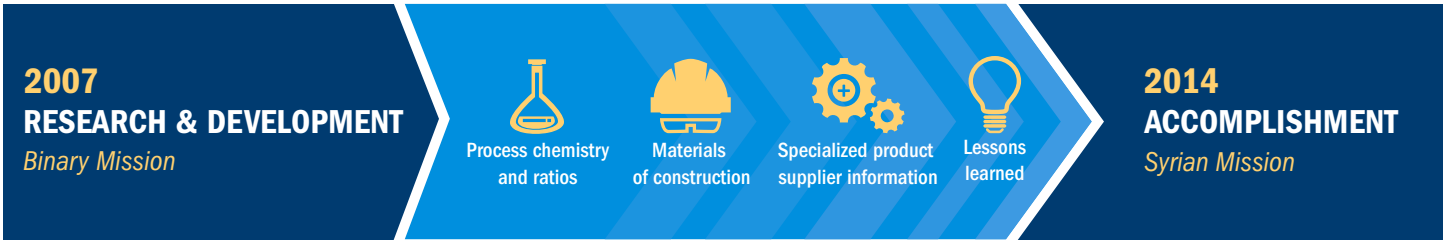
CHEMICAL WEAPONS DESTRUCTION EXPERTISE (CONTINUED)

DATA TRANSFER



Refining the technology for the Syrian mission

Fast forward seven years, and DoD needed a method to destroy Syrian chemical weapons, which included DF. The research for the binary mission led to RCMD recommending water chemistry for the process, and provided critical lessons-learned.

Water, when mixed with DF, produces a very strong acid, creating the need to monitor the pH or acidity of the effluent and the resulting heat generation. This was one of the areas where experience benefitted the FDHS development. While technical issues were simply part of the binary destruction process, the team never thought their research would assist in the development of future innovative solutions in such a short period of time.

The same process used to select the binary destruction method more than a decade ago was applied to the FDHS, a transportable, high-throughput modular demilitarization system designed to render chemical warfare materiel into compounds not usable in munitions. Developed in six months, the FDHS advantage was the extensive documentation that existed from the binary mission.

With an extremely short development timeline in which to create and deploy a transportable neutralization system, RCMD's former research assisted in advancing the development process for the FDHS deployment without any prior system testing. Field testing the system prior to deployment would have meant replicating the compounds, which is prohibited by CWC guidelines. Using RCMD's historical data enabled the FDHS deployment and established confidence in the system specifications and technology. This transfer of systems knowledge ultimately assisted in quickly developing a proven system that could handle the new configuration and capacity for the Syrian chemical weapons destruction mission.

The binary chemical weapons neutralization concluded on December 28, 2006, with the demolition of the Pine Bluff Integrated Binary Production Facilities, Pine Bluff Arsenal, Arkansas. Although the U.S. binary chemical weapons destruction mission concluded in 2007, this project provides just one example of how teamwork and access to subject matter experts provides technical advantages that will benefit generations to come.

RCMD provided process chemistry and ratios, including:

- Corrosivity data
- Process times
- Material of construction data
- Energy balances
- Heat characteristics
- Problems encountered
- Suppliers of the specialized products required