FACT SHEET

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Project Shipboard Hazard and Defense (SHAD)

Flower Drum, Phase II

Project Shipboard Hazard and Defense (SHAD) was part of the joint service chemical and biological warfare test program conducted during the 1960s. Project SHAD encompassed tests designed to identify US warships' vulnerabilities to attacks with chemical or biological warfare agents and to develop procedures to respond to such attacks while maintaining a war-fighting capability.

The primary purpose of the Flower Drum, Phase II, test was to determine the effectiveness of a shipboard water washdown system as a protective and decontaminant measure against simulated aerial delivery of VX nerve agent spray.

The US Navy Covered Lighter (Barge), YFN-811, was used as the platform for the test. During the test trials, the barge was towed by the US Navy Tug, ATF 105. It was towed approximately one kilometer behind the tug. A spray device on the barge disseminated agent or simulant onto the barge during tests.

A dyed liquid containing approximately 90 percent VX nerve agent (by weight) was used in this program. To assist in taking radiometric measurements of contamination, radioactive "tagged VX nerve agent" molecules containing a radioactive isotope, Phosphorous 32, were included in the agent. In addition to VX nerve agent, a simulant, Bis (2 ethyl-hexyl) hydrogen phosphite was used in this test.

Flower Drum, Phase II, tests were conducted at sea during November and December 1964, off the coast of Hawaii.

Test Name	Flower Drum, Phase II (Test 64-2)
Testing Organization	US Army Deseret Test Center
Test Dates	November and December 1964
Test Location	Testing was conducted in the Pacific Ocean, off the coast of Hawaii.
Test Operations	To determine the effectiveness of a shipboard water washdown system as a protective and decontaminant measure against simulated aerial delivery of VX nerve agent spray.
Participating Services	Navy, plus Deseret personnel
Units and Ships Involved	US Navy Covered Lighter (Barge), YFN-811 US Navy Tug, ATF-105
Dissemination Procedures	A dyed liquid containing approximately 90 percent VX nerve agent (by weight) was sprayed onto the barge. To assist in taking radiometric measurements of contamination, radioactive "tagged VX nerve agent" molecules containing a radioactive isotope, Phosphorous 32, were included in the agent.
Agents, Simulants, Tracers	VX nerve agent VX nerve agent containing radioactive isotope, Phosphorous 32 Bis (2 ethyl-hexyl) hydrogen phosphite
Ancillary Testing	Not identified
Decontamination	Water washdown system
Potential Health Risks Associated with Agents, Simulants, Tracers	VX Nerve Agent – Lethal Nerve Agent (Synonyms: Phosphonothioic acid, VX): VX is an extremely lethal nerve agent. It is an oily liquid that is clear, odorless and tasteless. Death usually occurs within 10-15 minutes after absorption of a fatal dosage. VX nerve agent is one of the most toxic substances ever synthesized. Symptoms of overexposure may occur within minutes or hours, depending upon the dose. They include: miosis (constriction of pupils) and visual effects, headaches and pressure sensation, runny nose and nasal congestion, salivation, tightness in the chest, nausea, vomiting, giddiness, anxiety,

	difficulty in thinking, difficulty sleeping, nightmares, muscle twitches, tremors, weakness, abdominal cramps, diarrhea, involuntary urination and defecation. With severe exposure symptoms progress to convulsions and respiratory failure. The permissible airborne exposure concentration for VX nerve agent in any 8-hour work shift can be found in Department of the Army Pamphlet 40-8. To date, however, the Occupational Safety and Health Administration has not promulgated a permissible exposure concentration for VX nerve agent. (Sources: Centers for Disease Control and Prevention http://www.bt.cdc.gov/Agent/Nerve/VX/ctc0006.asp [as of January 25, 2002]. *SBCCOM Online*, Edgewood Chemical Biological Center [ECBC], http://www.sbccom.apgea.army.mil/RDA/msds/vx.htm [as of April 2, 2002]. Department of Sustainable Development and Environmental Protection, http://209.61.192.180/phe/factsheet_5.htm [as of April 2, 2002]). Department of the Army Pamphlet 40-8: Occupational Health Guidelines for the Evaluation and Control of Occupational Exposure to Nerve Agents GA, GB, GD, and VX, http://books.army.mil:80/cgi-bin/bookmgr/BOOKS/P40_8/CCONTENTS [as of February 5, 2002]). Phosphorous 32 Phosphorous 32 is one of the highest energy beta-emitting radionuclides commonly used in biomedical research. In general Phosphorous 32 does not pose a severe threat from ingestion or inhalation. High energy betas from Phosphorous 32 pose an external (skin and lens of the eye) dose hazard, as well as a potential internal hazard. Radiogenic health effects (primarily cancer) are observed in humans only at doses in excess of 10 rem delivered at high dose rates. Below this dose, estimation of adverse health effects is speculative. Exposure can contribute to development of cancer.

	(Sources: Environmental Protection Agency, http://www.epa.gov/radiation/heast/docs/heast2_table_4-d2_0401.pdf. [as of February 28, 2002], Harvard University, http://www.uos.harvard.edu/ehs/radsafety/gui_p32.shtml.[as of February 28, 2002] Cornell University, http://msds.pdc.cornell.edu/msds/siri/msds/h/q428/q236.html [as of February 28, 2002]. Office of Radiation, Chemical and Biological Safety, MSU. http://www.orcbs.msu.edu/radiation/radsaf.html [as of February 28, 2002] University of California, Davis, http://ehs.ucdavis.edu/hp/shi/haz_sh.html [as of February 28, 12002]. University of Iowa, http://www.uiowa.edu/~hpo/facts/P32.htm [as of February 28, 2002]). Bis (2 ethyl-hexyl) hydrogen phosphite May be harmful by inhalation, ingestion, or skin absorption. Vapor or mist can be irritating to the eyes, mucous membranes, and upper respiratory tract. It can also cause skin irritation. It is not carcinogenic and there are no chronic exposure hazards. (Source: Cornell University, http://msds.pdc.cornell.edu/msds/siri/msds/h/q324/q431.html [as of February 28, 2002]).