Operation WIGWAM

Note: *For information related to claims, call the Department of Veterans Affairs (VA) at 800-827-1000 or the Department of Justice (DOJ) at 800-729-7327. For all other information, call the Nuclear Test Personnel Review (NTPR) Program at 800-462-3683.*

Operation WIGWAM was a deep underwater nuclear test conducted as part of the 1945-1962 United States series of atmospheric nuclear tests. It took place in May 1955 in the Pacific Ocean approximately 500 miles southwest of San Diego, California, under the joint administration of the Atomic Energy Commission and the Department of Defense (DoD). The purpose of the operation was to determine the radiation and pressure phenomenology associated with nuclear detonations at great depths and to ascertain the effects such explosions would have on submerged and surface vessels. Approximately 6,800 personnel and 30 ships took part in this operation under the Commander, Joint Task Force Seven.

Historical Background

A single, 30-kiloton nuclear device was suspended by cable from a towed unmanned barge to a depth of 2,000 feet in water that was 16,000 feet deep. Located at varying distances along the approximately six-mile (30,000 feet) long towline between this barge and the fleet tug, USS TAWASA (ATF-92), were a variety of pressure-measuring instruments, unmanned and specially prepared submerged submarine-like hulls (called squaws) as well as instrumented and also unmanned surface boats.

The ships and personnel conducting the test were positioned five miles upwind from the surface detonation point with the exception of USS GEORGE EASTMAN (YAG-39) and USS GRANVILLE S. HALL (YAG-40). These two extensively reconfigured ships, equipped with special radiological shielding, were stationed five miles downwind of the surface detonation point. With all the ships at their assigned stations and all personnel accounted for, the device was detonated at 1 p.m. Pacific Daylight Time on May 14, 1955.

WIGWAM resulted in three sources of radiological contamination: airborne activity, residual fallout and water contamination. During the first three seconds after the detonation, the radioactive debris was primarily contained within an initial bubble formed by the interaction of thermal energy with the water. Then, beginning at approximately H + 10 seconds (ten seconds after the detonation) these gaseous products began to reach the water surface, forming spikes and plumes reaching maximum heights of 900 to 1,450 feet and emerging from an area roughly 3,100 feet in diameter. As the plumes fell back into the water, a large cloud of mist was formed. This was the base surge, which at H + 90 seconds had a radius of 4,600 feet and a maximum height of 1,900 feet. The visible surge persisted to H + 4 minutes. At H + 13 minutes, a foam ring appeared with a 10,400 foot diameter. The area within this ring probably approximated the extent of the contaminated water.

While the surface water initially showed significant contamination levels, the water dispersed and radiation decayed rapidly, so that by May 18 the maximum radiation reading found over an 80 square mile area was on the order of one milliroentgen per hour (mR/hr) at 3 feet above the surface.

Contaminated water was found at several depths during the weeks following the test and tended to be in layers a few feet thick.

Radiation Protection Standards

Radiological safety was the responsibility of the U.S. Naval Radiological Defense Laboratory (NRDL). Radiation safety procedures included measures to minimize exposures to personnel, to measure and evaluate radiological hazards and contaminated areas, to control exposures to personnel and the spread of radioactive contamination from samples, equipment and other materials, and the documentation of levels of exposure and contamination. For the duration of the operation, an exposure limitation of 3.9 roentgen (R) was set. In addition, levels were specifically established for radioactive contamination of clothing and personal equipment, food, water, air, ship surfaces, equipment and materials.

An important part of the radiological safety procedures was the personnel dosimetry program. Nearly all individuals involved in the operation were issued a film badge to measure any exposure received during the operation. Personnel whose duties were such that exposure to radiation was possible (such as sampling water, recovering equipment or instruments) were issued additional film badges on a daily basis.

One of the vessels, the USS WRIGHT, contained a film processing center where badges were read and personnel exposures were recorded. Over the period of the operation, approximately 10,000 film badges were issued. These included operational, daily, calibration, and scientific project badging.

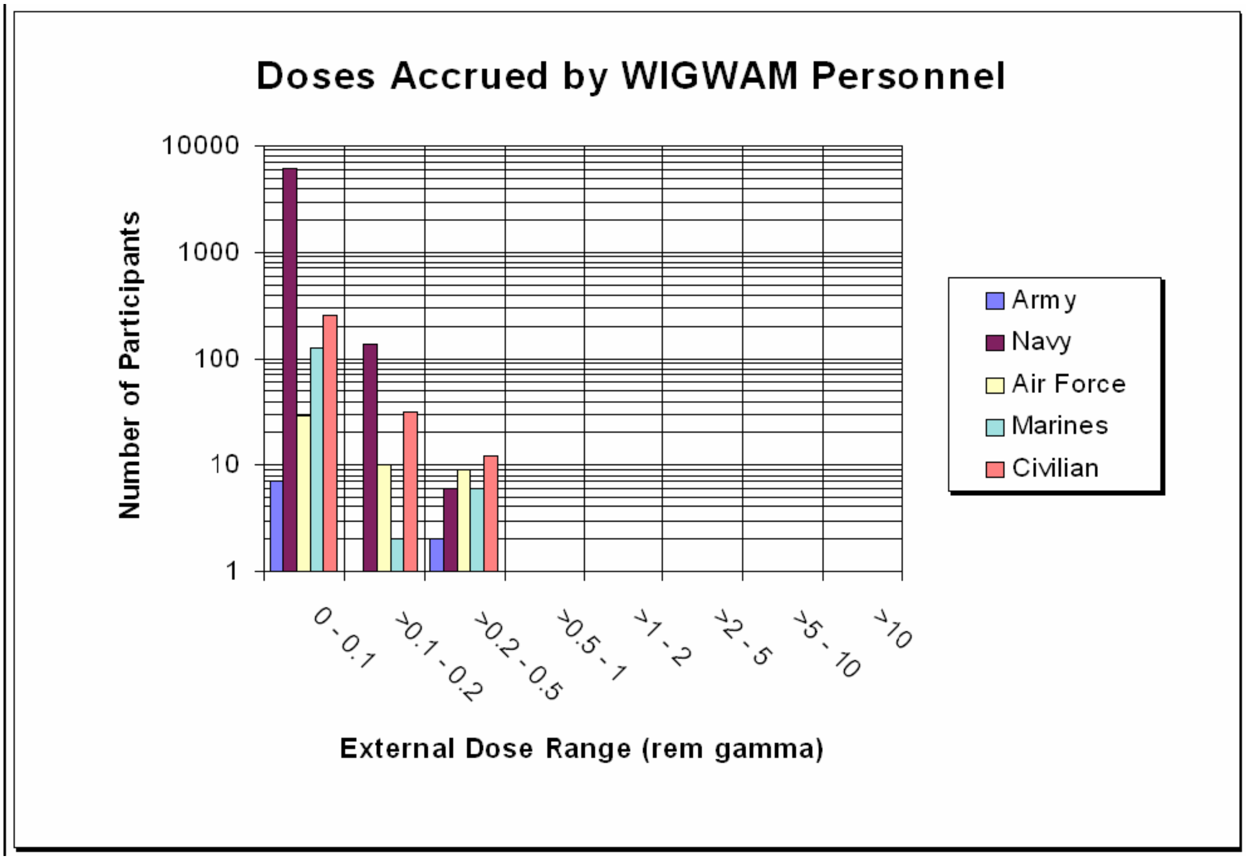
Radiation Doses at Operation WIGWAM

The radiation doses for WIGWAM personnel were very low. This was because the depth of the detonation caused very little airborne contamination – and even that was blown away from the task force by the prevailing wind. No traces of fallout were detected on any of the upwind ships.

The safety protection standard for WIGWAM was a limit of 3.9 rem* for the duration of the operation. The highest personnel dose during WIGWAM was 0.425 rem, which was received by an air sampler pilot from the aviation support group out of Naval Air Station, San Diego.

Six crewmembers aboard GEORGE EASTMAN and one crewmember aboard GRANVILLE S. HALL had film badge readings other than zero. In each instance, the readings were between 0.10 and 0.13 rem. One non-crew technician aboard GRANVILLE S. HALL received 0.20 rem.

The totals of reconstructed and film badge doses for WIGWAM participants are depicted below:



** A rem is a radiation protection unit of measure that quantifies the risk of biological effects resulting from exposure to ionizing radiation. Ionizing radiation is any radiation (gamma, x-ray, beta, neutron or alpha) capable of displacing electrons from atoms or molecules, thereby producing ions. According to the National Council on Radiation Protection and Measurements (NCRP, Report No. 93, Table 8.1), the general U.S. population receives about 0.36 rem per year from natural background radiation sources (radon, cosmic rays and rocks) and man-made radiation sources (medical diagnostic x-rays and consumer products).*

For more information, see the report "Operation WIGWAM 1955" (DNA 6000F), available online at http://www.dtra.mil/rd/programs/nuclear_personnel/atr.cfm.

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