

Fact Sheet

Defense Threat Reduction Agency



Operation CASTLE

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 Helpline at 800-462-3683.

Operation CASTLE was a six-detonation nuclear weapon test series (see table) held at the Atomic Energy Commission's (AEC) Pacific Proving Ground (PPG) from March 1 to May 31, 1954. The PPG consisted principally of Enewetak and Bikini Atolls in the northwestern Marshall Islands in the Central Pacific Ocean.

Historical Background

The CASTLE series was held to test large-yield thermonuclear, or hydrogen, devices. Work on this class of devices had progressed through the GREENHOUSE-GEORGE demonstration shot in 1951 and the IVY-MIKE shot of 1952. MIKE was the first device that generated substantial explosive energy from the fusion, or joining, of hydrogen atoms. These explosive devices were developed by the AEC, the civilian agency authorized to perform this activity by the Atomic Energy Act of 1946.

The devices were tested at the PPG by a joint military and civilian organization designated as Joint Task Force 7 (JTF 7). This was a military organization in form, but was populated by military, civil service, and contractor personnel of the Department of Defense (DOD) and AEC. The commander of this force was the appointed representative of the AEC and reported also to the Joint Chiefs of Staff and the Commander-in-Chief, Pacific. The peak DOD numerical strength of CASTLE was approximately 17,300 personnel.

Numerous technical demonstrations were carried out in conjunction with each of the six detonations. These demonstrations measured the power and efficiency of the devices and attempted to gauge the military effects of the explosions. DOD personnel participated in this test operation as individuals whose duty stations were at the AEC design laboratories, as units performing separate demonstrations, and as units performing various support roles. The CASTLE operations placed almost all of the Navy support groups at Bikini, where its ships provided living space for personnel who were evacuated from the islands for the first test and then could not return to live there because of the potential radiation exposure.

Summary of Operation CASTLE Nuclear Weapons Tests (1954)^a

Local Date (1954)	Shot	Location	Yield ^b
Mar 1	BRAVO	Bikini; sandspit off Nam Island	15 megatons
Mar 27	ROMEO	Bikini; barge in BRAVO crater	11 megatons
Apr 7	KOON	Bikini; surface of Eneman Island	110 kilotons
Apr 26	UNION	Bikini; barge in lagoon off Iroj Island	6.9 megatons
May 5	YANKEE	Bikini; barge in UNION crater	13.5 megatons
May 14	NECTAR	Enewetak; barge in MIKE ^c crater	1.69 megatons

^a Source: *United States Nuclear Tests, July 1945 through September 1992*, DOE/NV-209 (Rev. 15), Dec 2000.

^b One kiloton equals the approximate energy release of one thousand tons of TNT; one megaton equals the approximate energy release of one million tons of TNT.

^c IVY series detonation in 1952.

Radiation Protection Standards

Safety standards were established to limit the exposure of participants to the effects of nuclear detonations while, at the same time, allowing them to receive the sometimes unavoidable small doses of radiation as they performed their missions in the radiation areas.

The standards, which followed those set by the National Committee on Radiation Protection, included a total dose not to exceed 3.9 rem* for 13 consecutive weeks. The Commander of JTF 7 could authorize a one-time dose up to 20 rem for certain air missions.

Some key personnel approached or exceeded the CASTLE dose limit of 3.9 rem from being exposed to BRAVO fallout on Navy ships and from working in contaminated areas on Bikini. To allow for the completion of the remaining CASTLE shots, the JTF 7 commander issued a number of waivers authorizing doses of as much as 7.8 rem over 13 consecutive weeks. In a limited number of cases, even this level was exceeded.

Radiation Doses at Operation CASTLE

A limited number of JTF 7 personnel received radiation doses considerably in excess of the established limit. In particular, the 28 Army and Air Force personnel stationed on Rongerik Atoll had film badge readings of 32 to 52 rem. Three members of the U.S. Navy Bikini Boat Pool had heavily exposed badges with readings from 85 to 96 rem.

As a result of BRAVO, 21 individuals on USS PHILIP (DDE 498) and 16 on USS BAIROKO (CVE 115) sustained small skin lesions that resembled burns while at stations on the weather deck or near ventilation blowers. Initially these burns were deemed to be from beta radiation, but later they appeared to have been lime burns from chemical reactions with coral in the fallout.

* 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. 160, Table 1.1), the general U.S. population receives about 0.62 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). As a basis of comparison, a standard diagnostic chest x-ray delivers a radiation dose of about 0.02 rem.

The reconstructed dose to the crew of USS PATAPSCO (AOG 1) is 4.7 rem for the period from the time fallout commenced to their disembarking at Pearl Harbor. USS PATAPSCO, a Navy gasoline tanker, was approximately 190 nautical miles east of Bikini and steaming toward Hawaii when it was caught in the main path of the BRAVO fallout.

The totals of reconstructed and film badge doses for CASTLE participants are depicted below.

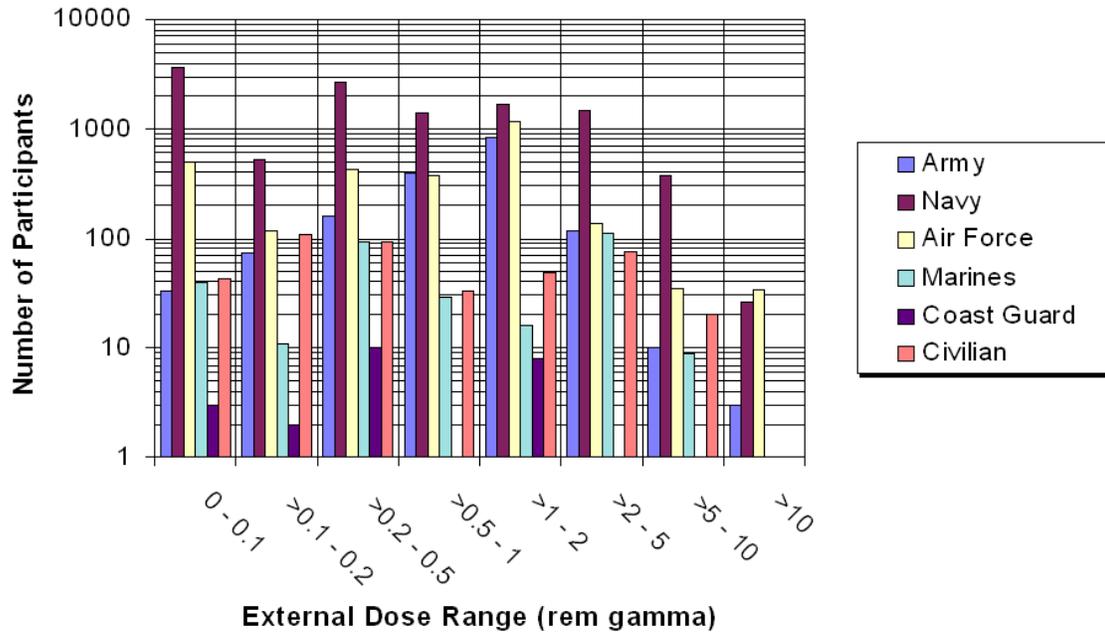


Figure 1. Doses accrued by CASTLE personnel

For more information on reconstructed doses, see the reports “Analysis of Radiation Exposure for Naval Personnel at Operation CASTLE” (DNA-TR-84-6), “Analysis of Radiation Exposure for Additional Naval Personnel at Operation CASTLE – Supplemental Report” (DNA-TR-89-256), and “Analysis of Radiation Exposure – Service Personnel on Rongerik Atoll” (DNA-TR-86-120). Also see the report “CASTLE Series 1954” (DNA 6035F). These reports are available online at <https://www.dtra.mil/DTRA-Mission/Reference-Documents/NTPR-Info/>.

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