

## Operation IVY

**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 IVY was an atmospheric nuclear test series held in the Atomic Energy Commission's (AEC) Pacific Proving Ground at Enewetak Atoll in the Marshall Islands during autumn 1952. The series consisted of the two detonations listed below.

### Summary of Operation IVY Events (1952)<sup>a</sup>

Shot	Local Date	Location	Yield <sup>b</sup>
MIKE	November 1	Eluklab Island; surface	10.4 Mt
KING	November 16	Airburst (1,480 feet 440 meters) over reef off Funit	500 kt

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

<sup>b</sup> 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.

### Historical Background

The U.S. government decided to pursue the development of thermonuclear weapons in 1950, and the IVY series was a key step in this development. MIKE was an experimental device and produced the first thermonuclear detonation in which a substantial portion of its energy was generated by the fusion, or joining, of hydrogen atoms. KING was a stockpile weapon modified to produce a large yield. It was dropped from a B-36 bomber. The energy from KING was generated by the fission, or splitting, of plutonium atoms. These were the largest yield nuclear detonations at that time.

Elements of the four services, the AEC and other federal government agencies, and civilians from government laboratory organizations and contractors made up this organization. Commander JTF 132 reported to the Joint Chiefs of Staff, but was also designated the AEC's agent in conducting the tests. The joint nature of this test organization resulted from the requirements of the Atomic Energy Act of 1946. This legislation placed atomic energy development under civilian control; however, the remoteness of the IVY series test site required a military organization for physical security and technical and logistical support.

The total number of personnel involved in the task force was approximately 14,000, primarily military service personnel. Most of these personnel operated from Enewetak Atoll and from task force ships that were based there. Most of the remaining participants

were Air Force personnel based at Kwajalein, 360 nmi (667 km) southeast of Enewetak.

### **Radiation Protection Standards**

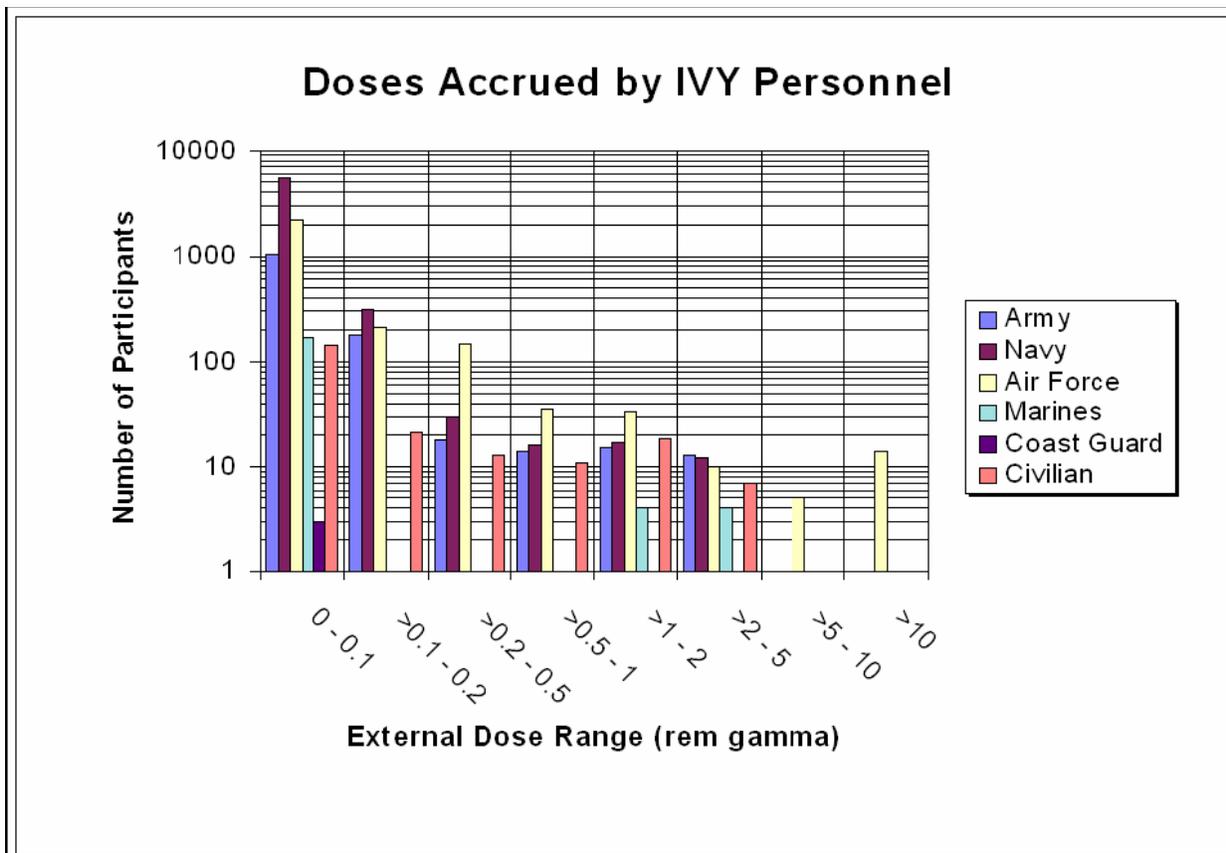
The safety of the task force personnel conducting the test series was an important factor in planning the conduct of the tests. Pretest measures taken to ensure the safety of personnel were:

1. Modification of ships and aircraft, including the installation of “washdown” systems aboard ships to prevent radioactive fallout accumulation and the installation of filters on aircraft pressurization systems to prevent radioactive particles from entering aircraft.
2. Design of special protective clothing, including a leadcloth shroud for aircraft pilots operating near the radioactive cloud.
3. A training program in radiation safety procedures.
4. The establishment of a technical support unit whose responsibility was to provide the task force with expert assistance in radiation safety, including monitoring of radiation, decontamination of personnel, laboratory support, maintenance of exposure records, and maintenance and calibration of radiation detection equipment.
5. The establishment of a meteorology group whose responsibility was to predict the direction of the winds aloft to avoid conducting the tests during times when radioactive fallout might be carried in the direction of the task force or inhabited islands.
6. The establishment of a program for the evacuation of all personnel from Enewetak Atoll for the MIKE test and the preparation of plans for emergency evacuation of task force personnel from Bikini and Kwajalein. Marshall Islanders living at Ujelang were placed aboard a Navy ship just before the MIKE detonation in readiness for movement to safety if the fallout moved to the southwest.
7. The establishment of procedures for issuing film badges to individuals whose activities might expose them to nuclear radiation so that exposure records could be kept. About 2,000 of the task force personnel received these badges.

### **Radiation Doses at Operation IVY**

The IVY dose limit of 3.9 rem\* was exceeded in only two situations. The seven-man crew in an amphibious plane that flew to the rescue of a downed pilot received doses between 10 to 17.8 rem. The highest dose for the crew of a photographic plane caught in the fallout was 11.6 rem.

Of the approximately 14,000 participants, only about 2,000 of the task force personnel received film badges. The intent of the badging program was to issue badges only to those personnel who might enter contaminated areas or be exposed to fallout. Therefore, the low-level fallout on the islands was not, for most personnel, measured by film badges. The reconstructed doses, however, for all individuals who stayed on the residence islands or aboard ships throughout IVY is less than 0.1 rem. The totals of reconstructed and film badge doses for IVY participants are depicted below. Nearly 99 percent of the task force received less than 1 rem as their total dose.



*\*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).*

Reconstructed doses for typical shipboard and land-based personnel are derived in the report “Analysis of Radiation Exposure for Naval Personnel at Operation IVY” (DNA-TR-82-98), available online at [http://www.dtra.mil/rd/programs/nuclear\\_personnel/pubs.cfm](http://www.dtra.mil/rd/programs/nuclear_personnel/pubs.cfm). Also see the report “Operation IVY 1952” (DNA 6036F), available online at [http://www.dtra.mil/rd/programs/nuclear\\_personnel/atr.cfm](http://www.dtra.mil/rd/programs/nuclear_personnel/atr.cfm).

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