

## Operation RANGER

**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 RANGER, the first series of atmospheric nuclear tests conducted by the Atomic Energy Commission (AEC) at the Nevada Proving Ground (NPG), consisted of five detonations, all of which were airdrops. The operation also included one non-nuclear high-explosive test detonated two days before the first nuclear event. RANGER lasted from Jan. 27 through February 6, 1951, and involved approximately 770 Department of Defense (DoD) participants in air support services, scientific projects, weather support, communications security, and observer activities. The series was intended to provide data for use in determining design criteria for nuclear devices scheduled for detonation at Operation GREENHOUSE, to be conducted at the Pacific Proving Ground from April 7 to May 24, 1951.

### Historical Background

Since RANGER was only a 13-day operation, the same units and participants performed the same duties throughout the series. The majority of DoD personnel at RANGER took part in the air support services provided by the Air Support Section of the Test Group. Air Force personnel from the Special Weapons Command (SWC) and Headquarters, U.S. Air Force, conducted most of these activities. At each test event, air support activities included the airdrop of the nuclear device, cloud sampling, cloud tracking, aerial surveys of the terrain, and courier service. Air Force personnel also provided meteorological services and communications security and monitored worldwide radioactivity from the RANGER tests for the Atomic Energy Detection System.

Air Force participation at the RANGER shots involved personnel from:

- Headquarters, U.S. Air Force
- Air Research and Development Command
- Air Training Command
- Strategic Air Command
- Air Force Security Service
- Air Weather Service
- Air Force Cambridge Research Laboratory
- 4901st Support Wing (Atomic) (SWC)
- 4925th Special Weapons Group (SWC)
- 374th Reconnaissance Squadron (Very Long Range) Weather
- 1009th Special Weapons Squadron

Primary Army participation came from the 82nd Reconnaissance Battalion from Fort Hood, Texas, which provided security at the test site.

The Scientific Tests Section of the Test Group administered projects at each nuclear detonation. DoD personnel were involved in eight projects at each shot except BAKER, where they took part in seven experiments. Of the 12 known DoD participants, six were from the Army Participation Group, an organization representing the Chief, Armed Forces Special Weapons Project. The other six were officers from the Army, Navy, and Air Force. Participants in these scientific experiments placed film badges, fabrics, and other materials and instruments in or around military fortifications constructed in the ground zero area. They retrieved the equipment after the detonation, when radiation levels had decreased and limited access into the shot area was permitted.

The number of observers at RANGER has been documented as 156, but only three of these are believed to have been military personnel.

### **Summaries of RANGER Nuclear Events**

The accompanying table details specific information for each nuclear shot in the RANGER series, and the accompanying map shows ground zero and the operations area. These five shots were of the same type, were detonated at the same site, and involved similar activities. Shot FOX, the last detonation, was the largest shot and the only event not detonated on schedule. A one-day postponement was caused by an oil leak in the B-50 drop aircraft. Fired 1,435 feet above Frenchman Flat, Shot FOX had a yield of 22 kilotons. The initial radiation survey, conducted about one hour after the detonation, showed a maximum gamma intensity of 15.5 roentgens per hour (R/h) at ground zero and 8.0 R/h about 200 meters from ground zero. At 900 meters, the radiation level decreased to 0.25 R/h.

### **Radiation Protection Standards**

The AEC established safety criteria to minimize the exposure of participants to ionizing radiation, while allowing them to accomplish their missions. DoD participants at RANGER were limited to a gamma exposure limit of 3.0 rem\* per 13-week period. Sampling pilots from the Air Weather Service were authorized to receive up to 3.9 rem because the special nature of their mission required them to penetrate the clouds resulting from the shots.

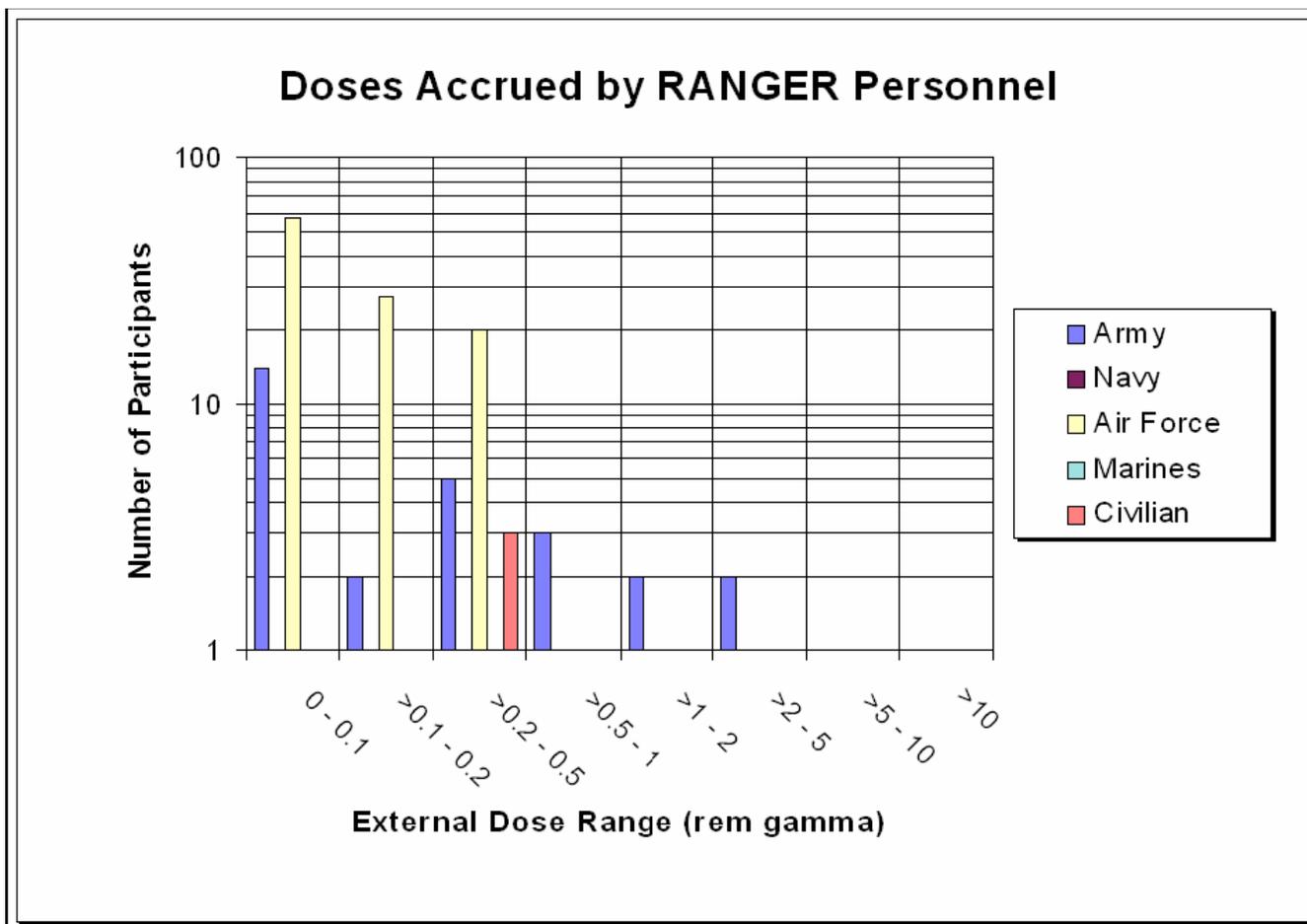
The Test Group was responsible for the radiological safety of all RANGER participants, and its Radiological Safety Section was responsible for implementing the radiological safety procedures. This section consisted of personnel from the AEC, the Los Alamos Scientific Laboratory, and the Army Corps of Engineers. Personnel from Headquarters, Air Force, implemented radiological safety procedures for Air Force participants. The general procedures followed by both groups were similar:

- Personnel dosimetry: issuing and developing film badges for participants and evaluating gamma radiation exposures recorded on film badges
- Use of protective equipment: providing clothing, respirators, and other protective equipment
- Monitoring: performing radiological surveys and controlling access to radiation areas
- Decontamination: detecting and removing contamination on personnel and equipment

### **Radiation Doses at Operation RANGER**

Shot FOX produced the most extensive radiation field. The initial radiation survey, conducted about one hour after the detonation, showed a maximum gamma intensity of 15.5 R/h at ground zero and 1.0 R/h

about 500 yards from ground zero. At 1,000 yards, the intensity was less than 0.05 R/h. For all RANGER shots, radiation levels were similar in all directions from ground zero because the fields were from neutron activation of the soil and all shots shared the same ground zero. Dosimetry information is available for 40 percent of the approximately 400 DoD participants at RANGER. These data indicate that three individuals received doses greater than the 3.0 rem limit. The totals of reconstructed and film badge doses for RANGER participants are depicted in the table 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 RANGER 1951" (DNA6022F), available online at [http://www.dtra.mil/rd/programs/nuclear\\_personnel/atr.cfm](http://www.dtra.mil/rd/programs/nuclear_personnel/atr.cfm).

### Summary of Operation RANGER Events (1951)<sup>a</sup>

Shot	ABLE	BAKER	EASY	BAKER-2	FOX
Sponsor	LASL	LASL	LASL	LASL	LASL

Planned Date	Jan. 27	Jan. 28	Feb. 1	Feb. 2	Feb. 5
Actual Date	Jan. 27	Jan. 28	Feb. 1	Feb. 2	Feb. 6
Local Time	5:45 a.m.	5:52 a.m.	5:47 a.m.	5:49 a.m.	5:47 a.m.
NPG Location	Frenchman Flat	Frenchman Flat	Frenchman Flat	Frenchman Flat	Frenchman Flat
Type	Airdrop	Airdrop	Airdrop	Airdrop	Airdrop
Height of Burst (Feet)	1,060	1,080	1,080	1,100	1,435
Yield (Kilotons) <sup>b</sup>	1	8	1	8	22

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

<sup>b</sup>One kiloton equals the approximate energy release of one thousand tons of TNT.

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