Fact Sheet

Defense Threat Reduction Agency
U.S. Strategic Command Center for Combating Weapons of Mass Destruction
Standing Joint Force Headquarters for Elimination

Operation TUMBLER-SNAPPER

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 TUMBLER-SNAPPER, a series of atmospheric nuclear tests, was conducted by the Atomic Energy Commission (AEC) at the Nevada Proving Ground (NPG) from April 1 to June 20, 1952. The operation consisted of eight nuclear detonations in two phases. The TUMBLER phase, of primary concern to the Department of Defense (DOD), consisted of four weapons effects tests, Shots ABLE, BAKER, CHARLIE, and DOG. These airdropped devices were detonated to collect information on the effect of the height of burst on overpressure. Shots CHARLIE and DOG were also part of the SNAPPER phase, of primary concern to the AEC and the Los Alamos Scientific Laboratory. The other weapons development tests in the SNAPPER phase were Shots EASY, FOX, GEORGE, and HOW. The primary purpose of these four tower shots was to gather information on nuclear phenomena to improve the design of nuclear weapons.

Historical Background

About 7,400 of the estimated 11,700 DOD participants in TUMBLER-SNAPPER took part in Exercise Desert Rock IV. The remaining DOD personnel assisted in scientific experiments, air support activities, or administration and support activities at the NPG.

Exercise Desert Rock IV, an Army training program involving personnel from the armed services, included observer programs and tactical maneuvers. Observer programs, conducted at Shots CHARLIE, DOG, FOX, and GEORGE, generally involved briefings on the effects of nuclear weapons, observation of a nuclear detonation, and a subsequent tour of a display of military equipment exposed to the detonation. Tactical maneuvers, conducted after Shots CHARLIE, DOG, and GEORGE, were designed both to train troops and to test military tactics. Psychological tests were conducted at Shots CHARLIE, FOX, and GEORGE to determine the troops' reactions to witnessing a nuclear detonation.

Soldiers from various Sixth Army units provided support for the Exercise Desert Rock IV programs. They maintained and operated Camp Desert Rock, a Sixth Army installation located 3 kilometers (1.9 miles) south of the NPG. These soldiers provided essential services such as food, housing, transportation, communications, construction, and security. Some of the Desert Rock support troops worked in the forward areas of the NPG to construct observer trenches, lay communication lines, provide transportation, and assist with other preparations for Desert Rock IV activities. Many of the Camp Desert Rock support personnel observed at least one detonation during TUMBLER-SNAPPER, and some were called upon to perform support or staff duties in the test areas during nuclear detonations.

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DOD personnel also participated in scientific experiments conducted by two test groups at TUMBLER-SNAPPER: the Military Effects Test Group and the Weapons Development Test Group. The Military Effects Test Group was sponsored by Test Command, Armed Forces Special Weapons Project (AFSWP), and involved more DOD participants than did the AEC Weapons Development Test Group. The Los Alamos Scientific Laboratory conducted most of the Weapons Development Test Group activities, but DOD personnel were sometimes involved. Test group participants placed instruments and equipment around ground zero in the days and weeks before the scheduled nuclear test. After each detonation, when it was determined that the area was radiologically safe for limited access, these participants returned to the test area to recover equipment and gather data.

DOD personnel also provided air support to TUMBLER-SNAPPER. The Air Force Special Weapons Center (AFSWC) from Kirtland Air Force Base, New Mexico, had primary responsibility for cloud sampling, courier missions, cloud tracking, aerial surveys of the terrain, and other air support as requested. AFSWC consisted of units of the 4925th Test Group and 4901st Support Wing, which staged out of Indian Springs Air Force Base, Nevada.

Although the AEC Test Manager was responsible for planning, coordinating, and executing TUMBLER-SNAPPER programs and activities, DOD personnel assisted in these duties. They were responsible for overseeing the DOD technical and military operations at the tests.

Summaries of Operation TUMBLER-SNAPPER Nuclear Weapons Tests

The eight TUMBLER-SNAPPER tests are summarized in the accompanying table. The accompanying map shows the ground zeros of these shots.

Shot ABLE, an airdropped device, was detonated 793 feet over Area 5 of Frenchman Flat at 9 a.m. on April 1, 1952. The test was a weapons effects test and involved DOD personnel from the Military Effects Test Group and the Weapons Development Test Group in about 30 scientific and diagnostic experiments. AFSWC activities included the airdrop, cloud sampling, courier service, cloud tracking, and aerial surveys. In addition, over 150 personnel from the Strategic Air Command (SAC) observed the detonation from B-50 aircraft flying over the test area. No formal military training exercises were conducted at this shot, although 15 members of the Camp Desert Rock support staff witnessed the shot near the Control Point, approximately 18 kilometers (11.2 miles) northwest of ground zero. Onsite radiation intensities were characterized by small areas of low-level radioactivity surrounding ground zero. Six hours after the shot, radiation intensities were below 0.01 roentgen per hour (R/h) beyond about 600 meters (0.4 miles) from ground zero.

Shot BAKER, an airdropped device, was detonated 1,109 feet over Area 7 of Yucca Flat at 9:30 a.m. on April 15, 1952. Shot BAKER was also a weapons effects test and involved DOD personnel from the test groups in 45 experiments. AFSWC activities included the airdrop, cloud sampling, courier service, cloud tracking, and aerial surveys. About 170 SAC observers flying in B-50 aircraft witnessed the detonation. No formal military training exercises were conducted, but 10 members of the Camp Desert Rock staff did witness the shot. Onsite radioactivity was characterized by small areas of radiation around ground zero. About one hour after the shot, the initial radiological survey team found a radiation intensity of 1.2 R/h at ground zero, decreasing to 0.01 R/h 750 meters south of ground zero.

Shot CHARLIE, an airdropped device, was detonated about 3,500 feet over Area 7 of Yucca Flat at 9:30 a.m. on April 22, 1952. About one hour after the shot, the initial survey showed that radiation intensities of 0.01 R/h or more were confined within 1 kilometer (0.6 mile) of ground zero.

As part of Exercise Desert Rock IV, the armed services fielded a troop observer program with 535 participants and a tactical troop maneuver with about 1,675 participants. The tactical maneuver at Shot CHARLIE was conducted by the following units:

Army

- 2nd Battalion, 504th Airborne Infantry Regiment, 82nd Airborne Division, Fort Bragg, North Carolina
- Company B, 167th Infantry Regiment, 31st Infantry Division, Camp Atterbury, Indiana
- Company C, 135th Infantry Regiment, 47th Infantry Division, Fort Rucker, Alabama
- Tank Platoon, 11th Armored Cavalry Regiment, Camp Carson, Colorado
- Engineer Platoon, 369th Engineer Amphibious Support Regiment, Fort Worden, Washington
- Medical Detachment (augmented), Sixth Army, numerous Sixth Army posts.

Air Force

- 140th Fighter-Bomber Group (Provisional) and elements from 140th Fighter-Bomber Wing, Clovis Air Force Base, New Mexico.

The CHARLIE tactical maneuver consisted of five activities:

- Observation of the shot
- Psychological testing
- Movement to objective
- Inspection of an equipment display
- Airborne exercise.

After observing the shot from trenches approximately 6.4 kilometers (4 miles) south of ground zero, the troops were tested by the Human Resources Research Office and the Operations Research Office to determine their reactions to the detonation. The troops then toured the display area and approached as close as 160 meters to ground zero, where they encountered radiation intensities of up to 0.01 R/h. While ground troops were taking part in these activities, Army paratroopers landed in a drop zone north of ground zero. Some of the paratroopers, however, jumped prematurely and missed the drop zone by as much as 13 kilometers (8 miles). Five paratroopers were slightly injured on landing. Despite this problem, the exercise was completed as planned.

In addition to Exercise Desert Rock activities, DOD personnel participated in about 50 scientific projects, approximately 190 SAC observers witnessed the shot from aircraft flying in the vicinity of the NPG, and AFSWC personnel provided air support, including the bomb drop.

Shot DOG, an airdropped device, was detonated more than 1,000 feet above Area 7 at 8:30 a.m. on May 1, 1952. Ground zero for Shot DOG was the same as for Shots BAKER and CHARLIE. The initial radiation survey, taken about one hour after the shot, showed that radiation intensities of 0.01 R/h extended approximately 1.6 kilometers (1 mile) from ground zero.

The Navy and Marine Corps conducted a troop observer program and a tactical troop maneuver at Shot DOG as part of Exercise Desert Rock IV. The observer program involved approximately 350 Navy and Marine participants. Desert Rock participants observed the shot from trenches 6.4 kilometers (4 miles) south of ground zero. The tactical maneuver was conducted by about 1,950 Marines from the Marine Corps Provisional Atomic Exercise Unit. This unit consisted of officers and enlisted men from the 1st Provisional Marine Battalion of Camp Pendleton, California, and the 2nd Provisional Marine Battalion of Camp Lejeune, North Carolina. The Shot DOG tactical maneuver was the first maneuver conducted by the Marine Corps during continental nuclear weapons testing. The Marines observed the shot, took psychological tests, and toured display areas 2 hours and 20 minutes after the detonation. In addition, some participants accompanied AFSWP and Desert Rock monitoring teams on their initial survey of the ground zero area immediately following the detonation in order to learn radiological monitoring techniques. At Shot DOG, three display areas

were established between 270 and 1,600 meters (0.17 – 1 mile) from ground zero. The Marines stopped their tour of the displays at 820 meters from ground zero because of the radiation intensities they encountered. In addition to Desert Rock activities, DOD personnel participated in about 50 of the scientific experiments conducted by the test groups, about 180 observers from the SAC watched the detonation from aircraft flying in the vicinity of the NPG, and AFSWC personnel provided air support, including the bomb drop.

Shot EASY was detonated from a 300-foot tower in Area 1 of Yucca Flat at 4:15 a.m. on May 7, 1952. DOD participants were involved in approximately 30 of the test group experiments, and AFSWC personnel provided air support. No formal Desert Rock IV training exercises were conducted. However, 1,000 personnel from Camp Desert Rock support units witnessed the shot from the Control Point at Yucca Pass, approximately 13 kilometers (8 miles) south of ground zero. Onsite residual radioactivity was heaviest around and to the north of ground zero. The initial radiological survey team was unable to complete the survey on shot day because of the large radiation area and rough terrain. On the day after the shot, the 0.01 R/h line was 900 to 1 kilometer (6.2 miles) east, south, and west of ground zero but extended about 6 kilometers (3.7 miles) north.

Shot FOX, a 300-foot tower detonation, was fired in Area 4 of Yucca Flat at 4 a.m. on May 25, 1952. Most onsite fallout occurred to the northeast of ground zero, overlapping residual radiation from Shot EASY. Ninety minutes after the shot, the 0.01 R/h line extended farther than 6.5 kilometers to the east. High radiation levels to the northeast prevented completion of the initial radiological survey on shot day. Three days after the shot, the 1.0 R/h line extended less than 500 meters (0.3 miles) from ground zero, except to the northeast where it reached nearly 2 kilometers (1.2 miles).

During Shot FOX, the largest single activity was the Army troop observer program, part of Exercise Desert Rock IV. Approximately 950 exercise troops from the 701st Armored Infantry Battalion, 1st Armored Division, Fort Hood, Texas, witnessed the shot from trenches 6.4 kilometers (4 miles) southeast of ground zero. An additional 500 observers from the six continental armies and the service schools also witnessed the shot from the same location. The observer program included psychological testing before and after the shot and a tour of the equipment display area.

In addition, DOD personnel were involved in 27 test group experiments. AFSWC personnel provided air support, and about 100 observers from the SAC witnessed the shot from aircraft flying in the vicinity of the NPG.

Shot GEORGE, a 300-foot tower detonation in Area 3, was fired at 3:55 a.m. on June 1, 1952. The initial radiation survey established the 0.01 R/h line at about 1.3 kilometers (0.8 miles) to the west, south, and east of ground zero. The area north of the shot tower could not be surveyed on shot day because of radiation levels in excess of 10.0 R/h.

The Desert Rock troop observer program and tactical troop maneuver at Shot GEORGE involved approximately 1,800 Army troops. Immediately after they observed the shot from trenches about 6.4 kilometers (4 miles) south of ground zero, about 500 soldiers toured the equipment display area, located about 500 to 2,500 meters (0.3 to 1.6 miles) southwest of ground zero. The remaining 1,300 soldiers took part in the tactical troop maneuver, a ground assault on an objective south of ground zero. Immediately after the shot, the troops, accompanied by five tanks, advanced from the trench area toward the objective. When Army monitors preceding the assault detected radiation intensities of 0.5 R/h at about 460 meters (0.3 miles) from ground zero, the attack was halted. Troops then proceeded to the equipment display areas. The following Army units took part in this maneuver:

- 23rd Transportation Truck Company, Camp Roberts, California
- 31st Transportation Truck Company, Fort Ord, California

- Tank Platoon of the 1st Armored Division, Fort Hood, Texas
- 369th Engineer Amphibious Support Regiment, Fort Worden, Washington.

In addition to these Desert Rock activities, DOD personnel participated in 25 of the test group projects, AFSWC personnel performed air support missions, and 24 observers from the SAC watched the detonation from two B-50s flying in the vicinity of the NPG.

Shot HOW, the last test of the operation, was detonated from a 300-foot tower in Area 2 of Yucca Flat at 3:55 a.m. on June 5, 1952. No Exercise Desert Rock programs were conducted, but DOD personnel did participate in about 30 of the test group projects. The onsite fallout pattern extended to the north and northwest of ground zero, but the initial radiological survey team did not monitor that area because no recovery operations were necessary there. The survey team did measure intensities of 0.01 R/h as far as 2 kilometers (1.2 miles) to the west of ground zero.

Radiation Protection Standards

The AEC established safety criteria to minimize the exposure of participants to ionizing radiation while allowing them to accomplish their missions. The AEC established a limit of 3.0 roentgens (R) of gamma exposure per 13-week period for Exercise Desert Rock, the joint AEC-DOD organization, and most of AFSWC. AFSWC sampling pilots were authorized to receive up to 3.9 R during TUMBLER-SNAPPER because their mission required them to penetrate the clouds formed by the detonations.

The Test Manager was ultimately responsible for the safety of participants in Exercise Desert Rock IV, of the personnel in the joint AEC-DOD organization, and of individuals residing within 320 kilometers of the NPG. Most onsite and offsite radiological safety procedures were performed by the AFSWP Radiological Safety Group, composed of personnel from the Army, Navy, and Air Force. An officer appointed by Test Command, AFSWP, headed the group.

The Desert Rock Exercise Director was responsible for conducting Exercise Desert Rock IV in compliance with the AEC radiological safety policies. The Desert Rock Radiological Safety Group was usually supervised and assisted by the AFSWP Radiological Safety Group. The AFSWP group was also responsible for processing the film badges worn by Desert Rock participants.

The 4925th Test Group (Atomic) implemented radiological safety procedures for AFSWC personnel at Indian Springs Air Force Base. For AFSWC personnel at Kirtland Air Force Base, the 4901st Support Wing (Atomic) carried out these procedures.

Although the missions and activities of each organization were different, the general radiological safety procedures followed by all groups were similar:

- Orientation and training – preparing radiological monitors for their work and familiarizing participants with radiological safety procedures
- Personnel dosimetry – issuing and developing film badges 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
- Briefing – informing observers and project personnel of radiological hazards and the radiological conditions in the test area
- Decontamination – detecting and removing contamination from personnel and equipment.

Radiation Doses at Operation TUMBLER-SNAPPER

The AEC established a limit of 3.0 rem* of gamma dose per 13-week period for Exercise Desert Rock personnel, for the joint AEC-DOD organization and for most AFSWC personnel. AFSWC sampling pilots were authorized to receive up to 3.9 rem during TUMBLER-SNAPPER in order to complete their scientifically vital mission.

Individual film badges were generally worn during missions in contaminated portions of the forward area, but dosimetry records are only partially available. Notably, the disposition of film badges issued to the Marine Corps Provisional Atomic Exercise Unit at Shot DOG has never been determined. Operational total doses are available for personnel based at Camp Mercury, and doses to Desert Rock IV personnel whose records are not available have been reconstructed.

About 40 DOD participants who were subject to the joint AEC-DOD organization limit of 3.0 rem exceeded it, and about 10 individuals subject to the 3.9 rem AFSWC limit received doses in excess of that level. The highest doses of about 10 rem were accrued by two members of the Army unit that assisted the AEC in radiological monitoring, the 216th Chemical Service Company. The highest AFSWC dose was less than 8 rem. Desert Rock IV personnel remained within their dose limit.

Some DOD personnel assisting the Military Effects Group received doses over the limits because the nature of their experiments required them to enter radiation areas before the recovery hour to retrieve instruments and records, or to remain in the radioactive areas longer than originally anticipated.

At Shot DOG, which had higher levels of radiation than did the previous three shots, 15 AFSWP participants received doses greater than 3.0 rem. At Shot FOX, Project 6.4 required flying repeatedly through the cloud, with peak intensity readings of as much as 40 R/h.

During Shot GEORGE, a T-33 flew through a highly radioactive part of the cloud while performing its cloud sampling mission. The plane reported a radiation intensity of 140 R/h and returned to base. Shot GEORGE produced more fallout than expected in the target area, resulting in “unusually extensive” decontamination activities. Six AFSWP participants received doses over 3.0 rem.

The totals of reconstructed and film badge doses for DOD participants at TUMBLER-SNAPPER are depicted below.

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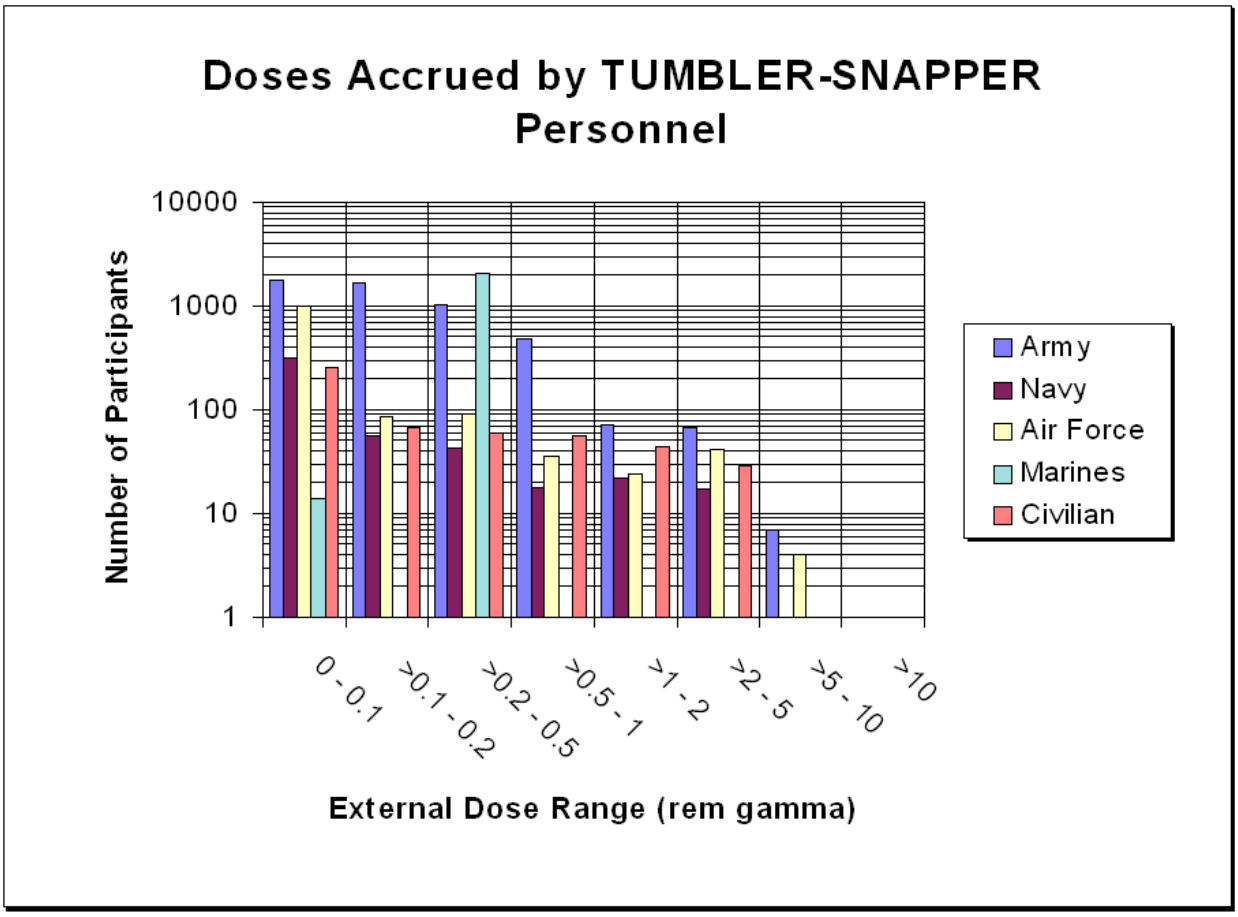
* *A rem is a radiation protection unit of measure that quantifies the risk of biological effects resulting from exposure to ionizing radiation. Ionizing radiation is any radiation (gamma, x-ray, beta, neutron, or alpha) capable of displacing electrons from atoms or molecules, thereby producing ions. 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.*



For more information on reconstructed doses, see the report “Analysis of Radiation Exposure for Observers and Maneuver Troops, Exercise Desert Rock IV, Operation TUMBLER-SNAPPER” (DNA-TR-85-277). Also see the report “Operation TUMBLER-SNAPPER 1952” (DNA 6019F). These reports are available online at http://www.dtra.mil/Home/NuclearTestPersonnelReview.aspx.

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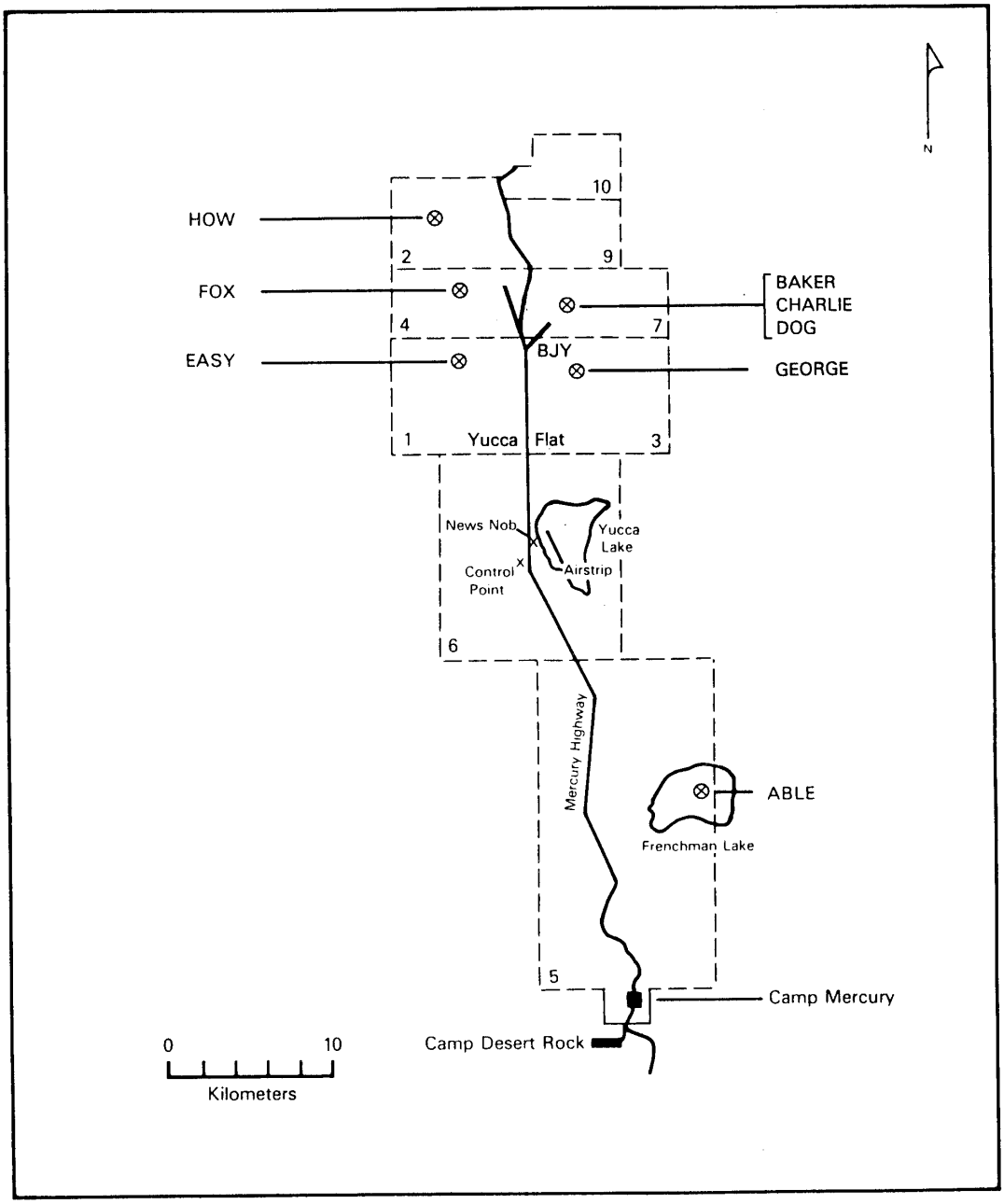
Summary of Operation TUMBLER-SNAPPER Nuclear Weapons Tests (1952)[a]

SHOT	ABLE	BAKER	CHARLIE	DOG	EASY	FOX	GEORGE	HOW
Sponsor	DOD-LASL	DOD-LASL	DOD-LASL	DOD-LASL	LASL	LASL	LASL	LASL
Planned Date	Apr 1	Apr 15	Apr 22	Apr 29	May 6	May 13	May 20	May 27
Actual Date	Apr 1	Apr 15	Apr 22	May 1	May 7	May 25	Jun 1	Jun 5
Time (Pacific Standard)	9 a.m.	9:30 a.m.	9:30 a.m.	8:30 a.m.	4:15 a.m.	4 a.m.	3:55 a.m.	3:55 a.m.
NPG Location	Frenchman Lake (Area 5)	Area 7	Area 7	Area 7	Area 1	Area 4	Area 3	Area 2
Type of Detonation	Airdrop	Airdrop	Airdrop	Airdrop	Tower	Tower	Tower	Tower
Height of Burst (Feet)[b]	793	1,109	3,447	1,040	300	300	300	300
Yield (kilotons)[c]	1	1	31	19	12	11	15	14

[a] Source: *United States Nuclear Tests, July 1945 through September 1992*, DOE/NV-209 (Rev. 15), Dec 2000.
[b] Altitudes are measured from mean sea level, while heights are measured from the ground. All vertical distances are in feet.
[c] One kiloton equals the approximate energy release of one thousand tons of TNT.



GROUND ZEROS FOR OPERATION TUMBLER-SNAPPER AT THE NEVADA PROVING GROUND