1971 Cannikin

At the Frontier of Missile Defense Technology

The morning before the Cannikin event at Amchitka Island, Alaska, the test site was subjected to rain and wind gusts up to 124 miles per hour. The test crew and visiting dignitaries, including Atomic Energy Commission Chairman James Schlesinger and his family, anxiously waited. Meanwhile, the Supreme Court ruled by a 4–3 margin that the test could take place. At 6:30 am on November 6, 1971, in Amchitka, the go-ahead came from the White House on a telephone hotline. Cannikin was successfully detonated at 11:00 a.m., and the nearly 5-megaton blast generated the ground motion of a 7.0 Richter-scale-magnitude earthquake.

A Spartan missile body with the nuclear device is lowered downhole for the Cannikin event. The test was successfully conducted on November 6, 1971, on Amchitka Island, Alaska.

Cannikin was a massive undertaking involving hundreds of Laboratory employees and nearly five years of effort. Test operations overcame myriad logistics hurdles, and experimenters achieved many technical firsts. Two years of drilling produced a record-breaking emplacement hole that was 6,150 feet deep and 90 inches in diameter with a 52-foot-wide cavity mined at its bottom. The diagnostics canister was 264 feet long, and altogether 400 tons of cables and equipment were lowered downhole. Cannikin was the first test in which a laser successfully aligned diagnostics downhole and a computer system assisted field operations. A record-setting number of recording trailers, 2,000 feet from ground zero and shock-mounted to withstand a ground upheaval of 15 feet at shot time, were instrumented with 250 oscilloscopes. One hundred percent of the test data was successfully retrieved.

The experiment tested the design of the warhead for Spartan, the interceptor used in the upper tier of the U.S. Safeguard anti-ballistic missile (ABM) system. Spartan missiles were to engage clouds of reentry vehicles and decoys above the atmosphere and destroy incoming warheads with a burst of high-energy x rays. The Laboratory stepped up to the difficult challenge of designing the appropriate warhead. The Spartan warhead had high yield, produced copious amounts of x rays, and minimized fission output and debris to prevent blackout of ABM radar systems. Livermore also developed and tested the warhead technology for the second-tier interceptor, the Sprint missile. Subsequently, Los Alamos was assigned responsibility to develop the nuclear warhead for Sprint.

The Safeguard ABM system was a scaled-down version of the Sentinel system for defense of U.S. cities. Rapid evolution of offensive missile technologies (see Year 1970) made national defense impractical, and in 1972, the United States and the Soviet Union signed the ABM Treaty. However, protection against ballistic missile attack remained a noble goal and technological challenge for Laboratory researchers and was pursued with renewed vigor after President Ronald Reagan launched the Strategic Defense Initiative. Nuclear directed-energy weapons were pursued at Livermore, including experimental demonstration of x-ray lasing at the Nevada Test Site. Laboratory researchers also devised the concept of Brilliant Pebbles for nonnuclear defense against missiles in boost phase, which led to the Clementine experiment to map the Moon (see Year 1994).

During preparation for the Cannikin event, workers—including Test Director Phil Coyle sitting on the right—ate their meals near the rigging.