The Atomic Cannon

It was fired only once, but it helped end a war

by James Lamont

The picture below was taken on the morning of May 25, 1953, at the U.S. Atomic Energy Commission's Nevada Proving Ground (now the Nevada Test Site). It shows the scene less than a minute after the Army's gigantic "atomic cannon" made its first and only firing of a nuclear-tipped artillery round. The gun itself was a conventional cannon, but it had to be extraordinarily big and built with unique features to accommodate its special projectile.

The atomic cannon shortly after firing, May 25, 1953. The explosion is seven miles away.
(NATIONAL ARCHIVES/VCE.COM/COURTESY OF PETER KURAN)

The cannon was anchored at the south end of Frenchman Flat, about 75 miles northwest of Las Vegas. It launched the projectile 7 miles to the north, where it detonated 524 feet above the desert floor with a force of 15 kilotons, the same as the bomb that had devastated Hiroshima. A crowd of 575 official guests witnessed the test, as did about 2,500 soldiers huddled in trenches in the shadow of the blast, some as close as 2.3 miles to ground zero, the dry bed of Frenchman Lake. As a tactical exercise, the soldiers charged toward the

explosion a few minutes later, with the mushroom cloud still rising above them. Units became disoriented in the swirling dust churned up by winds created by the tremendous pressures of the nuclear explosion.

The atomic cannon first got rolling in 1949 as the result of a turf war between the Army and the Air Force. Since becoming a separate branch of the military two years before, the Air Force had been lobbying for exclusive rights over delivery of nuclear weapons. But the Army already had its own nuclear weapon: the T-124 atomic shell, a gun-barrel device that was a compact version of “Little Boy,” the Hiroshima bomb, and packed the same wallop. Unfortunately, the Army had no means to deliver it. Fearful of losing its weapon to the upstart flyboys, the Army quickly set about finding a delivery method.

The urgency of the program ruled out taking the time to develop a new system, so the Army searched its existing arsenal. Since missiles and rockets were in too early a stage of development, attention turned to artillery. The T-124 shell required a 280-mm (11-inch) cannon, but the Army had none with a muzzle that large. So the Army turned to a cannon project that had been under development since the end of World War II. It was based on a giant 280-mm German gun that traveled on railroad tracks. The Germans called that gun Schlanke Bertha (Slim Bertha), while the Allies nicknamed it Anzio Annie for the drubbing it gave that Italian beachhead in 1944.

The new 280-mm atomic cannon was, and remains, the largest and heaviest artillery piece the U.S. Army ever ordered—inches shy of 85 feet long (longer than a railway passenger coach) and weighing a ton per foot. It was too heavy and cumbersome to be maneuvered by a single tractor, so two identical tractors, called “transporters,” were developed to move it. For long-distance moves, the cannon could be suspended on a platform between them. The two transporters had separate operators, who coordinated their actions via radiotelephone. This arrangement allowed the cannon to be turned as much as 90 degrees in either direction. The cannon was so heavy that it required a paved road, or at least a surface prepared by packing the dirt, to support it. The gun had its own electrical generator, which powered a remote electrical firing system and a hydraulic system. The hydraulics helped handle and chamber the 803-pound nuclear round and could rotate the gun up to 360 degrees on its mount. The effective range of the new cannon, 20 miles, exceeded that of all other land-based guns of the time.

Other than its size and the electrical firing system, not much about the cannon was new. Even the transporters were based on existing wheeled tractor units. The Army ordered 20 of the guns, and the first two to emerge from its Watervliet, New York, arsenal were immediately subjected to extensive testing. Over 18 months, first at the Aberdeen Proving Ground in Maryland and then at the Army’s artillery center in Fort Sill, Oklahoma, nearly a thousand conventional rounds were fired from each gun.

One purpose of the tests was to measure the flight time of each round from firing to burst point, 7 miles distant and 500 feet above the target. Since this was decades before computerized telemetry, the problem had to be solved mechanically. This was done using a high-speed motion-picture camera borrowed from the Army's signal school. The camera had a built-in clock whose dial was superimposed in each frame. The camera was focused on the target area, and the clock began running when the primer ignited. Seconds later the camera started. Developed footage gave the firing-to-burst time down to tenths of a second.

The only problem—and it proved to be a major one—was that there were far too many misfires. Technicians knew the trouble lay with the electrical firing apparatus, for the guns operated according to standard when they were fired using the mechanical backup system, by pulling a lanyard to trigger a hammer, which strikes a firing pin on the shell primers. In the electrical system, no firing pin was involved; the primers were ignited electrically. Difficulties with the system continued to vex the project on-site in Nevada. Just days before the scheduled firing of the nuclear round, the problem was finally traced to the wiring of the primers.

The electrical firing system was made necessary by the nature of the payload. No nuclear device had ever been instantly accelerated to 2,060 feet per second before, so there was some question whether the sudden jolt might cause the device to attain critical mass prematurely. A larger question was what might occur in the highly unlikely event of a "catastrophic metal fatigue failure" at the ignition point—in other words, if the barrel blew apart at the instant of firing. Such catastrophes were uncommon, but they could not be ruled out, especially with a cannon and payload that went so far beyond anything previously tried.

Thus the big central worry: Would a nuclear detonation occur at the firing point? A true nuclear explosion with supercriticality was extremely unlikely because successful detonation of a nuclear device involves a precise sequence of events with timing measured in picoseconds, and any sudden, violent disruption of this process would almost certainly derail it. Yet while the device would not create a nuclear explosion or a mushroom cloud, it might still spread lethal radioactivity across the immediate blast area.

That's why the electrical firing system was developed: to let the gun crew be away from the gun when it was fired. Unfortunately, standard artillery procedure requires a gun crew's presence to quickly clear the weapon (by opening up the breech and pulling out the shell) in the event of a misfire. These conflicting requirements were the subject of some back-and-forth among officers. In the end, the only time the cannon was fired with a live nuclear payload, the Army decided to rely upon the basic soundness of the cannon, and a gun crew was present.

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In late summer 1952 one of the guns being tested was selected to deliver the nuclear round. It was nicknamed Atomic Annie and was scheduled to be part of a series of tests of nuclear devices to be held in the spring of 1953. The series was called Operation Upshot-Knothole, and the specific test that would involve the atomic cannon was named Grable, apparently after Betty Grable, the favorite GI pinup of World War II. Other weapon tests in the series had such names as Ruth, Dixie, Badger, Simon, and Encore.

Over the winter of 1952–53 the Korean War slogged on, peace talks having been suspended the previous October. In January Dwight D. Eisenhower became President. During the campaign he had pledged to end the war, and even before his inauguration, he had visited Korea. In the already scheduled Upshot he saw an opportunity: What better way for America to put pressure on the communists than with a high-profile series of nuclear tests? Eleven “shots” were planned at weekly intervals from mid-March to the end of May.

A publicity blitz began for the pending series. The Defense Department and Atomic Energy Commission issued dozens of news releases in hopes of attracting big crowds. Much of the publicity focused on military equipment that was placed on the desert floor to be blown up. In the Grable shot, a railway locomotive was parked some distance from ground zero and tested after the explosion to measure the effects on its engine.

The city of Las Vegas joined in enthusiastically, with hotel-casinos inviting families to come visit and see a nuclear test firsthand. Entrepreneurs promised to guide tourists to the best viewing sites, and hundreds of spectators could be seen lining ridges in the early-dawn hours before each test. One brochure featured a man, a woman, two children, and a dog standing beside a station wagon and pointing with glee at a mushroom cloud rising in the background. Hollywood entertainers, including Bob Hope, dropped by. Casino players would leave their chips and cards on the tables and dash outside to see the remnants of a mushroom cloud.

On April 26, with this atomic circus in full swing, peace talks resumed in Panmunjom. Washington seized the opportunity to ratchet up the pressure on the communists. On May 21 Secretary of State John Foster Dulles sent a group of messages to the Chinese and North Koreans through assorted diplomatic channels. The exact content of the messages remains unknown, but the best

indication came 12 years later, during a discussion between Eisenhower and President Lyndon B. Johnson about Johnson's options for the Vietnam War.

Present at that meeting was Gen. Andrew Goodpaster, who was then on the Joint Chiefs of Staff. Goodpaster took notes on the meeting and wrote them up in a memorandum, which today is in the Eisenhower Library. The relevant portion reads: "He [Eisenhower] next considered the question of Chinese Communist or Soviet intervention [in Vietnam]. He said that if they threaten to intervene, we should pass the word back to them to take care lest dire results occur to them. He commented on how the armistice was brought about in Korea. Following two years or more of inconclusive effort, shortly after he came to office, he had three messages passed to the Koreans and the Chinese… . The gist of these messages was that if a satisfactory armistice were not signed promptly, we would remove the limits we were observing as to the area of combat and the weapons employed."

The cannon with its transporters…
(U.S. DEPARTMENT OF ENERGY/NEVADA SITE OFFICE)

…the gun crew runs away after loading…
(U.S. DEPARTMENT OF ENERGY, COURTESY OF ATOMIC VETERANS HISTORY PROJECT)

…observers look away from the blast.
(U.S. DEPARTMENT OF ENERGY, COURTESY OF ATOMIC VETERANS HISTORY PROJECT)

Back at the test site, publicity for grable reached a peak. The arrival of Atomic Annie and its backup in Nevada triggered more than 20 news releases, and more than 100 reporters came to witness the test. The guest list was headed by Defense Secretary Charles Wilson, the Chairman of the Joint Chiefs of Staff, the Secretary of the Army, the Army's Chief of Staff, and 79 congressmen, 9 more than had attended the previous three tests put together. Except for the Army

Secretary, Robert T. Stevens, who was in a trench with troops, the guests viewed the test from about a mile south of the cannon. Reporters were even farther away—off the test site entirely, arrayed on a ridge 10 miles from the cannon. That was as close as they could get, because the event had been designated a closed test, with no nonofficial persons allowed on-site.

To this day it is uncertain whether the atomic shot was fired electrically or manually. The fact sheet issued at the time by the Atomic Energy Commission, the Army record, and accounts at the Nuclear Testing Archives in Las Vegas all state that the nuclear round was fired electrically. Yet the officer in charge of the gun crew that day, Lt. Col. Donald L. Harrison—a World War II artillery veteran and career Army officer who would have been personally responsible for clearing the cannon of the nuclear round in the event of a misfire—maintained until he died in 2003 that he fired the nuclear shot using the mechanical backup method, by pulling the 20-foot lanyard.

However it was accomplished, the firing occurred without incident. Annie's 44-foot-long barrel was set at a firing angle between 15 and 20 degrees. The propellant charge weighed 150 pounds, and a motion-picture clip of the test shows that it took the shell 19.2 seconds to cover the 7 miles to ground zero.

Grable's success was trumpeted worldwide, with much emphasis on how the artillery round had the same yield as Little Boy and how the new delivery system would expand the Army's tactical options. Typical of these remarks was a statement issued the evening of May 25 from Las Vegas by Rep. W. Sterling Cole of New Hampshire, chairman of the joint congressional committee on atomic energy, which read in part: "In order to understand the military importance of our progress, one has to recall that the 1945 bomb was so big as to require a four-engine B-29 bomber to carry it to Hiroshima… . The projectile fired in today's test was just over 11 inches in diameter. They have concentrated into capsule form what once filled an entire bomb bay."

Not all comments were so sanguine, as Army and Air Force backers weighed in with opposing opinions. Air Force proponents derided the cannon, calling it too cumbersome to be tactically effective and pointing out that a fighter-bomber could deliver a small nuclear device with greater versatility and more cheaply (the single round that Annie shot had cost the Army three million dollars). Army supporters, on the other hand, pointed out the cannon's all-weather capability and its ability to be in place where and when the Army needed it. A balanced (and, in retrospect, prescient) commentary was provided by Dick Pearce of the San Francisco *Examiner*, who wrote: "The artillery shell now becomes the companion piece of the tactical A-bomb… . Thus the single A-shell explosion in Nevada may have accomplished all that was sought for the weapon. The Russian knows now that the shell exists for use against him; he will not willingly provide a situation for its use."

Soon afterward, Grable's success was upstaged by the final test of the series. The aptly named Climax, an air-dropped bomb detonated on June 4, was the highest-yielding device exploded on American soil up to that time, a pre-dawn 61-kiloton thumper that lit up the Western sky as far north as Washington. Windows were rattled in Medford and Klamath Falls, Oregon, 500 miles away, and in Los Angeles, 250 miles southwest, the Los Angeles *Herald Express* reported that police received numerous calls about "prowlers with flashlights rattling windows and doors."

All 20 of the 280-mm guns were formally put into combat readiness by being assigned to artillery battalions. While this was going on, the Korean armistice was signed in July. That cease-fire is still in effect; no peace treaty has ever been signed. Two of the batteries were deployed to Okinawa and from there to Korea. That autumn another pair of batteries went to U.S. forces in Europe. They remained on active duty until 1963, when smaller, more efficient nuclear weapons made their huge size obsolete.

Las Vegas hotel-casinos invited families to come visit and see a nuclear test firsthand. Spectators lined ridges in the early dawn.

A few of the behemoth cannons remain. Annie is back at Fort Sill, where she is a featured stop on the Artillery Museum's "Cannon Walk." Her backup sits atop a bluff alongside Interstate 70 just outside Fort Riley, Kansas, on loan from the Smithsonian Institution as part of a "Freedom Park" exhibit. Curiously, this gun is aimed at (and within range of) the Eisenhower Museum and Library in nearby Abilene. The cannon on display at the Army's Ordnance Museum in Aberdeen, Maryland, still has its two transporters attached.

Frenchman Flat can be visited on a day-long, bring-your-lunch tour sponsored by the National Nuclear Security Administration's Nevada Site Office (a division of the Department of Energy). The tour covers much of the Nevada Test Site, which is larger than Rhode Island and now serves, among other uses, as a site for environmental research on subjects like the desert tortoise.

The dry bed of Frenchman Lake is picturesque in a black-humor way, strewn with grotesquely mangled leftovers from years of atmospheric nuclear tests. Included are a steel railway trestle twisted into a gigantic, blackened pretzel by several blasts, a bank vault whose massive steel reinforcing rods are bent straight backward in the manner of bobby pins, and an odd assortment of shelters and other structures that survived the blasts. Today they lie half-buried in the desert sand like the discarded toys of some gigantic child.

The image of unwitting destructiveness is fitting because the fallout from Upshot-Knothole was the worst by far up to that time. The adverse effects of exposure on farms and communities in nearby southern Utah brought increased national attention to the issue of safety in nuclear testing. While Upshot-Knothole may have ended the war in Korea, it also helped give birth to America's antinuclear movement, which would only grow stronger in years to come. In addition to hastening the end of the Korean War, Grable helped set in motion the forces, domestic and foreign, that would culminate a decade later in the Nuclear Test Ban Treaty of 1963.

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Reference:

*Invention & Technology***,** Summer 2005