

Nevada Test Site marks 60th anniversary

When testing went to Nevada, so did Sandia

'We got real good at improvising whatever was needed for these tests'

Story by Rebecca Ullrich • Photos courtesy Sandia Archives

In the wee morning hours of Jan. 27, 1951, an Air Force B-50D carrying an assembled nuclear device lumbered down the runway at Kirtland Air Force Base in New Mexico, clawed its way into the dark sky, and headed west toward Frenchman Flat, a remote area at the just-established Nevada Test Site. As the aircraft neared its target, at about 3:50 a.m., personnel on board inserted a nuclear capsule into the device and armed it for detonation. After a series of practice bombing runs over the drop site, test officials radioed a message: Proceed. Just prior to 5:45 a.m., with dawn just kissing the horizon to the east, a bombardier released the nuclear device. It exploded at a height of 1,060 feet over the desert. The Able Shot was a success and the Nevada Test Site was open for business.

Now, to mark the 60th anniversary of the site — recently renamed the Nevada National Security Site — Sandia corporate historian Rebecca Ullrich has written a brief history of Sandia's involvement there. Rebecca's story focuses on the personnel in the field, the engineers and technicians who made the tests happen, who were on the ground, encountering and solving problems no one had ever heard of before. Theirs is a story to remember.

The images are familiar: Mushroom clouds rising, flaming in orange and red above the desert floor, shockwave and wind roaring over test structures as they disappear into fire, the earth lifting and leaving a trail of dust in the air before subsiding as cables snap and trailers rock near an underground detonation. This was nuclear testing through the Cold War years. The bulk of US testing was done at the Nevada Test Site, beginning 60 years ago with the Able shot of Operation Ranger on Jan. 27, 1951, and extending through 904 nuclear tests until 1992.

As pressure to expand the US stockpile increased after the Soviet Union tested a nuclear device and the Korean War began, President Harry Truman authorized creation of the Nevada Proving Grounds within the Nellis Air Force Bombing and Gunnery Range to supplement nuclear testing in the Pacific. The site was selected because it was already under government control, was large, had a low population density, and would be reasonably easy to protect.

Renamed the Nevada Test Site (NTS) in 1955, the facility expanded to more than 1,300 square miles by the mid-1960s. Its activities grew as well, as the Plowshare program conducted tests in pursuit of peaceful uses for nuclear devices and Project Rover developed a nuclear rocket. The nuclear tests themselves served a range of purposes, providing insight into weapon design, weapon effects, civil effects, seismic detection, safety, storage, and transportation.

A single nuclear test series involved thousands of people from a variety of organizations, including Sandia. Responsible for weapon assembly and component design for nuclear weapons, Sandia provided device assembly, arming and firing support, instrumentation, and data collection and analysis for the Pacific tests. When testing went to Nevada, so did Sandia.

Independence and ingenuity

From the beginning, Sandia's field test organizations maintained a decidedly do-it-yourself culture of independence and ingenuity. NTS did not offer much in the way

of comfort or convenience. Ben Benjamin summarized, "We got real good at improvising whatever was needed for these tests."

Preparing to record Ranger's five air-dropped shots, Benjamin's team set up cameras in desert winter cold. To be sure the cameras were working properly they needed to process film from test runs, but did not have a darkroom.



MEN TO MATCH MY MOUNTAINS — Robert Bunker, H. Swartzbaugh, and Shorty Whitlow during preparation for 1953's Operation Upshot-Knothole. It's not easy work.

"So we went downtown and bought a prefab building from Sears." Designed for grain storage, the building was converted to a darkroom. Staff borrowed wooden mop buckets from the janitor in the Control Point to hold chemicals for processing the test film.

After Ranger, Sandia turned to support for Operations Buster and Jangle in the fall of 1951. Gordon Miller supported Jangle, which included the first underground nuclear shot, a cratering experiment moved from Amchitka in the Aleutian Islands to NTS after much of the instrumentation was already designed.

"At times it seemed impossible to get enough relay contacts cleaned of dust to even envision an operation. . . . Power supplies that had no heating problem outdoors on Amchitka became heat-sensitive and unreliable in the desert — some simply blew up." But, Gordon noted, "whining simply wastes time."

80-hour weeks routine

Conditions were rough at the site and, while they improved over the years, the grindingly hard work remained consistent. During the 1951 tests, Gordon indicated they



OPERATION BIG SHOT in 1952. Note the observers in the foreground of the photo.

"stuck to a 14- to 16-hour work day, using mealtimes to talk over our plans, revise plans, re-revise plans. . . ."

A decade later, on Operation Nougat, Carter Broyles and his weapon effects team worked 80-hour weeks in the month leading up to the tests. And, a decade after that, when Matt Roach was doing drafting and experiment setup for Diamond Sculls, he worked 93 hours in the final week of test preparation.

Not everything was successful. Luke Vortman noted that they "had one underground effects test in 1958 in which we got one measurement. All the radiation measurements we fielded were wiped out."

Gordon described the effect of two desert tortoises collected by a colleague. One chewed through a control cable; once it was found and put outdoors the second one bit into an extension cord.

"The sparks, the beaker that popped, the lights going out, and the tortoise going wherever dead tortoises go ended a morning that had started out bright and full of promise."

A disarming experience

Much more frightening were experiences with atmospheric shots that did not go off. Walt Treibel and Bob Burton ended up disarming the first shot in 1951's Buster series and 1957's Diablo shot, respectively. Both had arming and firing responsibilities for their shots and so ended up on the teams sent out once the countdown ended with no detonation. Both described climbing the tower as terrifying, with Walt saying, "We stopped a lot on the ladder to catch our breaths because of the anxiety and because of our awareness that each step could be our last." Bob remarked that, "Climbing that ladder was the worst part of the whole thing. It took us 30 minutes or so." Both devices were disarmed and used later.

Increased testing expanded capability. In 1957, Sandia's growing involvement in radiation effects studies and the consequent concern about exposures garnered Harold Rarrick the task of forming a health physics group. He was assigned in March and was associated with a test group at NTS in April. "And I had the radiation safety, fallout trays, and air samplers for that project; it's kind of a way to learn health physics real fast."

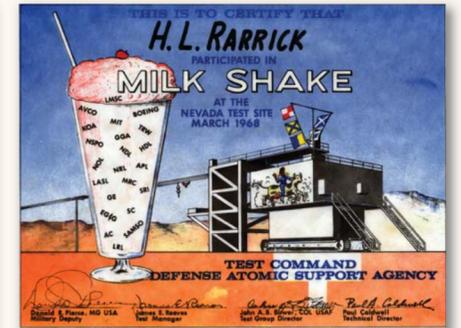
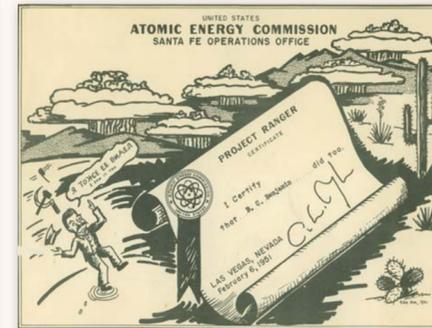
A very tender subject

Also in 1957, balloons were introduced as alternatives to towers for atmospheric tests. Employed to reduce both costs and fallout, they were perceived as difficult to handle. Gordon described the downside: "Talk about frustration; in the test biz, it's hard to find a more tender subject than balloons. . . . The best way to handle tests involving balloons is to find somebody else willing to tackle the business and offer your best wishes."

The 1958-1961 test moratorium meant a lull in activities at NTS, but when testing resumed, it was voluminous



EACH NUCLEAR WEAPONS TEST at the Nevada Test Site involved hundreds of personnel, all of whom worked long hours to meet Cold War-driven deadlines. Test participants were rewarded for



their efforts with certificates, each one custom designed to convey some unique aspect of the test. The certificates became coveted keepsakes for two generations of Sandians.

and predominantly underground; 1963's Limited Test Ban Treaty subsequently brought atmospheric testing to an end. Underground testing in vertical shafts and horizontal tunnels posed challenges for setting up instrumentation. But, line-of-site pipes leading from the detonation allowed for multiple experiments, and, relying on unprecedented engineering creativity, testers found ways to fit as many experiments as possible into the cramped spaces of drifts and mined rooms. Sandia introduced fast-acting closures to contain blast debris and protect instrumentation.

Moratorium and evolving missions

Dorris Tendall and Leo Brady established a series of seismic stations extending out beyond the test site to evaluate ground motion propagation from nuclear detonations. Don Shadel developed the Sandia TV system to document underground testing. He designed cameras, cable, reel, and a deployment truck, allowing views of the post-shot cavity or tunnel several thousand feet underground.

Similarly, the limited real estate for experiments and the increasingly sophisticated diagnostic instrumentation invoked Sandia's drafting organization. Matt Roach described working with the PhDs to convert their ideas into "workable underground test assemblies." For Diamond Sculls, the layouts, detail drawings, and assemblies for the experiments were completed in "approximately 10 weeks and burned nearly 11,000 drafting man hours."

In 1992, President H.W. Bush declared a unilateral moratorium on nuclear testing and NTS has hosted no full-scale nuclear tests since. On Aug. 23, 2010, NNSA announced the site was renamed the Nevada National Security Site, to reflect its evolution from nuclear testing into other research and training activities.

'Colors I didn't know existed'



Observers Program: In the 1950s, Sandians who were not participating in a test could apply to attend as observers, space and other concerns permitting; time and travel costs were covered by the employee. In 1953, Andy Lieber drove Tessie Wright and Dorothy and Leah Cohen to Nevada to observe a shot in Operation Upshot-Knothole.

"We sat in a cafeteria and sipped coffee until the wee hours of the morning, then boarded buses for the observation point," where they were issued dark goggles.

When Andy removed his goggles, he was awed: "I'm partially color blind but I've never seen anything as colorful as that fireball; colors that I didn't know existed. And, in the pre-dawn light, yuccas in the surrounding basin lit up like birthday candles."

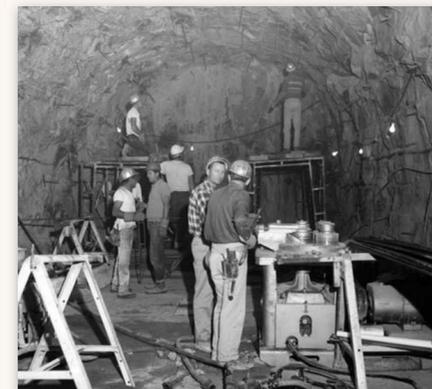
"About the time I thought we should be bracing for the shock wave, I saw it literally racing up the rise toward us — a vague sense of something optical and a line of dust at ground level. I had expected a "boom" like in the movies. But the sensation was a very loud "crack" as if a pistol had been fired in our ear."



EVERY UNDERGROUND TEST was supported by a massive above-ground infrastructure. In the photo here, instrumentation trailers are hard-wired to the test hole.



A WORKER PREPARES INSTRUMENTATION before the Ranier shot of Operation Plumbbob in 1957.



THE PREPARATION for a big test required a major mining operation. Here, Sandians prepare a tunnel for the Piledriver test in 1965.



SANDIANS work on line-of-site pipe in preparation for underground shot, Operation Midi Mist, in 1966.