

'Underground Events' Test Mettle of U.S. Atomic Arsenal

By Rick Atkinson

MERIDYAN, Nev. — In a dark, damp, and somewhat claustrophobic chamber, the tunnel walls are lined with concrete. Somewhere ahead in the darkness is the "working point" where the detonated fissile material a patch of rock the size of the Jefferson Memorial.

Here in the lairs of Area 12 on the Nevada Test Site, the Defense Department's nuclear wizards retreated more than 20 years ago to ply their sorcery underground. "Innocuous names for the tests—Misty Rain and Mill Yard and Diamond Bush—believe the violence of the craft."

As the U.S. nuclear weapons buildup gains steam, subterranean test activity in Nevada has increased in step. The Pentagon's Defense Nuclear Agency (DNA) will "pop" three nuclear weapons in fiscal 1985, compared with one every two years during the slackest period of the 1970s. About 7,000 nuclear workers, most of them government contractors, labor at the test site or in nearby Las Vegas compared with 5,000 in 1976, according to a spokesman.

Some of the government's smaller blasts are now kept secret, reversing a practice in effect since 1976 of announcing all tests.

"You're not going to hide the larger tests. There's no way to disguise them," said Department of Energy spokesman David P. Miller, because they can be felt in Las Vegas.

"But who reads the headlines of everything on the front page of The Washington Post or The New York Times? If they want data, let them work for it," he said. "It's just that simple. They may not have conducted a test, but if we don't confirm it, they aren't sure."

Since the Atomic Age began in 1945, the United States has detonated more than 700 nuclear bombs.

THINKING THE UNTHINKABLE

CONCLUSION — The Soviet Union more than 500, according to the Stockholm International Peace Research Institute, before then half of the world's nuclear weapons have been destroyed by a...

...merge of the Limited Test Ban Treaty, which forbade atmospheric tests after 1963.

Most of the 20 or so nuclear detonations each year are Energy Department experiments of new weapon designs or tests to make sure bombs in the stockpile will still explode.

NUCLEAR, From AI

A fraction are more elaborate DNA tests. At 140 million dollars and nearly two years in preparation, the DNA shots are costly, complex and usually intended to gauge the mettle of the American arsenal against a real nuclear blast rather than laboratory simulations.

Each DNA test has a "top" illustrating the code name. Huron Landing depicted a caricature of a man firing a bomb with his fingers in his ears.

The forthcoming "Fairy" test shows a woman in a bikini holding an umbrella.

Each test also has a specific military rationale. Diamond Bush, in July, 1972, tested the resistance to radiation of the now-defunct Safeguard antiballistic missile (ABM) system. Last Feb. 16, Midas Myth did the same for the MX missile's Mark 21 reentry vehicle. Huron King, a Nagasaki-sized blast in 1980, capped a satellite model with electromagnetic pulse (EMP).

"Literally every time something has been exposed to an underground test it has broken—sometimes catastrophically, sometimes only a little bit," said Richard L. Wagner Jr., atomic energy assistant to Defense Secretary Caspar W. Weinberger.

Scientists follow a cycle of "test-fix, test-fix," although some skeptics believe there is no guarantee that the fix would hold up in the stress of nuclear combat.

The DNA's "underground events" are "marvelous engineering achievements. I would say with due modesty," said Dr. Marvin C. Atkeson, the agency's deputy director. Huron Landing, conducted in tunnels 112N below Rainier Mesa in 1980, was typical of several recent tests in intent and design.

The bomb was placed in a large tunnel at the end of the tunnel. The sensors being tested—the DNA...

...to "bulldoze" in a chamber 6,000 feet from the bomb. The bore and chamber were connected by a straight, tapered pipe that was vacuum-pumped to simulate conditions 300,000 feet above the Earth.

When the bomb detonated, radiation streaked down the pipe at the speed of light, spattering the weapons with neutrons, gamma rays and X-rays like those from a Soviet ABM blast.

As the radiation passed, trap doors slammed shut in the pipe to prevent debris from following into the test chamber. The explosion also caused 300 feet of tunnel to collapse, further sealing debris from the bomb.

The emphasis on ABM vulnerability strikes some observers as odd, because the United States and the Soviet Union have a 12-year-old treaty banning all but one small ABM site for each side. But Lt. Gen. James A. Abrahamson, director of the Pentagon's so-called "Star Wars" space weapons defense office, warned a Senate committee last month of "massive Soviet investments" in ABM research.

A Defense Nuclear Agency official adds: "We don't want to give them a cheap kill."

Pursuing Compactness

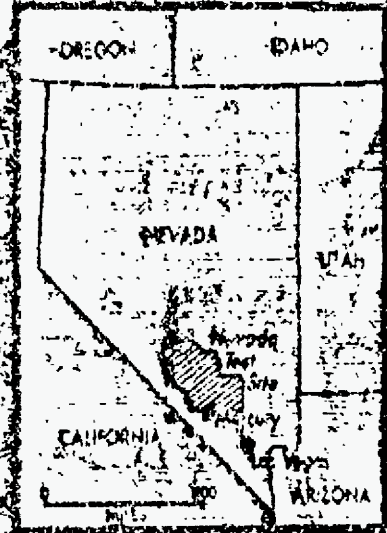
Not all the Nevada tests work as smoothly as Huron Landing. Three months ago, one technician was killed and 24 were injured when Midas Myth caused a cave-in on the site. A March 31 Energy Department test called Agate—DOE says the recent tests are named after processes—produced a small radiation leak.

Unlike the DNA test tunnels, most of DOE's bombs are exploded beneath the desert floor of Yucca Flats, now decommissioned like the moon by subsidence. Testers drill bits the size and shape of Mercury space capsules are used to burrow a hole from 100 feet to 1 mile deep, into which the bomb and its instruments are lowered in a hoist.

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The holes may be six to 12 feet in diameter. A seven- or eight-inch hole is big in the oil business. So when the "oilies" as we call the people who work in the oil industry, come out to work here, it blows their mind how big our holes are," DOE spokesman Miller said.

The blast is monitored in a control center perched in a mountain saddle overlooking the flats. A giant television screen, surrounded by 18 smaller screens, shows the bomb site.



The Washington Post

... data and measurements from radiation sensors. After the detonations workers eventually drill into the "puddle" of molten rock at the bottom of the blast chamber; for samples that offer clues to the bomb's efficiency.

In 1974, Washington and Moscow signed a treaty that, although unratified by the U.S. Senate, has kept both sides from exploding underground warheads larger than 150 kilotons, roughly 10 times the power of the Hiroshima bomb in 1945.

It is believed that warheads larger than that are tested in pieces. Some experts are convinced that many of the current tests are being used to develop "third-generation" nuclear weapons designed to generate X-rays

or other special effects that could "kill" enemy missiles.

"If you can develop a test device which is smaller and more easily utilized, then you can increase the number of tests you can conduct and you can bring down the cost of those tests," said William M. Arkin, an analyst at the Institute for Policy Studies. "I think, in this administration particularly, the trend toward lower yield tests is also based upon a desire to develop third-generation nuclear warheads."

DOE's Miller acknowledged that the test bombs have grown smaller as missiles have grown more accurate, obviating the need for the colossal bombs of the '50s and '60s. Also, smaller delivery systems, such as the subsonic cruise missile, need warheads as compact and light as possible.

"Why use a sledgehammer when a jack hammer will do what you need to do?" Miller added. "It's always been a general goal of weapons development to make them lighter in weight and cheaper.... Bottom line is bigger bang for the buck."

Just in case the Soviets decide to violate the 21-year-old moratorium on atmospheric testing, the Defense Department has kept up appearances at Johnston Island in the South Pacific, which once was a test site. The mothballed facilities aimed to be in such readiness that a major above-ground test could have been conducted within two weeks of a Soviet blast.

"But that was so expensive that we let things slip a bit. Now it would take several months," one official said.

Some scientists confess to yearning for one more atmospheric detonation monitored with today's sophisticated instruments. Because some nuclear effects are difficult to study underground or in simulators, there occasionally is talk of surreptitiously collaborating with the Chinese on an above-ground experiment.

"I think it's bar talk," Wagner, Weinberger's assistant, said. "Once a year you'll hear somebody say, 'Gee, wouldn't it be nice...'"

Modeling Ground Zero

Earlier this year, the DNA informed Congress that an April, 1983, test in Nevada called Mini Jade had allowed scientists for the first time to study "the motion and stresses in the ground directly under a nuclear detonation."

Exploded in a subterranean cavity 70 feet wide, Mini Jade "enabled us to validate many aspects of our cratering prediction codes" and will be followed in fiscal 1985 by a similar test called Mill Yard, the agency reported.

After triggering more than 700 explosions, the government recently became intrigued by what happens at ground zero, eight feet beneath the boom.

In the third days of atomic testing...

ing. Pentagon scientists say that did not seem important because it was assumed that everything that fell behind the enemy would be destroyed.

Nuclear strategists later assumed that "hardening" U.S. missile silos to survive the blast from a Soviet attack also would be futile. Even if the missiles were intact in their steel and concrete cocoons, the strategists reasoned, they would be useless because the silos, which need to be vertical so the missiles can be fired, would be lying horizontally in the massive crater carved by a Soviet warhead.

That thinking has changed recently, according to defense officials. Research under way will shape decisions about where, if anywhere, to base the MX and its proposed successor, the Midgetman.

"We had been overestimating the size of the craters," one officer said. "Most of the cratering analysis was done from tests that had been done in the South Pacific [atmospheric tests] in wet, saturated sand.... But modeling and other analyses tended to indicate that in loose, dry soil the craters would be much smaller in diameter [roughly half the size]. That had a tremendous impact on the issue of survivability."

Hence the DNA's interest in predicting craters.

The government also does another kind of underground testing in California, Louisiana, Utah and elsewhere; model silos have been built and tested under different geological conditions.

Most are either one-quarter or one-eighth scale. Anything smaller becomes astronomically expensive because concrete reinforcing bars must be machine-tooled. Some of the models copy U.S. silo designs; others mimic Soviet designs using CIA and Defense Intelligence Agency information.

High explosives are spread over the silo and then are covered with 10 to 20 feet of dirt. The contained explosion closely simulates the tremendous pressures generated in a nuclear detonation, Pentagon officials believe, and gives some notion of how sturdy U.S. and Soviet silos are.

That, in turn, has an impact on the design and engineering of U.S. silos, and on targeting decisions about how best to "take out" Soviet silos.

The Pentagon official said some model slabs have survived overpressure of 50,000 pounds per square inch (psi), compared with 100 psi commercial buildings, which collapse under 6 psi. The Air Force believes that it is possible to build once 50 times as durable as current Minuteman III silos using concrete, steel, foam and cushioning liquids. The DDA and the Air Force plan to test that hypothesis in 1986.

The idea, as usual, is to make life more difficult for the Soviets. Some Pentagon strategists believe that Moscow would have to use massive warheads in the 10- to 20-megaton range or develop a warhead that can burrow its way underground before detonating.

Added one officer: "It's a real interesting technical issue now that has to be resolved."

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