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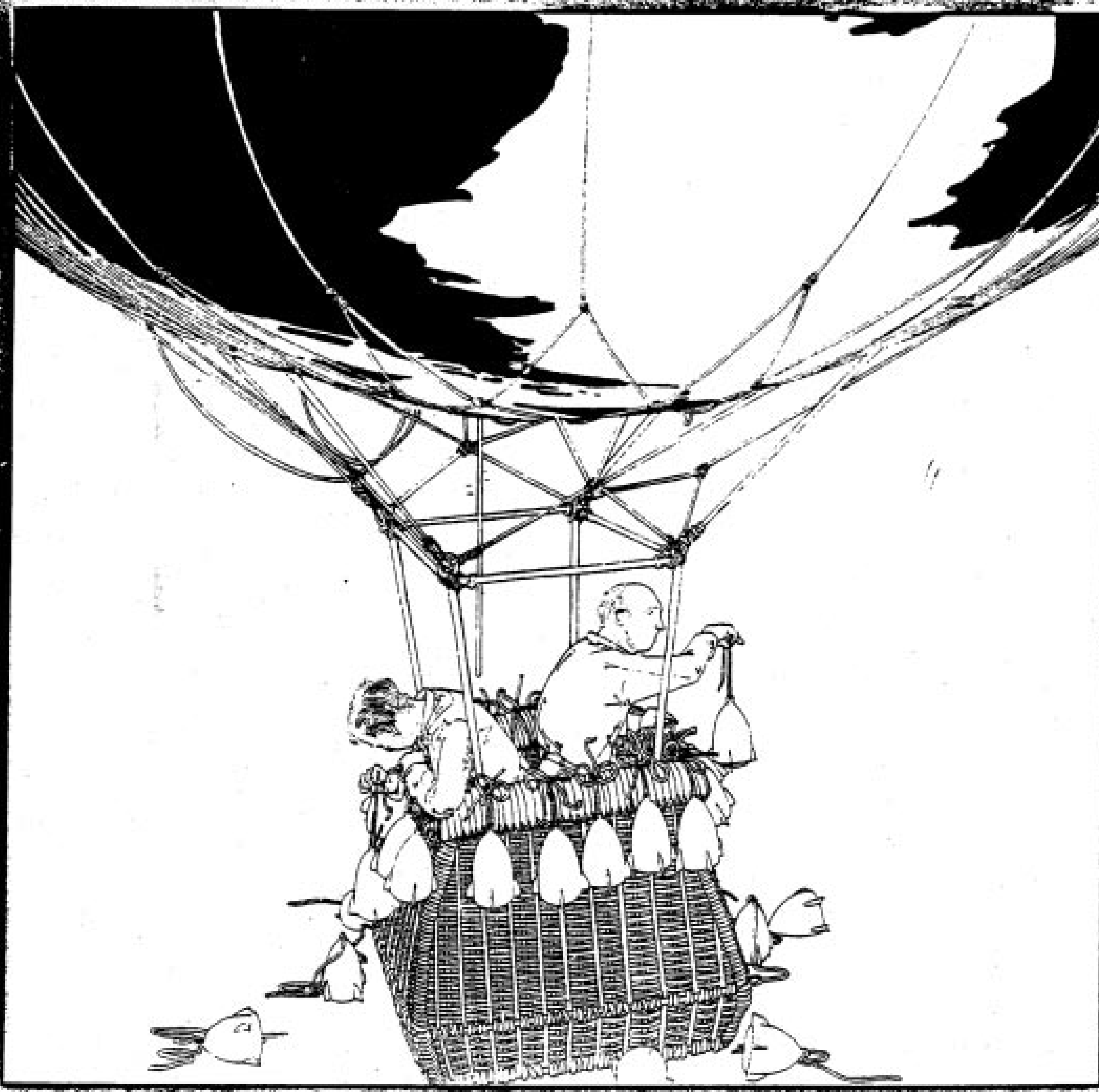
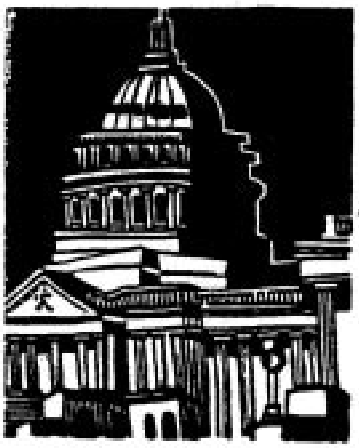
Radical Weapons Cu



Next Steps after the Summit

Gorbachev's Foreign Policy



Washington Report

Behind the disclosure of U.S. secret tests

U.S. practice for more than three decades has been not to announce all nuclear tests. While no official reason is given for this policy, Robert S. Norris of the Natural Resources Defense Council believes the government wants to "keep the visible level of activity lower than it is."

Secret tests are normally very small, some well below a kiloton, according to Norris. As the sensitivity and sophistication of seismic equipment increase, however, even these small tests can be detected. The NRDC's Nuclear Weapons Databook project has discovered to date 117 secret U.S. tests, 71 of these (in the period 1963–1978) only recently. The new findings were released in January in the project's working paper, "Known U.S. Nuclear Tests July 1945 to 31 December 1987," excerpted below (see also page 56).

The new data came from Riley R. Geary, a seismologist at the California Institute of Technology. Caltech's seismic information, says Norris, is second only to that of the U.S. government, whose data are secret. Ironically, many of the secret tests previously discovered by the Databook project were deciphered from a government source: the U.S. Geological Survey's monthly journal of seismic activity. "A certain number of sources have to report it for it to end up in the journal," says Norris, so the smallest tremors go unreported. It was these "tiny" disturbances that Riley uncovered in the Caltech data and identified as nuclear tests.

Detecting a nuclear test from seismic data is not that difficult, Norris says. "You zero in on the coordinates of the Nevada Test Site, you zero in on the times." Geary says most tests are conducted between 6 a.m. and 4 p.m., and a seismic disturbance "right on the minute—often at the hour or half-hour—is a dead giveaway." Another giveaway is an event's location within one of the known testing areas at the site, which are pinpointed with Caltech seismometers located in Owens Valley and the Mojave Desert in California, about 200 kilometers away.

To these factors, Geary adds observations about the character of the seismic waves generated by the event. Another distinctive feature of nuclear explosions that shows up on seismograms is the collapse of the test cavity that follows minutes or even days after the blast. Says Norris: "If it looks like a duck and walks like a duck, it's probably a duck."

—The editors

by Robert S. Norris, Thomas B. Cochran, and William M. Arkin

IT NORMALLY TAKES about a year to prepare a vertical shaft test. [Underground nuclear tests are conducted at the Nevada Test Site (NTS) in two different ways: in vertical shafts to test the yield and characteristics of nuclear explosive devices, and in horizontal tunnels to test a weapon's effect on equipment and systems.] Approximately 12 months before D-Day after the design of the device or weapon is known, the diagnostics are researched, the information for the canister (or rack) design is generated, the geology for the test hole is examined, the test location at NTS is selected, and the hole is drilled. . . . Normally tests below 20 kilotons are detonated in holes approximately 1,000 feet deep while tests of 20–150 kilotons use holes from 1,500 to 2,000 feet deep. . . .

At five weeks to D-Day tests are conducted on the firing system, and timing signals (systems tests) are sent to diagnostic stations to make sure they are operating. At three weeks the nuclear device or warhead is brought to the hole and is placed at the lower end of the long (up to 200 feet) cylindrical canister. The canister contains the nuclear device or warhead, firing components, radiation detectors, spectroscopes, electronic instrumentation, and television cameras. . . .

With two weeks until D-Day "stemming" or backfilling the hole begins. The purpose of stemming is to prevent the escape of radioactive materials into the environment. Emplacement holes are stemmed with layers of different materials. The first layer above the rack is magnetite, an iron oxide material which provides shielding for the experiment. This is followed by alternate layers of coarse gravel and fine sand. Two or more epoxy plugs about 10 feet thick are placed at intervals to provide gas blocking.

After shot Baneberry (December 18, 1970) vented an

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enormous amount of radioactivity into the atmosphere, new procedures were established in the preparation of each test. The Containment Evaluation Panel was created to assist . . . in reviewing each upcoming test so that it will be satisfactorily contained. . . .

When the device detonates, it creates a large underground cavity sometimes hundreds of feet in diameter, the bottom of which quickly fills with molten rock, materials, and debris. As the heat and pressure subside, material begins to fall into the cavity, creating a void that progressively works its way up. If the void reaches the surface, the overlying rock collapses under its own weight, producing a large subsidence crater. This may occur minutes, hours, or days after the explosion. . . . The NTS is pockmarked with several hundred craters of various sizes from 200 to 2,000 feet in diameter and up to 200 feet deep. Astronauts have used the test site for training missions prior to their journeys to the moon. . . .

Types of tests

Weapons development tests comprise approximately 75 to 80 percent of the nuclear tests conducted each year. These tests contribute to the engineering of a specific new warhead for a specific new weapon system. . . . It requires approximately six nuclear tests to develop a new design and to certify it for introduction into the stockpile. . . .

If the new concepts are very exotic many more tests might be needed. The Reagan administration has accelerated funding to examine five nuclear-driven directed energy weapon concepts. . . . The head of Theoretical and Computational Physics at Los Alamos National Laboratory estimates that it could require 100 to 200 test explosions per concept to perfect each of these new designs. This extra 500–1,000 tests would be in addition to exploring other concepts and having to test them as well. At current testing rates, or even accelerated ones, this would take decades, and tens of billions of dollars to accomplish. . . .

Production verification tests are underground nuclear tests of war-reserve warheads selected from the production line and are usually the first test in its actual stockpile configuration. . . .

A less frequent kind of test is a *stockpile confidence* test of an older warhead type already in the stockpile to see if it still performs as expected. These tests are very rare. Since 1970 only eight tests out of almost 300 (3 percent) have been conducted to correct defects in stockpiled weapons. . . . There must be some very good reason for a test to be conducted of an older warhead. There is no procedure by which warheads are randomly removed from the stockpile, transported to Nevada, and exploded. . . . In the past, problems have been identified through non-nuclear tests and inspections and explosive nuclear tests have been conducted to see if they were corrected, but even those cases have been quite rare.

Physics tests are conducted to improve the understanding of the fundamental phenomena of a nuclear explosion. Despite the fact that over 920 tests have been conducted and the national laboratories possess the largest computing facilities in the country, the warhead designers claim that there are still things which are not fully understood about a nuclear explosion. Therefore some two or three tests a year (approximately 5 percent) are conducted for this purpose. These tests are normally of a very small yield (fractions of a kiloton—down to 100 tons or below) and are normally not announced by the Department of Energy. . . .

The purpose of a *weapons effects* test is to research the range of nuclear effects—airblast, ground and water shock, heat, electromagnetic pulse, neutrons, gamma and X-rays—and apply that knowledge to military systems, plans, and policy. More specifically, the weapons effects test program assesses the survivability of U.S. military systems in a nuclear environment and predicts lethality levels for destruction of enemy forces and equipment. The Defense Nuclear Agency is responsible for research in this area and in recent years has conducted two or three tests per year at the NTS. Overall 89 weapons effects tests have been conducted accounting for approximately 11 percent of the total.

Most modern weapons effects tests are conducted within a horizontally mined tunnel drilled into Ranier Mesa [at the test site]. These extensive engineering projects take approximately 18 months to prepare. . . . Within the test chambers are placed hundreds of components and materials, from reentry vehicles to communications equipment. The experiments are mounted at various distances, chosen to expose the equipment to radiation between half and twice their design limits. . . . Various rapid closure mechanisms . . . allow radiation generated by the nuclear device to reach the test chambers but prevent the escape of debris and radioactive gases. . . . In a . . . recent test (Mighty Oak) the doors malfunctioned, which caused contamination throughout the tunnel thus ruining much equipment and many experiments. . . .

An average weapons development vertical shaft test costs approximately $20–$30 million. Because of the more extensive tunnelling needed for a horizontal effects test, costs are higher ranging between $40 million and $70 million per test.

Since the Manhattan Project the designing of new nuclear weapons has been one of the most important driving forces for the development of ever more powerful computers. . . . The higher power of the more recent supercomputers leads to more accurate modeling thus reducing the number of tests (and the cost) necessary to design a specific warhead. For example an earlier warhead designed with the Control Data Corporation (CDC) 6600 required 23 field tests, whereas a more recent one designed with the CDC 7600 needed only six. . . . This trend of reduced numbers of tests per warhead type should be kept in mind in comparing current numbers of U.S. tests with past years, as well as in comparing the annual numbers of tests by the United States and the Soviet Union. □