



Gallery of U.S. Nuclear Tests

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Between 16 July 1945 and 23 September 1992 the United States of America conducted (by official count) 1054 nuclear tests, and two nuclear attacks. The number of actual nuclear *devices* (aka "bombs") tested, and nuclear *explosions* is larger than this, but harder to establish precisely. Some devices that were tested failed to produce any noticeable explosion (some by design, some not), other "tests" (by official definition) were actually multiple device detonations. It is not clear whether all multiple device tests have yet been identified, and enumerated.

These pages focus principally (although not exclusively) on the period from 16 July 1945 to 4 November 1962, the era of atmospheric testing*. There are a number of reasons for this. These early years marked the height of the Cold War, when the U.S. nuclear weapons establishment came into being, when the major breakthroughs in weapon design occurred, and when the most severe effects of nuclear testing were felt around the world. During this period test series were grand operations, involving huge numbers of people, and each often with a set of clear objectives. The era of atmospheric testing is also the period for which the most information is available. When tests were exploded in the open, everyone could collect data on what was being tested. When the tests went underground, testing became routine, and information about what was being tested went underground too. And of course, we can't have a gallery without pictures- and atmospheric tests are the only ones for which pictures exist.

* There were actually a few surface tests included in the official test count conducted after 4 November 1962. These were a series of zero yield tests of plutonium dispersal conducted in 1963, known as Operation Roller Coaster.

Nuclear Testing and Health

Ever since nuclear testing began it has been very difficult to get a useful accounting of human exposures to the fallout from these tests. Partly this was motivated by military secrecy, partly by a desire to allay public fears (i.e public relations reasons), and partly by a fear of possible legal action by actual or potential victims. Some exposure related incidents have been revealed due to the impossibility of hiding them: namely the high radiation exposures of the [Marshallese](#) and the Japanese aboard the *Fifth Lucky Dragon* after the Castle Bravo disaster. But most information on this subject has been withheld, deliberately buried in obscure reports, or never collected (this is the principle of being careful not to learn what you don't want to know). This information has slowly come to light in bits and pieces over the last 20 years.

What is probably the most important study of the health effects of testing were announced by the National Cancer Institute in August of 1997, and released in October. The study report is now available on line: [National Cancer Institute Study Estimating Thyroid Doses of I-131 Received by Americans](#)

[From Nevada Atmospheric Nuclear Bomb Test.](#)

The basic finding of the report is that internal exposures to radioiodine (I-131) in fallout from continental nuclear testing was the most serious health consequence. Radioiodine concentrates in milk when consumed by cows when grazing, and then concentrates in human thyroid glands when contaminated milk is ingested. This concentration effect is especially strong in children. The NCI study estimates that the average American alive at the time received a thyroid radiation exposure of 2 rads, with some people receiving up to 300 rads. The effect of these exposures is to boost the chance of contracting thyroid cancer some time during a lifetime. This cancer is normally not very rare, and is highly treatable (as cancers go). It is possible to estimate the overall effect of the total radiation exposure of the American population. From the 380 million person-rads of total exposure roughly 120,000 extra cases of thyroid cancer can be expected to develop, resulting in some 6,000 deaths [[See note](#)]. For comparison, the worst industrial disaster in history (Bhopal, India; 3 December 1984) killed about 3000 people and injured 150,000.

No effort was made to systematically study the nationwide effects of atmospheric nuclear testing until congress ordered the study -- which was finally released *15 years* later. In hearing held in September 1998, Bruce Wachholz, chief of the radiation effects branch of the National Cancer Institute, told a Senate hearing that the basic results were known as early as 1989 and a final draft report was completed in 1992 yet none of the information was made public for five more years.

The Nuclear Test Series

United States nuclear tests were conducted on an intermittent basis from July 1946 to October 1958. During this period, nuclear tests were conducted in groups known as "operations" or "test series", each series was a distinct operation that was organized and carried out independently of other operations.

On 31 October 1958, just after it concluded the largest test series to date, the United States entered into a unilateral testing moratorium announced by President Eisenhower with the understanding that the former Soviet Union also would refrain from conducting tests. The Soviet Union honored this moratorium initially, but secretly prepared for a massive testing campaign which commenced in September 1961, and included the largest nuclear tests ever conducted.

On September 15, 1961, the United States resumed testing at the Nevada Test Site (NTS) on a year-round basis with Operation Nougat. From that time to the present, tests have principally been grouped for fiscal and reporting purposes into "operations" or "series" according to the fiscal year in which they took place. For example, fiscal year 1963 tests -- which began 1 July 1962 and extended through 30 June 1963 -- were in the Operation Storax series.

Important exceptions to this scheme were a number of test series conducted during 1962-63:

- Operation Dominic (which also been called Dominic I), conducted between 25 April and 4 November of 1962 (and thus overlapping Nougat and Storax); and which included
 - the Department of Defense (DoD) Operation Fishbowl high-altitude tests in the Pacific.
- Operation Sunbeam (also known as Dominic II), four weapons effects tests conducted by the DoD at the NTS between 7 July and 17 July 1962 (concurrent with Storax)
- Operation Roller Coaster, four zero-yield tests conducted jointly by the US and UK at Nellis Air Force Range (NAFR) between 15 May and 9 June 1963 (concurrent with Storax).

Atmospheric testing concluded with the test Dominic/Fishbowl Tightrope on 4 November 1962. The signing of the Atmospheric Test Ban Treaty on 5 August 1963 in Moscow halted all further atmospheric testing by both superpowers.

The Fiscal Year based underground series was perturbed in 1976, when the federal government changed the fiscal year to begin on October 1 and end on September 30. Accordingly, the Fiscal Year 1976 series, Operation Anvil, did not end on June 30, but was extended through September 30, 1976 -- a period of 15 months.

On March 31, 1976, the Soviet Union and the United States agreed to limit the maximum yield of underground tests to 150 kt.

On October 2, 1992, the United States entered into another unilateral moratorium on nuclear weapons testing announced by President Bush. President Clinton extended this moratorium in July 1993, and again in March 1994 until September 1995. With the signing of the Comprehensive Test Ban Treaty in September 1996, the United States -- along with the other nuclear powers -- made a legal commitment never to test nuclear devices again, even though this treaty will likely never go into force due to the opposition of India.

The Atmospheric Test Series

Trinity - The First Nuclear Test

Operation	Year	Location	Number
Trinity	1945	Alamagordo New Mexico	1

The Post War Test Series

Operation	Year	Location	Number
Crossroads	1946	Bikini Atoll	2
Sandstone	1948	Enewetak Atoll	3
Ranger	1951	Nevada Test Site	5
Greenhouse	1951	Enewetak Atoll	4
Buster-Jangle	1951	Nevada Test Site	7
Tumbler-Snapper	1951	Nevada Test Site	7
Ivy	1952	Enewetak Atoll	2
Upshot-Knothole	1953	Nevada Test Site	11
Castle	1954	Bikini Atoll Enewetak Atoll	6
Teapot	1955	Nevada Test Site	14
Wigwam	1955	Pacific Ocean	1
Project 56	1955	Nevada Test Site	4
Redwing	1956	Bikini Atoll Enewetak Atoll	17

Plumbbob	1957	Nevada Test Site	30
Project 58	1957	Nevada Test Site	2
Project 58 A	1958	Nevada Test Site	2
Hardtack I	1958	Bikini Atoll Enewetak Atoll Johnston Island	35
Argus	1958	South Atlantic	3
Hardtack II	1958	Nevada Test Site	37
Nougat	1961-1962	Nevada Test Site	32
Dominic (with Fishbowl)	1962	Christmas Island Johnston Island Central Pacific	36
Storax (with Sunbeam and Roller Coaster)	1962-1963	Nevada Test Site Nellis Air Force Range	56

Underground Tests at the Nevada Test Site

1963 to the present

[Overview of underground testing.](#)

[Official List of Underground Nuclear Explosions \(UNEs\) in Nevada from Sandia National Laboratories \(July, 1994\).](#)

U.S. Test Locations

The first test of a nuclear weapon was in the atmosphere on July 16, 1945, in a remote part of New Mexico on what was then the Alamogordo Bombing Range, and is now the White Sands Missile Range. The site is 55 miles northwest of Alamogordo, New Mexico. At various times between June 1946 and November 1962, atmospheric and underground tests were conducted by the United States in the Marshall Islands (known as the Pacific Proving Grounds or PPG), Christmas Island, Johnston Atoll in the Pacific Ocean, and over the South Atlantic Ocean. Between January 1951 and July 1962, atmospheric and underground nuclear tests were conducted in Nevada at the Nevada Test Site (NTS, originally called the Nevada Proving Grounds or NPG).

Since July 1962, all nuclear tests conducted in the United States have been underground, and most of them have been at the NTS. Some tests were conducted on the Nellis Air Force Range (NAFR); in central and northwestern Nevada; in Colorado, New Mexico, and Mississippi; and on Amchitka, one of the Aleutian Islands off the coast of Alaska.

Maps of the test sites:

- [Continental U.S. test sites \(65 K, 691 x 598\)](#)
- Pacific Ocean: [Larger map \(91 K, 976 x 710\)](#); [Smaller map \(49 K, 639 x 469\)](#)
 - Enewetak Atoll: [Larger map \(20 K, 920 x 1104\)](#); [Smaller map \(13 K, 466 x 611\)](#)
 - Bikini Atoll: [Larger map \(67 K, 944 x 796\)](#); [Smaller map \(56 K, 623 x 532\)](#)

- Christmas Island: [Map \(58 K, 503 x 481\)](#)
- Johnston Island: [Picture \(76 K\)](#)
- Nevada Test Site: [Topographic map \(17 K, 516 x 498\)](#), [Area map \(93 K, 443 x 647\)](#)

[About the Pacific Proving Ground](#)

Principle References Used for the Gallery of U.S. Nuclear Tests

- *The Swords of Armageddon: U.S. Nuclear Weapons Development Since 1945*, Chuck Hansen, October 1995, Chuckelea Publications;
 - *U.S. Nuclear Weapons: The Secret History*, Chuck Hansen, 1988, Orion Books;
 - *United States Nuclear Tests; July 1945 to 31 December 1992*, Robert S. Norris and Thomas B. Cochran, NWD 94-1, 1 February 1994, NRDC (Natural Resources Defense Council);
 - *Reflections of a Nuclear Weaponeer*, by Frank H. Shelton; 1988, Shelton Enterprise, Inc.
 - *United States Nuclear Tests, July 1945 through September 1992*, DOE/NV-209 (Rev. 14), December 1994
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On-Line Sources on U.S. Nuclear Tests

- [United States Nuclear Tests, July 1945 through September 1992, DOE/NV-209 \(Rev. 15\), 2001](#) - lists chronologically and alphabetically by name all nuclear tests and simultaneous detonations conducted by the United States. Acrobat (.pdf) download (36 kilobytes). Regretably the DOE Nevada web site has removed the HTML format on-line version of this catalog.
- [Radiological Effluents Released from U.S. Continental Tests, 1961 through 1992, DOE/NV-317 \(Rev. 1\), August 1996](#) - documents all U.S. continental nuclear tests from 1961 through 1992 from which radioactive effluents were released.
- [Official list of announced Nevada Test Site explosions \[1995\]](#)
- [Comprehensive List of All Nuclear Explosions by Jim Lawson \[8/1996\]](#)
- [Historical Estimates Of External Gamma Exposure And Population External Gamma Exposure From Testing At The Nevada Test Site. Part 1, Test Series Through Hardtack 2, 1958](#); Anspaugh, Lynn R; Church, B W.; Ucr1-87380; pg. 39; December 1, 1984; Acrobat (.pdf) download 3.7 megabytes.
- The *National Cancer Institute Study Estimating Thyroid Doses of I-131 Received by Americans From Nevada Atmospheric Nuclear Bomb Test*, 1997 is available from the [National Cancer Institute](#). To get the full report, in Acrobat (.pdf) format [click here](#).
- Go to the [DOE IHP Marshall Islands Program](#) this is an on-line repository of more than 6,000 documents pertaining to the U.S. Nuclear Testing Program in the Marshalls Islands.

