

The Top 10 Largest Nuclear Explosions, Visualized

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Just how powerful are nuclear explosions?

The U.S.’ Trinity test in 1945, the first-ever nuclear detonation, released around 19 kilotons of explosive energy. The explosion instantly vaporized the tower it stood on and turned the surrounding sand into green glass, before sending a powerful heatwave across the desert.

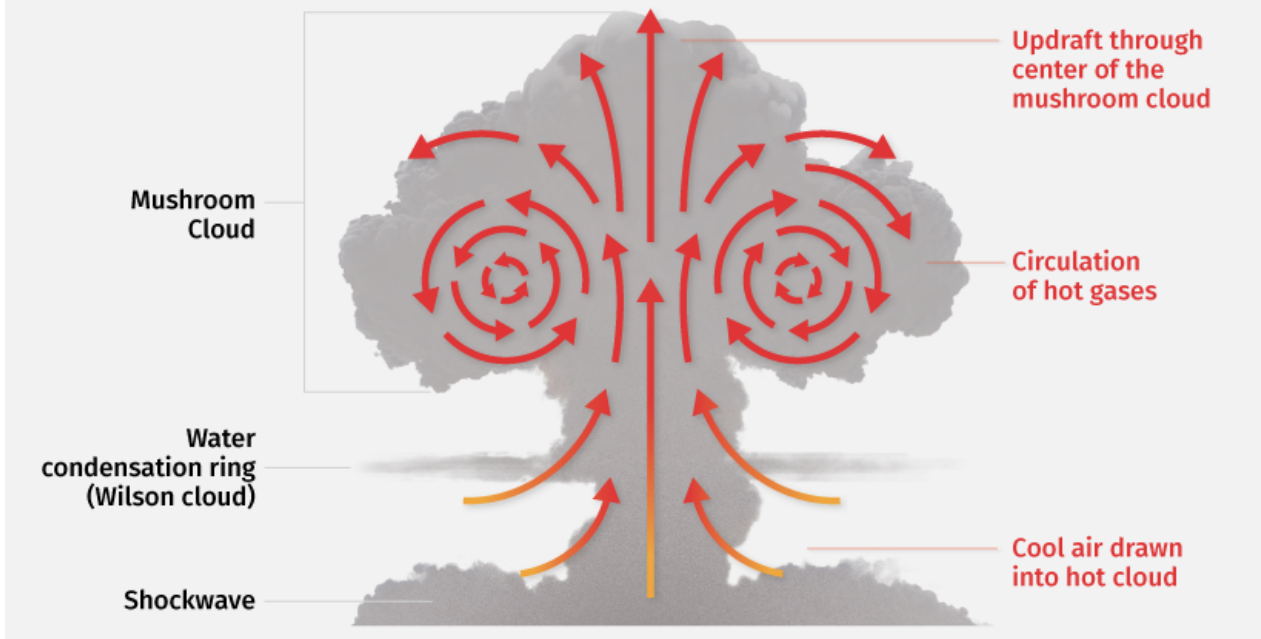
As the Cold War escalated in the years after WWII, the U.S. and the Soviet Union tested bombs that were at least 500 times greater in explosive power. This infographic visually compares the 10 largest nuclear explosions in history.

The Anatomy of a Nuclear Explosion

After exploding, nuclear bombs create giant fireballs that generate a blinding flash and a searing heatwave. The fireball engulfs the surrounding air, getting larger as it rises like a hot air balloon.

As the fireball and heated air rise, they are flattened by cooler, denser air high up in the atmosphere, creating the mushroom “cap” structure. At the base of the cloud, the fireball causes physical destruction by sending a shockwave moving outwards at thousands of miles an hour.

Anatomy of a Nuclear Explosion's "Mushroom Cloud"



A strong updraft of air and dirt particles through the center of the cloud forms the "stem" of the mushroom cloud. In most atomic explosions, changing atmospheric pressure and water condensation create rings that surround the cloud, also known as Wilson clouds.

Over time, the mushroom cloud dissipates. However, it leaves behind radioactive fallout in the form of nuclear particles, debris, dust, and ash, causing lasting damage to the local environment. Because the particles are lightweight, global wind patterns often distribute them far beyond the place of detonation.

With this context in mind, here's a look at the 10 largest nuclear explosions.

TOP 10 LARGEST NUCLEAR EXPLOSIONS

Since the first atomic bombs were dropped on Nagasaki and Hiroshima in 1945 during World War II, there have been over 2,000 nuclear tests around the world. Within 20 years, the United States and former Soviet Union tested nuclear weapons whose explosive power were at least 500 times greater.

We visually compare the top 10 largest nuclear explosions of all time.

The following nuclear explosions are displayed chronologically. All of them were conducted in remote locations and not near civilian populations.

KEY



Height of explosion's "mushroom cloud"

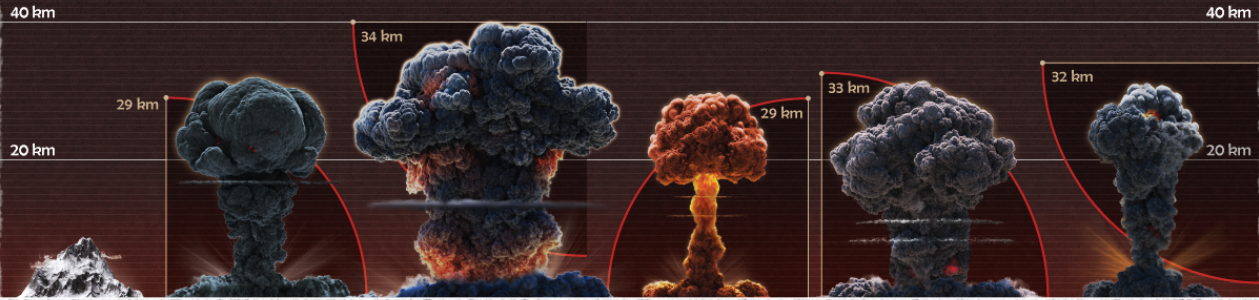
Measure of total* destructive radius *including radiation, heatwave, and shockwave; all radii illustrate blasts that occur on the surface

Operation Name
Location, Year

Country of origin

Nuclear Yield

Measures the amount of explosive energy in kilotons of TNT (kt)



Mount Everest
8.8 km

Ivy Mike
Johnston Atoll, 1952
10 400 kt

Castle Bravo
Bikini Atoll, 1954
15 000 kt

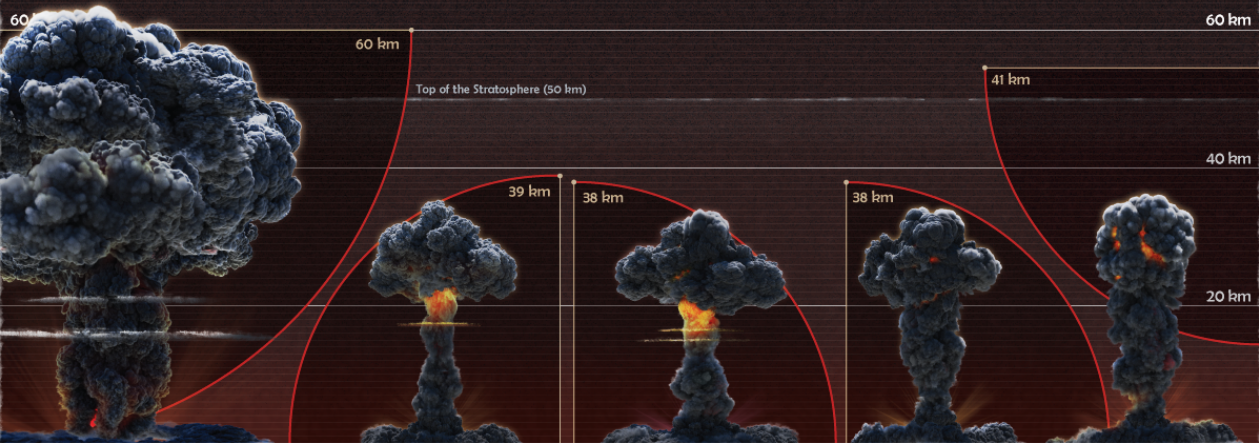
Castle Romeo
Bikini Atoll, 1954
11 000 kt

Castle Yankee
Bikini Atoll, 1954
13 500 kt

Soviet Test #123
Sukhoy Nos, 1961
12 500 kt

The most powerful nuclear explosions come from hydrogen bombs. Ivy Mike was the very first.

The **Bikini Atoll** is a coral reef in the Pacific Marshall Islands. It is 10 times more radioactive than Chernobyl as a result of repetitive nuclear testing.



Tsar Bomba
Sukhoy Nos, 1961
50 000 kt

Soviet Test #147
Sukhoy Nos, 1962
21 100 kt

Soviet Test #173
Sukhoy Nos, 1962
19 100 kt

Soviet Test #174
Sukhoy Nos, 1962
20 000 kt

Soviet Test #219
Sukhoy Nos, 1962
24 200 kt

The Tsar Bomba is the largest nuclear explosion of all time. It completely obliterated an abandoned village 55 km away.



The Soviet Union's largest nuclear tests were conducted on **Sukhoy Nos**, a region on the northern Russian archipelago called Novaya Zemlya.

There are no released photos or videos of this explosion. Despite being the second largest nuclear explosion of all time, it's height and destructive radius are estimated.

SOURCES: "These Are the 12 Largest Nuclear Detonations in History." Business Insider, shorturl.at/luYER. "1962 Soviet Nuclear Tests." Wikipedia, 1 July 2021, en.wikipedia.org/wiki/1962_Soviet_nuclear_tests. Mushroom cloud size and destructive radii data are calculated from NUKEMAP by Alex Wellerstein. (nuclearsecrecy.com/nukemap)



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#10: Ivy Mike (1952)

In 1952, the U.S. detonated the *Mike* device—the first-ever hydrogen bomb—as part of Operation Ivy. Hydrogen bombs rely on [nuclear fusion](#) to amplify their explosions, producing much more explosive energy than atomic bombs that use nuclear fission.

Weighing 140,000 pounds (63,500kg), the Ivy Mike test generated a yield of 10,400 kilotons, equivalent to the explosive power of 10.4 million tons of TNT. The explosion was 700 times more powerful than *Little Boy*, the bomb dropped on Hiroshima in 1945.

#9: Castle Romeo (1954)

Castle Romeo was part of the Operation Castle series of U.S. nuclear tests taking place on the Marshall Islands. Shockingly, the U.S. was running out of islands to conduct tests, making *Romeo* the first-ever test conducted on a barge in the ocean.

At 11,000 kilotons, the test produced more than double its predicted explosive energy of 4,000 kilotons. Its fireball, as seen below, is one of the most iconic images ever captured of a nuclear explosion.

#8: Soviet Test #123 (1961)

Test #123 was one of the 57 tests conducted by the Soviet Union in 1961. Most of these tests were conducted on the [Novaya Zemlya archipelago](#) in Northwestern Russia. The bomb yielded 12,500 kilotons of explosive energy, enough to vaporize everything within a 2.1 mile (3.5km) radius.

#7: Castle Yankee (1954)

Castle Yankee was the fifth test in Operation Castle. The explosion marked the second-most powerful nuclear test by the U.S.

It yielded 13,500 kilotons, much higher than the predicted yield of up to 10,000 kilotons. Within four days of the blast, its fallout reached Mexico City, roughly 7,100 miles (11,400km) away.

#6: Castle Bravo (1954)

Castle Bravo, the first of the Castle Operation series, accidentally became the most powerful nuclear bomb tested by the U.S.

Due to a design error, the explosive energy from the bomb reached 15,000 kilotons, two and a half times what was expected. The mushroom cloud climbed up to roughly 25 miles (40km).

As a result of the test, an area of 7,000 square miles was contaminated, and inhabitants of nearby atolls were exposed to high levels of radioactive fallout. Traces of the blast were found in Australia, India, Japan, and Europe.

#5, #4, #3: Soviet Tests #173, #174, #147 (1962)

In 1962, the Soviet Union conducted 78 nuclear tests, three of which produced the fifth, fourth, and third-most powerful explosions in history. Tests #173, #174, and #147 each

yielded around 20,000 kilotons. Due to the absolute secrecy of these tests, no photos or videos have been released.

#2: Soviet Test #219 (1962)

Test #219 was an atmospheric nuclear test carried out using an intercontinental ballistic missile (ICBM), with the bomb exploding at a height of 2.3 miles (3.8km) above sea level. It was the second-most powerful nuclear explosion, with a yield of 24,200 kilotons and a destructive radius of ~25 miles (41km).

#1: Tsar Bomba (1961)

Tsar Bomba, also called *Big Ivan*, needed a specially designed plane because it was too heavy to carry on conventional aircraft. The bomb was attached to a [giant parachute](#) to give the plane time to fly away.

The explosion, yielding 50,000 kilotons, obliterated an abandoned village 34 miles (55km) away and generated a 5.0-5.25 magnitude earthquake in the surrounding region. Initially, it was designed as a 100,000 kiloton bomb, but its yield was cut to half its potential by the Soviet Union. Tsar Bomba's mushroom cloud breached through the stratosphere to reach a height of over 37 miles (60km), roughly six times the flying height of commercial aircraft.

The two bombs dropped on Hiroshima and Nagasaki had devastating consequences, and their explosive yields were only a fraction of the 10 largest explosions. The power of modern nuclear weapons makes their scale of destruction truly unfathomable, and as history suggests, the outcomes can be unpredictable.

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Featured image: The world's first nuclear explosion - the U.S. 'Trinity' atomic test in New Mexico, July 16, 1945. If a nuclear war breaks out today, the devastation caused by modern nuclear weapons would make Trinity's power look small by comparison. Most life on Earth would likely be wiped out. | U.S. Department of Energy

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