

# Nuclear war

War



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## NUCLEAR WARFARE

Nuclear Weapons are explosive devices made to release nuclear energy. The first atomic bomb, which was tested on July 16, 1945, at Alamogordo, New Mexico, represented a completely new type of artificial explosive. All explosives get their power from the rapid burning or decomposition of some chemical compound. Such chemical processes release only the energy of the outermost electrons in the atom.

Nuclear explosives involve energy sources within the core, or nucleus, of the atom. The A-bomb gained its power from the splitting, or fission, of all the atomic nuclei in several kilograms of plutonium. A sphere about the size of a baseball produced an explosion equal to 20, 000 tons of TNT.

The A-bomb was constructed, and tested by the Manhattan Project, a big United States enterprise that was established in August 1942, during World War II. It was made by a group scientist including the physicists Enrico Fermi and J. Robert Oppenheimer, and the chemist Harold Urey, and was in charge by an U. S. Army engineer, Major General Leslie Groves.

After the war, the U. S. Atomic Energy Commission became in charge of all nuclear matters, including weapons research. Other types of bombs were developed to tap the energy of light elements, such as hydrogen. In these bombs the source of energy is the fusion process, in which nuclei of the isotopes of hydrogen combine to form a heavier helium nucleus. This weapons research has resulted in the production of bombs that range in power from a fraction of a kiloton to many megatons. The size of the bomb has been made smaller helping the development of nuclear artillery shells and small missiles that can be fired from portable launchers in the field.

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Nuclear bombs were originally developed as strategic weapons to be carried by large bombers; nuclear weapons are now available for a variety of both strategic and tactical applications. Not only can they be delivered by different types of aircraft, but rockets and guided missiles of many sizes can now carry nuclear warheads and can be launched from the ground, the air, or underwater. Large rockets can carry multiple warheads for delivery to separate targets.

#### Detonation of Atomic Bombs

Many different systems have been made to detonate the atomic bomb. The best system is the gun-type weapon. The atomic bomb exploded by the United States over Hiroshima, Japan, on August 6, 1945, was a gun-type weapon. It had the energy of anywhere between 12.5 to 15 kilotons of TNT. Three days later the United States dropped a second atomic bomb over Nagasaki, Japan, with the energy equivalent of close to 22 kilotons of TNT.

A more effective method, known as implosion, is used in a spherically shaped weapon. The outer part of the sphere consists of a layer of closely fitted and specially shaped devices, called lenses, consisting of high explosive and designed to concentrate the blast toward the center of the bomb. Each part of the high explosive is equipped with a detonator, and is wired to all other parts. An electrical impulse explodes all the chunks of high explosive all at the same time. At the core is a sphere of fissile material, which is compressed by the powerful, inwardly directed pressure, or implosion. The density of the metal is increased, and a supercritical assembly is produced. The Alamogordo test bomb, as well as the one dropped by the U. S. on

Nagasaki, Japan, on August 9, 1945, were of the implosion type. Each was equivalent to about 20 kilotons of TNT.

### Thermonuclear, or Fusion, Weapons

Even before the first atomic bomb was developed, scientists realized that a type of nuclear reaction different from the fission process was theoretically possible as a source of nuclear energy. Instead of using the energy released as a result of a chain reaction in fissile material, nuclear weapons could use the energy released in the fusion of light elements. This process is the opposite of fission, since it involves the fusing together of the nuclei of isotopes of light atoms such as hydrogen. It is for this reason that the weapons based on nuclear-fusion reactions are often called hydrogen bombs, or H-bombs.

### Thermonuclear Tests

November 1, 1952, there was a test with a fusion-type device called Mike, which was part of Operation Ivy. It produced an explosion with power equivalent to several million tons of TNT. The Soviet Union detonated a thermonuclear weapon in the megaton range in August 1953. On March 1, 1954, the U. S. exploded a fusion bomb with a power of 15 megatons. It created a glowing fireball, more than 4.8 km in diameter, and a huge mushroom cloud (1).

The March 1954 explosion led to worldwide identification of the nature of radioactive fallout (2). The fallout of radioactive debris from the huge bomb cloud also revealed much about the nature of the thermonuclear bomb. Had the bomb been a weapon consisting of an A-bomb trigger and a core of

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hydrogen isotopes, the only persistent radioactivity from the explosion would have been the result of the fission debris from the trigger and from the radioactivity induced by neutrons in coral and seawater. Some of the radioactive debris, however, fell on the Lucky Dragon, a Japanese vessel engaged in tuna fishing about 160 km from the test site. Japanese scientists later analyzed this radioactive dust. The results demonstrated that the bomb that dusted the Lucky Dragon with fallout was more than just an H-bomb.

### Blast Effects

As is the case with explosions caused by common weapons, most of the damage to buildings and other structures from a nuclear explosion results, directly or indirectly, from the effects of blast. The very fast expansion of the bomb materials produces a high-pressure pulse, or shock wave (3), that moves rapidly outward from the exploding bomb. In air, this shock wave is called a blast wave because it is equivalent to and is accompanied by powerful winds of much greater than hurricane force. Damage is caused both by the high excess of air at the front of the blast wave and by the very strong winds that persist after the wave front has passed. The degree of blast damage suffered on the ground depends on the TNT equivalent of the explosion; the height of the blast and the point directly under the bomb. For the 20-kiloton A-bombs detonated over Japan, the height of burst was about 580 m because it was estimated that this height would produce a maximum area of damage. If the TNT equivalent had been larger, a greater height of burst would have been chosen.

### Thermal Effects

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The very high temperatures attained in a nuclear explosion result in the formation of an extremely hot bright mass of gas called a fireball (4). For a 10-kiloton explosion in the air, the fireball will have a maximum diameter of about 300-m for a 10-megaton weapon the fireball may be 4.8 km across. A flash of thermal radiation is given off from the fireball and spreads out over a large area. The thermal radiation falling on exposed skin can cause what are called flash burns. A 10-kiloton explosion in the air can produce moderate (second-degree) flash burns, which require some medical attention, as far as 2.4 km from ground zero; for a 10-megaton bomb, the similar distance would be more than 32 km. Milder burns of bare skin would be experienced even farther out. Most ordinary clothing provides protection from the heat radiation. Flash burns occur only when the bare skin is directly exposed, or if the clothing is too thin to absorb the thermal radiation.

### Climatic Effects

Besides the blast and radiation damage from individual bombs, a large-scale nuclear exchange between nations could perhaps have a disastrous global effect on climate. According to scientists, the explosion of not even one-half of the combined number of warheads in the United States and Russia would throw enormous quantities of dust and smoke into the atmosphere. The amount could be sufficient to block off sunlight for several months, mostly in the Northern Hemisphere, destroying plant life and creating a subfreezing climate until the dust dispersed. The ozone layer might also be affected, permitting further damage as a result of the sun's ultraviolet radiation.

From all this you can see the mass destruction the one bomb can do. It can't

take out the whole human race. From my point of view we should be prepared for something like this because it could happen.