

LEARN ABOUT NUCLEAR WEAPONS

Initial radiation

The first radiation to appear after a nuclear weapon has detonated consists of gamma rays and neutrons emitted at the moment of explosion, lasting for at most a minute. This radiation causes damage to humans, animals, the environment, and electronic systems.

Electromagnetic Pulse (EMP)

When gamma radiation knocks electrons out of the atoms of air molecules, these electrons combine to form a strong pulse of electric current, generating an electromagnetic field. This field then expands as a very short-lived wave: an electromagnetic pulse. EMP causes disturbances and damage in electronic equipment. EMP is a serious threat to our modern society, since a major part of the infrastructure is constructed around electronics. There are numerous items that can catch and conduct electromagnetic energy, such as aerials and other antennae, telephone wires, railway tracks and so on. This energy can surge into computers and other sensitive equipment and cause damage to vital systems like those supplying water or electricity, or telecommunications. Without these systems, our society is extremely vulnerable. The EMP of a hydrogen bomb detonated at a high altitude could knock out all electronic systems within a very large area (e.g., all Northern Europe).

Thermal pulse

The nuclear explosion produces an enormous fireball, which generates an intense heat, grows at a tremendous speed, and then rises with the hot air. As it gains altitude, the fireball cools down, forming the mushroom-shaped cloud that characterises a nuclear explosion. This thermal radiation (heat), causes severe burns to humans and animals. Other material can be ignited and start raging fires.

Blast wave/shock wave

The great pressure within the fireball causes the blast. The amount of energy released during a nuclear explosion is enough to raise the temperature to tens of millions of degrees centigrade. The very matter of the bomb is transformed into a ball of fiery gasses. The great pressure boost of this scalding gas causes the fireball to expand in a blast that spreads faster than the speed of sound. First one feels the shock like a giant slap in the face (the static overpressure), next in the form of a gust of wind reaching hurricane strength (the dynamic overpressure). Since air rushes out from the point of explosion as the fireball rises into the air, a vacuum is formed at the centre of the explosion. Because of this, the gale turns after some ten seconds, blowing back towards the centre again. The blast affects buildings and other structures, crushing them or tossing them about, as well as causing deaths and severe injuries to people.

Radioactive fallout

Radioactive material produced by the nuclear explosion eventually falls to the ground as contaminated particles. This radioactive fallout can be local, regional or global. In local fallout, the radioactive particles are spread downwind and fall to the earth within a day. In some of the affected areas, the radioactive doses can be directly lethal to exposed humans. Other particles go directly into the troposphere (the layer of air closest to the Earth) after the explosion and then fall down over a wider area during the span of some weeks. This fallout can lead to illness in humans and, in the long run, to an increase in the numbers of cancer cases and genetic damage. After the explosion, the particles are taken up into the stratosphere (the upper atmospheric layer) and spread across the entire globe, slowly falling down after months or years have passed. Global fallout does not produce acute human health effects, but when we eat food or breathe air contaminated by radioactive particles they can still cause damage.

