

Nuclear Weapon Detonation

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Division of Environmental Health
Office of Radiation Protection



WHAT ARE WE TALKING ABOUT, AND WHAT IS THE RISK?

Both the former U.S.S.R. and the U.S. developed small, portable devices, sometimes called 'suitcase bombs' during the Cold War. The technology to create a workable bomb of this size is quite advanced, probably beyond that of any organization who might want to use it for terrorist means.

There is some evidence that an unknown number of "suitcase" size nuclear weapons are missing from the former U.S.S.R. arsenal. Though the source of this information is questionable, and official government representatives from Russia and the U.S. dispute the claim, this is a possibility that must be taken seriously.

Can a terrorist organization or rogue nation build a bomb? It is theoretically possible, though any group attempting to do so would have to acquire weapons-grade material (such as plutonium-239 or enriched uranium) and the construction would require a great deal of technical skill and equipment.

A homemade bomb would likely be physically larger than military weapons that are constructed using advanced technologies and manufacturing techniques. The successful placement of the nuclear weapon requires the device be transported, placed in a covert manner, so as to remain undetected until detonation. The size of the bomb, weight, and radiation content increase the probability that the weapon would be detected.

Once built, expertise is required since any nuclear weapon would have to be maintained to remain operational. Transporting any nuclear weapon into the United States would be difficult, as would making it work properly.

Most portable weapons have a yield of about 1 kiloton (KT), which is equivalent to the 1,000 tons of TNT. This magnitude of detonation is not large enough to destroy a city, but large enough to destroy a large building and much of a city block. Some “suitcase” size weapons may have yields as great as 10 KT, which could devastate an even larger area. A bomb used by a terrorist organization would likely be one of these (from 1 to 10 KT), since larger yield weapons would be much more difficult to transport and maintain.

So what is the risk of a terrorist group obtaining and using a nuclear weapon? The truth is, we simply don’t know. Our best defense is to be well informed, prepared and no longer consider it unthinkable.

So what is the risk of a terrorist group stealing a military nuclear weapon? A stolen weapon would be more compact, but safeguards in the device may preclude a nuclear yield from attempted detonation by an unauthorized individual.

What would be the effect of a nuclear detonation? The effects would depend on the yield and success of the detonation. A “homemade” or poorly maintained bomb could be a dud, producing no explosive yield but resulting in the spread of radioactive material; or the device could “fizzle”, meaning a partial nuclear detonation. A fizzle device, yielding 0.01 KT, would have an impact much greater than the explosive that destroyed the Oklahoma City Federal Building in 1995.

Most experts believe that a low-yield device (about 1 KT) is the most likely. The A-bomb detonated over Hiroshima was a 15-KT device; India’s test on May 11, 1998 was a 60 KT device while most strategic weapons today are over 1,000 KT.

Although catastrophic, the availability of resources from the state, the federal government, and even the international community make the consequences of this type of disaster manageable.

Air Blast: As with a conventional explosive, a nuclear detonation produces shock wave, or air blast wave. The air blast, with its accompanying winds, can damage structures and injure individuals. Individuals can also be injured by falling debris and flying glass shards. The air blast from a 1 KT detonation could cause 50% mortality from flying glass shards, to individuals within an approximate radius of 300 yards (275 m). This radius increases to approximately 0.3 miles (590 m) for a 10 KT detonation.

Heat: The second effect would be extreme heat, a fireball, with temperatures up to millions of degrees. The heat from a fireball is sufficient to ignite materials and cause burns far from the fireball, and the associated intense light may cause blindness. The heat from a 1 KT detonation could cause 50% mortality, from thermal burns, to individuals within an approximate 0.4 miles (610 m) radius.

This radius increases to approximately 1.1 miles (1800 m) for a 10 KT detonation. Shadowing by structures between the fireball and the individual will prevent or reduce heat effects.

Initial Radiation: The initial radiation is produced in the first minute following detonation. The detonation's intense initial pulse produces ionizing radiation that causes intense radiation exposures. The initial radiation pulse from a 1 KT device could cause 50% mortality from radiation exposure, to individuals, without immediate medical intervention, within an approximate $\frac{1}{2}$ mile (790 m) radius. This radius increases to approximately $\frac{3}{4}$ mile (1200m) for a 10 KT detonation. Individuals in intervening buildings and building basements may receive a reduced exposure due to the additional shielding.

Ground Shock: Ground shock, equivalent to a large localized earthquake, would also occur. This could cause additional damage to buildings, roads, communications, utilities, and other portions of the infrastructure. The ground shock and air blast would be expected to cause the major disruptions in the local infrastructure.

Secondary Radiation: Secondary radiation exposure due to fallout would occur primarily downwind from the blast, but changing weather conditions could spread radioactivity and enlarge the affected area. For a 1 KT device, radiation exposure from fallout within the first hour after the blast could cause 50% mortality from radiation exposure, to individuals without medical intervention, for approximately 3.5 miles (5500 m) downwind of the event. This distance increases to approximately 6 miles (9600 m) for a 10 KT detonation. These distances could be greater or smaller, depending on wind and weather conditions. Individuals in intervening buildings and building basements may receive a reduced exposure due to the additional shielding.

WHAT TO DO IN THE CASE OF AN EVENT?

What do you do if these events do happen?

Stay Inside: Shelter yourself from airborne radioactive particles, in the form of fallout, by staying inside your home or office, unless instructed to do otherwise. Close the windows, turn off the ventilation system, and stay toward the center of the house or building. If there is a basement, go there. Once the initial blast is over, the existing risk will be from airborne radioactivity.

Listen to the Radio: When you learn that a nuclear detonation has occurred, tune a radio to your local emergency-broadcasting network and listen for instructions. Federal, state and local agencies will be doing everything they can to minimize the hazards and keep you safe. You may need to use a battery-

powered radio, if electrical power is out in your neighborhood. Paying careful attention to any instructions given will help you minimize any exposure to radiation.

Follow Instructions: Your best chance of avoiding exposure is to do what the experts advise. If told to evacuate after the radioactive cloud has passed or gone in another direction do so immediately. Listen for news of the location of the cloud and travel at a right angle away from the cloud. Even if it has already passed, radioactive contamination may have been deposited on the ground.

Seek Help if Needed: If you know or suspect you've been contaminated or received a radiation dose, seek an assistance center, which will be set up as soon as possible. If that hasn't happened yet, go to a fire station or police station located outside the affected area.

Look for Symptoms: If you believe you have been directly in the path of the cloud or in the blast zone itself, watch for symptoms of exposure, like nausea, loss of appetite, reddening of the skin, or diarrhea. Seek immediate medical help if symptoms occur. Blood changes can be measured at even moderate exposures and are among the first detectable symptoms. A doctor can test for those changes.

Watch What You Eat: Avoid drinking fresh milk or eating fresh vegetables from the affected area. One of the most common radionuclides found in a nuclear explosion is iodine-131, which is taken up by and can affect the thyroid. The most common pathway for exposure to iodine-131 is through fresh milk and vegetables contaminated with fallout radiation. Wait until the Department of Health announces that produce and dairy products are safe to eat and drink.

Who will be responding?

- ◆ First responders will include firemen and emergency medical personnel. Police agencies will establish perimeters to secure the area and help evacuate people.
- ◆ The federal government will take responsibility for securing the scene of the event and will investigate the cause. The FBI is the lead agency for terrorist attacks, though other agencies will be involved as well.
- ◆ The U.S. Army at Fort Lewis will provide assistance with a specially trained Weapons of Mass Destruction Unit.
- ◆ The Washington State Emergency Management Division will coordinate the state and local response.

- ◆ The Washington State Department of Health, as the state's Radiation Control Agency, will assess health effects, monitor people and the environment, set up and staff emergency assistance centers, and make recommendations to minimize and prevent exposures.
- ◆ Local Health jurisdictions will ultimately take responsibility for implementing protective action recommendations.

In the case of an extreme detonation causing extensive damage the local and state authorities, emergency, fire and medical services may be overwhelmed and not able to provide normal government services. In this case, the federal government would provide government services and might temporarily assume control until the state and local governments can resume normal functions.

Remember, the local and state agencies are staffed by people who also live in your community and who have families here. They will take a personal interest in doing whatever is necessary to protect people to the best of their abilities.

Sources

NCRP Report No. 138

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