

HAZARDS

[REDACTED]. The actual dose that can kill an individual depends on the persons state of health his genetic makeup and the availability of treatment.

Exposure to small doses especially over a long term can result in health effects that can take yrs to develop. The dose are usually small enough such as tens to hundreds of msv to not lead to the loss of an organ or other clearly deterministic effects. Instead the ionizing radiation has potentially modified but not killed adffected cells which still retain their capacity to make more modified cells. This modification can result in cancer or cause hereditary harm if reproductive cells are affected. Only one cell need be affected to potentially cause harm while other modified cells may not lead to any illness. Unlike deterministic, that is, it is impossible to predict the ecxact health effect given the odse received. However a statistical distribution of health effects cvan be derived from a large enough sample size of affected individuals who have received similar radiation doses. Some will develop cancer, for example and others will not.

[REDACTED]

[REDACTED]

[REDACTED]

Industrial, scientific and public uses.

[REDACTED]

[REDACTED]

Industrial radiography

[REDACTED]

Because these sources are housed in portable equipment, they can pose a high security risk.

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]





Radiological weapons – radiological dispersal devices

If terrorists seized radioactive sources they would have two basic options, one passive and the other active, for instilling terror with these materials. Employing the passive option they could place radioactive sources in high profile areas such as highly trafficked urban sites and government facilities. An often cited example of the passive option is the situation in November 1995 where Shamil Basayev, a Chechen rebel leader, directed a Russian television crew to Moscow's Izmailovsky Park, where they found a container with a small quantity of Cs-137. No one reportedly suffered injury from this episode, which demonstrated the potential for inflicting harm with radioactive sources. Thus the effect of this incident was entirely psychological. Such sources would only cause harm to people who came in close contact with them but could still incite panic.

With the active option, terrorists would attempt to disperse the radioactivity over a large or confined area. Fortunately, they could not turn the radioactive sources that have been mentioned into nuclear weapons. EPA defines a dirty bomb as commonly referring to a device that spreads radioactive material by exploding a conventional (non-nuclear) explosive such as dynamite.

When constructing an RDD terrorists face constraints arising from the radioactivity of the source. To cause a large amount of radioactive contamination, they would be drawn toward very high activity sources. However, in order to prepare the source for effective dispersal by removing the shielding, terrorists would risk exposing themselves to lethal doses. Even suicidal terrorists might not live long enough to deliver a very highly radioactive RDD that uses gamma-emitting sources and is not shielded. If they tried to protect themselves by shielding the source, the weight of the RDD could significantly increase thereby increasing the difficulty of delivering the device and causing successful dispersion of the radioactive material.

RDD's may not be weapons of mass destruction however they can be **Weapons of mass Disruption, dislocation or effect.** The possible resulting chaos during evacuation of the immediate and surrounding areas could hinder emergency response efforts. Concerns over radioactive contamination could also cause long delays in first responders tending to casualties from a bomb blast, if such a method were used. Further the decontamination costs and the rebuilding costs, if necessary, could be immense – perhaps upwards of **billions** of dollars. These effects are classified as psychological, sociological and economic.

The actual health effects would depend on:

1. the conventional explosive, if this method were used.
2. the type and amount of radioactive material dispersed.
3. the weather conditions
4. the terrain
5. population density
6. emergency response.



[REDACTED]

[REDACTED]

[REDACTED]

Case Studies

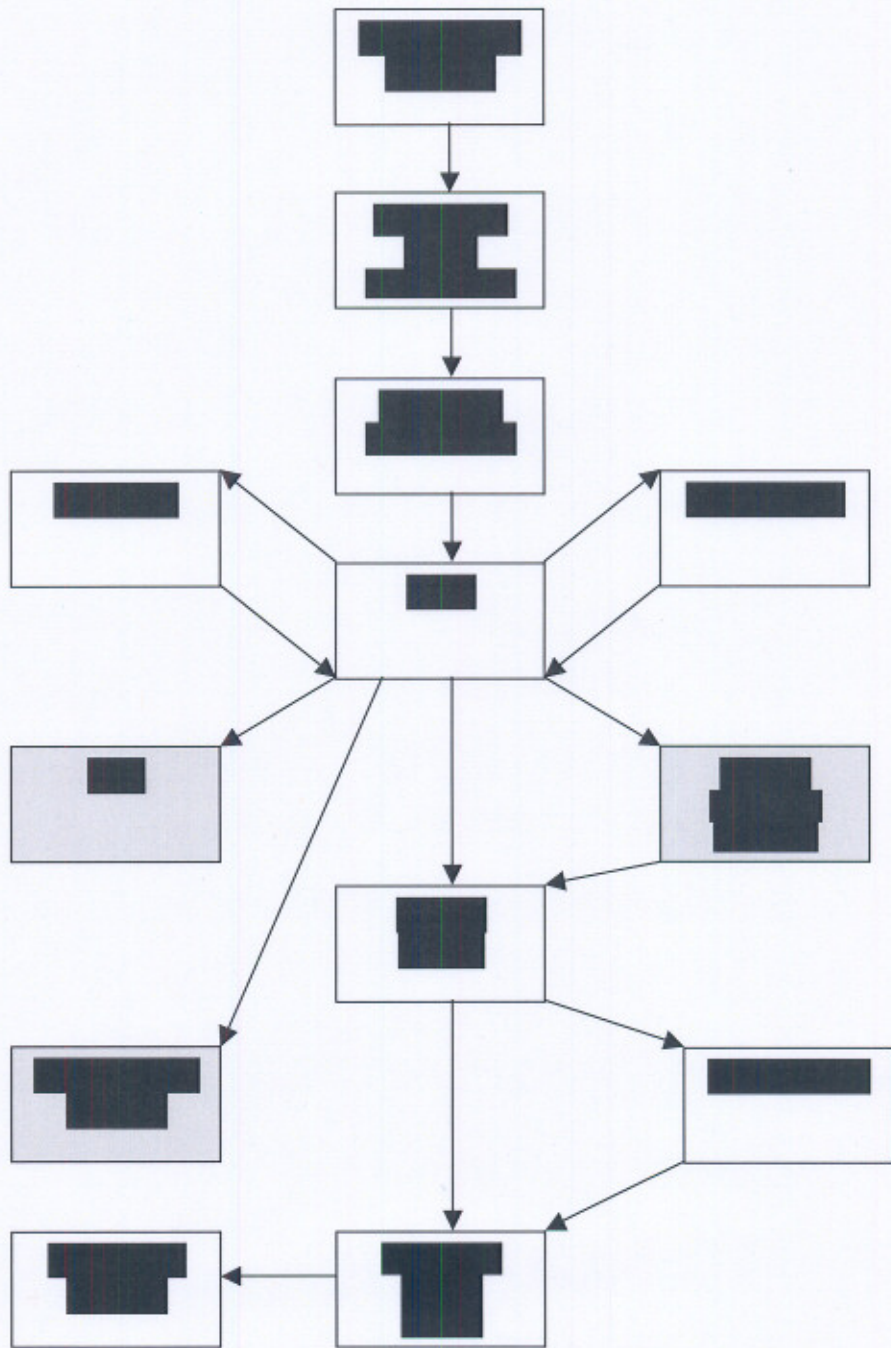
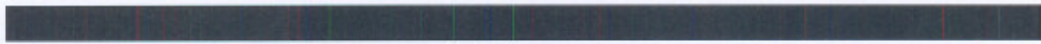
September 13 1987 in Goiania, Brazil

A canister **containing [REDACTED] cesium-137** in powder form finds its way to locals. When opened the wind and rainwater runoff quickly and spread radioactive contamination. On September 28 first case of radiation sickness diagnosed. More than 200 people had been contaminated, four deaths, one arm amputation and 28 people with radiation burns.

One square kilometer required massive cleanup, seven homes and other buildings had to be demolished. [REDACTED]

Cost

The clean up cost \$20 million, a small fraction of the total financial impact. Economic losses from collapse in tourism and business regression are difficult to assess but are estimated to be up to hundreds of millions of dollars. Many people fled the area, reversing previous growth in population.



[REDACTED]

[REDACTED]

[REDACTED]