Nuclear Terrorism

Making a nuclear bomb
Fusion Bomb
Need isotopes of hydrogen: deuterium or tritium
Use of ^{239}Pu and ^{235}U to start a fission reaction, temperature rises millions of degrees uniting the hydrogen isotopes in a fusion reaction, releasing energy
Release of nuclear energy in range of 10 megatons
Fission Bomb
Need sophisticated technology to enrich ^{238}U , which is found naturally, to ^{235}U
Need a critical mass of ^{235}U (25 Kg) or ^{239}Pu (8 Kg)
Need high explosive to cause two subcritical masses of ^{235}U to combine with tremendous force, causing the release of neutrons that start the chain reaction in this now formed "critical mass"
^{239}Pu Subcritical mass at the center of high explosives, which when detonated, squeeze the ^{239}Pu into a smaller volume, in which its subcritical mass becomes critical
Release of nuclear energy in range of 12,000-22,000 tons or 12-22 kilotons
Making a dirty bomb
Can use conventional type chemical explosives to disperse a dirty bomb
Need source of radioactive material in the form of metallic iridium, selenium (Se-75), cobalt 60, caesuim 137
Do not have to have knowledge of explosive devices. Radioactive material could be put in existing ventilation system
Uses of explosive devise: dispersion, wind, heat from explosion, destruction from chemical weapon exploding
Used for psychological effects of causing fear and panic on a large number of people
Economic disruption-area with radioactive contamination would take years to clean up
Physics used in technology to detect the radioactive materials
Security devices at ports, border crossings
Customs agents use pager-size radiation detectors that might detect highly radioactive isotopes such as ones used in dirty bombs, but not as good at detecting less radioactive uranium-235
Using x-ray type images to inspect cargos in containers and ships in port
With alpha decay, gamma radiation also given off, use this signature of energy, 185 keV to diagnose what is inside container, or truck at ports and border crossings
New technology involves neutron activation that causes some atoms to fission, releasing neutrons and gamma rays. Detector captures the gamma rays produced by the disintegration of each isotope. Device reads unique set of energies, (energy levels unique to each substance). This is the 'fingerprint' that permits identification of the isotope
Security devices at airports
Conventional x-rays
X-ray, high energy radiation, passes through skin and organs; high atomic number materials (bone, metal) absorb the x-ray photons. Machine interprets relationship between high and low - energy particles that are absorbed and those that pass through object, and focuses on those absorbed
Backscatter x-rays
Low atomic number materials (less dense, liquids, plastic, drugs) disperse/scatter the x-ray photons; detector senses these. Computer imaging compares absorbed and scattered, making photo type image of body, liquids, weapons
X-ray photons only penetrate to 1/10 inch of skin. Radiation dose from a single scan is about .005 millirems (mrem, a unit of absorbed radiation); 1 mrem/year considered to be negligible dose of radiation-amount received on three hour plane flight