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The Task of Detecting Illicit Nuclear Material: Status and Challenges

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In August 1994, police at the Munich airport intercepted a suitcase from Moscow with half a kilogram of nuclear-reactor fuel, of which 363 grams was weapons- grade plutonium. A few months later police seized 2.7 kilograms of highly enriched uranium from a former worker at a Russian nuclear institute and his accomplices in Prague. These are just two of 18 incidents involving the smuggling of weapons grade nuclear materials between 1993 and 2004 reported by the International Atomic Energy Agency. The consequences of a stolen or improvised nuclear device being exploded in a U.S. city would be world changing. The concern over the possibility of a nuclear weapon, or the material for a weapon or a radiological dispersion device, being smuggled across U.S. borders has led to the deployment of radiation detection equipment at the borders. Related efforts are occurring around the world. Radiation portal monitors are used as the main screening tool, supplemented by handheld detectors, personal radiation detectors, and x-ray imaging systems. Passive detection techniques combined with imaging, and possibly active techniques, are the current available tools for screening cargo for items of concern. There are a number of physics limitations to what is possible with each technology given the presence of naturally occurring radioactive materials, commercial sources, and medical radionuclides in the stream of commerce. There have been a number of lessons learned to date from the various efforts in the U.S. and internationally about the capability for interdicting illicit nuclear material.