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A Physicist Looks at the Terrorist Threat

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Many people fear a terrorist nuclear device, smuggled into the United States, as the one weapon that could surpass the destruction and impact of 9-11. I'll review the design of nuclear weapons, with emphasis on the kinds that can be developed by rogue nations, terrorist groups, and high-school students. Saddam, prior to the first gulf war, was developing a uranium bomb, similar to the one that destroyed Hiroshima. His calutrons (named after my university) were destroyed by the United Nations. The North Korean nuclear weapon was, like the U.S. bomb used on Nagasaki, based on plutonium. Its test released the energy equivalent of about 400 tons of TNT. Although some people have speculated that they were attempting to build a small bomb, it is far more likely that this weapon was a fizzle, with less than 1 percent of the plutonium exploded. In contrast, the energy released from burning jet fuel at the 9-11 World Trade Center attack was the equivalent of 900 tons of TNT for each plane – over twice that of the North Korean Nuke. The damage came from the fact that gasoline delivers 10 kilocalories per gram, about 15 times the energy of an equal weight of TNT. It is this huge energy per gram that also accounts for our addiction to gasoline; per gram, high performance lithium-ion computer batteries carry only 1 percent as much energy. A dirty bomb (radiological weapon) is also unattractive to terrorists because of the threshold effect: doses less than 100 rem produce no radiation illness and will leave no dead bodies at the scene. That may be why al Qaeda instructed Jose Padilla to abandon his plans for a dirty bomb attack in Chicago, and to try a fossil fuel attack (natural gas) instead. I will argue that the biggest terrorist threat is the conventional low-tech one, such as an airplane attack on a crowded stadium using the explosive fuel that they can legally buy at the corner station.