Defense-in-Depth in Understanding and Countering Nuclear and Radiological Terrorism

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Why Have Many Experts Been Wrong?

• “I don't want to fan hysteria but ... a dirty bomb attack is all but inevitable in the coming years,” as quoted in the San Francisco Chronicle, September 5, 2004

• Who said this?
Charles D. Ferguson

• Why hasn’t the attack happened?
The Lugar Survey On Proliferation Threats and Responses, June 2005

• More than 80 experts surveyed
• Even within the limited time span of five years, 82% (68 of 83) said that there was at least a 10% chance of a radiological attack that affects a major portion of a city.
• Almost half of respondents (40 of 82) judged the risk of such an attack as 50 percent or greater over 10 years.
Likelihood of Nuclear Terrorism

• “In the judgment of former U.S. Senator Sam Nunn, the likelihood of a single nuclear bomb exploding in a single city is greater today than at the height of the Cold War. Nuclear Terrorism states my own judgment that, on the current trend line, the chances of a nuclear attack in the next decade are greater than 50 percent.”

--Graham Allison, April 16, 2007
Another Expert’s Assessment

• Matthew Bunn of Harvard has created a probability model that estimates the probability of a nuclear terrorist attack over a ten-year period to be 29 percent. An assessment made about eight years ago.
But Can We Make Such Estimates?

- Risk = Probability X Consequence
  - Large uncertainties
  - Lack of data
  - Relative vs. absolute risk assessment

- Probability = Function (Motivation, Intention, Capability)

- Risk = Function (Motivation, Intention, Capability) X Consequence
Relative Risk Assessment

- Intact Nuclear Weapon
- Improvised Nuclear Device
- Attacks on or Sabotage of Nuclear Facilities such as Nuclear Power Plants or Spent Fuel Pools
- Radiological Weapon such as “Dirty Bomb”
Radiological Weapons

• “Dirty bombs” are only one type of RDD, radiological dispersal device

• Do not need conventional explosives to disperse certain types of radioactive material, e.g. cesium chloride

• RED: Radiation emission device – could think of as a motionless RDD

• Radiological Incendiary Device
Conclusion → Focus on securing and reducing highly enriched uranium as the top priority because of its relative ease of use in gun-type device.

Only takes about 25 kilograms of weapons-grade uranium or about 6 kg of plutonium per bomb.
Knowing the Mind of Nuclear Terrorists

• “We know more of the interior of the atom than we do of the interior of the mind of the terrorist,” Dr. Jerrold Post, 1987
Terrorist Motivations

• Those who study terrorist motivations are “underwhelmed by the probability of such an event [radiological or nuclear terrorism] for most – but not all – terrorist groups.” – Jerrold Post, IAEA presentation, Nov. 2001

• Psychological and political factors would constrain most groups
Rise of Mass Casualty Terrorism

An aerial view of the American Embassy as heavy cranes continue to remove rubble from the upper floors on 21 April, 1983, following the terrorist bombing three days earlier.

Terrorists’ Interest in Radiological Terrorism

- Al Qaeda-in-Iraq leader
- José Padilla??
- “Radicalized” Chechen rebels?
- Jihadist groups in South Asia
- Dhiren Barot a.k.a. Issa al-Hindi
- **But why no attacks?**
Terrorists are People, Too

- Dhiren Barot
  a.k.a. Issa al-Hindi
Unexpected Radiological Attack

- Litvinenko’s murder using Po-210
- October 2006 in London
- Criminal act with possible terrorism implications
Bale of Marijuana Argument

• **Learn from the drug smugglers:** They bring in “bales” of marijuana every day into the United States → Nuclear terrorists can do the same with fissile material or even a fully built nuclear explosive

• **Think Again:** Drug smugglers know that the cost of doing business is several seizures of marijuana, but they stay in business because there is plenty of supply

• Nuclear terrorists would likely have paid a dear price for nuclear materials or weapons → they would be extremely reluctant to run a significant chance of seizure
No Gold is Lost from Fort Knox

• Graham Allison has recommended the gold standard for nuclear security.
• All we need to do is lock up all of the fissile material in Fort Knox-like compounds.
• As we all know, no gold has been lost from Fort Knox. While probably true, gold like fissile material is used in plenty of places that are not like Fort Knox.
• And certain countries will continue to use highly enriched uranium for weapons, naval fuel, and perhaps for civilian purposes
Al Qaeda’s “Superbomb” Documents

• [David] Albright has cautioned there is no indication that al Qaeda's nuclear work has gone beyond theory. To create a nuclear weapon, Albright said a designer must learn a whole set of manufacturing steps not mentioned in al Qaeda's manual and develop confidence in the weapon's design.

• "Even a terrorist group that's going to go to the trouble of working on a nuclear weapon wants to have some certainty that it's going to explode as a nuclear explosive and not just explode as a high explosive," Albright said.

From a CNN January 2002 story
We Have to Succeed Every Time…

• But terrorists would only have to succeed once.

• **Think Again:** Nuclear terrorists would have to succeed with every step of a complicated plan.

• Many terrorists also fear failure. They fear disappointing their leaders and most importantly their higher power if they believe in such.
Terrorists are cool, calm, and cold-blooded murders, right?

• But nervous terrorists have revealed their plots. For example, the Millennium bomber was detained at the border crossing between Canada and the United States.

• Some terrorists have also often show themselves to be bunglers. For example, the medical doctors who botched the 2007 bombings in Great Britain.
Chain of Causation for Radiological or Nuclear Terrorism

1. Terrorists must be motivated to launch an unconventional attack using radiological or nuclear means.
2. They must have or must acquire the requisite technical expertise.
3. They must acquire radioactive or fissile materials and build the weapon.
4. They must be able to plan the attack without being detected and caught.
5. They must finally be able to carry out the attack by delivering the weapon to the target.
Murphy’s Law of Nuclear Terrorism

Defense-in-Depth Security System

- Secure
- Reduce
- Replace
- Detect
- Respond
- Recovery
Secure Radioactive and Nuclear Materials

- International Atomic Energy Agency

- National Nuclear Security Administration’s Global Threat Reduction Initiative

- World Institute for Nuclear Security

- Obama administration’s Nuclear Security Summit in April 2010 and the follow-on summits in 2012 in Seoul and next year in the Hague
Reduce

• Returned > 900 kg of Soviet-origin highly enriched uranium (HEU)
• Returned > 1,200 kg of U.S.-origin HEU
• Recovered > 32,000 unwanted or excess radioactive sources
• But much more to be done
Replace

• Convert HEU-fueled research reactors with LEU
  ➢ More than 50 research or isotope production reactors converted
  ➢ Dozens of reactors shut down
  ➢ But few dozen more remain to be converted
  ➢ Need to develop alternative fuels

• Continue to develop more alternatives, where appropriate, to certain types of radioactive sources
  ➢ For example, x-ray devices to replace research or blood irradiators
Detect

• “Second Line of Defense”
• Container Security Initiative
• Mega-ports Initiative
• Secure the Cities Initiative
Preparing for Radiological and Nuclear Attack

a) Educate the public, the press, and political leadership

b) Equip and train first responders

c) Conduct planning exercises

d) Develop effective mitigation and recovery techniques
Thank you for your attention

Any Questions?

See FAS.org for more information and analysis