Physics 280: Session 11

Plan for This Session

Questions about the course

News and discussion

Module 4: Nuclear Terrorism

News and Discussion

US Weighing Steep Nuclear Arms Cuts

by THE ASSOCIATED PRESS

WASHINGTON February 14, 2012, 09:07 pm ET

text size **A**

WASHINGTON (AP) — The Obama administration is weighing options for sharp new cuts to the U.S. nuclear force, including a reduction of up to 80 percent in the number of deployed weapons, The Associated Press has learned.

No final decision has been made, but the administration is considering at least three options for lower total numbers of deployed strategic nuclear weapons cutting to: 1,000 to 1,100; 700 to 800, and 300 to 400, according to a former government official and a congressional staffer. Both spoke on condition of anonymity in order to reveal internal administration deliberations.

The potential cuts would be from a current treaty limit of 1,550 deployed strategic warheads.

News and Discussion

A spokesman for the White House's National Security Council, Tommy Vietor, said Tuesday that the options developed by the Pentagon have not yet been presented to Obama.

Those who favor additional cuts argue that nuclear weapons have no role in major security threats of the 21st century, such as terrorism. A 2010 nuclear policy review by the Pentagon said the U.S. nuclear arsenal also is "poorly suited" to deal with challenges posed by "unfriendly regimes seeking nuclear weapons," an apparent reference to Iran.

In 2010, three Air Force analysts wrote in Strategic Studies Quarterly, an Air Force publication, that the U.S. could get by with as few as 311 deployed nuclear weapons, and that it did not matter whether Russia followed suit with its own cuts.

News and Discussion

Davis wrote that an arsenal of 300 weapons might be considered adequate for deterrence purposes if that force level was part of a treaty with sound anti-cheating provisions; if the U.S. deployed additional non-nuclear weapons with global reach, and if the U.S. had "hypothetically excellent," if limited, defenses against long- and medium-range nuclear missiles.

The U.S. already is on track to reduce to 1,550 deployed strategic nuclear warheads by 2018, as required by New START. As of last Sept. 1, the United States had 1,790 warheads and Russia had 1,566, according to treaty-mandated reports by each. The treaty does not bar either country from cutting below 1,550 on its own.

Nuclear stockpile numbers are closely guarded secrets in most states that possess them, but private nuclear policy experts say no countries other than the U.S. and Russia are thought to have more than 300. The Federation of American Scientists estimates that France has about 300, China about 240, Britain about 225, and Israel, India and Pakistan roughly 100 each.

News and Discussion

Boldest Nuclear Cutters Recently? It's Been GOP

by THE ASSOCIATED PRESS

WASHINGTON February 18, 2012, 02:26 pm ET

text size A A A

WASHINGTON (AP) — The Obama administration's consideration of severe cuts in nuclear weapons generated a flurry of GOP criticism — "reckless lunacy" in the words of Arizona Rep. Trent Franks. But the historical record shows that in the two decades since the Cold War ended, Republicans have been the boldest cutters of the nuclear arsenal.

"Republican presidents seem to have a thing for 50 percent nuclear reductions," says Hans Kristensen, a nuclear arms specialist with the Federation of American Scientists, a think tank founded by many of the scientists who built the first atomic bombs.

News and Discussion

For example, on President George H.W. Bush's watch, the number of deployed weapons as well as those held in reserve was nearly cut in half, from 22,217 to 13,708 warheads, according to official U.S. government figures. The number of deployed strategic warheads dropped from 12,300 to 7,114 in that same period, by Kristensen's calculations.

President George W. Bush went further, cutting the total stockpile by 50 percent, from 10,526 to 5,273 warheads. By Kristensen's count, the number of deployed warheads fell to 1,968 by the time Bush left office in January 2009.

In his two terms, Democratic President Bill Clinton trimmed just a little more than 2,000 warheads from the stockpile.

News and Discussion

James Miller, the Pentagon official who has led a study of U.S. strategic nuclear weapons requirements, told a nuclear deterrence symposium that he believes the U.S. can strengthen deterrence and maintain its security obligations to allies, while reducing the risks of the spread of nuclear technologies and arms, with a smaller nuclear force.

Rep. Michael Turner, R-Ohio, said Friday that he would be aghast at the notion of deep cuts to the nuclear force.

News and Discussion

Analysis and Critique of the AP News Story That President Obama is Considering Deep Reductions to Launch-Ready Nuclear Forces

What do we actually know?

- In April 2010, the Department of Defense released publicly the required quadrennial “Nuclear Posture Review”.
- The still-secret Presidential Policy Decision Directive (PPD-11) established the terms for the 90-day NPR Implementation Study.
- On February 14, Associated Press story was filed by Robert Burns, not the usual reporter covering the “nuclear weapons beat”.

News and Discussion

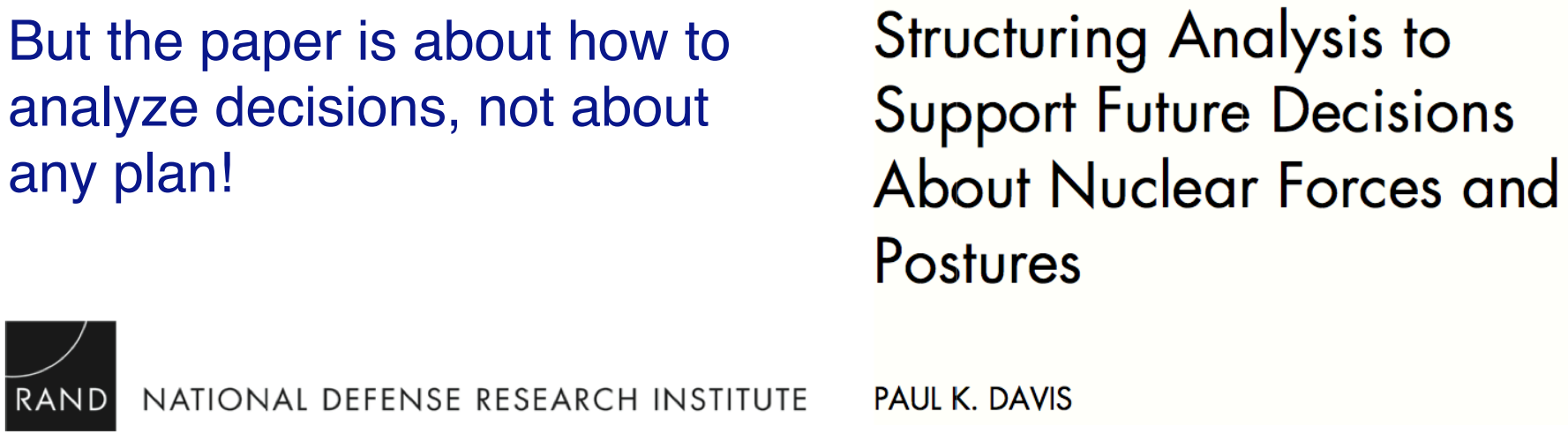
Who planted this story? Why did it appear now?

- Burns' story said "No final decision has been made, but the administration is considering at least three options for lower total numbers of deployed strategic nuclear weapons cutting to around 1,000 to 1,100, 700 to 800, or 300 to 400, according to **a former government official and a congressional staffer. Both spoke on condition of anonymity in order to reveal internal administration deliberations**."
- The annual Nuclear Deterrence Summit was to take place February 14-17, in Arlington, VA . The two first speakers were Senator John Kyle and Congressman Michael Turner, who used the planted AP story to denounce Obama's "plan". The planted story was *already* posted on Turner's web site.

News and Discussion

What else do we know?

- Burns' wrote "The notion of a 300-weapon arsenal is featured prominently in a paper written for the Pentagon by a RAND National Defense Project Institute analyst last October, in the early stages of the administration's review of nuclear requirements."
- But the paper is about how to analyze decisions, not about any plan!



iClicker Question (Use Channel C-C)

India first tested a nuclear device in what year?

A. 1964
B. 1968
C. 1974
D. 1988
E. 1998

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iClicker Answer

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Blank

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iClicker Question

A 1,000 weapon attack on the United States would probably kill and injure about how many people?

A. 10 million
B. 20 million
C. 50 million
D. 70 million
E. 100 million

Blank

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Module 4: Nuclear Terrorism

Nuclear Terrorism

Topics covered in this module:

Part 1: Terrorism and how to counter it

Part 2: Reducing the threat of nuclear terrorism

Key sources:

What Terrorists Want, by Louise Richardson

Preventing Catastrophic Nuclear Terrorism, by Charles D. Ferguson

Articles on Reading Assignments Page

News and Discussion

Troubling rise in Teen Uranium Enrichment

http://www.youtube.com/watch?v=ED3qoGEiWcU&feature=player_embedded

Terrorism and How to Counter It

The Importance of Understanding Terrorism

Endeavoring to understand or explain terrorism is not to sympathize with it.

Indeed, understanding the appeal of terrorism is the best way to forge effective counterterrorism policies.

Example: Gaining an understanding the Shining Path Maoist movement in Peru was much more effective in countering it than attempting to smash it —

- It had 10,000 members in the 1980s and controlled a large area of Peru
- Thousands of armed military and paramilitary forces were deployed over 20 years
- Shining Path and military units killed ~ 70,000 people, but terrorism did not diminish
- Only when the government established a special 70-man intelligence unit to study the Shining Path was it successfully countered
- The intelligence unit discovered that the leadership of the movement was highly centralized and depended on the academic Abimael Guzmán
- They studied everything about him and discovered he had a particular skin condition
- By old-fashioned police work and good electronic intelligence, Guzmán was tracked down though his medical prescription and captured with several of his top lieutenants

The Shining Path never recovered

Terrorism and How to Counter It

Topics covered here and in the readings —

- What is terrorism?
- Where have terrorists come from?
- What causes terrorism?
- The three Rs of terrorism
  (Revenge, Renown, Reaction)
- Why do terrorists kill themselves?
- What changed on 9/11 and what did not
- Why a “war on terror” can never be won
- What is to be done?

Categories of Violent Political Activity (Important)

Terrorism*: Deliberately* and *violently* targeting *civilians* for *political* purposes (all 4 criteria must be met)

Insurgency: An organized movement aimed at the overthrow of a constituted government through use of subversion and armed conflict. Insurgents may or may not commit terrorist acts.

Guerilla warfare: A type irregular warfare and combat in which a small group of combatants use mobile military tactics in the form of ambushes and raids to combat a larger and less mobile formal army. Guerilla warfare is not terrorism.

"Regular armed forces" must satisfy the four Hague Convention (Hague IV) conditions (1899 and 1907): they must (1) be commanded by a person responsible to a party to the conflict, (2) have a fixed distinctive emblem recognizable at a distance, (3) carry arms openly, and (4) conduct operations in accordance with the laws and customs of war.

What is Terrorism?

Terrorism is **deliberately** and **violently** targeting **civilians** for **political** purposes.

Terrorism often (but not always) has 3 other characteristics —

1. The point of terrorism is not to defeat the enemy but to send a message.
2. The act and the victim usually have symbolic significance.
3. The *victim* of the violence and the *audience* the terrorists are trying to reach *are not the same*.

Terrorism Carried Out by Governments – 1

Richardson argues that to have a clear understanding of the behavior of *terrorist groups*, we must understand them as sub-state actors. Although they and their leaders are not *terrorist groups,* states may engage in terrorism.

The terrorism committed by states can be divided into three categories:

1. State-sponsored terrorism: State sponsorship of terrorist acts against inhabitants of *other* countries as an instrument of foreign policy.

For example, to hurt other countries without risking the consequences of overtly attacking them (e.g., Libyan support of terrorist acts against U.S. interests during the 1980s, Iraqi support of Palestinian terrorist acts against Israel during the 1990s, Iranian support of terrorism against Israel by Hezbollah in Lebanon and Hamas in Gaza).

For example, as a way to engage in proxy warfare or covertly bring about internal change in another country without risking a direct confrontation (e.g., U.S. support of terrorist groups in Angola and Nicaragua in the 1980s).

Terrorism Carried Out by Governments – 2

2. State terrorism: Use of terrorism by a government against its own citizens, to coerce them into accepting the government's authority (examples: Germany in the 1930s, Argentina in the 1970s, Iraq in the 1980s and 1990s).

3. War terrorism: Use of terrorism by a government against the civilians of another country with which it is at war (examples: the German and Allied bombing campaigns in World War II, which damaged London and destroyed Dresden, Hiroshima, and Nagasaki and were deliberate efforts to target civilian populations in order to force the hands of their governments).

Collective punishment of communities that produce terrorists is another example of targeting civilians to achieve political ends and is therefore terrorism.

What is Terrorism?

The New York Times

February 26, 2009

The perception gap, which grew wider when President George W. Bush declared his war on terror in 2001, was blown even further apart in Gaza, when most Arabs came away certain who the real terrorists were.

"Public opinion views what happened in Gaza as a kind of terrorism," said Muhammad Shaker, a former Egyptian ambassador to Britain. "And on the other side, they see Hamas and other such organizations as groups who are trying to liberate their countries."

Many here said they saw little distinction between Hamas's shooting rockets into civilian areas of Israel and Israel's shooting rockets into civilian areas of Gaza, even if Hamas militants were operating there or just hiding out.

What is Terrorism?

"As for the Taliban fighters, they not only don't cherish life, they expend it freely in suicide bombings. It's difficult to imagine an American suicide bomber," *Washington Post* pundit Richard Cohen opined in a recent column. A few columns later Cohen returned to this theme, which clearly matters considerably to him: "There is really no such thing as an American suicide bomber. We don't extol the bomber and parade his or her children before the TV cameras so that other children will envy them for the death of a parent. This is odd to us. This is chilling to us. This is downright repugnant." Cohen added, "Maybe we have come to cherish life too much."

"The Cold War turned the entire United States into a suicide bomber rehearsing obsessively for the moment when we would 'push the button' and take down millions of our enemies with us. Seen in this light, Americans trained for the biggest suicide bombing mission of all." – Hugh Gusterson, Bulletin of the Atomic Scientists, January 2010

Understanding Terrorists – 1

Richardson points out that:

- Terrorism, even religious terrorism, is neither new nor the primary preserve of Islam
- Terrorists have sometimes later become statesmen
- People strongly opposed to terrorism have been labeled terrorists

She argues that the causes of terrorism are not to be found in objective conditions of poverty or privation or in a ruthless quest for dominance, but rather in a "lethal triple cocktail" that combines —

1. a disaffected individual
2. an enabling community
3. a legitimizing ideology

Richardson argues that terrorists are neither crazy nor amoral but rather are rationally seeking to achieve a set of objectives within self-imposed limits.

Understanding Terrorists – 2

Richardson argues that —

- The behavior of terrorists can be understood in terms of
  - ***long-term political objectives***, which differ across groups
  - ***more immediate objectives***, which are shared by terrorists with very different long-term objectives
- Terrorists' generally have much more success achieving their immediate objectives than achieving fundamental change.
- When terrorists act, they are seeking 3 immediate objectives (the "3 Rs"):
  - to exact revenge
  - to achieve renown (glory)
  - to force their adversary to react

The 3 Standard Initial Reactions to Terrorism

There are 3 standard phases in an inexperienced nation's reaction to terrorism —

Phase 1: Demonstrate resolve by adopting a draconian response that goes largely unchallenged by the public

Phase 2: Polarization of politics —

- The right demands tougher measures and denounces opponents as unpatriotic
- The left objects to many coercive measures

Phase 3: More reasoned reflection, when —

- Draconian measures have failed to produce the desired results
- The adversary has demonstrated his implacable commitment to harming the nation

Six Basic Rules for Containing Terrorism

Rule 1: Have a defensible and achievable goal

- If the goal of the U.S. is to defeat terrorism or eliminate terrorism, it can never be achieved
- If instead the goal of the U.S. had been to capture those responsible for the 9/11 attacks, it might very well have succeeded
- *Containing* the threat of terrorism *is* achievable
- By keeping this more modest and concrete goal firmly in sight and planning accordingly, the U.S. can ensure that its short-term tactics do not undermine its long-term goals

Rule 2: Live by your principles

Six Basic Rules for Containing Terrorism (cont'd)

Rule 3: Know your enemy

Rule 4: Separate the terrorists from their communities

Rule 5: Engage others in countering terrorists with you

Rule 6: Have patience and keep your perspective

U.S. counterterrorism policy after 9/11 did not initially follow these six rules, but it has improved with time.

Usual Initial Reactions to Terrorism

The U.S. often believes it is unique and consequently fails to learn from history or from the experiences of other countries.

The language of warfare connotes action and immediate results. We need to replace this language with the language of development and construction and the patience that goes with it.

The U.S. is beginning to learn from its mistakes and is gradually becoming more adept at countering terrorists.

The Bush Administration's Reaction to 9/11

Richardson argues that when the history of the immediate post-9/11 years comes to be written, it will be seen as marked by two major mistakes and two major missed opportunities —

Two major mistakes:

- declaration of a "global war on terror"
- conflation of the threat posed by al-Qaeda with the threat posed by Saddam Hussein

Two major missed opportunities:

- the opportunity to educate the American public to the realities of terrorism and the costs of our sole superpower status
- the opportunity to mobilize the international community behind us in a transnational campaign against transnational terrorists

The Bush Administration's Reaction to 9/11

Review

The term "war on terror" is nonsensical, because an armed attack on an emotion (terror) is logically impossible. We will not use this term in Physics 280.

The term "war on terrorism" is also nonsensical, because an armed attack on a tactic (terrorism) is also logically impossible. We will not use this term in Physics 280.

A "war on terrorists" would be a large-scale, sustained attack on terrorists by the military forces of a nation-state; while logically possible, it is not usually the most effective way to defeat terrorists.

The Changed Situation in the U.S. After 9/11

The biggest change — and the one with the most serious long-term implications, was our government's reaction to terrorism

Richardson argues that the declaration of a "global war on terror" —

- has been a terrible mistake
- is doomed to failure

She argues for a different approach —

- appreciate the factors driving the terrorists
- deprive them of what they need

Key Questions for Countering Terrorism

In thinking about counterterrorism policies, the question should *not* be

- Who's tough on terrorists?
- Who's soft on terrorists?

What matters is —

- *What actions are effective against terrorism?*
- *What are their costs?*

We are likely to experience terrorism in the future, just as we have in the past.

We are going to have to learn to live with and accept it as a price of living in a complex world in which communication is relatively easy.

The Relation of Democracy to Terrorism

Through improved security measures and enhanced intelligence, we can protect ourselves against the most dangerous weapons and the most sophisticated attacks.

It's important to remember that —

- Terrorists cannot derail our democracy by planting a bomb in our midst
- Our democracy can be derailed only if we conclude that it is inadequate to protect us
- Democratic principles are the strongest weapons against terrorists

Reducing the Threat of Terrorism

Richardson argues we should recognize that —

- Terrorism will continue to be employed as long as it is deemed effective
- Technological developments will make it easier for ever smaller groups to employ weapons of ever greater lethality against us
- Political, social, and economic developments will continue to produce disaffected individuals
- We will never be able to prevent every attack, but we can control our reaction to those attacks

If we keep terrorist attacks in perspective and recognize that the strongest weapons in our arsenal against terrorism are precisely the hallmarks of democracy that we value, then we can contain the terrorist threat.

iClicker Question

Which of the following is *not* a defining characteristic of terrorism?

A. The act must be violent or threaten violence

B. The violence must be against civilians

C. The individual victims must be randomly chosen

D. The violence must be deliberate

E. The violence must have a political purpose

Blank

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Reducing the Threat of Nuclear Terrorism

Reducing the Threat of Nuclear Terrorism

Two Possible Approaches

1. Invasion and war (often leads to insurgencies)

2. Cooperative efforts to secure or intercept nuclear explosive materials

Delivery Methods Other Than Long-Range Ballistic Missiles Pose Greater Threats

Several countries are capable of developing mechanisms to launch SRBMs, MRBMs, or land-attack cruise missiles from forward-based ships or other platforms. Some may develop such systems before 2015.

U.S. territory is more likely to be attacked with [nuclear weapons] using non-missile delivery means—*most likely from terrorists*—than by missiles, primarily because non-missile delivery means are —

- **less costly**
- **easier to acquire**
- **more reliable and accurate**

They also can be used without attribution.

— *Unclassified summaries of the most recent National Intelligence Estimates of Foreign Missile Developments and the Ballistic Missile Threat Through 2015*

Nuclear Threats to the United States

Physics 280: Session 12

Plan for This Session

Questions about the course

News and discussion

Video: “Last Best Chance”

Discussion of “Last Best Chance”

Reducing the Threat of Nuclear Terrorism

Video: “Last Best Chance”

Reducing the Threat of Nuclear Terrorism

Topics covered in this video —

- Who could be planning a nuclear terrorist attack?
- What nuclear weapons could terrorists use?
- Where could terrorists acquire a nuclear bomb?
- When could terrorists launch a nuclear attack?
- How could terrorists deliver a nuclear bomb?

Discussion of “Last Best Chance”

Physics 280: Session 13

Plan for This Session

Questions about the course

News and discussion

Module 4: Nuclear Terrorism (cont'd)

The Threat of Nuclear Terrorism

Terrorist pathways to a nuclear bomb —

- Stealing a bomb
- Buying a bomb
- Building a bomb

Stealing a Bomb

- About 25,000 nuclear weapons are in arsenals, with all but about 1,000 in Russia and the United States
- Stealing a bomb would be difficult but not impossible
- Activating a stolen bomb would be difficult —
  - The weapons of the United States, Britain, China, and France are protected by specialized security codes (permissive action links = “PALs”)
  - Most but not all Russian weapons have PALs
  - Whether the weapons of India, Israel, Pakistan, and North Korea use PALs is unknown

There are serious concerns about the security of Pakistani nuclear weapons and Russian tactical nuclear weapons.

Buying a Bomb – 1

- Nuclear-armed states are unlikely to sell a nuclear weapon because of the prospect of devastating retaliation
- But deterrence hinges on a credible retaliatory threat and credible evidence that a weapon transfer has occurred
- Gathering evidence that an explosion was produced by a transferred weapon is difficult
- Nuclear forensics and nuclear event attribution programs have received very little funding (~ $ 10–20 M per year)

Buying a Bomb – 2

More likely routes for terrorists to buy or be given a nuclear weapon —

- Corruption among nuclear custodians
- Nuclear black markets
- A coup that brings to power officials sympathetic to terrorists

Pakistan is of particular concern —

- It has a relatively new nuclear command and control system
- Taliban and al-Qaeda forces have a formidable presence
- Elements in Pakistan's military intelligence agency sympathize with the Taliban
- Pakistani leaders have been frequent assassination targets
- The infamous (A.Q. Khan) black market originated in Pakistan

Building a Bomb – 1

Some problems that terrorist organizations wishing to construct a nuclear explosive would confront —

- Assembling a team of technical personnel
- Substantial financial costs
- Radiation and chemical hazards
- Possibility of detection
- Acquisition of nuclear-explosive material

Building a Bomb – 2

No terrorist organization currently has the ability to produce weapons-usable enriched uranium.

Hence terrorists would have to acquire already made HEU.

There is enough HEU in worldwide stockpiles to make ~ 30,000 bombs.

Most HEU is under military control, but 40 countries have civilian HEU, including in more than 120 research reactors and related facilities.

The HEU stockpiles most vulnerable to theft are in Pakistan, Russia, and may countries with civilian reactor facilities.

Building a Bomb – 3

No terrorist organization currently has the ability to make plutonium for a weapon. Nuclear reactors to produce plutonium and reprocessing plants to extract plutonium from spent reactor fuel require resources available only to States.

Hence terrorists would have to seize plutonium from existing stockpiles or receive aid from a State.

There is enough plutonium worldwide to make ~ 30,000 bombs.

Plutonium is under both military and civilian control. Both pose a risk.

The United States, Britain, France, Russia, an North Korea have stopped producing plutonium for weapons. China may have stopped.

India, Israel, and Pakistan are continuing to make plutonium for weapons.

Building a Bomb – 4

To make a Hiroshima-style gun-type bomb, terrorists would need about 50 kg (110 pounds) of weapons-grade HEU.

They could try to reduce the amount needed by using special techniques.

An implosion-type bomb can use either HEU or Pu, but the technical challenges are significant —

- Machining and assembling the parts
- Triggering the implosion

A simple implosion-type bomb would require only 25 kg (55 pounds) of HEU or 4 to 10 kg (9 to 22 pounds) of Pu

Terrorists would be aided by the fact that they would not need to meet military requirements.

The key barrier for terrorists is acquiring enough HEU.

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Insecure Nuclear Explosive Materials

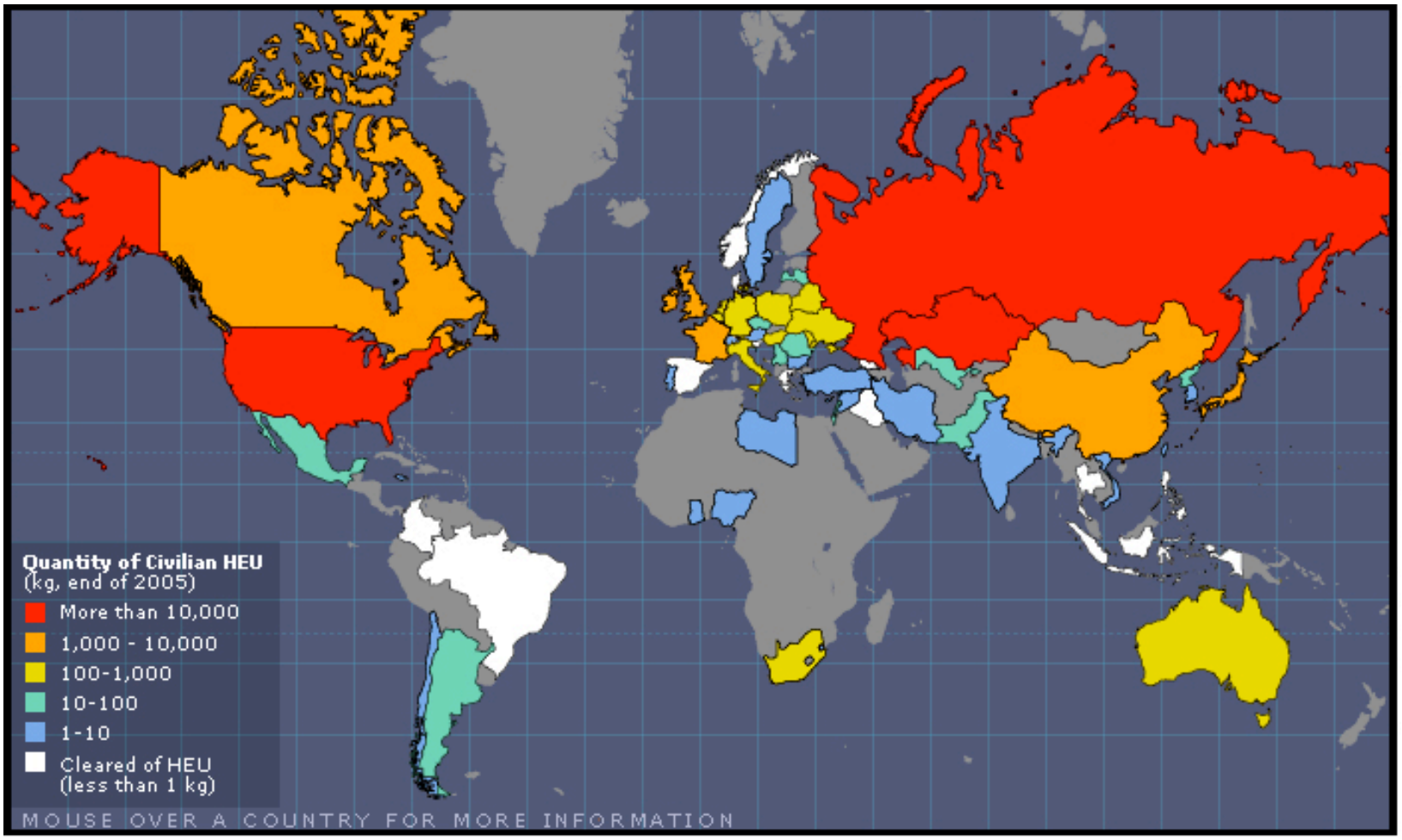
Availability of Uranium from “Atoms for Peace”

Atoms for Peace

- During the 1950s and 1960s, the U.S. Atoms for Peace program and the corresponding Soviet program constructed hundreds of research reactors, including reactors for export to more than 40 other countries.

- These reactors were originally supplied with low-enriched Uranium (LEU), which is not usable for nuclear weapons, but demands for better reactor performance and longer-lived fuel led to a switch to weapons-grade Highly Enriched Uranium (HEU).

Availability of Highly Enriched Uranium
Effect of "Atoms for Peace"



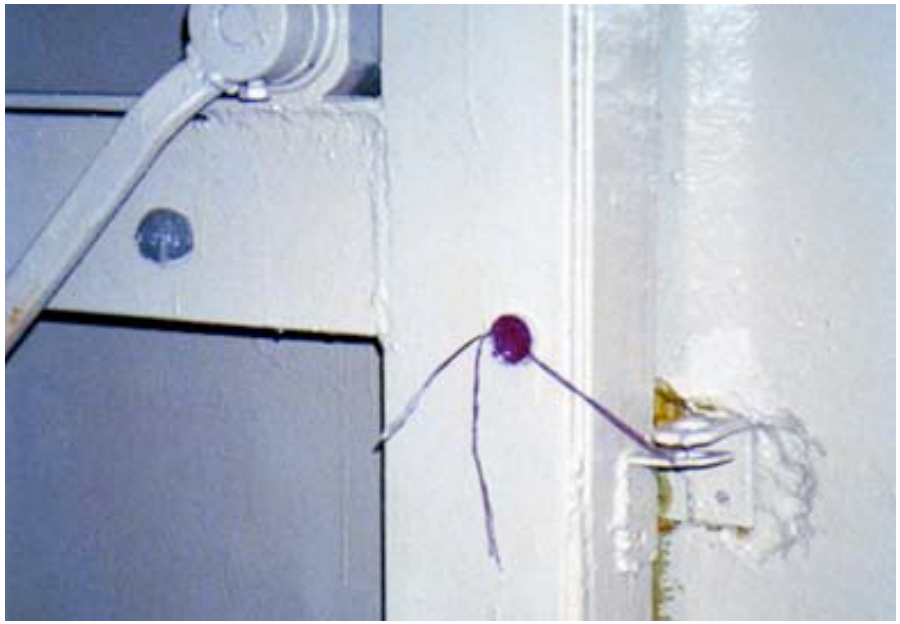
Availability of Nuclear Weapon Materials in the Former Soviet Union

As of 1994, Building 116 at the Kurchatov Institute in Moscow had enough HEU for a bomb at its research reactor, but had an overgrown fence and no intrusion detectors or alarms, an example of the poor state of security at many nuclear facilities after the collapse of the Soviet Union.

Source: http://www.nti.org/e_research/cnwm/threat/russia.asp

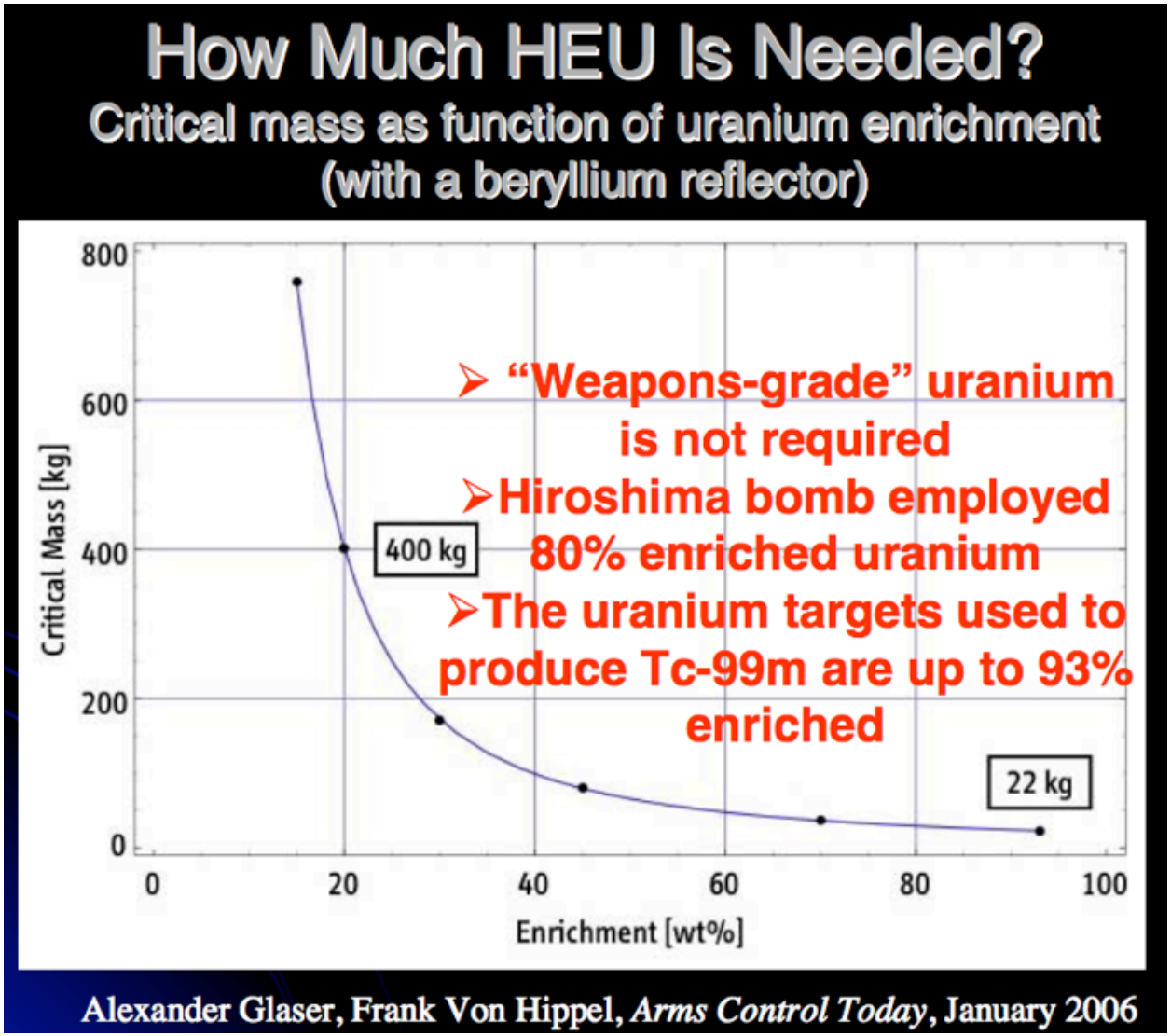
Availability of Nuclear Weapon Materials in the Former Soviet Union

Left and below: Inadequate security measures at former Soviet nuclear facilities, such as the padlock and wax seal shown, would allow easy access to anyone wishing to steal materials.

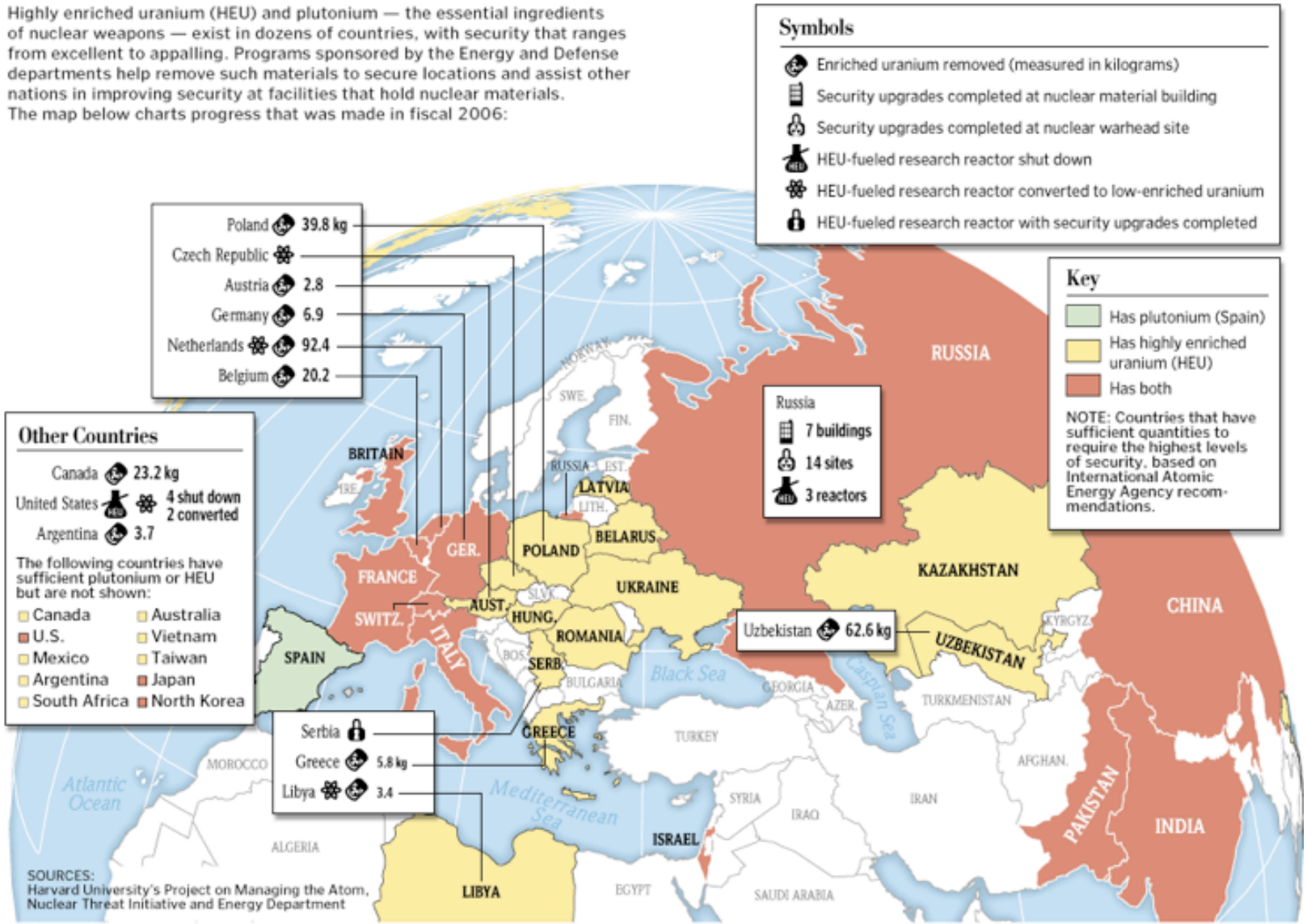


Source: http://www.nti.org/e_research/cnwm/threat/russia.asp

The Danger of Highly Enriched Uranium



Worldwide Highly Enriched Uranium (Details)



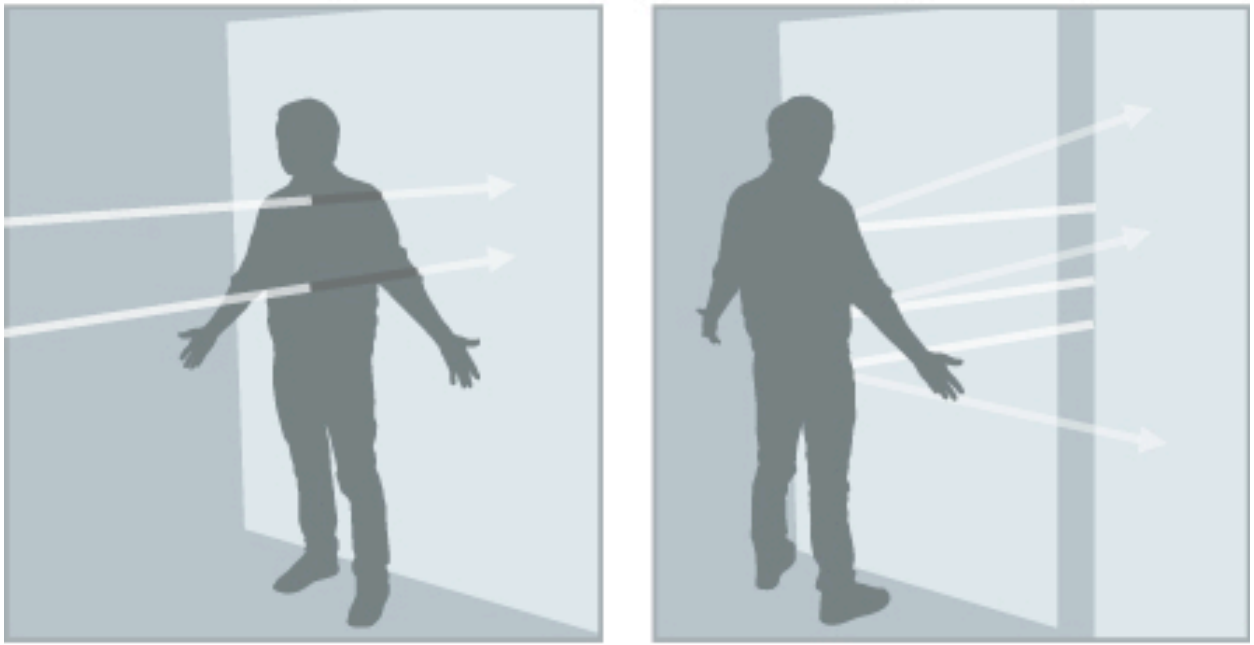
Intercepting Terrorists and Dangerous Nuclear Materials

Intercepting Nuclear Weapons and Materials

Intercepting Nuclear Weapons and Materials

A Reflection on You

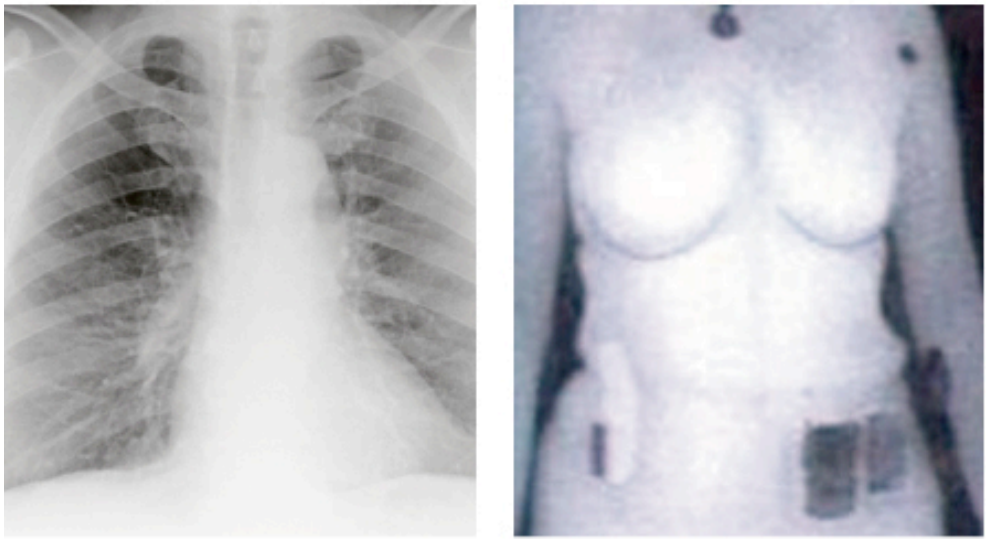
The technology of X-rays for whole-body scanning in airports involves tiny doses of radiation and technology to record how it bounces off the skin. Here's how it differs from medical X-rays.



Intercepting Nuclear Weapons and Materials

Transmission X-rays, such as those used for medical imaging, measure how much radiation an object absorbs. The machine shoots a radiation beam into an object and measures what comes out the other side. Dense objects absorb more radiation, producing the shadow-like images of a medical X-ray.
TYPICAL DOSE 4 millirems

Backscatter X-rays, such as those proposed for wide use in airports, measure reflected, or scattered, radiation. The machine sends a sweeping beam across an object and records the scatter to produce detailed depictions of a body under clothes. Organic material such as skin — or explosives — give off strong signals.
TYPICAL DOSE: .005 millirem



Sources: Health Physics Society; American Science and Engineering Inc.

THE NEW YORK TIMES

Intercepting Nuclear Weapons and Materials

Terrorists organizations known to have sought nuclear weapons or weapon materials —

- Al-Qaeda
- Jemaah Islamiyah
- Chechnyan Separatists
- Hezbollah
- Aum Shinrikyo

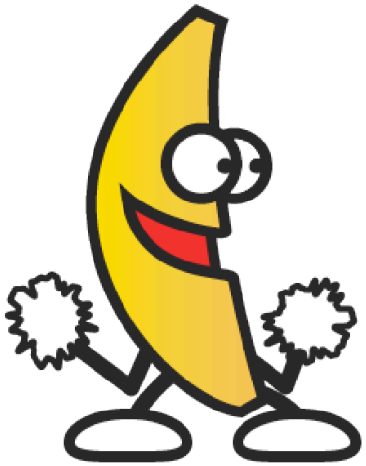
Border Security —

Seven million shipping containers enter the U.S. each year; only 6% are inspected carefully

A truck passes through a radiation portal monitor at the port of Newark, New Jersey.
http://www.whitehouse.gov/omb/budget/fy2006/dhs.html

Intercepting Nuclear Weapons and Materials

What do ceramics, bananas, and kitty litter have to do with border security?



They accounted for 80 percent of the over 10,000 radiological false alarms made by portal monitors between May 2001 and March 2005.

Intercepting Nuclear Weapons and Materials

Bed, Bath and Beyond recalls metal tissue boxes

The Associated Press

Posted Jan 15, 2012 @ 10:58 AM

San Francisco, Ca. — California health officials are advising people who bought specialty metal tissue boxes from retail chain Bed Bath and Beyond to return the items because they're contaminated with low levels of radioactive material.

Intercepting Nuclear Weapons and Materials

The radioactive material was discovered on Jan. 5 when radiation alarms were triggered during a check of a truck at an inspection station, said California Highway Patrol Asst. Chief Frank Parrish. The truck was bound for the retailer's stores in Santa Clara and San Jose.

He would not say where the inspection was held over concerns that truckers would use alternate routes to avoid inspections.

Identifying the Sources of Dangerous Nuclear Materials (Nuclear Forensics)

Nuclear Forensics Definitions

Nuclear Attribution is the process of identifying the source of nuclear or radioactive material used in illegal activities, to determine the point of origin and routes of transit involving such material, and ultimately to contribute to the prosecution of those responsible.

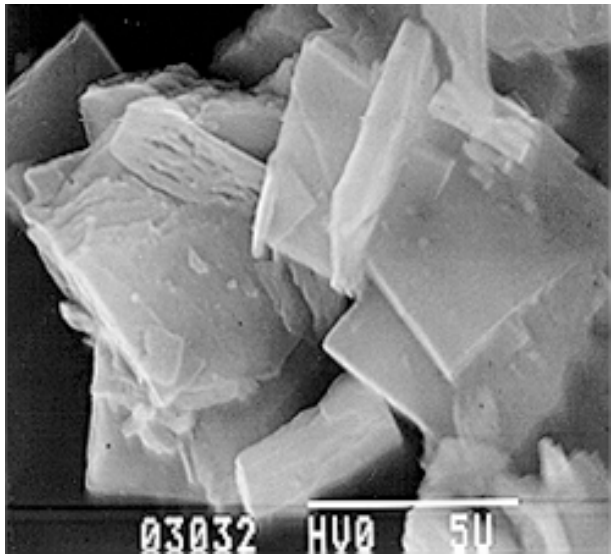
Nuclear Forensics is the analysis of intercepted illicit nuclear or radioactive material and any associated material to provide evidence for nuclear attribution.

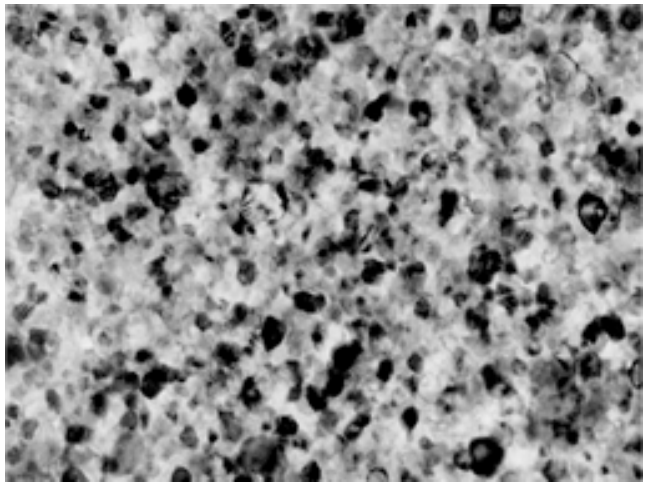
*International Atomic Agency's reference manual *Nuclear forensics support: technical guidance*

Nuclear Forensic Techniques

Electron Microscopy —

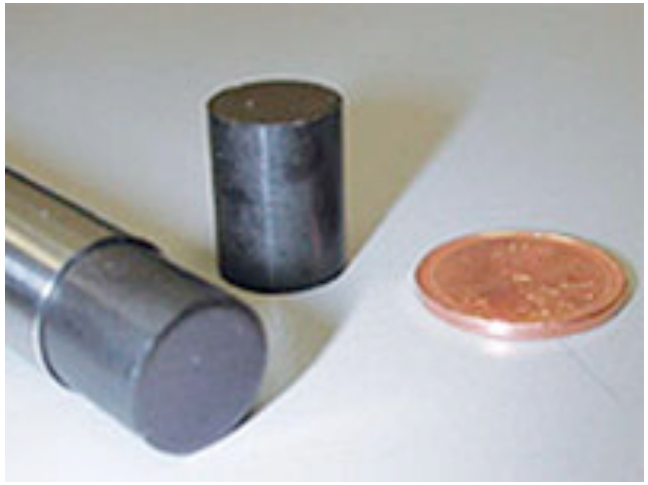
- Typography, morphology, elemental composition, and crystallographic structure
- Scanning Electron Microscopy (SEM) produces images of the surface at high magnification.
- Transmission Electron Microscopy (TEM) uses electrons that pass through the sample to produce images of the internal structure.





Source: Analyst, 2005: 130

Nuclear Forensic Techniques



http://www.nti.org/e_research/cnwm/threat/russia.asp

Analyst, 2005: 130

Profilometry —

- Measures the surface roughness of fuel pellets.
- Production facilities use two types of grinding procedures to reach the desired cylindrical shape: dry grinding and wet grinding. Wet grinding produces a smoother finish.

Size and features —

- The dimensions of the fuel pellet, including the height, radius, and the type of hole present (if any), are specific to certain types of reactors.

Nuclear Forensic Techniques

Isotopic composition reveals the enrichment process, intended use, and reactor type.

Impurity composition reveals the production process and previous geolocation.

Source: Analyst, 2005: 130

Nuclear Forensic Techniques

Age —

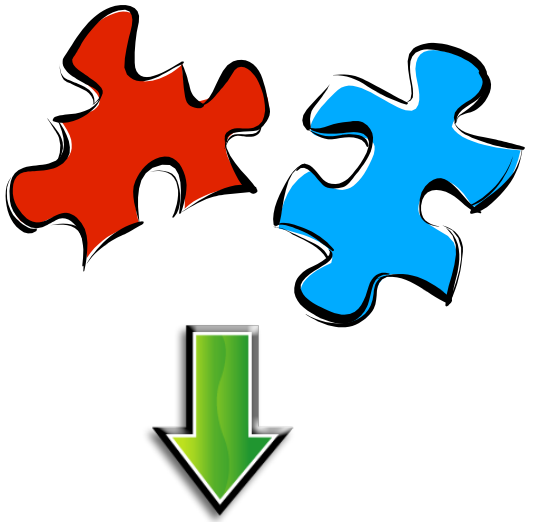
- As a radiological sample gets "older," the parent isotope disintegrates and its daughter nuclides accumulate.
- Knowledge of the age helps an analyst identify when the material was produced.

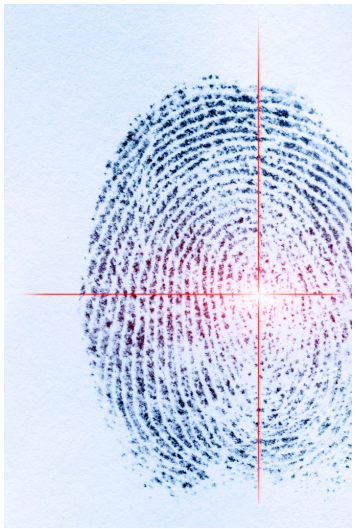
$^{18}O/^{16}O$ Ratio —

- Certain ratios are observed in rainwater, and these "variations up to 5 percent...depend upon average temperature, average distance from the ocean, and the latitude" (Mayer).
- By these means, an analyst can identify the former geolocation of the material.

Nuclear Forensic Techniques: Conclusion

- By using the techniques and analysis methods of nuclear forensics, one can create a “nuclear fingerprint” of the material.
- Information, such as material type, reactor type, production plant, production date, enrichment process, intended use, and geolocation, are pieces of the puzzle that must be solved to form a bigger picture of the radiological evidence’s history.





Status of Programs to Secure and Intercept Nuclear Materials

Securing Vulnerable Nuclear Materials

2010 Government Accountability Office Report on Status of the U.S. Nuclear Security Program

(see also *Arms Control Today*, Jan/Feb 2011)

The GAO reported that the National Security Council (NSC) has approved a document that serves as a government-wide strategy for achieving President Barack Obama's goal of securing all vulnerable nuclear materials within four years.

However, the GAO said that "this interagency strategy lacks specific details concerning how the initiative will be implemented."

Securing Vulnerable Nuclear Materials

Russia

The NNSA received the highest marks for its Material Protection, Control, and Accounting (MPC&A) activities in Russia.

Through this program, which works to conduct security upgrades at nuclear facilities, the NNSA has improved security at 110 Russian nuclear warhead and material sites, the GAO said.

However, the GAO noted that the MPC&A program is due to expire on Jan. 1, 2013, and transfer full responsibility for its activities to Russia.

The report argued that the NNSA would be unlikely to meet this deadline and recommended that the NNSA and Congress take steps to prepare for extending the program past 2012.

Securing Vulnerable Nuclear Materials

Other NNSA programs in Russia have achieved more limited success, the GAO said. The Materials Consolidation and Conversion (MCC) program was created in 1999 with the goal of moving highly enriched uranium (HEU) from 50 buildings and five sites by 2010; it "has achieved removal of all HEU from only 1 site and 25 buildings," the report said.

Likewise, the Global Threat Reduction Initiative (GTRI), which includes an effort to convert or shut down Russian HEU reactors, has made little progress toward that end, the GAO said.

According to the report, the GTRI plans to convert or shut down 71 HEU-fueled research reactors and related facilities in Russia by 2020. To date, Russia has shut down three HEU facilities and committed to shutting down five others, the GAO said.

Securing Vulnerable Nuclear Materials

Ukraine

Following Ukraine's commitment at the April 2010 nuclear security summit in Washington to get rid of all of its HEU by 2012, in May the GTRI facilitated the removal of "more than a third of Ukraine's HEU inventory" to Russia, according to the report.

South Africa

NNSA has completed a contract with South Africa for the return of U.S.-origin spent HEU fuel to the United States. the contract, signed in August 2010, covers 5.8 kilograms of U.S.-origin HEU spent fuel. This will mark the final removal of all U.S.-origin HEU spent fuel from South Africa.

Securing Vulnerable Nuclear Materials

Belarus

Belarus has committed to give up its stockpile of highly enriched uranium (HEU) by the end of 2012.

Prior to the agreement, Belarus, Russia, the United States, and the International Atomic Energy Agency conducted two secret operations in which portions of Belarusian HEU were moved into secure facilities in Russia.

In these operations, a total of 85 kilograms of HEU were transported.

One shipment of 41 kilograms was slightly irradiated; the other consisted of fresh HEU fuel.

Securing Vulnerable Nuclear Materials

July 24, 2011

by Matthew Rusling

WASHINGTON, July 24 (Xinhua) -- A prominent group of U.S. nuclear security experts is blasting a U.S. House plan to cut millions of U.S. dollars in funding for a program aimed at keeping nuclear materials out of the hands of terrorists.

The Nuclear Fissile Working Group (FMWG), a non-governmental organization in nuclear security which comprises more than 60 nuclear security experts, castigated the U.S. House of Representatives Appropriations Committee bill to cut funding from the Global Threat Reduction Initiative.

The group argued that the initiative helps reduce the threat of global terrorism by converting nuclear reactors worldwide to run on non-weapons grade low enriched uranium, instead of highly enriched uranium, which can be used to make bombs.

Securing Vulnerable Nuclear Materials

The House cut 120 million U.S. dollars from the initiative for fiscal 2012. Of that amount, 70 million dollars was for the conversion program. But 35 million U.S. dollars were then restored by an amendment.

The cut came on the heels of a 123-million-dollar cut to the initiative in the final fiscal year 2011 resolution passed by Congress in April.

More than 125 reactors around the globe still need to be converted, many of which are in Russia, Poland, Kazakhstan and Uzbekistan, and some with a history of lax security, according to the FMWG.

"These cuts are pretty difficult to comprehend, given that the program is aimed at combating the biggest threat to national security, namely the threat posed by nuclear terrorism,"said Kingston Reif, director of the Nuclear Non-Proliferation Center for Arms Control and Non-Proliferation.

Matthew Bunn, an associate professor at Harvard's Kennedy School of Government and FMWG member, said that funding for this program directly affects the pace at which highly enriched uranium can be removed from vulnerable sites.

Securing Vulnerable Nuclear Materials

GLOBAL SECURITY NEWSWIRE
DAILY NEWS ON NUCLEAR, BIOLOGICAL & CHEMICAL WEAPONS, TERRORISM AND RELATED ISSUES

U.S. Global WMD Security Efforts Cut Under Obama Budget: Analysis

Feb. 17, 2012

A Partnership for Global Security analysis of the administration's fiscal 2013 spending proposals found that planned allocations to National Nuclear Security Administrations efforts to secure foreign WMD-related materials are down 23.3 percent compared to enacted fiscal 2012 levels (see *GSN*, Feb. 14).

Securing Vulnerable Nuclear Materials

The NNSA International Nuclear Materials Protection and Cooperation initiative, which is involved in nuclear security and antitrafficking efforts in countries of concern, would see its funding levels decreased by $206 million to $311 million for the fiscal year that begins on Oct. 1. The initiative's Second Line of Defense program, which provides radiation detectors to foreign nations, would see a 65-percent funding drop.

Securing Vulnerable Nuclear Materials

A rail portal monitor at Belgium's Port of Antwerp, one recipient of radiation detection equipment under the U.S. National Nuclear Security Administration's Second Line of Defense program. The Obama administration has proposed cutting the effort's funding by 65 percent in fiscal 2013 (U.S. National Nuclear Security Administration photo).

Securing Vulnerable Nuclear Materials

Efforts to protect and retrieve stocks of nuclear and radioactive materials would be reduced by $34 million.

Nuclear and Radiological Material Removal program of the Global Threat Reduction Initiative will be cut nearly 20 percent.

The Global Nuclear Security initiative of the Defense Department's Cooperative Threat Reduction program would be cut by $21.3 million, to $99.8 million.

The State Department's program to improve export controls in partner states would be cut by close to 10 percent, receiving only $55 million.

The State Department's Global Threat Reduction initiative would receive $64 million, a reduction of 7 percent from the present budget cycle.

iClicker Question (Use Channel C-C)

Which one of the following nuclear processes is essential for creating a nuclear explosion?

A. Radioactivity

B. Spontaneous fission

C. Induced fission

D. Neutron activation

E. All of the above

Blank

iClicker Answer

Which one of the following nuclear processes is essential for creating a nuclear explosion?

A. Radioactivity

B. Spontaneous fission

C. **Induced fission**

D. Neutron activation

E. All of the above

iClicker Question (Use Channel C-C)

Which one of the following statements is **false**?

A. A nuclear explosion can be created using any fissionable material

B. A nuclear explosion can be created using any fissile material

C. A nuclear explosion can be created using U(235)

D. A nuclear explosion can be created using Pu(239)

E. A nuclear explosion can be created using reactor fuel

Blank

iClicker Answer

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What We Need To Do

What We Need to Do (Important)

The centerpiece of a strategy to prevent nuclear terrorism must be to deny terrorists access to nuclear weapons or materials

To accomplish this, nuclear terrorism experts argue that we must insist on "Three No's" —

1. No loose nukes
2. No new nascent nukes
3. No new nuclear weapon states

What We Need to Do (Important)

1. No Loose Nukes

Insecure nuclear weapons or materials anywhere pose a grave threat to all nations everywhere.

The international community can therefore rightly insist that all weapons and materials—wherever they are—be protected to a standard sufficient to ensure the safety of citizens around the world.

Russia has been the principal focus of concern for the past decade, but other countries—such as Pakistan—are of growing concern.

What We Need to Do (Important)

2. No New Nascent Nukes

Construction of any national production facilities for enriching uranium or reprocessing plutonium must be prevented.

The former head of the IAEA, Mohamed ElBaradei, has said that the existing NPT system made a mistake in allowing non-nuclear weapon states to build uranium enrichment and plutonium production plants.

Closing this loophole will require deft diplomacy, imaginative inducements, and demonstrable readiness to employ sanctions to establish a bright line.

What We Need to Do (Important)

3. No New Nuclear Weapons States

This means drawing a line under the current eight nuclear powers (the United States, Russia, Great Britain, France, China, India, Pakistan, and Israel) and unambiguously declaring “no more”.

North Korea poses a decisive challenge to this policy. But if North Korea is accepted as a nuclear weapons state, South Korea and Japan are likely to follow within a decade, making Northeast Asia a far more dangerous place than it is today

The spread of nuclear weapons states makes it more likely that nuclear weapons or materials will be sold to others, including terrorists, or stolen by them.

End of Nuclear Terrorism Module