
Preventing Nuclear Terrorism: The Nuclear Terrorism Convention and Other Urgently Needed Steps

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Suppression of Acts of Nuclear Terrorism
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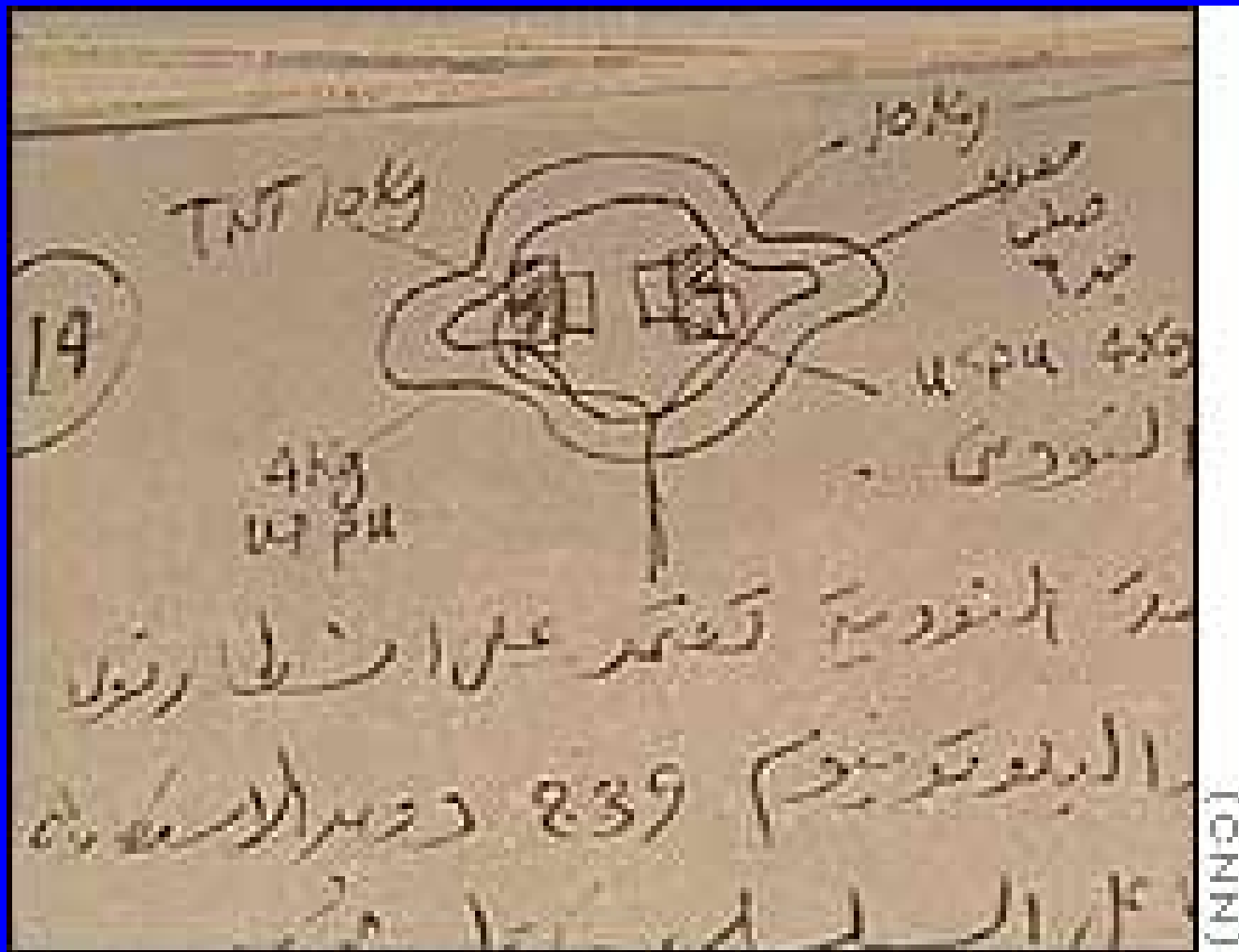
<http://www.managingtheatom.org>

<http://www.nti.org/cnwm>

3 types of nuclear terrorism

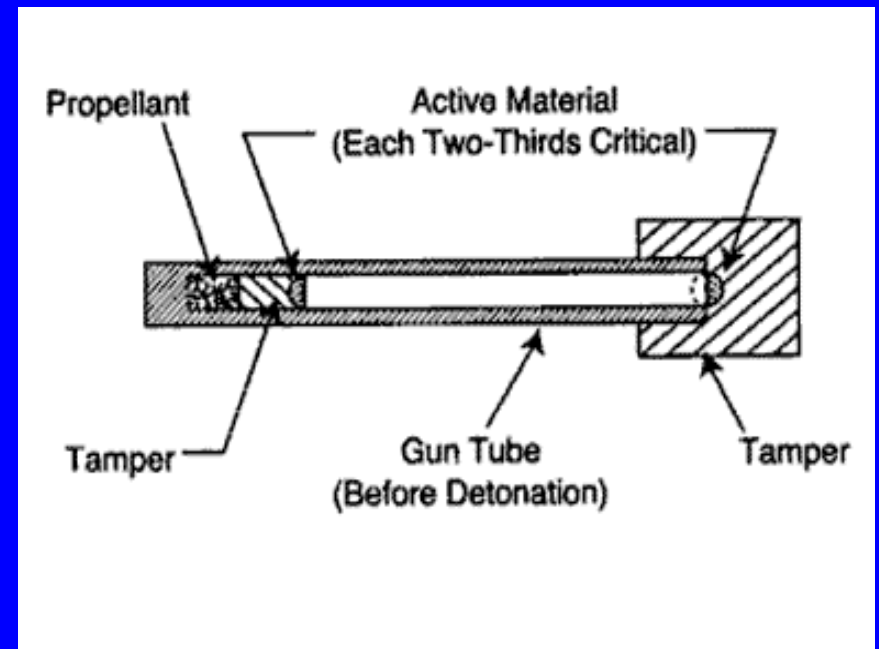
- ◆ *Nuclear explosives* -- potential for terrorist group to steal or build a Hiroshima-scale bomb, which could potentially kill >100,000 people, rip the heart out of any major city. Extremely catastrophic, but difficult for terrorist group to accomplish
- ◆ *Nuclear sabotage* -- potential for sabotage of a nuclear power plant or spent fuel/nuclear waste storage facility, dispersing radioactivity over huge area -- in worst case, 10s of thousands of deaths (mostly long term). Extremely catastrophic, but difficult for terrorist group to accomplish
- ◆ *“Dirty Bomb”* -- conventional explosives used to disperse some radioactive material. Disruption, terror, high clean-up costs -- but few if any deaths. Much less catastrophic, but much easier to accomplish

Terrorists are seeking nuclear weapons – Al Qaida nuclear bomb design



With nuclear material, terrorists may be able to make crude nuclear bombs

- ◆ With HEU, gun-type bomb – as obliterated Hiroshima – smashes two pieces of HEU together at high speed
- ◆ Implosion bomb (required for Pu) more difficult for terrorists, still conceivable (especially if they got help)



Hiroshima – result of a gun-type bomb



Nuclear terrorism: not just a threat to the United States

- ◆ Attacks in London, Madrid, Bali, Moscow, Jordan make clear this is a global threat
- ◆ Even if attack were in United States, economic impact, political and foreign-policy transformations would reverberate throughout the world
- ◆ Kofi Annan: nuclear terror attack would “would stagger the world economy and thrust tens of millions of people into dire poverty,” creating “a second death toll throughout the developing world.”
- ◆ “Security Chernobyl” would be political catastrophe for the nuclear industry worldwide, ending any substantial hope for a large-scale nuclear renaissance

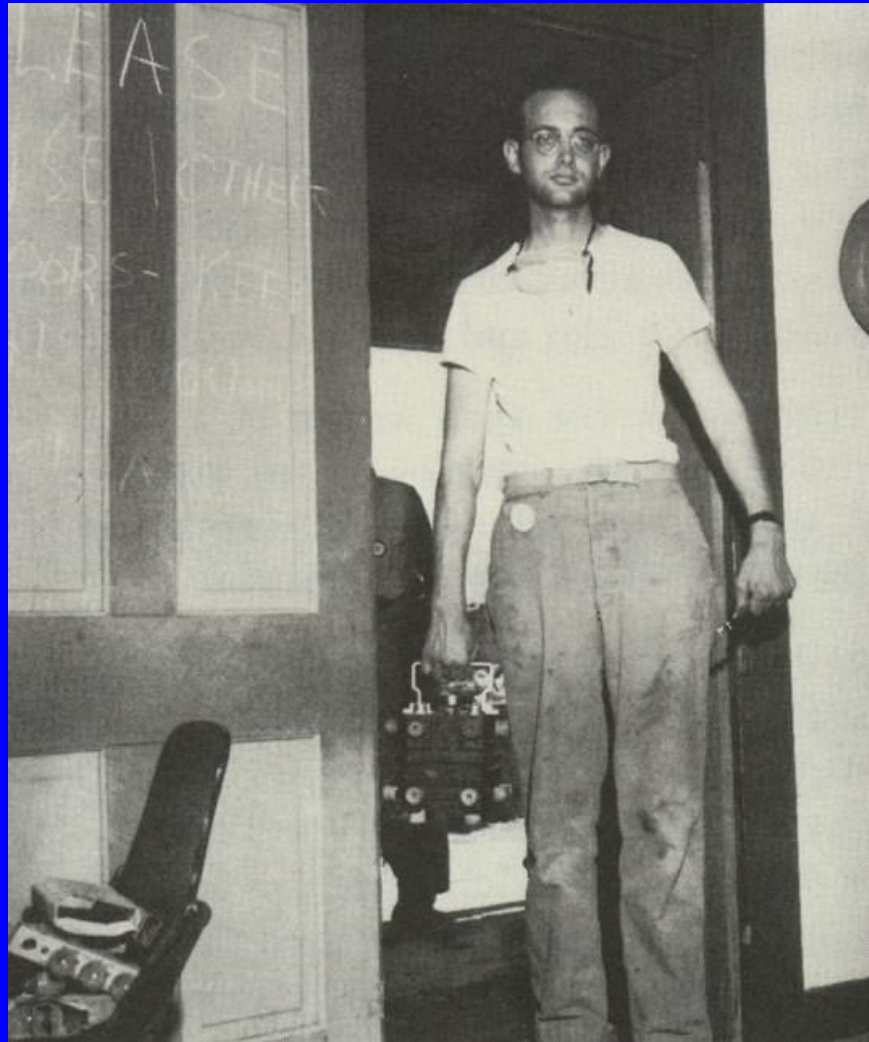
Securing nuclear stockpiles -- a global problem

- ◆ Thousands of tons of weapons-usable nuclear material exist in hundreds of buildings in more than 40 countries worldwide
- ◆ Security ranges from excellent to appalling -- no binding global standards in place
- ◆ >130 operational research reactors fueled with HEU in > 30 countries – most with modest security
- ◆ Pakistan: small nuclear stockpile, heavily guarded – but huge threats, outsider and insider
- ◆ Russia has world's largest stocks, still in transition from Soviet security system not designed for open society with open borders – other Eurasian states have little experience, few resources, for guarding nuclear materials

Moscow building with enough HEU for a bomb -- 1994



Nuclear material is not hard to smuggle –
plutonium box for first-ever bomb



Summary: the nuclear terrorist threat

- | | Yes | No |
|---|-------------------------------------|--------------------------|
| ◆ Do terrorists want nuclear weapons?
– Clear Bin Laden statements, some Chechen interest | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| ◆ Is it conceivable terrorists could make a crude bomb if they got the material? | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| ◆ Is there material that might be vulnerable to theft and transfer to terrorists? | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| ◆ Is it likely that terrorists, if they had a crude device, could smuggle it to Moscow, London, Paris, Washington, or New York? | <input checked="" type="checkbox"/> | <input type="checkbox"/> |

The threat of nuclear sabotage

- ◆ Most nuclear power plants protected by security forces, containment vessels, and redundant safety systems
- ◆ *But*, levels of security vary widely, few civilian facilities designed to cope with Sept. 11 threat -- multiple, coordinated teams, suicidal, well-trained, from a group with substantial combat and explosives experience
- ◆ *If* attackers could successfully destroy multiple safety systems, reactor could melt down, breach containment, spread tons of radioactive material
- ◆ Similarly, *if* attackers could successfully drain the water from a spent fuel pool, real risk that fuel could get hot enough to catch fire -- potential Chernobyl-scale disaster
- ◆ U.S. power plants have small number of armed guards

The threat of nuclear sabotage (II)

- ◆ Some countries have no armed guards at nuclear facilities
- ◆ Older Soviet-design plants do not have Western-style containment, and have fewer redundant safety systems
- ◆ Public design and safety information provides significant guidance on what items to sabotage to cause beyond-design-basis accident (Chernobyl-style meltdown and dispersal of radiation)
- ◆ Well-placed insiders could shift probability of failure of a safety-critical part from 1 in a billion to 100% -- whether 1 insider could cause meltdown depends on design, security
- ◆ Spent fuel pools often less secured than power plants

The threat of “dirty bombs”

- ◆ Dirty bomb could be very simple -- dynamite and radioactive material together in a box
- ◆ Little bits of radioactive material easy to get -- millions of of radioactive sources in industrial and medical use worldwide -- but wouldn't do much
- ◆ Even with dispersal of a large radiological source, usually 0-few acute radiation deaths, few hundred to few thousand from cancer many years later (undetectable against cancer background)
- ◆ *But*, fear of anything “nuclear” could create panic, would have to evacuate area for extended period, cleanup and disruption would be very costly (possibly >\$10 billion)

The solution: a global nuclear security partnership – to serve common interests

- ◆ Fast-paced effort to ensure that every nuclear weapon, every kilogram of separated plutonium and HEU worldwide is secure and accounted for
- ◆ Russia and the United States have >95% of the world's nuclear weapons, >80% of the world's HEU and separated plutonium; responsibility to lead a global effort – must start with high security for their own stocks and facilities
- ◆ Need to build effective global nuclear security standards – nuclear security only as strong as its weakest links
- ◆ Need to remove weapons, material from most vulnerable sites – upgrade security for the remainder
- ◆ *Large improvements in nuclear security can be made at costs that are tiny compared to military security investments or nuclear energy revenues*

A global nuclear security partnership (III)

- ◆ Accelerate, strengthen, U.S.-Russian effort
 - Complete upgrades by end of 2008
 - Put in place resources, organizations, incentives to ensure effective security and accounting will be sustained, improved, after U.S. assistance phases out – high-level Russian commitment needed
 - Strengthen “human factor” – additional training, incentives, organizational changes
- ◆ Quickly remove nuclear material from vulnerable sites
 - Seek to eliminate all civilian use of HEU within 10 years
 - Includes converting research reactors to LEU, shutting down facilities that are no longer needed, shipping HEU back to country of origin (or other secure location)
 - Global Threat Reduction Initiative (GTRI) provides foundation – but targeted incentives needed for each facility

Legal frameworks:

The Nuclear Terrorism Convention

- ◆ Opened for signature in 2005
- ◆ Focuses primarily on committing states to criminalize:
 - Terrorist use of a nuclear bomb
 - Terrorist sabotage of a nuclear facility
 - Terrorist use of a “dirty bomb”
 - Attempts, threats, and assistance with the above
 - Arrangements for extradition, jurisdiction in other states
- ◆ Also requires all parties to “make every effort” to ensure “appropriate” physical protection for nuclear and radiological material, “taking into account” IAEA recommendations
 - No more specific requirements for nuclear security improvements

Need to convince states to sign, ratify, and implement

Legal frameworks: The Physical Protection Convention Amendment

- ◆ Completed in 2005
- ◆ Extends Physical Protection Convention's coverage to:
 - Civilian nuclear material in domestic storage, use, and transport (not just international transport as previously)
 - Sabotage, as well as theft
 - Still does not include radiological sources or military stocks
- ◆ Mandates that states implement very general “Fundamental Principles” of physical protection “insofar as is reasonable and practicable”
 - Establish system of physical protection regulation, with inspections
 - Establish independent regulatory organization with authority to enforce the rules
 - Provide “defense in depth”, promote “security culture”
 - No specific, binding standards for how secure material should be

Need to convince states to sign, ratify, and implement

Legal frameworks: UNSCR 1540

- ◆ Approved unanimously in 2004
- ◆ Passed under Chapter VII, binding on all states
- ◆ Requires states to implement a range of measures to keep nuclear, chemical, biological weapons out of terrorist hands
 - export controls, border controls, security for stockpiles, and more
- ◆ Requires all states to provide “appropriate effective” security and accounting for nuclear stocks
 - No one has yet defined essential elements of “appropriate effective” nuclear security and accounting system – should be done
 - Should build common understanding that to be “effective,” security systems must be capable of defeating demonstrated terrorist and criminal threats
 - Should then work to help (and pressure) all states to put these essential elements in place

IAEA nuclear security recommendations

- ◆ IAEA recommendations are in INCIRC/225/Rev. 4
 - Non-binding, but most states follow this advice (some supply agreements require compliance)
 - Most specific international “standard” for nuclear security
 - But still very general:
 - » Category I material should have a fence, intrusion detectors, and guards – but how high a fence, how good the intrusion detectors, how many guards, should they be armed...?
 - Tends to be rule-based, not performance-based – no guidance on what security systems should be able to defend against
 - Last revision long before the 9/11 attacks
 - International discussion of new revision now beginning; should seek agreement on minimum design basis threat
 - » E.g., all Cat. I material should *at least* be protected against a modest group of well-trained, well-armed outside attackers, capable of operating in 2 teams, and/or 1-2 well-placed insiders

Cooperative frameworks: Bilateral cooperation

- ◆ Extensive U.S.-Russian cooperation (>\$2 billion spent to date) to put in place modern security, control, and accounting systems for nuclear warheads and weapons-usable nuclear material
- ◆ Bush-Putin Bratislava summit statement in 2005 accelerated, strengthened the effort
 - Planning to complete agreed upgrades in 2008
 - Several-year transition to sustainability planned
 - Extensive exchanges of “best practices” on nuclear security approaches (e.g., vulnerability assessment, security regulation, security culture...)
- ◆ United States also cooperating with former Soviet states, Pakistan, China, HEU-fueled research reactor operators; other donor states also contributing...
 - Cooperation possible *without* compromising security secrets

Cooperative frameworks: IAEA-led peer reviews

- ◆ When countries request nuclear security help, IAEA organizes teams of experts to carry out peer reviews
 - INSServ – International Nuclear Security Advisory Service: review of all nuclear security issues, from physical protection of nuclear materials to radioactive source controls to border controls (identifies needs for more specific review and recommendation in key areas)
 - IPPAS – International Physical Protection Advisory Service – reviews physical protection for nuclear material and facilities
 - IAEA does not have funds to finance recommended improvements, but helps find funds from donor states as needed
 - Many states – even some advanced developed states, such as Norway – have benefitted from international peer review
 - International review of nuclear security should become a normal, accepted practice for all states, as it is in the case of nuclear safety

Cooperative Frameworks: The Global Initiative to Combat Nuclear Terrorism

- ◆ Launched by the United States and Russia, July 2006
- ◆ Now scores of states participating – all have accepted very general “statement of principles”
- ◆ Provides forum for cooperation, workshops, exercises, and the like focused on several aspects of reducing the risk of nuclear terrorism
- ◆ Example: just-completed Miami workshop on strengthening law enforcement agencies’ abilities to address nuclear terrorism

Jury still out on how effective the Global Initiative will prove to be in reducing the risk

What every state should do

- ◆ Understand that nuclear terrorism is a real and urgent threat to all states, worthy of investing resources to prevent it
- ◆ Sign, ratify, and implement the Nuclear Terrorism Convention and the Amendment to the Physical Protection Convention
- ◆ Fully implement all elements of UNSC 1540
- ◆ Provide security for all nuclear stockpiles sufficient to reliably defeat demonstrated terrorist and criminal threats
- ◆ Reduce number of sites where nuclear weapons, materials exist to the absolute minimum
 - Convert research reactors to LEU
- ◆ Join in Global Initiative to Combat Nuclear Terrorism
- ◆ Request assistance, review, where needed

Nuclear security in 2015: the vision

- ◆ No nuclear terrorism has occurred, no terrorists or hostile states have gotten nuclear weapons or materials
- ◆ All nuclear weapons and nuclear explosive material (separated plutonium and HEU) worldwide are sustainably secured and accounted for, to standards sufficient to defeat demonstrated terrorist and criminal threats
- ◆ All high-consequence nuclear facilities are similarly secure from both outsider and insider sabotage and attack
- ◆ All large radiological sources are under effective control
- ◆ Effective border control, police, and intelligence measures in place to interdict nuclear smuggling
- ◆ There is sufficient transparency to give the international community confidence these steps have been taken

Nuclear security in 2015: the vision (II)

- ◆ Effective international police and intelligence cooperation has largely eliminated high-capability terrorist groups with potential for nuclear terrorism
- ◆ The number of facilities with nuclear weapons or nuclear explosive material worldwide has been greatly reduced
- ◆ Nuclear weapons and stockpiles of nuclear explosive material (separated plutonium and HEU) are drastically reduced worldwide
- ◆ Sustained or expanded energy contribution from nuclear power, with reduced proliferation impact – including reduction in proliferation-sensitive activities

The 1st priority: high-level leadership

- ◆ Success will require *dramatic* increase in sustained, high-level (White House and Cabinet) U.S. leadership – and comparable leadership from other countries
- ◆ U.S. President, other leaders of key states, should appoint a senior official with *full-time* responsibility for these issues, reporting directly to them
- ◆ Such officials could keep next steps on the front burner, lay out a strategic plan to reduce threats to world security as rapidly as practicable, identify obstacles to acceleration and means to overcome them, seize synergies, avoid overlaps
- ◆ These national officials should meet regularly to build global partnership, identify and act on top priorities

For further reading...

- ◆ A major web section we maintain for the Nuclear Threat Initiative, *Securing the Bomb*:
 - <http://www.nti.org/securingthebomb>
- ◆ Includes hundreds of pages of analysis, links, and databases, and our most recent reports:
 - *Securing the Bomb 2006* (July 2006)
 - *Securing the Bomb 2005: The New Global Imperatives* (May 2005)
 - *Securing the Bomb: An Agenda for Action* (May 2004)
 - *Controlling Nuclear Warheads and Materials: A Report Card and Action Plan* (March 2003)
- ◆ For regular e-mail updates from *Managing the Atom*, write to atom@harvard.edu

Backup slides if needed...

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Dealing with the sabotage threat

- ◆ Similar to preventing theft: 1st priority is high security at highest-risk sites
 - Need sabotage threats to be categorized by priority, as materials are
 - Need protection against outsider attack and insider conspiracy
 - Outsider attack could include:
 - » Groups of armed terrorists attacking by land, boat, or helicopter
 - » Truck bombs, boat bombs
 - » Large aircraft crashes
 - » Small aircraft packed with explosives
- ◆ For future systems, design for security:
 - Strengthens case for “inherently safe” systems
 - Designs must ensure against catastrophic release BOTH in the event of external attacks and internal sabotage (harder problem)
 - Terrorism risk will inevitably be a key factor publics, utilities, governments will consider in choosing energy sources

Dealing with the “dirty bomb” threat

- ◆ Better control, accounting, security for radioactive sources:
 - All high-priority sources worldwide should be accounted for, regulated, and have basic security measures (strong locks, alarms, etc.) throughout their life-cycle – “Code of Conduct”
 - Improved transport security especially needed
 - Retrieve, safely dispose of disused sources
 - >100 countries worldwide have inadequate controls
- ◆ Radiation detection at ports, borders
- ◆ Improved capacity to detect, assess, respond to attack
- ◆ Develop improved urban decontamination technologies
- ◆ Most important: communication strategy to limit panic, tell public how to respond – complicated by past gov’t lies

The later lines of defense

- ◆ Preventing weapons and materials from being stolen in the first place is 90% of the battle -- once stolen, extremely difficult to find and interdict
- ◆ *Intelligence and law enforcement cooperation.* Need drastically increased cooperation to detect, analyze, all key indicators of nuclear conspiracies
- ◆ *Smuggling interdiction.* All countries have UNSC 1540 legal obligation to put in place effective border controls, transshipment controls – including to stop nuclear and radiological materials. Vast amount of work to be done
- ◆ *Nuclear emergency response.* Need effective measures in place to respond to a nuclear emergency – evacuation, treatment, decontamination, public communication – but should focus first on prevention.

Essential elements of an “appropriate effective” physical protection system

- ◆ A *design basis threat* reflecting today’s threats
- ◆ Effective *regulation* requiring all facilities with potential bomb material or posing a catastrophic sabotage risk to have security capable of defeating the DBT
 - Backed up by inspections, and enforcement
 - Ideally including *realistic tests* of the system’s ability to defeat outsider and insider threats
- ◆ A strong *security culture*, to ensure that all relevant staff understand the threat and the importance of security
- ◆ *Police and intelligence* efforts focused on ensuring that nuclear conspiracies will be detected
- ◆ *Regular review and adaptation* to ensure the system adapts to changing threats and opportunities

Demonstrated insider threats

- ◆ The desperate insider
 - Danger in Russia reduced with Russian economic stabilization (but still frequent incidents of minor theft by soldiers and sailors)
- ◆ The greedy/corrupt insider
 - e.g., recent conviction of Atomflot deputy director Tyulyakov for uranium trafficking -- countless other cases worldwide
- ◆ The ideologically sympathetic insider
 - e.g., case of Sultan Bashiruddin Mahmood in Pakistan
- ◆ The blackmailed insider
 - Chechens, others have used tactic of kidnapping a child of an official -- many other possibilities
- ◆ *Outsiders and insiders may work together*

Demonstrated outsider threats

- ◆ Large overt attack

- e.g., Moscow theater, October 2002: ~ 40 heavily armed, well-trained, suicidal terrorists, striking without warning

- ◆ Multiple coordinated teams

- e.g., 9/11/01 -- 4 teams, 4-5 participants each, well-trained, suicidal, from group with access to heavy weapons and explosives, >1 year intelligence collection and planning, striking without warning

- ◆ Significant covert attack

- e.g., Indian incident with thieves drilling through wall for sources

- ◆ Use of unusual vehicles

- e.g., helicopters used in many recent jail escapes
- e.g., speedboat planned for use in \$200M Millennium Dome theft

Strong security culture is critical

- ◆ Officials, managers, will not assign needed priority, resources to security unless they believe in the threat; staff will not take security seriously, and will cut corners on burdensome security rules, unless they believe in the threat
- ◆ All relevant staff must understand *what* the security rules are and *why* they are important
- ◆ Can build security culture with:
 - Threat briefings, videos, and other training
 - Nuclear terrorism exercises
 - Incentives for strong security performance
 - IAEA guidance in preparation
- ◆ *Probability of major radioactive release from terrorism is higher than from accidents – security requires same level of care and scrutiny as safety – major culture shift*

Security culture matters: Propped-open security door



*From GAO, Nuclear Nonproliferation: Security of Russia's Nuclear Material
Improving, More Enhancements Needed (GAO, 2001)*