

---

# “Appropriate Effective” Nuclear Security and Accounting – What is It?

Matthew Bunn

Project on Managing the Atom, Harvard University

“Appropriate Effective” Material Accounting and Physical Protection -- Joint Global Initiative/UNSCR 1540 Workshop  
18 July 2008, Nashville, Tenn.

<http://www.managingtheatom.org>

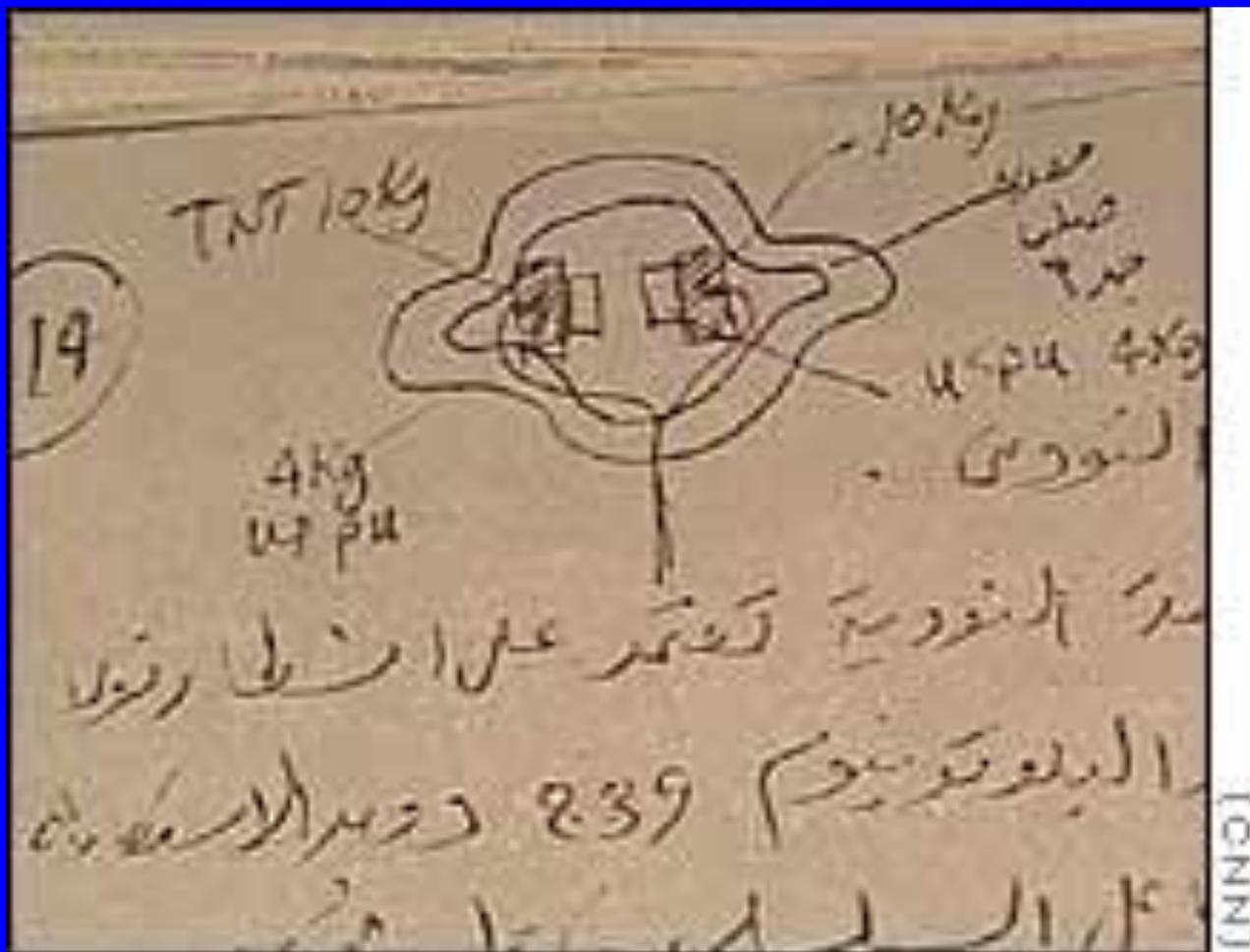
# Outline

---

- ◆ Nuclear terrorism: a real threat
- ◆ UNSCR 1540 – a major new tool, little used
- ◆ What UNSCR 1540 says
- ◆ Essential elements of “appropriate effective” physical protection
- ◆ Essential elements of “appropriate effective” material control and accounting
- ◆ How can we move forward from here?

*Work in progress, not final answer – intended to provoke debate, discussion*

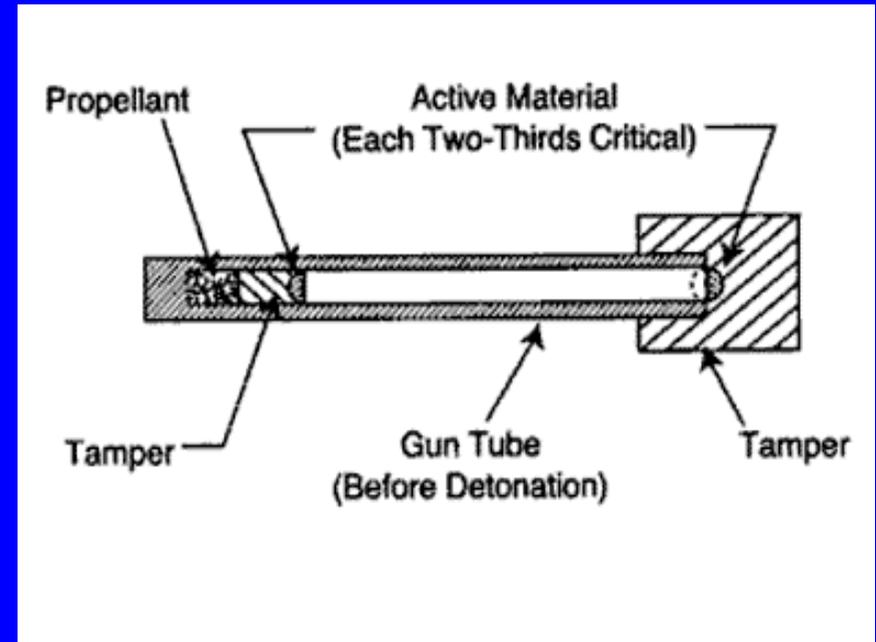
# Terrorists are seeking nuclear weapons...



Source: CNN

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

- ◆ With HEU, gun-type bomb – as obliterated Hiroshima – very plausibly within capabilities of sophisticated terrorist group
- ◆ Implosion bomb (required for Pu) more difficult, still conceivable (especially if they got help)



Source: NATO

# Hiroshima -- result of a gun-type bomb

---



*Source: U.S. Army*

# UNSCR 1540: a dramatic opportunity

---

- ◆ New binding legal obligation on every UN member state to put in place “appropriate effective”:
  - Laws criminalizing non-state WMD proliferation
  - Security and accounting for WMD, their means of delivery, and related materials
  - Physical protection
  - Border controls and law enforcement to block illicit trafficking
  - Export controls and transshipment controls
- ◆ Obligation not limited to parties to NPT or other multilateral agreements
- ◆ But what would an “appropriate effective” system be, in each of these cases? Not defined

*A key new nonproliferation tool – but so far not used to its full potential*

# Nuclear security: what UNSCR 1540 says

---

- ◆ All states *must* put in place “appropriate effective”:
  - “measures to account for and secure” nuclear weapons and “related materials”
  - “physical protection measures” for nuclear weapons and materials
- ◆ Note that nuclear security and physical protection treated separately
  - Securing these items effectively is a *broader* concept than just providing effective physical protection – would generally include police, intelligence...
- ◆ Radiological material, sabotage are not mentioned in the obligation
- ◆ The next step – defining what the obligation to put in place “appropriate effective” systems requires

# Steps to effective implementation

---

- ◆ ***Defining what's required:*** For each major obligation, find a way to reach a definition of what, specifically, states are required to do
- ◆ ***Assessing what's needed:*** Find approaches to finding out what states already have in place, what the most urgent weaknesses to correct are
- ◆ ***Helping put the needed measures in place:*** Help (and pressure) states to put in place the measures required for an “appropriate effective” system
- ◆ Each of these steps will be most effective if all are linked together, in an integrated approach

# What is “appropriate effective” nuclear security?

---

- ◆ Plain language: If “appropriate effective” means anything, it should mean that security systems can “effectively” defeat threats that terrorists and criminals have shown they can pose
  - *Protecting reliably against demonstrated threats.* All sites, transports with nuclear weapons, or a Category I quantity of nuclear material must have security in place capable of defeating, with high confidence, a specified set of insider and outsider threats comparable to those terrorists and criminals have demonstrated in that country (or nearby)
  - *Global minimum protection for nuclear stocks.* Facing terrorists of global reach, all such stocks anywhere should *at least* be protected against 2 small teams of well-trained, well-armed outside attackers, one well-placed insider, or both together

# Essential elements of “appropriate effective” nuclear security

---

- ◆ To be “appropriate effective”, a nuclear security system should include:
  1. ***Effective rules based on a DBT.*** Clear and well-enforced rules requiring each facility or transporter with nuclear weapons or Cat. I nuclear materials to have security measures in place capable of defeating a specified set of threats. Regulator must have adequate authority, independence, competence, and resources.
  2. ***Strong security culture.*** A regular, effective process for assessing security culture and continually improving it.
  3. ***Defense in depth.*** Security systems should include a balance of multiple elements, and should still protect if any one element fails.
  4. ***Graded approach.*** An approach should be in place to focus the most security resources on the materials that would be easiest to use to make a nuclear bomb (but should not be “cliffed safeguards” where virtually all security removed past some arbitrary cutoff)
  5. ***Vulnerability assessments.*** Requirements for regular in-depth vulnerability assessments, with identified vulnerabilities corrected in a timely way

# Essential elements of “appropriate effective” nuclear security (II)

---

◆ Additional essential elements:

6. *Security plans.* Facility-level security plans for meeting the security rules, appropriately reviewed
7. *Effective guard forces.* Well-armed, well-trained, and well-motivated guard forces
  - » For Cat. I nuclear material, no real substitute for on-site armed guards
8. *Effective screening and monitoring of personnel.* In-depth examinations of the background of all personnel given nuclear security-related responsibilities, with ongoing review, measures to limit access to authorized personnel.
9. *Effective measures to address insider threats.* Keep material in vaults where possible; 2-person rule; continuous monitoring of material status; portal monitors to detect removal; effective accounting; etc. (More on this in accounting discussion.)

# Essential elements of “appropriate effective” nuclear security (III)

---

◆ Additional essential elements:

- 10. *Realistic testing of performance.*** Should include not only tests of subsystems and components – e.g., does the portal monitor detect HEU? – but “red team” exercises of the system’s ability to defeat outsiders trying to break in, insiders stealing material
- 11. *Active efforts to minimize sites and transports.*** Should be a focused program to eliminate nuclear stocks from as many locations as possible.
- 12. *Measures to stop the threat before an attack.*** Should be a focused police/intelligence effort to increase the chance of detecting, stopping nuclear plots before a theft attempt begins
- 13. *An effective emergency response plan.*** Should be detailed plans in place – and exercised – for off-site response forces to aid on-site forces, and for search and recovery in the event of theft

# What is “appropriate effective” nuclear material control and accounting?

---

- ◆ Plain language: to be “appropriate effective,” it must effectively address the key threats MC&A intended to cope with. It should provide high confidence of detecting (and ideally localizing)
  - Abrupt theft of significant quantity (ideally in time to respond, certainly in <1 month)
  - Protracted theft of significant quantity (ideally while left is in progress and can still be stopped)
- ◆ Should also be accurate enough to provide high levels of assurance that *no* removal of a significant quantity has occurred
- ◆ Ability to localize where theft occurred, who had access at that time and place, helps deter insiders

# Essential elements of “appropriate effective” material control and accounting

---

- ◆ To be “appropriate effective”, a nuclear material control and accounting system should include:
  1. *No unmonitored access.* 2-person rule; security cameras monitoring access, handling
  2. *Minimum access of any kind.* Access to material by anyone only when absolutely necessary; material in vault when not in use
  3. *No exit without screening.* Effective portal monitors at all exits, no other ways to get nuclear material out
  4. *Effective use of tamper-indicating devices and alarms.* Material not in process should be in sealed containers with tamper-resistant TIDs with unique identifiers; devices to set off an alarm in the event of any tampering should be used where practical
  5. *Regular measured inventories.* Measured inventories should be taken regularly.

# Essential elements of “appropriate effective” MC&A (II)

---

◆ Additional essential elements:

5. *Rapid and effective resolution of anomalies.* Whenever accounting suggests missing material, the investigation should be swift and thorough.
6. *Shipper-receiver reporting and resolution of differences.* Material must be measured and sealed before shipment, measured on receipt, and differences effectively resolved.
7. *Accounting system structured to allow localization.* Where practicable, the material balance areas should be structured to keep measurement uncertainties in any one area small and to make it possible to localize problems to particular areas
8. *Measurement control program.* Must be a rigorous program to calibrate, control measurement systems – “without measurement control, may as well not measure”
9. *Performance testing and assessment.* Performance goals should be established, and system performance must be regularly tested

# Toward a global nuclear security standard

---

- ◆ A broadly accepted definition of what UNSC 1540's "appropriate effective" obligation requires would become, in effect, a binding global standard for nuclear security
- ◆ To succeed, such a definition of what's needed must:
  - Not be seen as unduly interfering with sovereignty (and secrecy) over nuclear security
  - Be simple enough to allow each state to pursue its own approaches – but specific enough to be effective, and to hold states accountable for complying with the obligation
  - Be pursued at a political level, bypassing expert-level talks where those focused mainly on costs traditionally object
  - For example, two-page statement could be agreed at G8 summit, or in Global Initiative to Combat Nuclear Terrorism

*Insecure nuclear material anywhere is a threat to everyone, everywhere*

# After defining what's required, assess what's needed, help put it in place

---

- ◆ Assessment teams led by the United States, Russia, or other major powers – or by the IAEA's Office of Nuclear Security – could assess needs worldwide
- ◆ Assistance and funding for upgrading security arrangements where needed could be provided bilaterally by the United States and other participants in the Global Partnership or the Global Initiative – or through the IAEA
- ◆ Given the substantial ongoing cost of ensuring effective physical protection – and the continuing risk of theft wherever weapons-usable nuclear materials exist – removing material entirely from all sites where it is not needed should be part of this effort
  - The costs of meeting effective nuclear security standards, if adopted, will give sites incentives to eliminate nuclear material

# Strengthening the IAEA role

---

- ◆ In many countries, definitions of “appropriate effective” approaches; assessments of needs; and assistance in implementing UNSC 1540 coming from the IAEA will be more welcome than those pushed by the United States
- ◆ IAEA Office of Nuclear Security already provides assessments, helps coordinate assistance, on physical protection and illicit trafficking – but has very limited resources
- ◆ Office of Nuclear Security should be given the mission and resources to help countries implement UNSC 1540 – not by itself, but in coordination with donor-state efforts
  - Judge case-by-case which activities are most effectively done through IAEA, which in other venues

# UNSCR 1540:

## Seizing the opportunity

---

- ◆ On current track, danger that UNSCR 1540 will have little impact on nuclear security and accounting
  - Each country declares that its existing approaches are “appropriate effective,” therefore no major changes needed
  - Weak links remain
- ◆ But still a chance to make UNSCR 1540 the foundation for effective, binding, global standards, elimination of weak links worldwide
  - If broad agreement develops on demanding definitions of what is required, and fast-paced global effort is undertaken to help countries put in place much stronger security and accounting
- ◆ Making that happen will take a major effort from the highest levels of government – it’s time to try!

*“Nuclear security is only as good as its weakest link.”*

# For further information...

---

- ◆ Website of the Managing the Atom project:
  - <http://www.managingtheatom.org>
- ◆ A major web section we maintain for the Nuclear Threat Initiative, *Controlling Nuclear Warheads and Materials*
  - <http://www.nti.org/securingthebomb>
- ◆ Includes our most recent report:
  - *Securing the Bomb 2007* (September 2007)
- ◆ For regular e-mail updates from Managing the Atom, or to explore volunteer internships, write to [atom@harvard.edu](mailto:atom@harvard.edu)