



Nuclear waste transportation.

Lessons from 9/11/2001
applicable to nuclear waste
transportation program planning,
security, and emergency response.

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Specialties:

- **Political sociology**
 - Study of power relations, government influence, and bureaucracies and regulatory agencies.
- **Criminology and deviance**
 - Terrorism studies
 - Effects on first responders – police, fire, and medical personnel.





TOPICAL OUTLINE

1. Pre-September 11, 2001:
Nevada's NRC petition for rulemaking.
2. Pre-September 11, 2001:
Various vulnerability assessments.
3. Pre-September 11, 2001:
Various consequence assessments.
4. Post-September 11, 2001:
Lessons that can be learned.
5. Recommendations.



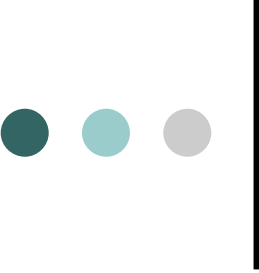
NRC Petition for Rulemaking

- 6.22.99 Nevada files Rulemaking Petition with NRC
- 9.13.99 Petition published in Federal Record.
- 11.29.99 Public comment period ends.
- To date no resolution.
- Some of the basis for Nevada's petition:
 - Changing nature of shipments and symbolic value of casks as targets.
 - Changing nature and characteristics of terrorism.
 - Increase in RDD related terrorism activities.
- Issues:
 - Reexamine design basis threat for radiological sabotage.
 - Expand definition of radiological sabotage.
 - Strengthen advanced approval requirements of shipment routes.
 - Adopt new requirements for planning/scheduling.
 - Strengthen escort requirements for road and rail shipments.
 - Comprehensive update of consequence assessment methodology.



Pre-September 11: Vulnerability assessment

- Some of the relevant studies on cask and shipment vulnerability:
 - Sandoval 1983.
 - Dietrich and Walters 1983.
 - Halstead and Ballard 1997.
 - International Fuel Containers 1998.
 - Luna 1999.
 - DOE 1999 (DEIS).
 - DOE 2002 (FEIS).
 - Audin 2002.
 - Meserve 2002a.
 - Meserve 2002b.
- Summary of issues these studies pose:
 - NRC Chairman Meserve noted that none of the current casks have been tested full scale for terrorist attacks.
 - DOE's FEIS notes average rail cask inventories of ~ 816,000 curies of **Cesium 137** and ~ 136,000 curies for truck casks.
 - 1980's era studies indicate the breach vulnerability of casks to shape charges and in particular note the danger when a secondary device for dispersal of contents is used.
 - 1999 study by Sandia indicates both rail and truck casks are vulnerable to shape charges and to anti-tank munitions, especially truck casks.
 - Industrial testing of a European rail cask design shows breach vulnerability.



Pre-September 11, 2001: Consequences assessment.

○ Relevant studies on consequences:

- Sandoval 1983.
- Dietrich/Walters 1983.
- NRC 1984.
- SAIC 1991.
- Halstead/Ballard 1997.
- Luna 1999.
- DOE 1999 (DEIS).
- DOE 2002 (FEIS).
- Audin 2002.
- Lamb et al. 2002.

○ Summary of issues these studies pose:

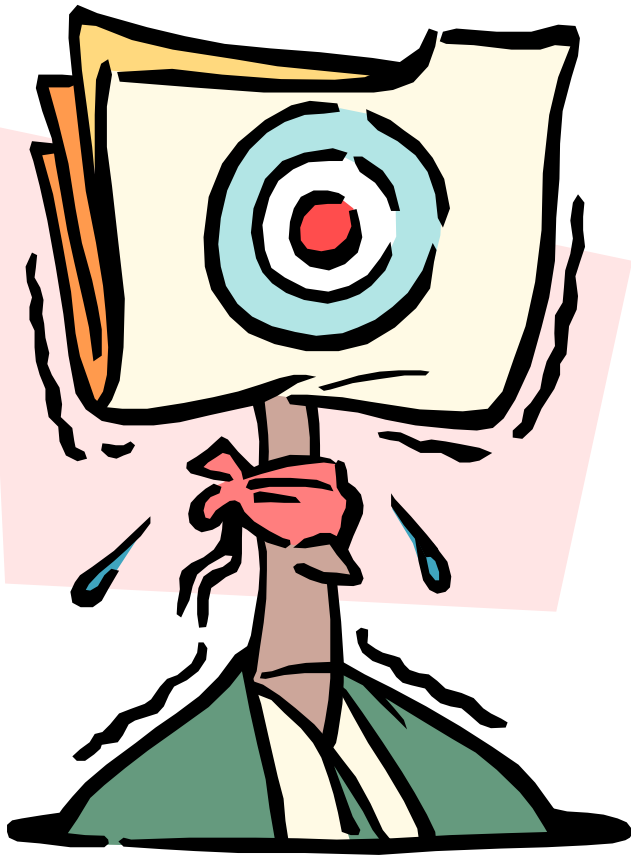
- Acknowledgment by NRC, DOE and Nevada of the downwind dispersal of respirable particles (< 10 microns).
- Under certain weather conditions, the dispersal plume (area) could be as large as 10 square kilometers.
- The larger materials dispersed into the environment could contaminate an area upwards of 100 meters from dispersal point.
- DOE's FEIS estimates a successful attack could create a population dose of 96,000 person rem and 48 latent cancer fatalities (LCF).
- DOE's FEIS did not estimate clean up costs for a terrorist incident but did note the costs for a worst case accident (~ \$10 billion).
- Reanalysis found a considerable differential in estimates with 300 to 1,800 LCF for a shape charge attack and 3,000 to 18,000 LCF for a fully perforated attack using an antitank weapon.



Post-September 11, 2001: Issues to reconsider.

- The issue of risk reconsidered.
- Changing agency and bureaucratic cultures.
- Communication, response, and prevention.
- The integration of differential levels of government.
- Special issues for urban and rural first responders.
- Oversight in the post-September 11 world.

Risk analysis reconsidered

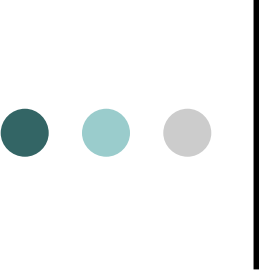


- Accidents are not terrorist attacks.
- Human initiated events are potentially much more powerful and disruptive.
- Risk assessment and terrorism experts are asking for reconsiderations of how risk assessment is conducted
 - **Mark Abkowitz, Vanderbilt University.**
 - Transportation risk and security reconsiderations.
 - **Kristin Shrader-Frechette, Notre Dame.**
 - “Science” as fact debate.
 - Biased methods of risk assessment.
 - Risk v. dose regulation debate.
 - **James David Ballard, NATO project**
 - Suicidal terrorism with respect to nuclear and radiological attacks
 - Unorthodox weapons and tactics used by terrorists.
 - The role of active insiders for nuclear facilities and RDD attacks.



Changing bureaucratic and agency cultures

- Max Weber on bureaucracies.
 - The iron cage of rationality v. the logic of mass suicide attacks.
- How do you change bureaucracies that were enabled to fight the Cold War and get them refocused on the war on terrorism?
 - One key issue: Accidents are not terrorism and the security requirements, responses, and consequences are likewise different.



Communication, prevention and response.

- Kevin Jack Riley and Bruce Hoffman, Rand Inc. researchers, conducted a survey of law enforcement agencies and what these agencies felt were key issues in terrorism:
 - Bi-directional and informed communication is critical for prevention and response.
 - Local experiences are key to prevention of terrorism attacks.
 - Differential expectations and perceptions between local law enforcement and federal agencies with respect to terrorism.



Integration of the various levels of government.

- Prevention is front line defense.
 - Needs interaction between various levels of government.
 - Must be future orientated, not historically bound.
- Response post-incident is localized, at least for the first hours/days after the attack.
 - Key is training of first responders.
- Consequence management is another critical post-incident issue.
 - Funding, training, public relations, crime scene issues, health and safety of first responders.
 - Potential for change of regulations *ex post facto* and public reaction to said changes.
- Increasing institutional complexity at federal level.
 - Department of Homeland Security
 - Transportation Security Administration.



Special issues for urban and rural emergency responders.

○ Urban:

- Threats from outside groups that may reside in the urban location.
- Higher probability of attacks due to proximity of media, supplies, and symbolic value of attack site itself.
- Long term consequences for radiological contamination of a urban area.
- Other issues logically related to a terrorist attack and already noted in the literature (LCF, cost of clean-up, etc.)

○ Rural:

- Large size and remote location of some jurisdictions.
 - Response times are slower due to distance and lack of resources.
 - Difficulty of communications due to terrain and infrastructure.
- Rates of turn over in personnel.
 - Paid forces are small, cross trained, and typically underpaid.
 - Unpaid forces are subject to high turn over and have serious issues of availability and commitment in the event of a radiological attack.
- Funding for emergency response personnel and equipment is very limited and can be subject to highly variable budgets at the local, state, and federal levels.
- Funding siphoned towards larger cities and thus away from rural agencies as part of the political appropriations process.



Oversight activities, post 911

- Oversight of the transportation planning must be reviewed periodically.
 - NY Twin Towers built to withstand an airplane hit but not by the new generation of planes that came decades later.
 - Will nuclear waste casks hold up under new technologies and do risk mitigation efforts make sense in light of new tactics, weapons, philosophies, etc.
- Oversight must be build in and systematized to have a chance at effectiveness.
 - ? year reviews of the planning.
 - ? year review of the cask testing.
 - ? year review of the regulation.
 - ? year review of the threat environment.



Recommendations

- Operationally define terms (e.g., shipment, etc.) and standardize the discussion.
- Analyze these radioactive cargoes as potential RDD's and as a symbolically important target for domestic and international terrorists.
- Settle outstanding regulatory issues (e.g., Nevada petition, etc.).
- Review the DOE Yucca Mountain EIS assessment of vulnerabilities and consequences.
- Consult stakeholders on transportation planning and revisions.
 - Address pre-September 11, 2001 alterations in risk assessment paradigms.
 - Address the lessons learned from September 11, 2001 attacks.
- Prioritize the role of the first responder community.
 - They will respond to an incident or accident.
 - The burdens (health, safety, response, and consequences) will fall on them.
 - The pre and post incident costs will impact their budgets.
 - Their relevant experiences and knowledge are relevant to all aspect of planning.