

TESTIMONY

Perspectives on the Threat of Nuclear Terrorism

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Governmental Affairs on April 15, 2008

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**Before the Committee on Homeland Security and Governmental Affairs
United States Senate**

April 15, 2008

Introduction

Mr. Chairman, Senator Collins, and members of the Committee, thank you for the opportunity to address the Committee on the important subject of confronting the prospects of a nuclear terrorist attack. I am a Senior Policy Researcher at the RAND Corporation and my remarks will draw on several sources, notably:

- A 2004 exercise-based RAND research effort supported by the Undersecretary of Information Analysis & Infrastructure Protection and the Private Sector Office of the U.S. Department of Homeland Security (DHS) that addressed the impact of a nuclear terrorism attack on the Port of Long Beach. Participants in this exercise included senior government officials as well as senior representatives from private-sector emergency-response organizations and the owners and operators of critical national infrastructures.
- A 2006 RAND publication, *Considering the Effects of a Catastrophic Terrorist Attack*, which built on the 2004 study and further explored the economic impact of a nuclear terrorism attack on a key U.S. port.
- A 2003 RAND analysis of how individuals should prepare for and respond to nuclear detonation, entitled *Individual Preparedness and Response to Chemical, Radiological, Nuclear and Biological Terrorist Attacks*.
- Several other exercise-based RAND studies that examined various dimensions of U.S. preparedness and response in the event of catastrophic incidents, to include bioterrorism attacks, dirty bomb attacks, and Category 4/5 hurricanes.

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² This testimony is available for free download at <http://www.rand.org/pubs/testimonies/CT304/>.

- The advantages of a nuclear engineering doctorate and four decades of involvement with all aspects of the acquisition, use, and effects of nuclear weapons in the Cold War and subsequently.

Much of what I have to say on this general subject will focus on:

- Characteristics of nuclear terrorist attacks that warrant special emphasis;
- The extent, character, and modalities of potential private sector assistance in order to meet needs both inside and outside the impacted area; and
- The broader economic and commercial implications for the region and the nation as a whole, and the relationship of those economic effects to private sector actions.

In the realm of terrorism, few challenges are more demanding, as your hearings will vividly illuminate, than the challenge posed by a nuclear terrorist attack on one or more major American cities. Any major nuclear or other mass effect terrorist incident will likely have both prompt and prolonged impacts that would severely challenge local, regional, and national response and recovery resources. In advance of such events, plans to properly integrate private (and possibly unique) expertise and resources into national responses and decision-making are consequently of fundamental importance.

The Nuclear Terrorism Threat

In addressing the challenges posed by nuclear terrorism, it is important to recognize the profound uncertainties in any assessment of the current or future threat. In our report, "Considering the Effects of a Catastrophic Terrorist Attack," we postulated a single nuclear device exploding in the Long Beach, California harbor followed by deep uncertainty as to whether another device was already inside the United States, in another U.S. harbor, or in transit. This inescapable uncertainty will play a significant role in any response to a nuclear terrorism event. The nature of the many potential routes by which a terrorist group might acquire a nuclear weapon, and the unlikelihood that this would result from the gradual collection of small quantities of fissile material, emphasize the reality that a terrorist group that acquires one nuclear weapon is more likely than not to possess more. As the efforts supported by the Nunn-Lugar Cooperative Threat Reduction Program have emphasized, there may be nuclear weapons and fissile material from the former Soviet Union states that may never be accounted for, and legitimate fears that either materials or weapons from that or other sources may be available to interested buyers in an emerging nuclear black market.

A Terrorist Nuclear Attack

In addressing the challenges posed by nuclear terrorism, it is important to recognize the uncertainties in any assessment of the current or future threat. As a result, planning and analysis efforts frequently use individual scenarios to provide a way to explore potential future events, their effects, and their implications for response and recovery planning. The centerpiece of RAND's 2004 DHS-supported study featured an exercise that addressed the impact of a nuclear terrorism attack on the Port of Long Beach in California. In the exercise scenario, terrorists conceal a 10-kiloton (Hiroshima-size) nuclear bomb in a shipping container that explodes shortly after being unloaded to a pier in the Port of Long Beach.

We used this attack scenario because analysts consider it feasible, it is highly likely to have a catastrophic effect, and the target is both a key part of the U.S. economic infrastructure and a critical global shipping center. Here I want to emphasize that we did not select this scenario and target because we viewed it as the most likely target of a terrorist attack, but rather an attack (such as that against a financial center like New York or a government center like Washington, DC) that would have a profound strategic impact on the United States because of the immediate impact and the cascading economic and other effects that it would likely produce.

In preparing the scenario, we developed models of the effects of the blast and subsequent radioactive plume overlaid on detailed geographical, infrastructural, meteorological, economic and demographic information about the region. RAND weapons effects experts, psychologists, physicians, economists and others then analyzed the likely effects on critical infrastructures, people and the economy that would unfold immediately following the blast, and in the period immediately thereafter. This analysis was presented to the exercise participants as input to the exercise.

Specifically, participants were informed that as a result of the nuclear explosion there is widespread death, injury and destruction extending two to three kilometers from the blast center. There is widespread damage and fires in the harbor but because of the low yield of the weapon there is relatively little physical damage to the city of Long Beach. People within one to two kilometers of the blast center who were not shielded quickly absorb dangerously high doses of radiation. Those who are several kilometers from the blast center but were not shielded by structures suffer flash burns.

Within ten minutes the mushroom cloud from the detonation reaches its maximum height of 20,000 feet and begins to spread out. Highly radioactive local fallout begins to be deposited immediately but the path of the fallout will initially be uncertain, depending on prevailing winds.

People see or quickly learn about the attack and begin to evacuate from the city. There is likely to be initial misinformation and confusion about the effects of the detonation, the location and consequences of the likely local fallout, and what actions are most appropriate for people in different areas. News program experts will be pervasive but are not likely to agree about the extent of the fallout zone and who should evacuate.

In this context the President and his national security and homeland security advisors will be deeply concerned about the risk of other weapons in other ports or weapons already within the United States. The President can be expected to close all ports for an indefinite period and order the immediate inspection of all rail and truck traffic carrying containers away from U.S. ports.

As models of the possible fallout pattern using current weather data are run, it becomes clear that there will be a serious fallout region many miles wide and extending 20 to 30 kilometers downwind from Long Beach.

Panic can be expected to spread across the Los Angeles area as large numbers of residents attempt to evacuate the city. Gridlock quickly ensues on almost all freeways and major surface streets as cars run short on gas, gas stations are exhausted, and traffic jams shut down the outflow of Los Angeles residents.

The initial effects of the bomb on the population will likely include more than 5,000 fatalities and tens of thousands of injuries, including several thousand serious burn victims. The heavy local fallout presents the prospect of tens of thousands of additional deaths. In excess of 100,000 people are likely to have been exposed to enough radiation to get sick, but the great majority should survive with lingering chronic effects from their exposure to radiation.

Fallout is likely to seriously contaminate at least half of the 10 petroleum refineries in the Los Angeles basin (which represent 40 percent of the capacity that supplies southern California, Nevada, and much of Arizona) with the remainder in the evacuation zone. While some of the refineries in light fallout zones could in principle be reoccupied, it seems clear that personnel safety issues will delay restarting those facilities as well. Because no pipelines flow into the region from other parts of the country, this situation will produce a sustained acute gasoline shortage for the region, a major impact on response and recovery activities, and a government response program that quickly produces gasoline shortages nationwide.

We expect that within three to four days after the attack, most critical infrastructures, including water, sanitation, and electricity, outside of the fallout and blast zone and the heavy fallout zone could begin to be restored. At this point we could expect that the fallout zone will be carefully

mapped with electric utilities, for example, sending repair workers into the cooler parts of the fallout zone for short periods.

The area of radiation contamination (approximately 500 square km) that will require long-term relocation of people and businesses (according to the Environmental Protection Agency's relocation guidelines) is home to an estimated two million people. These people must be moved within a few days and will not be able to take most of their possessions because of the threat of contamination.

Private Sector Involvement in Response and Recovery Assistance

This scenario was designed to foster deliberation among public and private sector exercise participants about their mutual responsibilities, likely actions and constraints on effective action in the wake of an incident of nuclear terrorism. The exercise featured crisis-driven deliberations in which parallel groups of government and private-sector representatives sought consensus on courses of action on a set of key issues and an overall course of action in very challenging evolving circumstances.

We ran this exercise on several occasions in 2004, with senior participants from government and industry representing all of the major critical infrastructures industries (electric power, telecommunications, oil and gas, transportation, medical care, water, etc.).

The exercise focused on the broad private sector involvement in response and recovery assistance to the *affected area* that is directly impacted by the terrorist attack (especially the people therein or those evacuated from the area), and the potential state, regional, and national level critical *infrastructure*-related consequences that emerge as a result of the terrorist attack.

Exercise participants were challenged to address actions to be taken at two points in time:

- 24 hours after the event in terms of *immediate* response and contingency planning/action in the face of substantial uncertainty about effects.
- 72 hours after the event in terms of response activities now working with more information on the extent of the damage and its implications; and planning with a horizon that now extended several weeks or months into the future.

The results of the exercise identified potential private sector roles and contributions in the event of such an attack as well as barriers to private involvement in response and recovery activities. We

will discuss those results in three areas, private sector roles in: (1) providing assistance to affected areas, (2) addressing the infrastructure impacts of a nuclear incident, and (3) the broader economic impacts of such an event.

Assistance to Affected Areas

The exercise succeeded in identifying many key issues in government-private sector coordination in response/recovery assistance to the affected area.

Logistics problems will be huge. The business community, in possession of extraordinary logistics capabilities, will be crucially concerned with who at the federal or state level is in charge of coordinating help from business.

Effective medical care will present the most immediate challenges. Private sector actors, in hospitals and other parts of the medical system, have direct roles in addressing this need. Availability of air transport assets to move the injured will be a problem. Radiation burn patients must have surgery urgently to avoid infection. Burn victims should not be moved much in first 24-48 hours, so medical care just outside of the plume zone will be important.

The strategic response to support area hospitals will need to be coordinated, especially logistics and supplies between hospitals and shelters. All hospitals have just-in-time inventories and will run out supplies quickly, putting a premium on addressing the gasoline problem and getting transport assets for moving medical supplies up-and-running quickly.

Within a few days, replacement of exhausted medical staff will be necessary. Credentialing medical care personnel from outside the area and establishing ad hoc medical facilities also may face problems in terms of liability protection. Ad hoc facilities (e.g., hotels) may also face problems of reimbursement for care.

Long-term sheltering will loom as a difficult problem. The pre-fabricated home industry and large construction companies could surge but only with Defense Production Act authority.

The availability of water, particularly for people in the desert areas, would be a key problem. Private sector organizations would have obvious roles in providing both food and water to affected populations, though coordination with government to ensure such efforts can occur – and can do so effectively – would be needed.

Decontamination will be a huge task and encounter increasingly frustrating delays due to lack of both assessment and decontamination capabilities.

The federal government will need to put a higher priority on long-term effects. A key issue will be a government-private sector framework for mitigating the spillover effect of a destroyed Los Angeles economy on the rest of the nation.

Addressing Infrastructure Impacts

Government-private sector coordination also will be critical to address potential state-, regional-, and national-level critical infrastructure-related impacts.

Companies will be making business decisions based on the information they have, but will be looking for additional information from the government that may influence their decisions, such as when ports will reopen. Information will be needed immediately from the government on staging areas where shipping containers already in the country and in the hands of the private sector may be relocated and inspected. The government will want to know from business what goods are in containers in transit, and what transportation capacity exists in different areas. These examples highlight the need for effective government-private sector communications in the immediate post-attack period.

An early assessment of damage to the ports and critical infrastructures (like electricity) that were directly affected by the attack will be urgently needed. An initial shutdown of much of the commercial transportation network (ports, rail, trucking, and aircraft) is an imperative, but pressures will emerge to lift the shutdown because of the pain it would cause for the entire United States.

Reopening of the U.S. ports and trade lanes would also be crucial to guaranteeing the flow of relief material. A global effort would be needed to redirect U.S. container traffic to other ports and establish delivery priorities. However, operations at other U.S. ports may face problems since most other ports are not as deep as the ports of Long Beach and Los Angeles, making them unusable for larger ships.

The refinery shutdowns in Los Angeles and the temporary halt of all crude imports through other ports will create a major energy crisis throughout California, Nevada and Arizona - with very serious implications for U.S. energy infrastructure and distribution networks. Within seven days, the Alaska pipeline would have to be shut down because there would be no destination for the fuel because of diminished refinery capacity. It could take months to get to the point at which the markets will settle. Without government guidance during this time, companies would be optimizing

for profits with the threat of severe price gouging, which in principle only the government could prevent (e.g., through quickly negotiated voluntary agreements to allocate and transport fuel to the affected region).

The effects on the region's commerce would be just as significant. The just-in-time nature of commerce today also means that businesses and other facilities (e.g., water treatment plants and hospitals) carry small stocks so that a disruption in their supplies can shut them down in a few days. The resulting tenuous viability of many companies (e.g., as a result of the huge loss of infrastructure in Los Angeles) will cause great uncertainty within commercial markets.

Finally, there will be a need to allocate critical relief resources that are in the hands of the private sector (such as food, ice, water, and gasoline – as proven in the aftermath of Katrina) that will require guidance from the federal government about priorities and a relaxation of anti-trust regulations. In such circumstances, industry would likely prefer to enter into a voluntary agreement (e.g., under the Defense Production Act), where if appropriate regulatory rules were relaxed (in particular the length of the review periods currently mandated), individual corporations could more effectively plan for and contribute to a relief effort.

Long-Term Economic Implications

In RAND's 2006 study, *Considering the Effects of a Catastrophic Terrorist Attack*, we addressed the prospect that the economic effects of the catastrophe would likely spread far beyond the initial attack, reaching a national and even international scale. Decision makers would face two particularly difficult challenges: keeping the global shipping supply chain operating and restoring orderly economic relationships.

In the aftermath of the attack, different stakeholder groups affected might have differing interests. Consequently, their decisions might often be at odds. How to contend with such conflicting interests is the key challenge for policymakers. In terms of global shipping, the main tension might be between the political aim of preventing a future attack and the business interest in seeing that U.S. ports and the global shipping supply chain continue to operate.

While the business community would want unaffected U.S. ports to reopen as early as possible (or maybe even stay open), harsh realities facing the financial and real estate communities might prove a barrier. The Long Beach attack might cripple an insurance industry struggling to absorb massive losses from claims. Insurance would be in tremendously short supply—particularly for terrorist and nuclear risks. Without it, ports and related infrastructure could not operate, raising concerns of a sustained closure of U.S. ports, or a period of substantially reduced port activity.

The attack will also threaten the financial industry as many loans and mortgages in Southern California threaten to default without government assistance and the nation's largest insurance companies face severe financial demands. In addition, investors in some of the largest financial markets might be unable to meet contract obligations for futures and derivatives.

Although the exact outcomes are difficult to predict, these hypothetical consequences suggest important vulnerabilities. Restoring normalcy to economic relations would be daunting, as would meeting the sweeping demands to compensate all of the losses.

Conclusions

In closing, I would like to leave you with the following salient points.

The Long Beach exercise described above highlighted many of the horrors and challenges that could be expected after a nuclear detonation in a strategically important U.S. port city like Long Beach. Through this exercise, we sought to elicit the interest and engagement of senior private and public sector decisionmakers to understand the capabilities they could bring to the pre-attack planning process and to the post-attack emergency response and longer term recovery efforts - and the constraints that could undermine such efforts.

In each of our exercises, there was clear indication that private sector owners and operators of critical infrastructure resources stand ready to offer their services selflessly and to the fullest extent of their capabilities. At the same time, however, fears were expressed that there may be insufficient channels of communication between government disaster managers and private sector managers to ensure that available private sector resources can be quickly and effectively marshaled for the recovery effort.

The good news here is the possibility that the United States can improve preparedness for such a major incident by drawing on available private sector capabilities, provided that mechanisms are in place to do so effectively and barriers that might otherwise prevent it are identified and removed. Such prevention efforts would benefit the country not only in the extreme case of nuclear terrorism, but would also be broadly applicable to the preparation for and response to other catastrophes such as major earthquakes and floods that could require mass evacuations for months or even years of contaminate regions.

Thank you again for this opportunity to address the committee and discuss RAND's work in this important area.