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Report on Department of Homeland Security
Sponsored Research Project at Lawrence
Livermore National Laboratory on Preparation for
an Improvised Nuclear Device Event

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**Report on Department of Homeland Security Sponsored
Research Project at Lawrence Livermore National Laboratory
on Preparation for an Improvised Nuclear Device Event**

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The scenarios we discuss today are so hard for us to contemplate and so emotionally traumatic that it is tempting to push them aside. However, now is the time to have this difficult conversation.

—Joseph Lieberman¹

Following the events of September 11th, a litany of imaginable horrors was trotted out before an anxious and concerned public. To date, government agencies and academics are still grappling with how to best respond to such catastrophes, and as Senator Lieberman's quote says above, now is the time to plan and prepare for such events. One of the nation's worst fears is that terrorists might detonate an improvised nuclear device (IND) in an American city. With 9/11 serving as the catalyst, the government and many NGOs have invested money into research and development of response capabilities throughout the country. Yet, there is still much to learn about how to best respond to an IND event.

Describe your internship project(s) and discuss your specific role.

My summer 2008 internship at Lawrence Livermore National Laboratory afforded me the opportunity to look in depth at the preparedness process and the research that has been conducted on this issue. While at the laboratory I was tasked to collect, combine, and process research on how cities and the federal government can best prepare for the horrific prospect of an IND event. Specific projects that I was involved with were meeting reports, research reviews, and a full project report. Working directly with Brooke Buddemeier and his support team at the National Atmospheric Release Advisory Center, I was able to witness first hand, preparation for meetings with response planners to inform them of the challenges that an IND event would pose to the affected communities. In addition, I supported the Homeland Security Institute team (HSI), which was looking at IND preparation and preparing a Congressional report. I participated in

meetings at which local responders expressed their concerns and contributed valuable information to the response plan. I specialized in the psycho-social aspects of an IND event and served as a technical advisor to some of the research groups.

Alongside attending and supporting these meetings, I worked on an independent research project which collected information from across disciplines to outline where the state of knowledge on IND response is. In addition, the report looked at meetings that were held over the summer in various cities. The meetings were attended by both federal responders and local responders. The meetings explored issues regarding IND preparation and how to mitigate the effects of an IND detonation. Looking at the research and current preparation activity the report found that the state of knowledge in responding and communicating is a mixed bag. Some aspects of an IND attack are well understood, some are not, but much is left to synthesize. The effects of an IND would be devastating, yet much can be done to mitigate those effects through education, preparation, and research. A major gap in current knowledge is how to effectively communicate with the public before an attack. Little research on the effectiveness of public education has been done, but it is likely that educating the public about the effects of an IND and how to best protect oneself could save many lives.

Discuss your achievements during the internship including contributions to publications

The major report that I authored noted several aspects of response to IND events. Many people still live under the Cold War mentality that if a city is attacked with a nuclear weapon, there is little chance of survival. This assumption, while perhaps true in the case of multiple, thermonuclear weapons exchanges, does not hold for the current threat. If a single IND were detonated in the United States, there would be many casualties at the point of impact; however,

there would also be many survivors and the initial response by two major groups will mean the difference between life and death for many people. These groups are the first responders and the public.

As part of my research, I looked at behavioral studies such as the one by Thomas Glass. His “Understanding Public Response to Disasters” provides a relatively clear picture of how the public responds to emergencies and how best to deal with that public response. Glass finds that following an emergency the public is very resourceful and saves the majority of survivors. These two points of interest, the public’s resourcefulness and the fact that the public often plays the role of first responder, leads Glass to recommend that EMS be trained how to work with the public instead of trying to work against them. Also according to Glass and other empirical evidence from many historical disasters², completely irrational behavior (i.e. panic) in an emergency is rare.³ However, if the public does not trust the authorities, people may act differently than authorities expect.

While the behavioral studies constituted a majority of the research I looked at, I also looked at historical evidence. One of the most important cases of response to a radiological disaster was in 1979 at the Three Mile Island nuclear power plant. Looking at the Three Mile Island accident of 1979 (TMI), Erickson found that the “evacuation shadow” phenomenon can be a very important aspect of a catastrophe. Two days after the news broke of an accident at TMI, an evacuation advisory was issued for pregnant women and young children within a five mile radius of the nuclear power plant. In reality, “for every person advised to leave home, almost 45” people actually evacuated.⁴ This shadow evacuation effect is one that should be understood as not only a result of faulty communications but also a reaction of an uninformed, confused, and frustrated public.

A key focus of the research project was communication with the public following an IND detonation. Informing the public during a crisis may seem straight forward; but as I learned, it is an extremely complicated process. Within the task of messaging there are three elements. First, a standard message must be developed before the event occurs. Next, officials must determine the best means by which to deliver the message. Finally, estimating natural public response and public response to the message is necessary to craft an effective event-specific message and approve it for dissemination. Following a process, such as the one Fischhoff has developed, would be very helpful in developing messages for IND events. Fischhoff's model begins with developing an expert model, then developing an open-ended protocol, and then conducting open-ended interviews. Following that process, a structured questionnaire is created and administered leading to the creation of a communication. Finally, a questionnaire is administered following the communication to evaluate the communication's effectiveness.⁵ While this sort of method would be impractical *during* an IND event, it is necessary that this method or a similar one be followed when creating a message *before* an event occurs that can be used as a guide during a real event.

The first step in communicating with the public is deciding on what information is correct. The major debate in IND response planning over the past decades has been over whether to shelter or evacuate the public. Today, the scientific community is coalescing around a shelter and then staged and informed evacuation strategy.¹ According to Cham Dallas, "The natural inclination is to flee . . . [but] most people should not flee because they won't be affected." It is therefore necessary to incorporate this information into response plans. Moreover, it is likely that the public will not receive any official information within the first minutes of a disaster;

¹ There are those who disagree. Chief among them is the Rand Corporation which says to "avoid radioactive fallout: evacuate the fallout zone quickly."

therefore, it is necessary to educate the public before an IND event occurs so that they know how to react immediately.

Following the research, in the report I propose that an easy-to-remember phrase such as the British model “Go in, Stay in, Tune in” be popularized through public education programs so that citizens know what to do before official word gets to them following an IND detonation. The idea of pre-event education is a controversial issue. Several response planners stated that if they tried to initiate an education program regarding IND events, their constituents would become worried that something was about to happen. The response planners were also concerned about being labeled ‘fear-mongers’. Thus, my report recommends that one of two strategies is pursued regarding public education. One method of educating the public would be to institute a national education model that can be incorporated into elementary or middle schools’ curricula. Another method to educate the public before an IND event would be to incorporate IND education into preexisting disaster education. Many cities have education programs for disasters such as earthquakes and tornadoes and IND preparation could be easily added to an all-hazards education program.

Looking at risk communication failures of the past, one finds that one of the most damning mistakes is to send mixed, or worse, conflicting, messages to the public during a crisis. In a study looking at communications aspects of disasters, LeVerle Berry et al. found that during the TMI nuclear power plant emergency “utility spokesmen offered explanations that were confused and often at odds with the views of the Nuclear Regulatory Commission.” These “conflicting statements brought swarms of reporters to TMI to probe what looked like an industry cover-up.”⁶ The study found that the conflicting reports contributed to the public’s sense

of helplessness and confusion. Thus, it is imperative that during the crisis the public is given clear and consistent information.

Synthesizing the findings from both historical and experimental research by others², I found that there are three fundamental aspects to communicating with the public. The three Cs (Clear, Correct, Constant) can be used as a shorthand for response planners to evaluate and develop messages so that messages are effective in informing the public. Clear means that the information provided is easy to understand and unambiguous. Correct means that the information is as accurate as reasonably possible and represents expert opinion. Constant refers to two important aspects of risk communication during crisis. First, official information needs to be issued continually in regular updates. Second, information issued needs to be consistent. By following these three Cs of risk communication during a crisis, responders can more effectively provide citizens with pertinent information.

Response to an IND still needs to be synthesized and organized. Response during the first few hours after an IND detonation is critical since the severely injured could be saved during this time and the uninjured would be confused and looking for official information and advice. Realizing the fact that federal assistance may be days away, local responders should develop response plans that can effectively save lives in the first few hours. Much information exists about how to best respond, but it seems that little has been done to utilize the information that has been found. While my review of findings and meetings serves as a crucial first step in that synthesization, local communities will need to take the lead in taking research findings and putting them to use in response plans, for they are the only ones that can do it. Each community is different and as such their needs for response planning are different. Nevertheless, all cities

² This information has been synthesized from the findings of Dennis Mileti in “Evidence-Based Guidance for Public Risk Communication and Education.” START. September 2006.

share one common element in response planning and that is the *necessity* to plan. Both this report and another one that I authored (Response to an Improvised Nuclear Device) are being published as documents from LLNL.

Discuss any ideas you may have of areas of research that should be considered to help the Department of Homeland Security accomplish its mission and goals.

Of the Department's seven identified strategic goals, my project on IND preparation falls under three of the most important ones (Awareness, Response, and Recovery). At the moment, DHS is headed in the right direction with regard to IND preparation. DHS, through the Office of Health Affairs, has invested money into research to develop a communications strategy that will include three important facets. The first is pre-event education. HSI has been working closely with a marketing agency to develop public service messages and commercial-like television spots to educate the public on the realities of IND events. The second facet of the DHS project is to develop prepared messages that leaders can use immediately following the IND detonation. I had the opportunity over the summer to work closely with the HSI team on this aspect of their project. We conducted focus groups of responders to narrow in on what sort of messaging should come from each level of government (i.e. local, state, and national). The findings were then synthesized and will be developed into actual messages in the very near future. The last and probably the most important aspect of the HSI project is to develop messages that first responders can use during the crisis. I also worked closely with the team on developing these messages. The team made a message matrix that contained the message themes that would be conveyed in the areas around the detonation at key time periods following the detonation of the IND.

Though DHS is certainly contributing invaluablely to the nation's preparedness for an IND event, there is still more that can be done from both a response point of view and a research point of view. I have developed five recommendations for each community (response and research, respectively).

For the response community, I recommend local meetings be held; pre-event education occur at all levels; response decisions should be made now; messages should follow the three Cs of effective communication; and the private sector should be engaged in the preparation process. First, individual communities should meet to discuss and plan for an IND event. Not only can meetings uncover gaps in IND preparations, they allow individuals who will work together during an emergency to meet and establish rapport. Second, public officials need education on the effects and injuries associated with an IND event. Public officials' misconceptions about IND effects must be corrected. A public education system needs to be instituted nationally or combined at the local level with preexisting education (e.g. earthquake preparation). By following one of these tactics, fear-mongering would likely be avoided. Moreover, responders should be educated in the unique psychological effects that an IND detonation will have on survivors. This education should include information on the difference between exposure to radiation, radiological contamination and the inappropriate stigma that can result from both. Third, response decisions need to be made now so that the public can know how to react before the event occurs. The model of "shelter first followed by informed, staged evacuation" needs to be incorporated into planning and messaging models for IND events. Because information may not reach citizens immediately following an IND detonation, "Go in, Stay in, Tune in" should be incorporated into education models so that citizens know how to respond *a priori* authorities' instructions. Fourth, messages should follow the three Cs of effective communication: clear,

correct, constant. These 3Cs represent the foundations for effective messaging during a crisis and thus information should be provided that fits into this model so that trust in authorities is maintained. Fifth, the private sector (i.e. businesses) should be engaged in preparation activities and integrated into the overall preparation. Specifically, the needs of non-residents populations (i.e., tourist and business travelers) has to be planned for in many cities. The cities at most risk of an IND detonation are frequented by many tourists. This recommendation means engaging hotels, casinos, and other places in response planning.

In addition to the response community, there are questions whose answers could prove extremely helpful in planning for an IND event. The five questions I have identified for the research community to answer are: What does the public believe about IND? How will the entire nation and unaffected communities react to an IND event? With regard to their children, how will parents react to an IND event? Will a radiological stigma develop against those who are exposed to radiation? Should message content be directly tied to the means of dissemination?

This internship certainly affected my career planning. While originally focused on pursuing a career in academia, the experiences here at LLNL showed me the opportunities that are available both with national labs and the federal government. I am now taking stock of how to best serve the country in my future plans and whether academia or perhaps a government position is best. Academically, this internship has, at the very least, affected where my future research interests will lie. I will assuredly be exploring the response efforts of the United States in the future and hope to integrate this research into my regular academic work on international relations.

Discuss how the internship experience impacted your academic and/or career planning. Include a description of lectures/activities sponsored by the hosting facility.

Beyond the projects that I participated in while at the laboratory, I was lucky enough to attend numerous lectures and response planning workshops. Some of the highlights included a trip to Pony Trax, a lecture on Jonathan Pollard, and a lecture on Nuclear Espionage. Pony Trax is a privately owned ranch in northern California that houses the world's largest collection of restored tanks. While perhaps not directly related to my research interests, the experience was once-in-a-lifetime and will not be soon forgotten. Also during the summer, I had the opportunity to travel to Sandia National Laboratory to attend a lecture given by Ronald Olive. Mr. Olive was the lead investigator from the Naval Criminal Investigative Service who tracked and arrested the spy Jonathan Pollard. His lecture was extremely interesting and enlightening. The other experience that deserves to be highlighted is the lecture by Jeffrey Richelson entitled "Spying on the Bomb: American Nuclear Intelligence from Nazi Germany to Iran and North Korea." While my research looks at the aftermath of nuclear attacks it was extremely interesting to hear about the acquisition process and how America has been tracking nations and their nuclear efforts.

Overall, the internship was a wonderful experience. I hope to incorporate much of the research that I conducted while at the laboratory into my thesis in the future. I also plan to continue supporting the HSI team on their project by reviewing and synthesizing much of their findings. This internship solidified my desire to work for the betterment of preparedness and protection of the American homeland. In the future, I will apply the skills and lessons that I have learned this summer to better protect America from the worst disasters and mitigate the effects of those disasters.

End Notes

- ¹ Sheridan, Mary Beth. "Risk of Nuclear Attack on Rise." *The Washington Post*. 16 April 2008. Available at <http://www.washingtonpost.com/wp-dyn/content/article/2008/04/15/AR2008041502969.html>
- ² Wessley, Simon. "Don't panic! Short and long term psychological reactions to the new terrorism: The role of information and the authorities." *Journal of Mental Health*. February 2005; 14(1): 1 – 6.
- ³ Glass, Thomas. "Understanding Public Response to Disasters." *Public Health Reports*. Supplement 2, Volume 116, 2002.
- ⁴ Erikson, K. *A New Species of Trouble: The Human Experience of Modern Disasters*. New York: WW Norton, 1995.
- ⁵ Fischhoff, Baruch, et al. "What Information Belongs in a Warning." *Psychology and Marketing*. Vol. 15 (7): 663-686, 1998.
- ⁶ Berry, LeVerle et al. "Media Interaction with the Public in emergency Situations: Four Case Studies." *Library of Congress Report*. 1999. Available at http://www.loc.gov/rr/frd/pdf-files/Media_Interaction.pdf