



**NAVAL
POSTGRADUATE
SCHOOL**

MONTEREY, CALIFORNIA

THESIS

**“DIRTY BOMB” ATTACK: ASSESSING NEW YORK
CITY’S LEVEL OF PREPAREDNESS FROM A FIRST
RESPONDER’S PERSPECTIVE**

by

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March 2006

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REPORT DOCUMENTATION PAGE			Form Approved OMB No. 0704-0188	
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instruction, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188) Washington DC 20503.				
1. AGENCY USE ONLY (Leave blank)		2. REPORT DATE March 2006	3. REPORT TYPE AND DATES COVERED Master's Thesis	
4. TITLE AND SUBTITLE: "Dirty Bomb" Attack: Assessing New York City's Level Of Preparedness From A First Responder's Perspective			5. FUNDING NUMBERS	
6. AUTHOR(S) John Sudnik				
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Naval Postgraduate School Monterey, CA 93943-5000			8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING /MONITORING AGENCY NAME(S) AND ADDRESS(ES) N/A			10. SPONSORING/MONITORING AGENCY REPORT NUMBER	
11. SUPPLEMENTARY NOTES The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government.				
12a. DISTRIBUTION / AVAILABILITY STATEMENT Approved for public release; distribution is unlimited.			12b. DISTRIBUTION CODE A	
13. ABSTRACT (maximum 200 words) Past history and recent intelligence have shown that New York City (NYC), a critical node of the U.S. economy, is clearly in the terrorist's crosshairs. In order to reduce the probability, lessen the risk, and minimize the consequences of a Radiological Dispersion Device (RDD), or "dirty bomb," attack, NYC's first responders must be adequately prepared for its seemingly inevitable occurrence. This particular type of attack on NYC has the potential to create immense panic and confusion on behalf of the general public. Adding to the complexity of the problem is the notion that, since 9/11, the expected actions taken by employees in NYC high-rise office buildings in response to shelter-in-place instructions can be extremely difficult to predict. Therefore, a proposed public awareness campaign and a shelter-in-place plan are two cost-effective and easily implemented terrorism preparedness programs that would build the confidence and increase the capability of the citizenry. Since an RDD incident would likely result in a major inter-agency emergency operation, the unification of command, control, and coordination among NYC's first responder community is an essential element to its overall success. Hence, an informed and collaborative response by both public and private sector entities could potentially reduce casualties and save lives.				
14. SUBJECT TERMS Preparedness; FDNY; New York City; Dirty Bomb; First Responders; RDD; Shelter-in-place; Incident Management; Public Awareness; Vulnerability.			15. NUMBER OF PAGES 119	
			16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT Unclassified	18. SECURITY CLASSIFICATION OF THIS PAGE Unclassified	19. SECURITY CLASSIFICATION OF ABSTRACT Unclassified	20. LIMITATION OF ABSTRACT UL	

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PREPAREDNESS FROM A FIRST RESPONDER’S PERSPECTIVE**

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Submitted in partial fulfillment of the
requirements for the degree of

**MASTER OF ARTS IN SECURITY STUDIES
(HOMELAND SECURITY AND DEFENSE)**

from the

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ABSTRACT

Past history and recent intelligence have shown that New York City (NYC), a critical node of the U.S. economy, is clearly in the terrorist's crosshairs. In order to reduce the probability, lessen the risk, and minimize the consequences of a Radiological Dispersion Device (RDD), or "dirty bomb," attack, NYC's first responders must be adequately prepared for its seemingly inevitable occurrence. This particular type of attack on NYC has the potential to create immense panic and confusion on behalf of the general public. Adding to the complexity of the problem is the notion that, since 9/11, the expected actions taken by employees in NYC high-rise office buildings in response to shelter-in-place instructions can be extremely difficult to predict. Therefore, a proposed public awareness campaign and a shelter-in-place plan are two cost-effective and easily implemented terrorism preparedness programs that would build the confidence and increase the capability of the citizenry. Since an RDD incident would likely result in a major inter-agency emergency operation, the unification of command, control, and coordination among NYC's first responder community is an essential element to its overall success. Hence, an informed and collaborative response by both public and private sector entities could potentially reduce casualties and save lives.

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LIST OF ABBREVIATIONS AND ACRONYMS

9/11	September 11, 2001
CBRN	Chemical, Biological, Radiological, Nuclear
CIMS	Citywide Incident Management System
DHS	U.S. Department of Homeland Security
DOE	U.S. Department of Energy
DOHMH	NYC Department of Health and Mental Hygiene
EML	DHS Environmental Measurements Laboratory
FDNY	Fire Department of New York
Haz-Mat	Hazardous Materials
HSPD	Homeland Security Presidential Directive
ICS	Incident Command System
IND	Improvised Nuclear Device
mR/hr	Milliroentgens per Hour
NIMS	National Incident Management System
NPG	National Preparedness Goal
NYPD	New York Police Department
OEM	NYC Office of Emergency Management
PRD	Personal Radiation Detector
R/hr	Roentgens per Hour
RDD	Radiological Dispersion Device
RID	Radionuclide Identifier Device
RPM	Radiation Portal Monitor
SWOT	Strengths, Weaknesses, Opportunities, Threats
TCL	Target Capabilities List
UTL	Universal Task List
WMD	Weapons of Mass Destruction
WTC	World Trade Center
U.S.	United States

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ACKNOWLEDGMENTS

When I began writing this thesis a little more than a year ago, I had little idea where I would go, how I would get there, and what I would find. After a long and arduous year, this once seemingly insurmountable task is now complete. While I found the entire process to be intellectually stimulating and tremendously rewarding, there were many trials and tribulations along the way. Fortunately, I was given tremendous support at each pass from a core group of individuals, people worthy of my acknowledgment.

I would first like to express my sincere gratitude to all those people in the New York City Fire Department (FDNY) who made my participation in this Masters Program possible. I would like to extend a special thanks to Commissioner Nicholas Scoppetta, Assistant Commissioner Frank Cruthers, Chief of Department Pete Hayden, and Chief of Operations Sal Cassano. These distinguished public safety officials understand what it means to be a homeland security leader in the post-9/11 era, and are dedicated to the tenet that future FDNY leaders will continue along this path. Their commitment to this Program in particular is further proof of their steadfast endorsement of innovative policies that will better prepare the FDNY and New York City for the next terrorist attack.

I would also like to thank all my colleagues from the Naval Postgraduate School and the Center for Homeland Defense and Security who were so kind to take the time to offer valuable insight into this project. The knowledge and guidance provided by my thesis advisor Chris Bellavita, and second reader Ellen Gordon, had a profound and direct impact on the foundation of my thesis, and its ultimate success. The feedback offered by Bill Pelfry, Bob Bach, and Peter Chalk instilled the expertise that was needed throughout the various stages of my research. If not for the consummate professionalism of Lauren Wollman and the tireless dedication of Greta Marlatt, this research would have not gotten off the ground. Also instrumental in the development of my thoughts and ideas was the collective wisdom of my instructors Dave Brannan, Paul Stockton, Ted Lewis, Bob Simeral, Tony Kendall, Jim Breckenridge, and C.J. LaCivita, and their associates and guest lecturers.

Finally, the completion of this formidable task would not have been possible if it were not for the unwavering support of my loving family. I am grateful to my mother and father for their patience and encouragement. It is the lessons that they taught over the years that had truly prepared me for this academic endeavor, and the many other challenges in life. Most importantly, I am thankful to my beautiful wife Kori and my precious daughter Amanda. The sacrifices they made so that I could put in countless hours of study are testimony to their devotion. They granted me the inspiration to always look to the future, to always give it my all, and to always make a difference.

EXECUTIVE SUMMARY

Is NYC adequately prepared for a “dirty bomb” attack? An examination of the current research on this topic suggests that the overarching problem can be analyzed incrementally. This thesis answers this relatively broad question in the ensuing chapters by critically assessing the following prevention, preparedness, and response measures from the perspective of a NYC first responder. First, it analyzes the current trend of terrorism and its implications in order to make an adequate threat and vulnerability assessment for NYC’s first responder agencies. Second, it investigates the radiation detection technology initiatives used for RDD prevention and response while recommending steps to be taken to improve upon notable deficiencies. Third, it studies the significance of a public awareness campaign with regard to this catastrophic, yet manageable, type of incident and offers a pragmatic plan for fear management. Fourth, it explores the practicability of a shelter-in-place plan for NYC, the borough of Manhattan in particular, and advocates the development of a collaborative response plan. Fifth, it confronts the strong points and limitations in the collaborative effort put forth by NYC’s public sector entities with regard to emergency response and incident management and makes suggestions for best practices. The strategic plan put forth in the final chapter of this thesis is available for implementation by senior NYC public safety officials, on either a selective or collective basis.

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I. INTRODUCTION

A. PROBLEM STATEMENT

A Radiological Dispersion Device (RDD), or “dirty bomb,” attack is sometimes referred to by terrorism experts as the type of Weapons of Mass Destruction (WMD) event most likely to occur in the United States (U.S.).¹ Meanwhile, it is also widely accepted that New York City (NYC) is at or near the top of the list of potential terrorist targets. Fortunately, NYC public officials realize the magnitude of this looming threat, and have accomplished much in the way of preparing for its occurrence; but much more still remains to be done. Since 9/11, many counter-terrorism measures have been taken in NYC with respect to equipment, technology, and capability.² These accomplishments are extremely important first steps; realistic training and planning is needed, however, to achieve a level of preparedness that looks as good in practice as it does on paper. In particular, new and existing strategies must be implemented to increase the readiness of NYC’s public and private sectors to respond safely and efficiently to an RDD attack.

Past history and recent intelligence have shown that NYC, a critical node of the U.S. economy, is clearly in the terrorist’s crosshairs.³ In order to reduce the probability, lessen the risk, and minimize the consequences of a RDD, NYC’s first responders must be adequately prepared for its seemingly inevitable occurrence. This particular type of attack on NYC has the potential to create immense panic and confusion on behalf of the general public. Adding to the complexity of the problem is the notion that, since 9/11, the expected actions taken by employees in NYC high-rise office buildings in response to shelter-in-place instructions can be extremely difficult to predict. Therefore, a proposed

¹ In his article, Keller states: “That is why, if you polled the universe of people paid to worry about weapons of mass destruction (W.M.D., in the jargon), you would find a general agreement that this is probably the first thing we’ll see. ‘If there is a W.M.D. attack in the next year, it’s likely to be a radiological attack,’ said Rose Gottemoeller, who handled Russian nuclear safety in the Clinton administration and now follows the subject for the Carnegie Endowment.” Bill Keller, “Nuclear Nightmares,” *New York Times Magazine*, May 26, 2002, <http://query.nytimes.com/gst/abstract.html?res=F20D15FB3E5C0C758EDDAC0894DA404482> (accessed January 19, 2006).

² For example, see Nicholas Scoppetta (FDNY Commissioner), in testimony to the *9/11 Commission* panel, May 18, 2004.

³ For example, see Michael Bloomberg (NYC Mayor), in testimony to the *9/11 Commission* panel, May 19, 2004.

public awareness campaign and a shelter-in-place plan are two cost-effective and easily implemented terrorism preparedness programs that would build the confidence and increase the capability of the citizenry. Since an RDD incident would likely result in a major inter-agency emergency operation, the unification of command, control, and coordination among NYC's first responder community is an essential element to its overall success. Hence, an informed and collaborative response by both public and private sector entities could potentially reduce casualties and save lives.

B. LITERATURE REVIEW

Although the concern about the modern terrorist use of WMD has been around for more than a decade, the concept of RDD in particular has only recently reached its heightened level of attention since 9/11. It is also important to note that a terrorist attack resulting in an actual "dirty bomb" explosion has not yet taken place anywhere in the world. Hence, the relevant literature on the topic is still relatively young. Fortunately, the current work found in scientific research reports, scholarly books and journals, and various periodicals is generally reliable and sufficiently comprehensive. The research by prominent terrorism authorities on the WMD threat in general, and to NYC specifically, is equally substantive and pertinent. Whereas universal information on public awareness of a WMD attack is readily available from internet sources, there exists no known public record of shelter-in-place strategies for major metropolitan areas. The spoken testimony of top local officials and emergency response experts at a pivotal public safety hearing offers credible insight into the current situation between NYC's two main first responder agencies. These on-the-record statements are especially valuable when leveraged against the findings of locally and federally mandated post-9/11 initiatives and recommendations on the framework of emergency preparedness and incident management.

Over the past roughly twelve years, NYC has been the target of two successful terrorist attacks and numerous other failed attempts. Using this recent history as a presage of future events, certain conclusions can be drawn on the likelihood of an RDD attack. The works of notable terrorism experts Bruce Hoffman and John Parachini are useful in establishing an overview of the threat to the U.S., and to NYC in particular. For his part, Hoffman offers intriguing insight into the type of group or non-group most likely to be responsible for the next attack, whether the attack will be either secular or religiously

motivated, and the terrorist's penchant to inflict damage on the US economy.⁴ Conversely, by suggesting that the bulk of counter-terrorism funding be allocated to preventive measures at the expense of first responder preparedness, Parachini seemingly discounts the likelihood of a WMD attack.⁵ Based upon the work of these authors, and other related findings, general inferences may be made about the urgency of the threat.

In order to fully comprehend the challenges presented by a radiological attack, it is necessary to identify the possibility and consequences of its occurrence. In a *New York Times* article entitled "Nuclear Nightmares," Bill Keller asserts that the likelihood of attacks could be classified into two distinct categories: an unlikely but vastly devastating nuclear explosion; and the more probable but still chaotic "dirty bomb" attack.⁶ The detailed discussion convincingly builds a case for the potentiality of nuclear materials, obtained from Russia and surrounding countries, getting into the hands of terrorists. He cites an important study conducted by Henry Kelly of the Federation of American Scientists (FAS) that uncovers the short and long term physical and psychological damage caused by such an occurrence.⁷ Unlike the FAS report, however, Keller's commentary does not address whether a successful, measured response plan could prove to be a sufficient deterrent.

Any in-depth analysis conducted on a nuclear terrorist attack or, more specifically, an RDD event, should include the work of Charles D. Ferguson and William C. Potter and their book, *The Four Faces of Nuclear Terrorism*.⁸ This recently updated compilation of nuclear terrorism research focuses on the threat of an RDD event as one of the "faces" and, as such, may be considered the standard by which all related studies are

⁴ Bruce Hoffman, *Testimony: Lessons of 9/11* (Santa Monica, CA: RAND, October 2002), 13-15, <http://www.rand.org/pubs/testimonies/2005/CT201.pdf> (accessed February 21, 2006); *Inside Terrorism* (New York: Columbia University Press, 1998), 92; and *Al-Qaeda, Trends in Terrorism and Future Potentialities: An Assessment* (Santa Monica, CA: RAND, 2003), 11, <http://www.rand.org/pubs/papers/2005/P8078.pdf> (accessed February 21, 2006).

⁵ John V. Parachini, "Putting WMD Terrorism in Perspective," *The Washington Quarterly* 26, no. 4 (Autumn 2003): 48.

⁶ Keller, "Nuclear Nightmares."

⁷ Henry Kelly, testimony before the Senate Committee on Foreign Relations on March 6, 2002, Federation of American Scientists, <http://www.fas.org/ssp/docs/030602-kellytestimony.htm> (accessed January 19, 2006).

⁸ Charles D. Ferguson and others, *The Four Faces of Nuclear Terrorism* (Monterey, CA: Monterey Institute for International Studies, 2004), 259-317.

measured. In one of the opening chapters, the authors reaffirm the findings made by Hoffman regarding the type of groups most likely to commit nuclear attacks.⁹ They uphold Keller's assessment of the RDD threat, but in a more comprehensive manner. Their inquiry provides recommendations for preventing and responding to these potential attacks, including such measures as public education and first responder training. Most importantly, despite offering ideas on how to enforce the nonproliferation of radiological materials, they maintain that "...reducing the probability of a terrorist incident may be a less effective risk-reduction strategy in the short term than seeking to mitigate the consequences of an RDD attack, an event that must be considered highly likely to occur in coming years."¹⁰ Hence, with the exception of the definitive shelter-in-place strategy emphasized in a recent *New York Academy of Medicine* survey, Ferguson and Potter offer useful and realistic insight into the RDD preparedness issues, and the underlying strategies, outlined and proposed in this thesis.

Short of the impossible task of successfully accounting and controlling for all sources of radiological material, perhaps the most effective means for deterring an RDD attack is to bolster a jurisdiction's prevention and response capabilities with the installation of a comprehensive radiation detection system. In a 2004 *Physics Today* article entitled "Detecting Illicit Radiological Sources," Joseph McDonald provides an investigatory report into the various types of radiation detection technology currently available for homeland security application, including the devices used by first responders.¹¹ His research revolves around an in-depth practical analysis of the most cutting-edge technology; therefore, it comes across as primarily a highly-scientific report on the technical operation of the most commonly used devices. However, he does provide some interesting insight into the advantages and shortcomings of each, and offers realistic advice for the future development and acquisition of new technology. It is important to note that all of the devices he refers to in this article are currently being utilized by NYC first responder agencies.

⁹ Ferguson, *Four Faces*, 18-20.

¹⁰ *Ibid.*, 11.

¹¹ Joseph C. McDonald, Bert M. Coursey and Michael Carter, "Detecting Illicit Radiological Sources," *Physics Today* (November 2004): 36, http://homeland-security.pnl.gov/pdf/raddetectors-physics_today_nov_04.pdf (accessed January 19, 2006).

In a presentation to the New York Area Science and Technology Workgroup in December, 2004, Dr. Lawrence Ruth from the U.S. Department of Homeland Security (DHS) Environmental Measurements Laboratory (EML) in NYC briefed a multi-agency group of local emergency management personnel on the status of a proposed NYC Incident Management Radiological Monitoring Network.¹² This “for official use only” document provides useful insight into the proposed system that was scheduled to be unveiled for pilot testing in March, 2005. The plan, which was devised in collaboration with NYC Office of Emergency Management (OEM), focuses on building a detection network in and around NYC, with the initial emphasis placed upon protecting the financial institutions and transportation hubs in the “defense zone” south of 59th St. in the borough of Manhattan. The recommended concept of operations identifies the roles and responsibilities of multi-agency partners, and the plan’s coordination with other ongoing radiological initiatives as significant challenges that must be overcome. Undoubtedly, these issues are of concern given the findings of the DHS “playbooks” project and the recently released Citywide Incident Management System (CIMS) protocol. Despite this recently implemented effort, however, a 2004 *Congressional Research Service* (CRS) report finds, “Detecting RDDs, though, is not simple... [And the] difficulty of finding RDD material emphasizes the value of eliminating or securing it.”¹³

According to a *Cato Institute* policy analysis, emergency preparedness is contingent upon gaining public support through an education and information campaign.¹⁴ More specifically, the aforementioned CRS report advocates a “large-scale public education program” as a possible solution to reduce the consequences of an RDD attack.¹⁵ Coincidentally, the Federal Emergency Management Agency (FEMA) also recommends heightened public awareness for terrorist attacks, including those involving

¹² The information regarding this program was obtained from a power-point presentation posted on a secure Web site restricted for use by the New York Area Science and Technology Workgroup. Up-to-date, de-classified information on this topic for the purposes of this thesis was provided by Lawrence Ruth, PhD. (DHS Environmental Measurements Laboratory), interview by author, May 25, 2005.

¹³ Jonathan Medalia, “Terrorist ‘Dirty Bombs’: A Brief Primer,” *Congressional Research Service* (April 1, 2004): 6.

¹⁴ Eric R. Taylor, “Are We Prepared for Terrorism Using Weapons of Mass Destruction,” *Cato Institute: Policy Analysis*, no. 387 (November 27, 2000): 15, <http://www.cato.org/pubs/pas/pa387.pdf> (accessed January 19, 2006).

¹⁵ Medalia, “Terrorist ‘Dirty Bombs’,” 6.

an RDD, and has developed a set of specific guidelines for the uninformed citizen to follow.¹⁶ These basic and easily understandable procedures are readily available on the FEMA Web site. Similarly, the RAND Corporation offers a comprehensive and user-friendly instruction manual that supplements the FEMA terrorism awareness information.¹⁷ Included with this report is a handy “reference card” that consolidates the key points and instructions into an easily accessible pamphlet. Hence, the fundamental first step in RDD preparedness is to propose a concerted and formalized effort to mainstream these crucial recommendations in order to change the public’s perception and awareness of these types of attacks.

Whereas the aforementioned *New York Times* article falls short, RD Lasker excels in his research on how the public will perceive and react to a RDD attack.¹⁸ In a comprehensive study conducted in 2004 for the *New York Academy of Medicine*, Lasker suggests that, according to current plans, only three-fifths of the people told to do so would stay in place at a location other than their home. The underlying conclusion reached in this report can be best explained thus: “The public’s full cooperation in the dirty bomb situation could be increased substantially by developing shelter-in-place plans in the places people frequently are in and making people very aware of those plans; by strengthening people’s confidence in community preparedness plans; and by enhancing people’s trust in official instructions and actions.”¹⁹ It is worth noting that in the hypothesis, specific reference is made to post-9/11 NYC. Although it is difficult to discount the applicability of these recommendations, Lasker does not ask the questions: Is a shelter-in-place plan in a densely populated area such as NYC entirely feasible? Can the unique construction features of high-rise buildings render this strategy ineffective? Would the consequences be significantly different if shelter-in-place instructions were not given to the occupants of a building in a timely and appropriate manner? Otherwise,

¹⁶ Federal Emergency Management Agency, “Are You Ready? An In-depth Guide to Citizen Preparedness,” 169-172, http://www.fema.gov/pdf/areyouready/areyouready_full.pdf (accessed January 19, 2006).

¹⁷ Lynn E. Davis and others, *Individual Preparedness Response to Chemical, Radiological, Nuclear, and Biological Terrorist Attacks: A Quick Guide* (Santa Monica, CA: RAND, 2003), 7-9, http://www.rand.org/pubs/monograph_reports/2005/RAND_MR1731.1.pdf (accessed January 20, 2006).

¹⁸ Roz D. Lasker, “Redefining Readiness: Terrorism Planning Through the Eyes of the Public,” *The New York Academy of Medicine* (2004): 31-42.

¹⁹ *Ibid.*, 37.

this is an extremely useful source of information and should be used as a guide to be followed when developing new or re-designed emergency response plans.

This literature evaluates NYC's RDD attack preparedness and, as such, may contribute significantly to the development of a comprehensive response strategy for public and private participants. In order to highlight the importance of this study, general assertions are necessarily made by examining current terrorism trends and the probable consequences of a successful attack. Conceivably, the deployment of a comprehensive detection system and corresponding response plan could prove to be an effective preventive measure and a potential deterrent. So that the harmful effects of a successful attack are sufficiently limited, a general understanding of the public's reaction to an RDD attack may assist in the development of a realistic and workable evacuation/shelter-in-place plan. By following the tenets of incident command, the overall efficiency of first responders operating at this complex incident is greatly enhanced. Thus, interagency coordination and training, particularly between the Fire Department of New York (FDNY) and the New York Police Department (NYPD), is a key element in the strategy's overall success.

C. METHOD

A critical analysis of the generally recognized threats and vulnerabilities generates fundamental conclusions regarding the current trends and future potentialities for NYC. Although some important literature is available on the actual and potential measures available for countering an RDD attack, its reliability is corroborated through interviews with local subject-matter experts. Current research on the psychology of fear and terrorism reveals that there are options available to NYC public safety officials for increasing public awareness with programs that provide critical emergency response instruction prior to and during an actual RDD event. Due to the fact that an RDD attack has not yet taken place, there is a relative scarcity of relevant information on the practicality of sheltering-in-place during such an event; thus a survey of high-ranking NYC public safety officials can offer some insight into the feasibility of this seemingly problematic strategy. Finally, an objective professional assessment of recently enacted local policies when evaluated against mandated national preparedness strategies will reflect on the state of readiness of NYC's first responder community.

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II. THREATS

A. CURRENT TRENDS IN NYC TERRORISM

1. Introduction

Within the realm of homeland security, much attention has been focused on NYC being perhaps the greatest target afforded terrorists in the United States. It could be argued, however, that other cities, Washington D.C. notwithstanding, possess the same lure to terrorist plots as NYC; and thus, receive a disproportionate amount of resources for responder preparedness. Yet, time and again, intelligence reports have shown that NYC, and the island borough of Manhattan in particular, are clearly in the terrorist crosshairs. This often leads critics to wonder, “What makes NYC so attractive for terrorists? How severe is the threat?” This chapter will proceed to answer these questions, not only to satisfy the inquiries, but also for the benefit of those public safety officials seeking information on the direction of the current trend of terrorism in NYC. With this information, policymakers from first responder agencies will then be able to better assess preparedness, allocate resources, develop plans, and implement strategies.

2. Recent History

The terrorist attacks on the World Trade Center (WTC) in 1993 and 2001 are two well-documented cases that have been scrutinized by many renowned experts from various fields and disciplines. From a rudimentary terrorism standpoint, it appears that these two events have some common denominators. First, aside from the obvious fact that the attack was leveraged against the same exact building, the most compelling general inference to be drawn is that it was a calculated strike against our Nation’s economy. Interestingly, in the 1993 attack the location of the building, its physical attributes, and a desire to inflict a large number of casualties, were the most prominent factors in choosing the target.²⁰ Despite almost \$300 million in damage, economic fallout was not the prime motivator in the first attempt to topple the towers.

²⁰ John V. Parachini, “The World Trade Center Bombers: 1993,” in *Toxic Terror: Assessing Terrorist Use of Chemical and Biological Weapons*, ed. Jonathan B. Tucker, 185-206 (Cambridge, MA: The MIT Press, 2000), 189, <http://cns.miis.edu/research/wtc01/pdfs/toxter11.pdf> (accessed February 13, 2006).

Unfortunately, since the 2001 attack, “financial Armageddon” is a theme that al-Qaeda has clearly adopted. In a citation of British journalist Paul Eedle, terrorism expert Bruce Hoffman notes,

In particular, articles posted on the [al Neda Web] site have sought to draw a connection between the destruction of the World Trade Center and the cumulative blow struck against the U.S. economy by the September 11 attacks. Among the claims of proof the site offers are the weakening strength of the American dollar, the precipitous decline of the U.S. stock market, and the loss of confidence both at home and abroad in the American economy.²¹

Hoffman also states that continuous rhetoric presented by Osama bin Laden exposes “[the U.S.] as a ‘paper tiger,’ on the verge of financial ruin and total collapse much as the USSR once was, with the power of Islam poised similarly to push America over the precipice.”²² Most importantly, however, is bin Laden’s own words to his devout followers in 2001, in which he states,

America is in retreat by the grace of God Almighty and economic attrition is continuing up to today. But it needs further blows. The young men need to seek out the nodes of the American economy and strike the enemy’s nodes.²³

Additionally, as recent as August, 2004, a heightened level of alert was issued for Manhattan’s Citicorp Center and the New York Stock Exchange, with intelligence pointing toward a possible al-Qaeda attack at these financial institutions.²⁴ Thus, a new battle-hymn has been sounded for the cadre of al-Qaeda loyalists and sympathizers, suggesting a trend toward further attacks on U.S. financial centers.

A second consideration worth noting is the audacity of al-Qaeda striking not only in the same city but at the exact same building. Certainly, other major cities in the U.S. have high-rise buildings tall enough to have been easily penetrated by commercial airliners. Also, the calculated amount of WTC casualties could not have been estimated as significantly greater than in another building and/or city. This leads one to ask, “Why

²¹ Hoffman, *Al-Qaeda*, 11.

²² *Ibid.*

²³ *Ibid.*, translated by Eedle to Hoffman via personal communication, July 31, 2002.

²⁴ Greg Gittrich, “Al Qaeda Plot Targets Us,” *Daily News*, August 2, 2004, <http://www.nydailynews.com/front/story/218255p-187749c.html> (accessed January 3, 2005).

hit the WTC again after the first attempt to bring it down had failed?” In reference to predictions of future attacks on Washington, D.C. made by some Bush administration, law enforcement, and intelligence officials, Hoffman explains that, “Al Qaeda’s penchant to return to targets that previous attacks had failed to destroy consumed these experts’ thoughts and therefore they viewed the White House and U.S. Capitol as at the top of the terrorists’ hit list.”²⁵ Perhaps it could be argued that the subsequent media exposure regarding the construction of the building provided bin-Laden with vital information on its design flaws, and thus, created the impetus for the repeat performance. More likely the case, however, is the broadly accepted premise that al-Qaeda will persistently and patiently attempt to exploit specific high-value targets, whenever possible, so that maximum exposure is attained.

The type of methods used to deliver the two destructive strikes is a third factor worthy of distinction. The 1993 attempt, featuring a van containing approximately 1500 pounds of urea-nitrate explosives detonated a sub-level parking garage, pales in comparison to the jet-fuel laden commercial airplanes used in the 2001 episode. Incidentally, a 1993 Federal Bureau of Investigation (FBI) report on terrorist acts finds that, “Due to the loss of human life, serious bodily injuries, extensive property damage, and economic loss, the bombing of the WTC is considered to be the single largest international terrorist incident ever conducted in the United States.”²⁶ Was bin-Laden’s own hubris and omnipotence as the ultimate leader of the jihad movement the likely motive for the second and more spectacular NYC attack? If so, any future al-Qaeda attack in the U.S. could be expected to be at least as devastating as the last and, once again, may include NYC as a key recipient.

It is helpful to perform a cursory examination of the relatively recent and unsuccessful terrorist plots in NYC in order to establish a baseline modus operandi. The following past failed attempts are listed in chronological order:

- In 1995, Abd al-Rahman, otherwise known as the “Blind Shiek,” was convicted not only for the 1993 WTC attack but also for planning to bomb

²⁵ Hoffman, *Al-Qaeda*, 1.

²⁶ U.S. Department of Justice, Federal Bureau of Investigation, *Terrorism in the United States: 1993*, 2, <http://www.mipt.org/pdf/TerrorismInUS1993.pdf> (accessed January 19, 2006).

the United Nations, the FBI building, the Holland and Lincoln Tunnels, and other NYC landmarks. According to a published U.S. State Department report, “Trial evidence showed that Abd al-Rahman was the leader of an organization whose aim was to wage a self-styled ‘holy war’ of terror against the United States because he considered it an enemy of Islam.”²⁷

- In 1997, in a raid based on a tip-off of a planned subway bombing, Gazi Ibrahim Abu Mezer and Lafi Khalil were shot and wounded by NYPD officers in their Brooklyn apartment.²⁸ Although a letter sent to the U.S. State Department shortly before their arrest called for the release of six Arabs from U.S. and Israeli jails, it could not be proven that the two were affiliated with a particular group.
- In 2003, two al-Qaeda plots to strike NYC were uncovered and thwarted.²⁹ In one instance, the alleged terrorist operatives infiltrated a Manhattan Garment Center business in an attempted plot to smuggle weapons via a ship container from Pakistan. In the other scheme, the perpetrators were conducting surveillance operations on the Brooklyn Bridge with the apparent intent of planning its demise.
- In August, 2004, two NYC natives were arrested for planning to blow up the 34 St. subway station in the heart of Manhattan’s Herald Square.³⁰ The two friends had no known ties with al-Qaeda or any other organization, prompting one NYPD official to classify it as a “homegrown, lone-wolf incident.”³¹

²⁷ U.S. Department of State, *Patterns of Global Terrorism: 1995* (1996): 2, <http://www.mipt.org/pdf/1995pogt.pdf> (accessed January 3, 2005).

²⁸ U.S. Department of Justice, Federal Bureau of Investigation, “Terrorism in the United States: 1997,” 5, <http://www.mipt.org/pdf/TerrorismInUS1997.pdf> (accessed January 19, 2006).

²⁹ Raymond Kelly (NYPD Commissioner), in testimony to the *9/11 Commission* panel, May 18, 2004.

³⁰ Craig Horowitz, “Anatomy of a Foiled Plot,” *New York Magazine*, December 6, 2004, <http://newyorkmetro.com/nymetro/news/features/10559/index.html> (accessed January 19, 2006).

³¹ *Ibid.*

Hence, over approximately the past twelve years, there exists a commonality regarding these plots. All of the attempts involved either Islamic fundamentalists or those sympathetic to the cause. In each case, the pattern of attack points to the use of bombs at various symbolic and transportation sites, including two intended for the subway system. Moreover, three out of the five failed efforts can be linked to organized terrorist groups.

3. Types of Terrorist Groups

Based upon the aforementioned information, it is possible to establish a general overview of the type of group, or non-group with ideological affiliation, that could potentially be responsible for the next NYC attack. Obviously, the general trend points toward a future attack involving participants that share Islamic fundamentalist views. On the other hand, it cannot be predicted with any reasonable degree of certainty whether it will include dedicated members of an organized group (the foiled 1995 and two 2003 plots, and the 2001 attack), or the “lone-wolf” type individuals (the 1997 and 2004 plots). Regarding the current threat for prospective attacks presented by al-Qaeda, Hoffman suggests terrorists could be otherwise classified by one of the following four types:³²

- *The professional cadre.* Well trained, and dedicated members trusted with surveillance and funding for the “highest value” missions. The 19 hijackers in the 2001 attack clearly match this criterion.
- *The trained amateurs.* Less professional due to lack of training, however still considered dangerous in the event a successful attack. The failed airline “shoe-bomber” Richard Reid is one such example of this type of operative.
- *The local walk-ins.* Local Islamic groups and loosely tied affiliates that propose plans for attack in an attempt to obtain financial assistance from al-Qaeda.
- *Like-minded insurgents, guerillas and terrorists.* “[I]nsurgent or terrorist groups who over the years have benefited from bin Laden’s largesse

³² Hoffman, *Lessons of 9/11*, 13-15.

and/or spiritual guidance; received training in Afghanistan from al-Qa'ida; or have been provided with arms, materiel and other assistance by organization.”³³

Consequently, any future NYC attack could be largely based upon an Islamic fundamentalist ideology but, the type of potential perpetrator may run the gamut from the consummate professional to the initiated walk-in amateur.

The nature of the next attack could be predicted by determining whether the attack is religiously or politically motivated. For example, the 1997 failed plot by the unaffiliated team of abu Mezer and Khalil seemingly upholds David C. Rapoport's argument, “Most observers of Islam know that [terrorism] fuses religion and politics in ways unparalleled in other major religions, a fact reflected in Ayatollah Khomeini's constantly re-iterated phrase that ‘politics and religion are one.’”³⁴ Meanwhile, the attack perpetrated by the “Blind Shiek” on the WTC in 1993 supports the theory that the more serious terrorist attacks, in terms of casualties or politics, have shown religion as a prime motivator.³⁵ Hence, based solely upon the fact that the 1993 and 2001 WTC attacks were more successful and damaging than either the 1997 and 2004 failed subway plots, it appears that purely religious-inspired and organized groups are more professional and thus, extremely dangerous. However, the lethal potential of the less structured political and religiously motivated individuals, or local walk-ins, should not be underestimated. It could be only a matter of time before pay dirt is hit.

4. Types of Attacks of Greatest Concern

It is the profound belief of one top NYC public safety official that the next attack could be at the hands of a “suicide bomber.”³⁶ In his opinion, several suicide attacks occurring a few days apart in the transportation hubs of Penn Station, Grand Central Station, and the subway system would psychologically cripple the general public.

³³ Hoffman, *Lessons of 9/11*, 13-15.

³⁴ David C. Rapoport, “Perceptions and Misperceptions of Religious Terror,” unedited paper contributed to the International Conference on Countering Terrorism through Enhanced International Cooperation, 4.

³⁵ Hoffman, *Inside Terrorism*, 92.

³⁶ Harold Meyers (FDNY Manhattan Borough Command Chief), personal conversation with author, December 31, 2004.

Lending support to this conjecture, Dr. Irwin Redlener from the Columbia University Center for Disaster Preparedness expects an event similar to the Madrid train bombings to take place in Penn Station.³⁷ Coincidentally, in a recent dissertation, Scott Atran states, "...terrorists are becoming increasingly effective by using suicide attacks, and the trend points to a catastrophic unconventional terrorist attack that could make the March 11 attacks in Madrid and the September 11 attacks in New York and Washington pale in comparison."³⁸

Contrary to this "suicide bomber" estimation, however, is the basic argument that these types of attacks have not yet materialized in NYC. Hence, it is the viewpoint of at least one U.S. intelligence specialist that a potential suicide terrorist experiencing social exposure to American people inherently becomes more comfortable with his surroundings, thus decreasing his desire to follow through with a suicide attack.³⁹ Apparently lending support to this theory, it is suggested that the 19 hijackers on 9/11 were able to sufficiently isolate themselves with frequent and unrestricted travel; therefore, effectively breaking any emotional ties with society.

It is important to note that, although not well-known or publicized, a terrorist suicide attack has already taken place in NYC. In 1997, at the Empire State Building, a Palestinian man shot and killed one man, injured several others, and then turned the gun on himself. An apparent suicide note found in the killer's possession pointed to the "enemies of Palestine" as the reason for the attack.⁴⁰ Thus, it can be surmised that a suicide attack is well within the realm of would-be terrorists in NYC. The cohesiveness and sustainability of such occurrences, however, remains somewhat uncertain.

Since 9/11, much attention has been focused on local preparedness for an attack involving WMD. As a direct result of the lessons learned on that one particular day, first responder agencies have been the recipients of a major influx in federal funding. The

³⁷ Christopher McDougall, "Reasons They Haven't Hit Us Again," *New York Magazine*, December 6, 2004, <http://newyorkmetro.com/nymetro/news/features/10560/index.html> (accessed January 19, 2006).

³⁸ Scott Atran, "Mishandling Suicide Terrorism," *The Washington Quarterly* 27, no. 3 (Summer 2004): 70.

³⁹ McDougall, "Reasons They Haven't Hit Us."

⁴⁰ U.S. Department of State, *Patterns of Global Terrorism: 1997* (1998), under *1997 Global Terrorism: The Year in Review*, <http://www.mipt.org/pdf/1997pogt.pdf> (accessed January 19, 2006).

intended use of these grants is to enhance and increase the capability and expertise of ill-equipped organizations to respond to such events. For example, in 2004 alone, the FDNY had completed training for 46 technically enhanced and specialized hazardous materials units in preparation for a potential WMD attack.⁴¹ Additionally, new equipment, including a “state-of-the-art” mobile command center and chemical, biological, radiological, and nuclear (CBRN)-rated self-contained breathing apparatus, has been introduced to further augment the Department’s ability to operate at these incidents effectively and safely. Surprisingly, John V. Parachini, a notable policy analyst at RAND, seemingly disagrees with the formula of increasing spending for first responder WMD preparedness at the expense of law enforcement, intelligence, border patrol, diplomacy and military action.⁴² In an attempt to dispel this line of reasoning one may ask, “How likely is it that a WMD attack will occur in NYC?”

In building his WMD argument Parachini states, “More than anything else...the mindset of leadership, opportunity and technical capacity are the factor’s that most significantly influence a [terrorist] group’s propensity to seek, to acquire and to use unconventional weapons.”⁴³ In his analysis of each factor he primarily takes a stand against the eventuality of a WMD attack, claiming that historically there exists no proof of relative success. However, Parachini’s effort pre-dates the recent public announcement by a former Central Intelligence Agency officer of the 2003 fatwa, issued by the well-known Islamic cleric Sheik Nasir bin Hamid al Fahd, permitting the use WMD as a means of attack.⁴⁴ Hence, it would be imprudent to disregard the “obsessive” mindset of the al-Qaeda leadership evident in this important religious ruling.

Recent data obtained from military operations in Afghanistan supports the popular belief that al-Qaeda has persistently tried to acquire materials for the development of biological and radiological weapons.⁴⁵ Moreover, the opportunity needed to obtain

⁴¹ New York City Fire Department, “Commissioner’s Message,” Department Order No.1, Supp. No.1, January 4, 2005.

⁴² Parachini, “WMD Terrorism,” 48.

⁴³ *Ibid.*, 42.

⁴⁴ Kelly Uphoff, “Osama bin Laden’s Mandate for Nuclear Terror,” *JINSA Online* (December 10, 2004), <http://www.jinsa.org/articles/print.html/documentid/2762> (accessed January 19, 2006).

⁴⁵ Steve Bowman, “Weapons of Mass Destruction: The Terrorist Threat,” *Congressional Research Service* (March 7, 2002): 3.

material for unconventional weapons is not beyond the imagination or means of even a small group of terrorists. In a *New York Times* article entitled “Nuclear Nightmares,” author Bill Keller explains that cobalt-60, a radioactive material that could potentially be used in a dirty bomb, is commonly found in hospitals and food irradiation plants.⁴⁶ Regarding the technical capacity needed to disperse this substance, Keller cites an FAS deposition outlining the catastrophic effects of this easily improvised homemade device.⁴⁷

In assessing the realistic threat of a WMD terrorist attack, Parachini gets it right when he states, “Al-Qaeda...continues to be interested in [WMD] but is also willing and able to conduct significant, multiple, and near simultaneous attacks with conventional means.”⁴⁸ Generally speaking, this assessment holds true; however, in NYC the threat of a WMD attack cannot be downplayed. To suggest that any significant effort made toward increasing preparedness be undermined for the sake of marginal economic efficiency is irrational given the severe consequences of such events.

5. Conclusion

The nature of terrorism is conceptually too dynamic, complex, and sophisticated to expound on many explicit assumptions. However, it can be beneficial to closely examine current trends in order to create an adequate level awareness and preparedness that is critically needed in NYC. Hence, it is entirely feasible to rely on the following conclusions:

- Any large scale attack could reasonably be expected to involve the Financial District in lower Manhattan. With hundreds of financial firms encompassing all aspects of the industry, it is arguably the most valuable “node of the American economy” worth protecting. On any given business day, a few hundred thousand employees inhabit a relatively small

⁴⁶ Keller, “Nuclear Nightmares.”

⁴⁷ While Keller points out that the Federation of American Scientists (FAS) testimony before Congress suggests the detonation of a homemade dirty bomb in the area of Lower Manhattan would have disastrous consequences, the FAS estimation is perceived by some as being overly pessimistic. See, for example, F. T. Harper, S. V. Musolino and W. Wentz, “Realistic Radiological Dispersal Device Hazard Boundaries and Ramifications for Early Consequence Management Decisions,” *International Journal of Risk Assessment and Management* (forthcoming).

⁴⁸ Parachini, “WMD Terrorism,” 46.

cavernous, high-rise building area of less than one square mile. This area has previously been the recipient of two relatively catastrophic attacks; and it remains an extremely susceptible target for yet another, more cataclysmic, strike by the patient and importunate al-Qaeda organization.

- The type and location of future attacks, in general, may be predicated on the category of terrorist involved. A relatively small scale attack by al-Qaeda could be expected to be at the hands of either trained amateurs or local walk-ins. These types have consistently expressed a penchant to attack the NYC transportation system in areas within the borough of Manhattan. While not as proficient, “lone-wolf” participants sympathetic with al-Qaeda can be equally as dangerous and can be expected to be successful over time. Also, purely religious actors have been shown to be more adept and destructive than their secular-minded counterparts.
- The specific type of attack will vary depending upon the type of participant. Suicide attacks using explosives have not yet occurred and, unlike those occurring in the Middle East, the future of such may be extremely sporadic. The potential offender is likely to be of either the local walk-in or a “lone-wolf” type.
- The next terrorist strike in NYC will aptly make use of conventional explosives to achieve the desired objective. Its relative ease of use by the professional and amateur alike, as well as its overall reliability and effectiveness, accounts for it continuing to be the weapon of choice. Among the list of most likely targets, financial institutions and transportation systems remain inclusively at the top.
- Finally, a terrorist incident employing WMD is another low probability event; however, the consequences could be extremely high. Hence, first responder agencies should continue to make in-roads in preparedness in anticipation of its inevitable occurrence. The al-Qaeda organization is seemingly the most qualified and motivated group to succeed in this endeavor.

III. VULNERABILITIES

A. THE INEVITABLE RDD ATTACK

1. Introduction

Given the greater likelihood of future terror attacks involving the use of conventional explosives, why then should NYC public safety officials and first responders continue to remain focused on preparing for the lower probability WMD attack, and more specifically one utilizing an RDD? A plausible explanation is that future risk-based funding provided by DHS for first responder equipment and training will be funneled in this direction. Also, NYC is arguably the largest stakeholder of business and finance infrastructure in the Nation; and terrorists, through their pattern of attacks and plots, have shown a willingness to return. Furthermore, the after-effects of 9/11 have proven that an attack on this sector will reverberate through the entire U.S. economy. Thus, NYC's emergency response community must do all it can to increase its own preparedness in order to minimize the effectiveness of this type of attack.

2. Risk-based Funding

In a July, 2005 statement made before the U.S. Senate Committee on Commerce, Science and Transportation, DHS Secretary Michael Chertoff emphasized the importance of concentrating preparedness efforts towards catastrophic attacks.⁴⁹ In an environment of finite resources, he suggests that the U.S. must maximize security by preparing for more devastating types of events at the expense of a willingness to accept relatively more risk, with potentially lesser consequences, at more vulnerable infrastructure. Specifically, he singles out a nuclear attack on U.S. soil as one such event that would be particularly catastrophic. Based upon this assessment, the current Administration has proposed that Congress should “establish and fund a Domestic Nuclear Detection Office (DNDO) to develop and deploy the next generation of systems that will allow us to dramatically improve our ability to detect and intercept a nuclear threat.”⁵⁰ In assessing the current level of U.S. preparedness for nuclear terrorism, Chertoff notes that, “[some] of the tools

⁴⁹ Michael Chertoff (U.S. Department of Homeland Security Secretary), in a statement made before the United States Senate Committee on Commerce, Science and Transportation, July 19, 2005, U.S. Department of Homeland Security Official Web site, <http://www.dhs.gov/dhspublic/display?content=4643> (accessed October 2, 2005).

⁵⁰ Ibid.

needed to prevent, respond and recover from such awful scenarios are already in place; but others need significant improvement.”⁵¹ Fortunately, at the present time, the DNDO is actively engaged in developing and deploying radiation detection technologies for the NYC area. (An overview of these technologies will be discussed in greater detail in Chapter IV.)

However, not all resources are expended solely on comprehensive detection equipment capabilities. Being fully prepared for a nuclear event also requires a substantial investment in first responder training. Over time, the recurring costs associated with a robust and ongoing training program could eclipse the fixed expenses associated with the procurement and maintenance of equipment. So, why then should NYC agencies be willing to spend its own limited resources on any current and/or future training programs considering the fact that a terror attack using nuclear or radiological weapons has not yet occurred?⁵² The answer to this question lies in an analysis of the threat and potential consequences of a successful RDD attack, especially in the areas of Midtown or Lower Manhattan.

3. Nuclear Terrorism

In 2002, with the devastating blow delivered on 9/11 still relatively fresh in the minds of the American public, reports of other types of terror attacks had already begun to enter the mainstream media. With increased regularity, the term “CBRN” (Chemical, Biological, Radiological, and Nuclear) was being used interchangeably with “WMD” (Weapons of Mass Destruction) to describe the events that would likely rival or surpass that experienced on 9/11.⁵³ The article “Nuclear Nightmares,” written for the widely-circulated *New York Times*, had undoubtedly raised concerns of a nuclear event occurring

⁵¹ Chertoff statement.

⁵² A well-documented case of a terrorist group utilizing radiological material occurred on November 23, 1995 in Izmailovsky Park, Russia. Chechen rebels placed a package containing cesium-137 without attaching it to an explosive device, or otherwise considered a radiation emission device (RED), under a park bench. Although this could technically be construed as a radiological event, it is worth mentioning that a distinction between an RDD and an RED does exist. It also demonstrates the attractiveness of using radiological material as a weapon and its relative ease of acquisition.

⁵³ Generally speaking, the acronyms “CBRN” and “CBRNE” (with the “E” representing high-yield explosives) are often times used interchangeably, depending upon the context and/or publication. For the purposes of this thesis, the former will be used to represent the more unconventional types of attacks. More specifically, CBRN is used throughout the NYC Citywide Incident Management System (CIMS) document to distinguish these types of events as separate and distinct from conventional attacks using explosives.

on U.S. soil.⁵⁴ But, the focus was now on the unconscionable act being committed by non-state actors rather than another nuclear-equipped nation.

In a February, 2002 interview, then U.S. Office of Homeland Security Director Tom Ridge expressed concern that of all the potential terrorist attacks involving WMD, an incident involving nuclear materials was the one he feared most.⁵⁵ To the uninformed NYC citizen, however, this generalization would likely invoke thoughts of a Hiroshima-type mushroom cloud rising above the cavernous high-rise office buildings of Manhattan.⁵⁶ For the sake of clarification, there is general agreement among experts that terrorists could conceivably exploit nuclear resources in four separate and distinct ways. Each one possesses varying degrees of severity and probability of occurrence. Table 1 provides an overview of each of these four mechanisms.

Within the realm of nuclear terrorism, the RDD attack is seen as the type most likely to occur. For example, former Clinton administration and current Carnegie Endowment expert on Russian nuclear safety, Rose Gottemoeller believes that “If there is a W.M.D. attack in the next year, it's likely to be a radiological attack.”⁵⁷ The logic behind this school of thought is three-fold. First, radiological material is readily available to terrorists from commercial sources, and relatively easy to obtain through illicit transactions. Second, the weapon could be transported by terrorists to the intended target unimpeded if properly shielded from any existing radiation detection system. Third, a dirty bomb is fairly simple for terrorists to manufacture, with the greatest technical obstacle being the effectiveness of the radioactive dispersion.⁵⁸

Perhaps the most compelling case made for the probability of an RDD attack is put forth in a 2005 survey conducted by U.S. Senator Richard G. Lugar, Chairman of the Senate Foreign Relations Committee. The survey polled a group of leading national

⁵⁴ Keller, “Nuclear Nightmares.”

⁵⁵ Ibid.

⁵⁶ See, for example, the World Health Organization Web site, Radiological Dispersion Device information sheet, http://www.who.int/ionizing_radiation/en/WHORAD_InfoSheet_Dirty_Bombs21Feb.pdf

⁵⁷ Rose Gottemoeller, quoted in Keller, “Nuclear Nightmares.”

⁵⁸ Ferguson, *Four Faces*, 269-79.

security experts on various WMD proliferation issues. In comparison to the threat of a chemical, biological, or nuclear attack on a major city, the survey group found

...the risk of a radiological attack as significantly higher. The median and average estimates of risk were 25% and 27.1% respectively over the next five years. Over ten years, both the median and the average estimate of risk jumped to 40%. The median estimate of the probability of a radiological attack over ten years was twice as high as the estimate for a nuclear or biological attack during the same period.⁵⁹

Table 1. Four Possible Types of Terrorist Nuclear Events

Nuclear Event	Material Source	Potential Consequences	Relative Probability of Occurrence
Nuclear Weapon	Theft (most likely from Russia and Pakistan)	Hundreds of thousands of lives; trillions of dollars in economic damage; long term health effects	Very Low
Improvised Nuclear Device (IND)	Theft or purchase of fissile material (from any nation worldwide including the U.S.)	Hundreds of thousands of lives; trillions of dollars in economic damage; long term health effects	Low
Nuclear Facility	Sabotage or attack on a nuclear power plant	Tens to hundreds of billions of dollars in economic damage; long term health effects	Medium ^a
Radiological Dispersion Device (RDD)	Unauthorized acquisition or theft of radiological materials (from any nation worldwide including the U.S.)	Hundreds of lives; tens to hundreds of billions of dollars in economic damage; long term health effects ^b	High

(From: Ferguson, *Four Faces*, and Keller, “Nuclear Nightmares.”)

⁵⁹ Richard G. Lugar, “The Lugar Survey on Proliferation Threats and Responses,” (June 2005): 6, <http://lugar.senate.gov/reports/NPSurvey.pdf> (accessed October 17, 2005).

a. Ferguson points out, “[under] most circumstances, it would be difficult for a terrorist organization to produce a massive radiation release from a U.S. nuclear facility. More terrorists, however, might be prepared to attempt this act than acquire and detonate a nuclear weapon.”

b. It is worth noting that Henry Kelly of the Federation of American Scientists has estimated that the economic losses would be in the trillions of dollars.

Most of the empirical data on the potential consequences of any future RDD attack is found in an analysis of a 1987 accidental radiological release of 1,375 curies of powdered cesium-137 in Goiania, Brazil. A case study of this unintended disaster found that it had resulted in the following:

- Four deaths and 28 people with radiation burns;
- At least 100 people with significant internal doses due to inhalation and ingestion;
- Psychological and social effects caused by wide-spread panic;
- Over 110,000 people seeking medical attention for perceived contamination (‘worried-well”);
- Contamination of an area equivalent to approximately 40 city blocks, requiring \$20 million in clean-up costs and the destruction of several homes and buildings;
- Total damage to the local economy and its two main industries, tourism and agriculture.⁶⁰

Terrorist attacks involving CBRN are unique in the sense that each one presents its own inherent degree of destructive consequences and probability of occurrence. An RDD attack is just one of several utilizing nuclear material, however, it is considered the most likely to occur. The underlying potential for this type of attack on NYC is evident in the abundance of opportunities it presents for terrorists to maximize their rate of return.

4. New York City’s Vulnerabilities

Contrary to general public perception, an event involving an RDD will not likely result in an immediate health hazard to nearby people or first responders outside of the immediate point of detonation.⁶¹ Unlike the mass casualties that would be rendered by a nuclear weapon or an IND, all prompt fatalities caused an RDD attack would be directly

⁶⁰ Ferguson, *Four Faces*, 270.

⁶¹ Health Physics Society: Position Statement, “Guidance for Protective Actions Following a Radiological Terrorist Event” (January 2004), <http://hps.org/documents/RDDPAGs.pdf> (accessed January 28, 2006).

or indirectly related to the explosion itself. This absence of mass casualties leads many experts to categorize the RDD as more of a weapon of mass “disruption” rather than a weapon of mass destruction. Does this terminology hold true for an RDD attack in NYC? In order to put the RDD threat to NYC into proper context, consider the challenging consequences proposed by the following realistic scenario:

At 8:30 a.m. on a Tuesday morning, as commuters converge on Manhattan, an al Qaeda operative explodes a dirty bomb outside the New York Stock Exchange. The device, while not especially powerful, contains a radioactive payload -- in this case, cesium extracted from radiological equipment that was stolen from a New Jersey hospital by a sleeper working there as a lab tech.

The initial blast kills only a few dozen people, but radiation is quickly dispersed by the prevailing winds. Minutes after the explosion, New York City Police officers arrive -- still unaware of the real nature of the blast. But when a radiation detector in one officer's car goes wild, it becomes clear that a dirty bomb has detonated in the financial center of America's biggest city.

Word of the explosion reverberates throughout New York. Many residents panic -- despite assurances from the mayor and police chief that contamination levels would exceed government limits only in about 40 city blocks. And by 3 p.m., half of Manhattan has tried to leave, clogging trains, highways, and bridges.

Six months later, the financial district remains largely off-limits, and the local economy is limping along amid a cratering of business confidence, the collapse of the tourism industry, and a property market in free fall. Economists put the eventual economic losses at an astronomical \$1 trillion.⁶²

Data has shown that the estimated loss to the NYC economy as a result of the 9/11 attacks was approximately \$27.3 billion for the rest of 2001 and all of 2002.⁶³ Contributing to this deficit was the approximate 30 percent reduction in Lower Manhattan office space and the destruction or temporary relocation of almost 200,000 jobs. The overall damage of physical assets was estimated at just over \$16 billion while

⁶² Spencer E. Ante, Amy Barrett, and Paul Magnusson, “New York Takes Another Hit,” *BusinessWeek Online*, September 19, 2005, http://www.businessweek.com/magazine/content/05_38/b3951012.htm (accessed January 19, 2006).

⁶³ Gail Makinen, “The Economic Effects of 9/11: A Retrospective Assessment,” *Congressional Research Service* (2002): 5-6.

rescue, cleanup, and related costs amounted to roughly \$11 billion.⁶⁴ More significant is the fact that all of the damage incurred that day took place in only a relatively small pocket within the entire NYC Financial District.

An RDD attack in which 40 city blocks in Lower Manhattan are contaminated beyond Environmental Protection Agency (EPA) guidelines would undoubtedly cripple the local and regional economies.⁶⁵ For example, despite a recent moderation, Manhattan real estate prices remain among the highest in the Nation.⁶⁶ The devastating effects on the real estate market in general would be far-reaching since many homeowners in the affluent suburban communities surrounding NYC are employed by the financial firms in Manhattan. Wide-spread contamination would force major financial institutions to relocate away from NYC, many of which would ultimately choose not to return. As a result, employees of these firms would have no choice but to leave the metropolitan area. Inevitably, the lofty residential and commercial real estate prices would soon follow.⁶⁷

Of equal importance are the psychological effects an RDD attack would create on the general public. In fact, the World Health Organization states that

The main purpose of a dirty bomb is to frighten people by contaminating their environment with radioactive materials and threatening large numbers of people with exposure. Such use of radiation is only hypothetical and has not been used by terrorists before, but the possibility exists. Dirty bombs are designed to spread fear and panic.⁶⁸

⁶⁴ Robert Looney, *Strategic Insight: Economic Costs to the United States Stemming From the 9/11 Attacks*, Monterey CA: Naval Postgraduate School Center for Contemporary Conflict (2002).

⁶⁵ In his testimony, Henry Kelly states “Since there are often no effective ways to decontaminate buildings that have been exposed at these levels, demolition may be the only practical solution. If such an event were to take place in a city like New York, it would result in losses of potentially trillions of dollars.”

⁶⁶ David Leonhardt and Motoko Rich, “Slowing Is Seen in Housing Prices in Hot Markets,” *New York Times*, October 4, 2005, <http://www.nytimes.com/2005/10/04/realestate/04reals.html?pagewanted=2&th&emc=th> (accessed October 4, 2005). As of 9/30/05, the average sales price of co-op or condominium apartment in Manhattan was \$1.15 million.

⁶⁷ Although there is recent evidence showing that speculators are already looking for value in the depressed areas of New Orleans following Hurricane Katrina, it is unclear whether there would be the same interest expressed in a radiation-contaminated NYC following an RDD attack. For example, in a case study, Ferguson found “Goiania [Brazil] had relied on tourism and agriculture to earn much of its revenue. Following this radiation safety accident, tourism plummeted, and people fled the region. Prices on agricultural goods fell even though they were found not to be contaminated. In effect, Goiania became a pariah city.” Ferguson, *Four Faces*, 270.

⁶⁸ World Health Organization Web site.

The fear generated following an RDD attack would stem largely from the properties of radiation itself; it is invisible, and undetectable to the human senses at low levels.⁶⁹ Despite government officials' assurances that the probability of long term health effects for most of the exposed would be minimal, the number of people demanding medical attention, or the "worried-well," would likely be many multiples higher in NYC than the reported 110,000 in the Goiania incident. Conflicting media reports from subject matter experts attempting to provide guidance on the acceptable amounts of radiation exposure would only exacerbate the problem.⁷⁰

Whereas it is safe to assume that an RDD attack would, in certain respects, be disruptive to other geographic areas or local municipalities, the term "mass disruption" is misleading. The aftermath of an RDD attack in NYC would make the well-known visuals of 9/11 seem disruptive in comparison. If such an event were to take place in the areas of Lower or Midtown Manhattan, utter devastation would be offered on the entire NYC metropolitan area. Hence, it is entirely appropriate to consider a radiological attack at any one of these locations a weapon of mass "destruction" event.

5. Implications for the U.S.

If a successful RDD attack were to take place within the densely-populated areas of Manhattan the overall repercussions for the Nation in general could be substantial and very likely unprecedented. A recent report from a prominent think-tank suggests

[The] economic ramifications of a successful radiological attack occurring in the continental United States could be enormous, irrespective of the number of people actually killed. Depending on the sophistication and size of the device, areas as large as tens of square miles could be contaminated at levels above recommended civilian exposure limits. In serious cases, demolition may be the only practical solution for dealing with affected buildings. Should such an event take place in a city such as New York, it would result in huge losses.⁷¹

⁶⁹ Ferguson, *Four Faces*, 268.

⁷⁰ "Lack of consensus among experts can increase public fear and anger." U.S. Department of Homeland Security, *Working Group on Radiological Dispersion Device (RDD) Preparedness, Medical Preparedness and Response Sub-Group* (May 1, 2003): 33, http://www1.va.gov/emshg/docs/Radiologic_Medical_Countermeasures_051403.pdf. (accessed January 20, 2006).

⁷¹ Peter Chalk and others, *Trends in Terrorism: Threats to the United States and the Future of the Terrorism Risk Insurance Act* (Santa Monica, CA: RAND, 2005), 34, http://www.rand.org/pubs/monographs/2005/RAND_MG393.pdf (accessed January 3, 2006).

In order to put the RDD incident depicted in the Goiania case study into a U.S. context, it is useful to compare its potential destructive nature to the fiscal impacts following 9/11 (Table 2). Whereas the attacks on NYC had a crippling short term effect on the local economy, the data presented in Table 2 shows that the medium term implications for the greater U.S. economy are even more significant. Furthermore, it should be presumed that the longer term, indirect effects of continued NYC terrorist activities on the global economy will likely give rise to increases in transaction costs and resulting decreases in output. For example, two separate studies have placed the total loss to the U.S. as a result of the 9/11 attacks at \$639 billion and 40% of gross domestic product, respectively.⁷² Based upon the above assumptions, it is entirely feasible to transpose an RDD attack on NYC into Table 2 by replacing references to “transportation” and “airline” with “banking” and “financial.”

Table 2. Economic Effects on the U.S. Following the 9/11 Attacks

Medium Term Impacts of 9/11 Attacks	Long Term Impacts of Future Terror Attacks
Increases in insurance premiums for key industries (including aviation, transportation, construction, and tourism and energy generation)	Increased spending on security, higher insurance premiums and longer wait times for activities
Devaluation of airline industry	Larger business inventories due to less reliable air and rail transportation
Adverse effect on tourism and tourism-related industries (including hotels, tourism, automobile rentals, travel agents, and civilian aircraft manufactures)	Higher risk premiums transferred to businesses in the form of higher interest rates and lower equity prices, with an adverse effect on business investment, and a smaller capital stock
Increase in underlying transportation costs	Shift of resources away from the civilian labor force toward the military for use in the containment of terrorism
Increases in security and military spending	Shift away from globalization due to potential disruption of cross-border flows of goods and assets

(From: Looney, *Economic Costs from 9/11*.)

⁷² Nancy R. Kingsbury, “Review of Studies of the Economic Impact of the September 11, 2001, Terrorist Attacks on the World Trade Center,” *U.S. General Accounting Office* (May 29, 2002): 32, <http://www.gao.gov/new.items/d02700r.pdf> (accessed January 3, 2006).

It is worth pointing out that the overarching economic effect of terrorism is a matter of debate. For example, citing a quick post-9/11 economic recovery, at least one analyst downplays the economic effects of future terrorist acts given the enormity of the U.S. economy.⁷³ Yet, while difficult to quantify the exact amount of economic damage likely to be incurred, the aforementioned *BusinessWeek* article suggests that losses resulting from an RDD attack in the area of the New York Stock Exchange could actually reach \$1 trillion. Under the assumption that these projected losses would be the direct costs to the local economy, it would represent a significant increase over the \$83 billion cumulative loss sustained by NYC as a result of 9/11.⁷⁴ Since the actual outcome of 9/11 and the predicted outcome of an RDD attack are similar in terms of relatively modest human casualties combined with tremendous economic consequences, it could be estimated that the contraction of the U.S. economy following an RDD event would exceed the cumulative economic fallout following 9/11 by an order-of-magnitude greater than 12.⁷⁵

6. Conclusion

The radiological expert's repeated use of NYC as the backdrop for an RDD attack is hardly arbitrary. With its dense population and highly concentrated area of key U.S. financial centers, NYC is widely considered the "Financial Capital of the World." The daunting effect of a predicted \$1 trillion loss suggests that NYC is a logical choice for al-Qaeda and other terrorists groups motivated to attack the "nodes of the American economy." Moreover, the media-entrenched island of Manhattan provides terrorists with the ultimate world-wide stage for a vivid portrayal of hundreds of thousands of people in mass panic.

Undoubtedly, the economic impact of a successful RDD attack on the entire NYC region would likely make the after-effects of 9/11 seem mild by comparison. Regardless of the proclamations made by some economists touting its resiliency and apparent imperviousness, a severe contraction in the U.S. economy would be a tremendous blow

⁷³ Makinen, "Economic Effects of 9/11," 12.

⁷⁴ "According to one study conducted by one of New York's leading management consulting firms, the attacks on the twin towers of the World Trade Center cost the city roughly \$83 billion in direct economic losses." Chalk, *Trends in Terrorism*, 21.

⁷⁵ \$83 billion x 12 = \$996 billion.

under normal circumstances. Given the recent burgeoning of the budget deficit, it must be anticipated that such a catastrophic event would have a profound and adverse effect on the U.S. economy.

In basic terms, RDD risk is a function of the consequences of an attack multiplied by its probability of occurrence. As demonstrated in table 1 and reinforced throughout this chapter, in NYC, the value attached to these two factors is precariously high. Fortunately, policies and strategies can be revised, developed, and implemented to minimize both. The overall cost of financing this enhanced preparedness with additional expenditures on equipment, training, and planning is minimal, especially when compared with the potential benefits to be gained. Fortunately, DHS acknowledges that the threat is real and has earmarked additional preparedness funding for such catastrophic events. The remaining chapters of this thesis will focus on how first responders can best utilize this funding to increase RDD preparedness and lower the overall RDD risk; thereby providing a sufficient deterrent against this type of WMD attack.

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IV. PREVENTION AND RESPONSE

A. FIRST RESPONDER APPLICATION OF RADIATION DETECTION TECHNOLOGY

1. Introduction

A sure-fire solution to the problems presented by a potential terrorist attack employing a “dirty bomb” would be to secure all supplies of radiological material. However, short of the impossible task of successfully accounting for and controlling all of these sources, the most effective measure that may be taken to prevent, and possibly deter, an RDD attack is the installation of gamma radiation detection systems. Meanwhile, although the future prospects for these systems are promising, early detection is often difficult and ineffective.⁷⁶ Fortunately, in the likelihood that pre-emptive measures fail, radiation detection technology can also be utilized for the resulting incident management and response functions.

In a 2003 meeting with the International Atomic Energy Association (IAEA), U.S. Secretary of Energy Spencer Abraham called for an improvement in U.S. technology to counter the threat of an RDD attack.⁷⁷ More specifically, personal radiation detectors, hand-held survey meters, radionuclide identifier devices, and radiation portal monitors represent the tools currently available to achieve these objectives.⁷⁸ Hence, the use of this technology to assist NYC first responder agencies prepare for this type of event is an essential aspect of an RDD prevention and response strategy. This chapter will examine the utility of each of these technologies and point out their deficiencies and shortcomings. It will also suggest practical recommendations for those senior level managers tasked with making RDD prevention and response policy decisions.

2. Personal Radiation Detectors

Perhaps the most simplistic of the radiation detection devices in terms of utility, the personal radiation detector (PRD) is a small and relatively sensitive device that is generally used by first responders as an early warning system.⁷⁹ It operates by detecting

⁷⁶ Medalia, “Terrorists ‘Dirty Bombs’,” 6.

⁷⁷ McDonald, “Detecting Illicit Sources,” 36.

⁷⁸ Ibid.

⁷⁹ Ibid.

photons and/or neutrons and transferring them into light, and using a scintillator attached to an electronic photo-multiplier to count impulses. The PRD indicates higher levels of radioactivity by way of a “clicking” noise, a preset audible alert, and/or a numeric digital readout. Although the FDNY and the NYPD both utilize these types of devices as primarily a “proof-positive” tool for radiation detection, particularly in the aftermath of an RDD attack, the main objectives of its application by each agency are somewhat different.⁸⁰

Utility for Prevention and Response: In 2003, the FDNY issued *Radalert 50* radiological monitors and corresponding written guidelines to all first responder units operating in the field.⁸¹ Included in the types of events recommended for its use are incidents involving explosives or explosive material, or in other words, a potential RDD. The device is set to audibly alarm at a level 1.00 mR/hr (milliroentgens per hour) which, considering normal background levels are between .01 and .05 mR/hr, constitutes an elevated, but still very safe level of radiation. Current operational procedures call for deploying the device(s) in such a manner as to establish an isolation zone, or hot zone, around the incident scene using a 2.00 mR/hr threshold on its LCD display. At this point, with the exception of performing risk/reward-based life saving operations, all first responding FDNY personnel are advised to operate defensively until the arrival of more highly trained and equipped units. As an added layer of protection, each field unit is supplied with a pager-type detector with higher dose rate (mR-R range) capabilities, and a set of personal dosimeters to measure total accumulated dose. Thus, first arriving units are directed to collectively utilize all of these devices to further monitor conditions and exposure while performing any immediate life-saving operations.

Another directive put forth in the FDNY *Radalert 50* operating procedures is the use of the monitor for the purpose of radioactive plume tracking. Immediately following an RDD explosion, all FDNY units citywide equipped with these devices may be notified to take and record readings at intervals specified by the Bureau of Operations. The

⁸⁰ Richard Schlueck (FDNY Battalion Chief, Haz-Mat Operating Battalion), interview with author, June 17, 2005.

⁸¹ New York City Fire Department, “Operational Guidelines for Radalert 50 Radiological Monitor, Fire Tactics and Procedures: Hazardous Materials 11” (December 22, 2003): 1-6.

readings will then be faxed to the Fire Department Operations Center (FDOC) staff where the results will be plotted on a citywide unit location map.

Periodically, the FDNY issues an official order reminding field units to maintain the *Radalert 50* in the “on” position at all times. This is intended as a possible preventive measure since units generally move about the City within their designated response areas on a twenty-four hour basis. In essence, the overall concept is one of a network of mobile sensors capable of detecting the radioactive material used in a potential dirty bomb.

The NYPD has also recently developed its own PRD capability and, to protect against the threat of a radiological attack, has issued pager-type radiological detectors to all police sergeants on patrol.⁸² The concept of operations for these devices is similar to that proposed by the FDNY’s network of mobile sensors; however, the primary objective for its use, unlike the FDNY, is interdiction before an attack occurs.⁸³ For example, a PRD-equipped officer standing next to a truck at a traffic stop could potentially detect if it were carrying the radioactive material that could be used for an RDD. But, despite this well-intentioned operational strategy, the U.S. Department of Energy (DOE) has determined that these devices, when used alone, have certain limitations for search and are most effective only when used in conjunction with portal monitors.⁸⁴

Shortcomings and Deficiencies: Some of the FDNY’s guidelines for use of the *Radalert 50*, while ambitious and well-intentioned, must be reviewed when applied to the response to an RDD explosion. Recent studies have recommended that an initial hot zone be set up within 500 meters of the release if the source material is unknown, or at 1 R/hr (roentgen per hour).⁸⁵ Using dose rate as the parameter for the establishment of an access control line, this newly proposed guideline is 500 times less restrictive than the current FDNY *Radalert 50* protocol. Also, this device is only able to provide readings of up to 50 mR/hr before reaching the maximum gauging capacity. Depending on the exact nature of

⁸² Raymond Kelly testimony to the *9/11 Commission* panel.

⁸³ Schlueck interview.

⁸⁴ Gary L. Jones and Laurie E. Ekstrand, “Customs Service: Acquisition and Deployment of Radiation Detection Equipment,” *U.S. General Accounting Office* (October 17, 2002): 3, <http://www.gao.gov/new.items/d03235t.pdf> (accessed June 19, 2005).

⁸⁵ S. V. Musolino and F. T. Harper, “Emergency Response Guidance for the First 48 Hours after the Outdoor Detonation of an Explosive Radiological Dispersal Device,” *Health Physics* 90, No. 4 (forthcoming).

the release, first responding units may be required to set up an initial hot zone at a location too far away from the incident site to effectively perform life saving operations for those injured or trapped as a result of the explosion. Likewise, the use of the pager-type PRDs may be somewhat limited because only one such meter is assigned per unit; thus, rescuers are restricted to operating close together in teams of five or six.

Aside from the fact that the DOE has found that pager-type PRDs have certain limitations for prevention, a critical issue surrounding the NYPD's use of this equipment is the lack of a coordinated emergency response plan with the FDNY. An RDD attack in NYC, in the areas of Midtown and Lower Manhattan in particular, will necessitate a well-organized response utilizing all the technology, equipment, and capability that is currently available. Unfortunately, until a logical, task-specific, inter-agency plan is formulated and practiced, any advantages gained from advancement in PRD technology will not be fully realized; and will certainly result in less than optimum RDD consequence management. It is also worth noting that NYPD sergeants are not equipped with sufficient personal protective equipment (PPE), particularly self-contained breathing apparatus, to allow safe emergency and/or life saving operations during the initial stages of an RDD explosion. Hence, the use of these devices by this group of NYPD officers should be deemed to be primarily preventive in nature; in spite of the fact its tactical efficiency in this regard is also generally limited.

Recommendations: The FDNY should continue to monitor ongoing testing of the *Canberra Ultra-Radiac* PRD in order to expedite its issuance to all firefighters and fire officers Citywide.⁸⁶ This device is small, rugged, and in addition to total dose, it can measure dose rate up to 500 R/hr. The higher dose rate capability will enable first responding units to more accurately delineate work zones in high dose fields. Additionally, when used in conjunction with the *Radalert 50*, it will enhance the prevention capabilities of these units, especially when they are carried into buildings during the normal course of emergency operations and inspectional duties.

During the emergency response phase of an RDD attack, NYPD officers equipped with PRDs, operating within the limitations of basic PPE such as goggles, gloves, and a

⁸⁶ Schlueck interview.

half-face air purifying respirator, should be assigned to establish, maintain, and control the larger, uncontaminated area of the cold zone.⁸⁷

The most crucial requirement for the effective use of PRD technology is inter-agency cooperation. This can best be accomplished by recognizing the level of training, protective equipment, and capability of both first responder agencies; formulating a joint inter-agency response plan based upon the operating parameters of the PRD; and then practicing the plan with periodic joint training sessions. Institutionalizing these measures will ensure that all first responders are adequately prepared to operate cohesively in a radioactive environment and offset many of the significant challenges presented by an RDD attack.

3. Hand-Held Survey Meters

Another necessary first responder radiation detection tool is the hand-held survey meter. This device operates on the same principle as the PRD, but with more refined electronics and wider dynamic range.⁸⁸ Some types also have the advantage of applying interchangeable probes to achieve different objectives. Because the FDNY will be in command of life safety operations and decontamination at an RDD event, this agency will likely obtain the most benefit from this device.

Utility for Prevention and Response: Whereas FDNY units equipped with PRDs (*Radalert 50* and future acquisition of the *Canberra Ultra-Radiac*) can serve as a preventative mobile force of detection, survey meters are generally not used in this regard. Instead, it is used primarily for consequence management. For example, the FDNY utilizes the *Ludlum 2241* survey meter with three different types of probes: the pancake probe for determining if a person or object is contaminated by measuring counts per minute; a beta/gamma scintillator probe for taking dose rate readings in the fairly wide range of mR/hr to R/hr; and an alpha scintillator probe for measuring the dose rate of alpha particles.

⁸⁷ Musolino, "Emergency Response Guidance." It is suggested that a first responder's uniform along with goggles, gloves and a half-face APR be used as a minimum requirement for personal protective equipment after an RDD release.

⁸⁸ McDonald, "Detecting Illicit Sources," 36.

There are approximately seventy-five survey meters in service for use by FDNY units Citywide.⁸⁹ Following an RDD explosion, units on the scene equipped with these meters will initially take readings using the beta/gamma and alpha scintillator probes. The main tactical objectives of these units are to redefine the previously established initial hot line, and to locate any “hotspots,” or highly radioactive areas. Once the decontamination phase of the operation commences, these units will then utilize the pancake probe for scanning contaminated persons.

Shortcomings and Deficiencies: Due to the geographically dispersed location of units equipped with these meters, and the difficulties they will confront trying to get into an incident scene with a panic-stricken general public, it will take too much time to get an adequate number of hand-held survey meters on the scene to effectively identify “hotspots” and access control points (evacuation corridors) in a timely manner. Meanwhile, when enough meters finally become readily available, there will be too many persons from various agencies (FDNY, NYPD, DOHMH) reporting meter readings from too many locations to enable an Incident Commander to make a informed, sound, and timely evacuation or shelter-in-place decision.

After contaminated victims are isolated and asked to remove their outer clothing (dry decontamination), the next tactical step for first responders involves measurement of radiation exposure prior to more extensive, technical decontamination. However, it is a time consuming process to monitor persons using the pancake probe. A generally accepted principle among first responders is that it takes approximately five to ten minutes to sufficiently scan a contaminated victim.⁹⁰ Given the tens of thousands of people that may need to be monitored, and the limited amount of devices and trained personnel, this shortcoming presents a significant operational challenge. At an RDD attack in Midtown or Lower Manhattan this mission could conceivably take days to accomplish.

Recommendations: A recently instituted program sponsored by the DHS and EML called the Radiological Emergency Management System (REMS) utilizes a system

⁸⁹ Schlueck interview.

⁹⁰ This information was provided by the members of FDNY Engine Company 44, a highly-trained hazardous materials technician unit, personal conversation with author, June 28, 2005.

of networked radiation sensors designed for the purpose of providing first responders with a “single picture of [the] threat during [the] time of weakest coordination.”⁹¹ The newly devised plan places fixed sensor units at strategic locations in Manhattan, south of 59th St., and near high profile sites (i.e. financial, transportation centers). These detectors, dubbed the Comprehensive Radiation Sensor – Generation II, are installed outdoors, 2-12 stories above street level, with a clear view of the southern sky (for satellite purposes).⁹² The readings produced by the sensors are sent to and monitored by EML and the NYC OEM 24 hours a day, and seven days a week. Proclaiming the efficacy of this proto-type system, EML touts that “[timely, authoritative, accurate, information increases public cooperation; avoids panic; minimizes disruption; and facilitates recovery.]”⁹³ Hence, this program should be further developed, supported, and funded, as it will assist first responders in accomplishing these critical RDD consequence management goals. However, in order to fully realize the capabilities of this incident management technology, the concept of operations should provide for the processed data to be monitored directly at the scene by the Incident Commander from the first responder agency responsible for life safety operations. With further refinement and integration into an inter-agency response plan, this innovative technology could effectually negate the aforementioned operational shortcomings of the hand-held survey meters.

In order to accommodate the prolonged and extensive decontamination and monitoring operations that will be required following an RDD attack, sheltering-in-place strategies should be developed for the densely-populated areas of Midtown and Lower Manhattan. Moreover, site-specific shelters (i.e. armories, schools) should be pre-designated as casualty collection points in the likely event that large numbers of people will self-evacuate prior to, or in spite of, official instruction.

⁹¹ Some information regarding this “for official use only” program was obtained from a power-point presentation posted on a secure Web site restricted for use by the New York Area Science and Technology Workgroup. Further information on this topic was provided by Lawrence Ruth, PhD. (DHS Environmental Measurements Laboratory, NYC), interview with author, May 25, 2005.

⁹² Ibid., The detector equipment is powered by 110 vAC and is equipped with Ethernet access. It consists of a detector module, a communications module, and a satellite antenna and modem. The fiberglass-housed detector module is made up of a sodium iodide scintillator, a photomultiplier tube, an Ortec digiBase multi-channel analyzer, a Canberra Mini-Radiac, and an embedded computer. The communications module utilizes a redundant system of Ethernet, cellular, and satellite technology and is connected to the authorized users (EML and NYC OEM) via a virtual private network (VPN).

⁹³ Ibid.

4. Radionuclide Identifier Devices

Application of PRDs and hand-held survey meters by first responders for interdiction of illegal radioactive sources, or incident management in the aftermath of an explosive RDD attack, is limited to determining the general presence and/or level of gamma radiation. However, in order to obtain a more complete picture of the overall threat, it is always necessary to identify the specific type of isotope in question. The radionuclide identifier device (RID), by utilizing a sodium iodide detector, a photomultiplier, and other related electronics, creates a pulse-height spectrum to expose the exact type of gamma source present.⁹⁴

Utility for Prevention and Response: Although information on the specific use and capability for the RID by the NYPD is not readily available, the utility of the device for RDD prevention by law enforcement agencies so equipped is to separate legal radioactive sources from those intended to inflict harm. For example, there exists, throughout normal course of everyday life, many radioactive materials that are neither dangerous nor illegal. Monitoring officials must be able to decipher commonly transported radioactive cargo, including ceramic tiles, bananas, and kitty litter, from the Cs137 used in a “dirty bomb.” The RID can be deployed to adequately perform this function and avoid the labor intensive task of manually checking every “hit” on a PRD, survey meter, and/or portal monitor. This will allow legal commerce to proceed unimpeded.

During the early stages of an RDD event with a radioactive release, FDNY Hazardous Materials (Haz-Mat) Co. #1 will respond into the scene as the only Fire Department unit Citywide equipped with a hand-held RID. Once this highly-specialized FDNY unit properly identifies the type of isotope and spectra, the results will be transmitted to the NYC Department of Health and Mental Hygiene (DOHMH) for specific guidance.⁹⁵ Since all radiological materials possess physical and chemical properties in addition to its radioactivity, Haz-Mat Co. #1 will then find it necessary to make a determination as to the type of decontamination to be undertaken, wet or dry.

⁹⁴ McDonald, “Detecting Illicit Sources,” 36-7.

⁹⁵ Schlueck interview.

Thus, for events involving certain isotopes, they may decide it more beneficial not to use the water curtain corridor provided by the FDNY mass decontamination procedure.

Shortcomings and Deficiencies: Whereas the limitations of the PRDs and survey meters are generally strategic and operational in nature, the RID presents significant mechanical deficiencies. “The need to miniaturize a lab system, use batteries, and keep size, weight, and cost low inevitably compromises [RID] performance.”⁹⁶ Durability, sensitivity, and responsiveness are cited as reliability issues that need to be addressed for all types of devices, inclusive of the RID.⁹⁷ Laboratory tests have also shown that identifier devices produce an inordinate amount of false positive and false negative readings.⁹⁸

Recommendation: Senior FDNY and NYPD decision makers in charge of technology and equipment procurement must hold the manufacturers of the RID to account by making informed purchases and demanding certain minimum requirements. The National Institute of Standards and Technology (NIST) and DHS have recently conducted performance tests and evaluations of commercially available radiation detectors for the guidance of first responder agencies.⁹⁹ It is incumbent on management to carefully assess the results of these tests prior to making an investment in this relatively expensive piece of equipment.

5. Radiation Portal Monitors

The radiation portal monitor (RPM) is a large and extremely sensitive radiological detection apparatus that is most notably found at fixed locations near shipping and border ports of entry. Most of these detectors incorporate a plastic scintillator attached to a phototube and mounted in a water-resistant housing placed on both sides of vehicular

⁹⁶ McDonald, “Detecting Illicit Sources,” 37.

⁹⁷ U.S. Department of Homeland Security, NY/NJ Radiological Pilot Program Regional Steering Committee (meeting, New York, NY, June 22, 2005).

⁹⁸ “Tests conducted in 2003 by Los Alamos National Laboratory found that the handheld machines, designed to be used in labs, produced a false positive or a false negative more than half the time. The machines were the least reliable in identifying the most dangerous materials, the tests showed.” Eric Lipton, “U.S. to Spend Billions More to Alter Security Systems,” New York Times, May 8, 2005.

⁹⁹ Radiological Pilot Program meeting.

lane of traffic.¹⁰⁰ Due to the relatively high degree of sensitivity, RPMs are usually used in conjunction with various types of hand-held devices for greater isotope discrimination.

Utility for Prevention and Response: In addition to its well-known function at ports, the RPM is also employed at strategic locations in and around the perimeter of a city. In NYC, for instance, there are fixed monitors in place near certain metropolitan area bridges and tolls. Also, as a proactive preventive measure, the NYPD has reportedly set up portable RPMs at undisclosed times and locations.¹⁰¹ The utilization of this technology is seemingly all part of the “multi-layered defense” concept of operations put forth by the DHS-sponsored NY/NJ Radiological Pilot Program. Although portable RPMs could conceivably be used to scan contaminated victims as a function of consequence management, at this time, this procedure does not appear to be part of any formalized NYC protocol. Hence, the RPM should generally be considered an RDD prevention device.

Shortcomings and Deficiencies Perhaps the most noteworthy deficiency of the RPM is that it is unable to discern between naturally occurring radioactive products and those materials likely to be used in an RDD.¹⁰² In fact, these detectors function so aimlessly that some U.S. Customs officials have described them as “dumb sensors.”¹⁰³ As previously mentioned, these devices must be used along with other hand-held detecting equipment, such as the RID, in order to properly rule out illicit sources.

From an operational standpoint, the RPM presents significant problems in regards to economic efficiency. Each passing vehicle, person, or package that creates a positive “hit” on the meter must be further examined by a Customs official or police officer. In order to fully realize the benefit of this technology as it now stands, this task could potentially require agencies to hire additional personnel for surveillance duties. Additionally, frequent and repeated traffic stops required by the inspections could result in increased shipping costs and/or decreases in worker productivity. Thus, private industry may also pay the price for the inferior product design of the RPM.

¹⁰⁰ McDonald, “Detecting Illicit Sources,” 37.

¹⁰¹ Anonymous.

¹⁰² McDonald, “Detecting Illicit Sources,” 37.

¹⁰³ Lipton, “U.S. to Spend Billions.”

Recommendation: Until the effectiveness of the technology catches up to the basic needs and requirements of first responder agencies, these devices will provide a false sense of security. Again, senior-level decision makers should continue to work with the manufacturers of the devices; the national laboratories tasked with designing new and improved technology; and the organizations charged with testing its performance. With more advanced RPM technology, the current shortfalls found in this aspect of RDD prevention and response could be sufficiently reduced.

6. Conclusion

In the post-9/11 era, the advancement of radiation detection technology is necessarily undergoing a transformation in order to meet the needs of homeland security. Various national laboratories are analyzing the RDD threat and assessing the demands placed upon the first responder community for preventing and responding to an attack. However, these technical experts cannot proceed alone with this endeavor. Senior level decision makers from NYC first responder agencies must continue to work together with product engineers and manufacturers to specify the usefulness of any new technology; while at the same time participate in ongoing testing in order to identify deficiencies with the equipment currently proposed or already in use. Of equal importance, however, is the need to understand the complexity of the potential event in relation to the limitations of the devices themselves and the capabilities of the responding agencies as a whole. Only through the continuous evaluation, development, and improvement of new and existing technology, and the operational strategies proposed in the remaining chapters, can the challenges presented by an RDD attack be met.

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V. PUBLIC AWARENESS

A. MANAGING RADIOLOGICAL FEAR THROUGH PUBLIC EDUCATION AND RISK COMMUNICATION

1. Introduction

Among the many preparedness challenges NYC faces for a terrorist attack involving a “dirty bomb”, perhaps the most significant is to effectively reduce the pervasive fear that would likely infect the general public in its aftermath. A 2004 article for the *Defense News* suggests that “Psychologically immunizing citizens, through a credible public education campaign, about the usually limited consequences of a dirty bomb, and its differences from a nuclear weapon, lessens terrorists' ability to cause undue panic -- an easy way to make an attack less inviting.”¹⁰⁴ Seemingly, the best way to meet this objective is to provide NYC's citizens with accurate information on the likely radiological effects presented by such an event, and a clear and unambiguous set of emergency response instructions to deal with its consequences.¹⁰⁵

The National Academy of Sciences suggests “To optimize the overall health and well being of the population, and to improve the overall response to terrorism events, it is necessary that [psychological reactions] be addressed preventively as well as throughout the phases of an event.”¹⁰⁶ NYC's first responder agencies, the FDNY and NYPD, are sworn to uphold these objectives for all types of terror attacks, including those involving an RDD. Hence, they must develop innovative programs for managing any adverse psychological effects that would likely result from this potentially catastrophic event. More specifically, it is recommended that a functional strategy, referred to as the Haddon Matrix, be used to formulate a comprehensive psychological consequence preparedness plan.¹⁰⁷ Although this matrix can be used for all phases and factors of a terrorist attack,

¹⁰⁴ Charles Ferguson and Kaleb Redden, “Facing the Inevitable: Arm Public with Facts on Dirty Bomb Defense,” *DefenseNews.com*, February 9, 2004, <http://www.defensenews.com/sgmlparse2.php?F=archive2/unknown/atpc9647816.sgml> (accessed January 20, 2006).

¹⁰⁵ Ferguson, *Four Faces*, 300.

¹⁰⁶ Adrienne S. Butler, Allison M. Panzer and Lewis R. Goldfrank, *Preparing for the Psychological Consequences of Terrorism: A Public Health Strategy* (Washington, D.C.: The National Academies Press, 2003), 63.

¹⁰⁷ *Ibid.*, 100-105.

first responders would be primarily involved in initiatives associated with the pre-event and event stages. The applicability of these two stages, as it relates to radiological fear management, will be the focus of this chapter.

2. Fear of Radiation

The average citizen's fear of radiation is a phenomenon that has been demonstrated in a select few number of case studies; most notably, the accidental releases of radiation at Three Mile Island, Chernobyl, and Goiania, Brazil, each of which resulted in "extreme public anxiety."¹⁰⁸ The inability to detect radiation with the human senses, a general lack of knowledge of its effects, and the fact that the after-effects of exposure may not develop until years later, are cited as plausible explanations for the anxious and defenseless behavior exhibited at these incidents. However, contrary to general public perception, experts on the physiological effects of a radiological attack suggest that an event involving a RDD will not likely cause an immediate health hazard to nearby people or first responders outside of the immediate point of detonation.¹⁰⁹ While this estimation may arguably hold true, others point to the psychological effects as potentially taking the greatest toll on public health.¹¹⁰

It is important to note that the public's fear of the unknown is neither new nor insurmountable. For example, history has shown that the initial fear associated with the hazards of the modern technologies of electricity and natural gas had eventually subsided over time.¹¹¹ Theoretically, an increase in familiarity will lead to acceptance of the hazard and a subsequent decrease in the perceived risk. Not surprisingly, a 1994 National Council on Radiation Protection and Measurements (NCRP) study concluded that "The bedrock foundation of any plan to protect the public from radiation effects, particularly in time of emergency, is reliable information presented to an informed public."¹¹²

¹⁰⁸ DHS Working Group on RDD, 33-50.

¹⁰⁹ Health Physics Society, "Guidance for a Radiological Terrorist Event."

¹¹⁰ Ferguson, *Four Faces*, 308 and 334.

¹¹¹ National Council on Radiation Protection and Measurement (NCRP), "Advising the Public about Radiation Emergencies," NCRP Commentary No.10, November 30, 1994, 6. <http://www.ncrponline.org/Commentaries/NCRP%20Comm%20No.%2010.pdf> (accessed January 20, 2006).

¹¹² *Ibid.*, iii.

It is not difficult to imagine how NYC citizens sitting in their office spaces or dwellings might seek direction immediately following a reported “dirty bomb” explosion. An internet search engine request on “New York City dirty bomb preparedness” produces many readily available sources for information on official government and private sector Web sites. For example, the Federal Emergency Management Agency (FEMA) Web site recommends heightened public awareness for terrorist attacks, including those involving a RDD, and has developed a set of specific guidelines for the uninformed citizen to follow. Likewise, the Web sites of the NYC Office of Emergency Management (OEM), RAND Corporation, Nuclear Regulatory Commission (NRC), and U.S. Department of Homeland Security (DHS) each have their own links for similar type instructions.

Unfortunately, however, when taken collectively, the preparedness and response guidance to an RDD event that is currently available to the general public is largely inconsistent.¹¹³ Meanwhile, it has also been suggested that “lack of consensus [on causative exposure] among experts can increase public fear and anger.”¹¹⁴ Table 3 extracts from the aforementioned sites relevant information that NYC’s first responder personnel could reasonably expect the general public to utilize during the pre-event and event phases of an RDD incident.

Although the data presented in Table 3 is not all-inclusive, it does consolidate the information provided by each Web site regarding:

- the lethality of the event;
- the exposure to radiation and/or risk of cancer;
- the best practices for evacuation and sheltering;
- the measures for respiratory protection and personal decontamination.

Upon close comparison, the tactical information offered from one site to the next ranges from subtle differences to outright discrepancy. For example, for persons caught outside during the radiological release, the FEMA site recommends “...seek shelter indoors immediately in the nearest undamaged building;” the DHS site states “...go

¹¹³ Ferguson, “Facing the Inevitable.”

¹¹⁴ DHS Working Group on RDD, 33.

inside a building that has not been damaged;” while the NRC site instructs “Move away from the immediate area--at least several blocks from the explosion--and go inside.” For pedestrians seeking protection from radioactive fallout following an RDD attack it is quite evident that, depending on the circumstances, this disparate guidance could result in serious health implications.

Of particular concern is the information provided by the NYC OEM Web site. Perhaps the one site to which the NYC’s citizens would most likely refer, it is the undoubtedly the most generic of the lot. Given the probability that the structural and population density in NYC, and in the borough of Manhattan more specifically, would present first responders with significant obstacles at a large-scale event, a uniform and dependable public information strategy must be devised for the pre-event and event phases of an RDD incident.

Table 3. Examples of Web sites Offering Radiological Dispersion Device (RDD) Information

	Radiological effects	Emergency response instructions
NYC Office of Emergency Management (OEM)	<ul style="list-style-type: none"> • In most cases, the amount of material is unlikely to be lethal. • More damage and casualties may result from the explosion than from the radiation itself. 	<ul style="list-style-type: none"> • If you are outside, get inside. Remove all clothing and wash thoroughly. • If there’s an event indoors, try to get out of the building without passing through the contaminated area. If you cannot escape, it may be better to shelter in place. • Cover your nose and mouth to avoid ingesting dust.
Federal Emergency Management Agency (FEMA)	<ul style="list-style-type: none"> • Some devices could cause fatalities from exposure to radioactive materials. • Depending on the speed at which the area of the RDD detonation was evacuated or how successful people were at sheltering-in-place, the number of deaths and injuries from an RDD might not be substantially greater than from a conventional bomb explosion. 	<ul style="list-style-type: none"> • If you are outdoors, seek shelter indoors immediately in the nearest undamaged building. • If the explosion or radiological release occurs inside, get out immediately and seek safe shelter. • Remove and bag clothing (and isolate the bag away from you and others), and shower thoroughly with soap and water. • As you seek shelter from any location (indoors or outdoors) and there is visual dust or other contaminants in the air, breathe through the cloth of your shirt or coat to limit your exposure. • If you have time, turn off ventilation and heating systems, close windows, vents, fireplace dampers, exhaust fans, and clothes dryer vents.
Department of Homeland Security (DHS)	<ul style="list-style-type: none"> • It is not a nuclear blast. The force of the explosion and radioactive contamination will be more localized. • As with any radiation, you want to try to 	<ul style="list-style-type: none"> • If you are outside and there is an explosion or authorities warn of a radiation release nearby...go inside a building that has not been damaged. If you are already inside

	<p>limit exposure. It is important to avoid breathing radiological dust that may be released in the air.</p>	<p>check to see if your building has been damaged. If your building is stable, stay where you are.</p> <ul style="list-style-type: none"> • If you are inside and there is an explosion near where you are or you are warned of a radiation release inside, cover nose and mouth and go outside immediately. Look for a building or other shelter that has not been damaged and quickly get inside. • Once you are inside, close windows and doors; turn off air conditioners, heaters or other ventilation systems.
Nuclear Regulatory Commission (NRC)	<ul style="list-style-type: none"> • In most instances, the conventional explosive itself would have more immediate lethality than the radioactive material. • A dirty bomb is in no way similar to a nuclear weapon. • Just because a person is near a radioactive source for a short time or gets a small amount of radioactive dust on himself or herself does not mean he or she will get cancer. The additional risk will likely be very small. 	<ul style="list-style-type: none"> • Move away from the immediate area--at least several blocks from the explosion--and go inside. This will reduce exposure to any radioactive airborne dust. • Take a shower to wash off dust and dirt. This will reduce total radiation exposure, if the explosive device contained radioactive material.
RAND Corporation	<ul style="list-style-type: none"> • Beyond the risk of immediate injury from the explosion itself, the primary initial danger is inhaling the radioactive material that is suspended within the dust and smoke from the explosion. • The levels of radiation will be quite low, so the main concern is an elevated risk of cancer, which will only manifest itself after many years. 	<ul style="list-style-type: none"> • For an outdoor explosion, if you are outside, take shelter inside the nearest undamaged building; if you are inside an undamaged and unthreatened building, stay there. If the explosion occurs inside your building, get out. • Decontaminate by removing clothing and showering. • Close windows and doors and shut down ventilation systems. • You can further protect yourself by covering your nose and mouth. A dust mask (one with an N95-rated particulate filter) would be most helpful, but any cloth available will do, such as a shirt.

(From: See the New York City Office of Emergency Management (OEM) Web site, http://nyc.gov/html/oem/pdf/readyny_english.pdf; the Federal Emergency Management Agency (FEMA) Web site, http://www.fema.gov/areyouready/radiological_dispersion_device.shtm; the U.S. Department of Homeland Security (DHS) Web site, <http://www.ready.gov/america/radiation.html>; the Nuclear Regulatory Commission (NRC) Web site, <http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/dirty-bombs.html>; the RAND Corporation Web site, http://www.rand.org/pubs/monograph_reports/2005/RAND_MR1731.1.pdf).

3. Pre-event Fear Management

The concept of being attacked by terrorists using a “dirty bomb,” is not a choice matter of discourse for the general public, or for that matter, NYC public officials. One could candidly argue that to discuss such issues would create undue panic and apprehension, especially since an attack of its kind has not yet been attempted. On the

other hand, when asked about the unfortunate experience of a catastrophic fire occurring in one's home, the dialogue would likely garner less angst. This line of reasoning suggests that society as a whole is exposed to the tragedies and consequences resulting from fires with relative regularity. However, a general survey of the population would likely reveal that the vast majority would have not personally experienced a fire in their lifetime. Regardless of these assumptions, a constant state of fire prevention awareness and preparedness is instilled at a very early age. For example, a child is taught in grade school the following basic fire safety tenets: "Stop, drop, and roll." "Stay low and crawl below the smoke." "Plan a way out." This leads to the question: Is a terrorist attack using a RDD any less devastating than a fire?

According to a *Cato Institute* policy analysis, emergency preparedness is contingent upon gaining public support through an education and information campaign.¹¹⁵ But, as demonstrated by the overly generalized information provided by the NYC OEM Web site, the extent of NYC's adherence to this particular aspect of terrorism preparedness appears suspect. It is worth noting that preventing fires in NYC is a critical mission of the FDNY; and as such, it has in place a comprehensive, formalized fire prevention program. Likewise, a terrorism awareness and preparedness campaign based in principle upon this highly successful public safety program could be equally effective.

A RAND study on citizen preparedness to terrorist attacks finds "The more that individuals know about government plans for emergency... the better prepared they will be to respond appropriately and the more likely they will be to comply with what officials suggest."¹¹⁶ A cost effective solution for reversing NYC's shortcomings in terrorism education is to incorporate reliable information into a citizen's emergency response guide. A NYC-specific public information pamphlet could be produced and published through a joint FDNY and NYPD inter-agency program and distributed during a proposed *NYC Public Safety/Terrorism Preparedness Campaign*. Once each calendar year, commencing on the second Monday in September, both agencies could participate

¹¹⁵ Taylor, "Are We Prepared," 15.

¹¹⁶ Davis, *Individual Preparedness Response*, 25.

in a week-long public/private sector initiative entitled *NYC Public Safety/Terrorism Preparedness Week*.¹¹⁷ The recommended details of the program are as follows:

Public Sector Responsibilities

- The campaign would focus on terrorism-related safety and preparedness activities, and would replace regularly scheduled activities (drills, building inspections etc.) for duration of the campaign.
- The program would include, but not be limited to:
 1. Distribution of terrorism preparedness and awareness literature.
 2. Local area outdoor exercise/drill sessions utilizing the equipment, technology, and procedures likely to be used during a terrorist attack.
- Specialized units from both agencies with enhanced terrorism-related capabilities would be scheduled to participate in demonstrations at various locations throughout the City.
- Suggested locations for the campaign activities would include:
 1. Symbolic and historical buildings and landmarks
 2. Financial institutions
 3. Mass transportation stations
 4. Schools and universities
 5. Hotels
 6. Theatres and other places of public assembly
 7. Malls and shopping centers
- Each agency's public information officer (PIO) would coordinate with the local media to promote the campaign and provide the location of the various exercise/drill sites throughout the City.

Private Sector Responsibilities

- Building management would promote the campaign to all employees and encourage attendance and participation at the joint FDNY/NYPD drill sessions.
- Private companies would ensure that sufficient time is allotted for employees to participate in terrorism preparedness activities.
- Throughout the week-long campaign, building management would review building-specific shelter-in-place/evacuation plans with all employees.

¹¹⁷ The format of which would be similar to FDNY Fire Prevention Week, normally held during the first full week of October each year.

4. Event Fear Management

It is critically important that first responders be armed with accurate and reliable information for the inquiring public prior to operating at a large-scale incident caused by an RDD attack. During an event, first responders are well-positioned to provide critical information that would quell the initial fear stemmed by the unknown of radiation exposure. In fact, one particular terrorism preparedness guide offered by the Homeownership Alliance in conjunction with DHS instructs occupants to “Be prepared to adapt this information to your personal circumstances and make every effort to follow instructions you receive from authorities on the scene.”¹¹⁸ Moreover, the NCRP has found that

The public will accept advice and guidance from emergency personnel if it is confident that the personnel are credible and capable of comprehending and dealing with the emergency. Emergency workers should have a satisfactory understanding of radiation hazards and means to deal with them.¹¹⁹

Thus, a first responder workforce trained to provide safe and accurate information regarding the potential levels of radiation exposure would gain the trust of those exposed, which would result in a more cooperative general public, and lead to a better organized emergency response effort.

Information given to the public regarding the radiation emergency must not only be accurate but must also be delivered promptly.¹²⁰ The importance of releasing such timely information following an RDD attack is evidenced by the legal requirement imposed upon government officials for notifying the public within 15 minutes after being alerted to an incident involving a commercial nuclear power plant. While a small percentage of the NYC population will have immediate access to prompt information delivered by public officials via the media outlets of television and radio, the vast majority will likely receive first notice of the event from first responders at the scene. Hence, in order to attain maximum compliance with official instruction offered in the

¹¹⁸ Homeownership Alliance Web site. http://www.homeownershipalliance.com./tips_and_resources/emergency.php (accessed November 16, 2005).

¹¹⁹ NCRP, “Advising the Public,” 9.

¹²⁰ *Ibid.*, 5, and Ferguson, *Four Faces*, 308.

initial stages of the emergency response, it is essential that the FDNY and NYPD institutionalize an inter-agency Risk Communication Plan.

The overarching objective of this proposed strategy is to expedite the release of scenario specific information in the immediate aftermath of an attack. Despite the many intrinsic barriers prohibiting effective risk communication to the public, there exists feasible solutions to the problems.¹²¹ A research scientist at Carnegie Mellon University recommends that the first step involves taking a proactive approach to each possible scenario. He states that

We have the ability to design, research, and refine messages for the most likely threat potentials. Further, cognitive psychologists could test the messages during mock exercises...Thus, it is possible to develop proactively a series of “evidence-based messages,” rather than develop messages in a perpetually ad hoc fashion as situations arise.¹²²

To best implement this strategy, pre-planned messages could be formulated by a specially-trained, inter-agency Risk Communication Team consisting of designated FDNY, NYPD, and DOHMH officials. The primary objective of this unit would be to “focus on what the public should know, rather than how and what the public should be told.”¹²³ So that this information would ultimately be delivered in the most consistent way possible, this team would develop a protocol for educating all first responders from both agencies. It would also be deployed during an actual crisis for the benefit of on-scene Incident Commanders, and for the purpose of reinforcing pre-existing messages and releasing up-to-date information.

5. Conclusion

Only by providing the citizenry with timely and accurate information can the psychological stress caused by the age-old fear of radiation become more manageable. In NYC, the current guidance in place for accomplishing this task seemingly does not go far enough. NYC public safety officials should heed the advice offered by the aforementioned RAND report on preparedness, which finds that “Beyond simply

¹²¹ Victor W. Weedn, “Public Information and Risk Communication in Times of Crises,” in *A Little Knowledge: Privacy, Security, and Public Information after September 11* (New York: Century Foundation Press, 2004), 57-69.

¹²² Weedn, “Public Information,” 66.

¹²³ Ibid.

providing basic information, governments and private industry can spearhead formal education and training programs, to take knowledge from theory to practice.”¹²⁴ An inter-agency plan for the development of an official public awareness campaign and a Risk Communication Team, designed to disseminate information both prior to and during an actual RDD event, are low-cost solutions to the hindrances placed upon the current guidelines for raising the public’s level of awareness. It is incumbent upon NYC’s first responder agencies to implement these strategies in order to achieve an overall increase in RDD preparedness. They could prove to be particularly helpful when applied in conjunction with the sheltering-in-place strategies exhibited in the next chapter.

¹²⁴ Davis, *Individual Preparedness Response*, 25.

VI. SHELTERING-IN-PLACE

A. MANHATTAN SHELTER-IN-PLACE FEASIBILITY ANALYSIS

1. Introduction

Since protecting the civilian population from radiation exposure is clearly a key tenet in RDD emergency response, it is necessary to critically analyze the capability, readiness, and feasibility of NYC first responders to effectively perform the task of sheltering-in-place. From a strategic point of view, the concept of sheltering-in-place is not new nor is it applicable only to radiological attacks. In theory, sheltering can be used at any hazardous materials incident in which persons will be less exposed remaining inside a building or other place of refuge than they would be outside its confines. It is commonly used as a temporary measure of protection until such time the hazardous substance has been accurately identified and the release has dissipated to a level that allows safe evacuation. It is also preferred when immediate evacuation is generally not feasible or desirable. For instance, complete evacuation of certain institutions such as jails, hospitals, and nursing homes creates operational problems for first responders for obvious reasons. Additionally, the sheer magnitude of a relatively large-scale incident could potentially overwhelm the available resources needed to effectively coordinate a mass evacuation effort. Therefore, it seems most logical that the universal guidance following a significant RDD attack, as previously shown by the various Web sites referenced in Table 3, instructs people outside of the immediate area of the explosion to seek shelter inside buildings.

While sheltering-in-place clearly has its benefits for reducing the amount of personal exposure and contamination in the aftermath of an RDD attack, closer examination of this strategy reveals significant concerns and many unanswered questions. Is sheltering-in-place a feasible strategy for the densely-populated, high-rise building areas of Lower and/or Midtown Manhattan? Will the citizens follow the instructions given by public officials and first responders? Do NYC first responder agencies have enough capability and resources to effectively coordinate the search, rescue, fire suppression, monitoring, sheltering, evacuation, and decontamination operations? Is there a sheltering-in-place plan in place and is it practiced? This chapter will identify the

problems posed by these questions, particularly as it relates to the borough of Manhattan, and offer realistic recommendations for the benefit of NYC's first responder agencies.

2. Key Assumptions

Since many unpredictable variables would ultimately affect the outcome, there is no way to determine with any degree of exactness the hazardous conditions that would likely result from a dirty bomb attack.¹²⁵ However, for the purpose of determining how well prepared NYC will be in the event such an attack takes place, certain underlying assumptions must be made. The radiological attack scenario outlined in the draft version of the *National Planning Scenarios* provides detailed information on what local, State, and Federal governments could expect following a dirty bomb attack against a moderate-to-large city.¹²⁶ With respect to the potential impact on sheltering-in-place decisions, some of the more applicable postulations are as follows:

- Radioactive contamination is found inside and outside of buildings over an area of approximately thirty-six city blocks;
- The entire scene is contaminated with ¹³⁷Cs (cesium chloride), though not at levels impeding the operations of first responders;
- Roughly 180 people are killed and 270 injured people require medical assistance as a result of the explosion;
- Approximately 20,000 people may require monitoring for radiation and possible decontamination;
- Most of the subway system is contaminated;
- Wind patterns carry the radioactive material in random directions, creating numerous radioactive "hot spots;"
- Negative pressure draws contaminated air into buildings via cracks around windows and doors, and air intakes increase contamination inside larger buildings;
- Radioactive plume dispersion continues for 20 minutes before particles have fully settled.¹²⁷

Although the planning scenario mentioned above specifies that 25,000 persons will be given sheltering-in-place instructions, if an RDD event were to take place in a

¹²⁵ Medalia, "Terrorist 'Dirty Bombs'," 3.

¹²⁶ U.S. Homeland Security Council, *National Planning Scenarios*, Version 20.2 Draft (April 2005): 11-1-11-3.

¹²⁷ Ibid.

densely populated area in Manhattan it should be expected that this number would be of an order of magnitude several times greater.

3. Public Reaction to Instructions

When devising and implementing sheltering-in-place plans it is important to take into consideration just how the general public would react to instructions for remaining in a nearby building following an RDD attack. A recent behavioral study and public survey conducted by the *New York Academy of Medicine* on this issue reveals some interesting data that could be of particular use to public safety officials and first responders.¹²⁸ Most notably, it found that only 59 % of the public would remain inside when told by officials instructing them to do so (Figure 1). For emergency personnel responding to an RDD attack along the magnitude outlined in the *National Planning Scenarios*, the strategic implications surrounding these findings are quite significant. It should be anticipated that not only would tens of thousands of NYC citizens be exposed to the harmful effects of radiation, but first responders would also be blocked from entering the incident scene during the critical initial stages of the emergency operation.¹²⁹ Dealing with scores of narrowly-spaced, densely-populated high-rise office buildings will present considerable operational challenges for NYC's first responder agencies, particularly in light of the multifarious factors put forth in the RDD scenario.

Meanwhile, in what appears to be a reasonable opportunity for remedying the relative disregard of official instruction, the *New York Academy of Medicine* study finds that there are measures that can be taken to improve upon these numbers. According to the survey, the number of people cooperating with official sheltering instructions would increase to 74% if one or more of the following conditions were met:

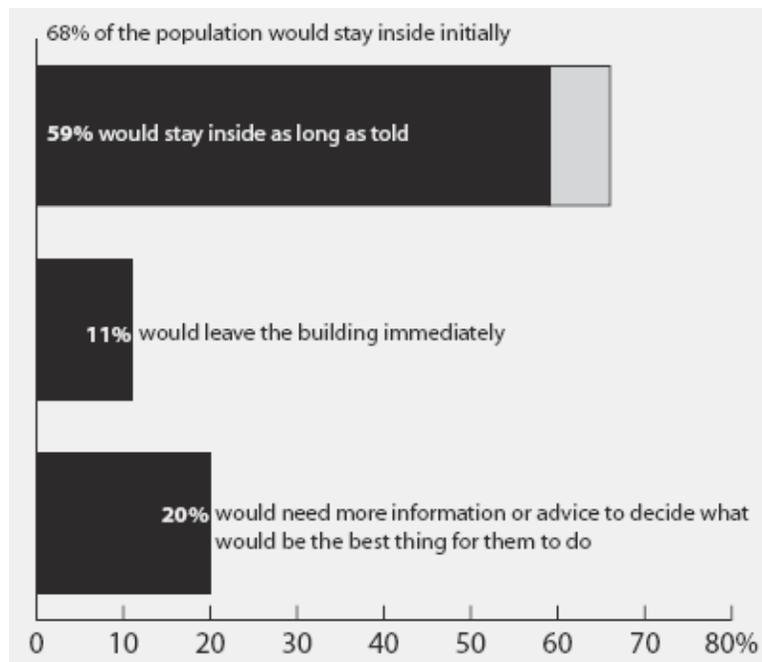
- If they were able to communicate with people they care about via telephone or e-mail;
- If they weren't able to communicate but knew the people they cared for would be well taken care of for at least three days;
- If they knew that there were plans in place to keep them safe and fed in the building that they were sheltering in.¹³⁰

¹²⁸ Lasker, "Redefining Readiness," 31-42.

¹²⁹ Ferguson, *Four Faces*, 308.

¹³⁰ Lasker, "Redefining Readiness," 33-35.

Figure 1. Public Cooperation in the Dirty Bomb Situation



(From: Lasker, “Redefining Readiness,” 32.)

However, given the vastness and complexity of Manhattan’s urban environment, fulfilling these personal needs without proper pre-planning would prove to be exigent. The task would basically entail convincing building management, and its personnel, that their occupancies could potentially be used as a “safe haven.”¹³¹ Since mandating regulatory guidance on these matters would likely be politically unfeasible, these conditions would best be addressed by a “best practices” public/private sector planning effort; one that involves collaborative participation on behalf of NYC’s first responder agencies, building management, and the general public. A viable option would be to promote the adoption of these concepts along with the official release of the recently proposed NYC Fire Department rule requiring owners of high-rise office buildings to

¹³¹ Lasker, “Redefining Readiness,” 41.

prepare an Emergency Action Plan (EAP). It is worth noting that, in addition to a site-specific evacuation plan, this rule requires that a provision be made within the EAP for sheltering-in-place.¹³²

Perhaps the most significant factor brought out in the study is the fact that the group of respondents residing in NYC were found to be less inclined to be cooperative than the other people surveyed.¹³³ The infamous order given to the victims at the WTC on 9/11 to remain in the building is cited as the reason for this inconsistency. Not surprisingly, since 9/11 the phenomenon of en-masse self-evacuation has been seen at relatively minor operations in which the occupants of the building were neither officially ordered out nor were presented with imminently perilous conditions.¹³⁴ The general public's bias toward immediate evacuation underscores the importance of institutionalizing the concept of sheltering-in-place and ensuring that the public is fully informed of the details of such plans. Hence, the study accurately concludes that "The public's full cooperation in the dirty bomb situation could be increased substantially by developing sheltering-in-place plans in the places people frequently are in and making people very aware of those plans; by strengthening people's confidence in community preparedness plans; and by enhancing people's trust in official instructions and actions."¹³⁵

4. First Responder Guidance

Given all of the above assumptions, it appears that the strategy of sheltering-in-place, as it applies to NYC, presents first responders with a daunting task. This is especially true in light of the most up-to-date information available on the early emergency response to an explosive RDD. As part of a recent DHS-sponsored "playbooks" project, a leading health physicist from Brookhaven National Labs proposes

¹³² The proposed FDNY rule provides that "The sheltering in place provisions of the Emergency Action Plan shall be based on an analysis of the circumstances in which such action would best ensure the safety of building occupants, and the manner in which it could be best implemented in the building." New York City Fire Department, "Office Building Emergency Action Plans," 3 RCNY §6-02 (2005): 9, http://nyc.gov/html/fdny/pdf/rcny/rcny_6_02_proposed_rule.pdf. (accessed December 10, 2005).

¹³³ Lasker, "Redefining Readiness," 37.

¹³⁴ In 2004, the author had personally experienced the early self-evacuation of a high-rise office building at an emergency operation involving a relatively minor fire located in an adjacent sidewalk transformer vault.

¹³⁵ Lasker, "Redefining Readiness," 37.

numerous event-specific countermeasures and operational guidance relating to RDD preparedness.¹³⁶ Some of the more useful information provided by the project that would factor into the sheltering-in-place/evacuation decisions of NYC's first responder agencies is summarized as follows:

- The area of highest concern is limited to within 500 meters of the blast location.
- The primary exposure routes are from groundshine¹³⁷ (external) and material on skin and clothes. The exposure hazard due to inhalation is not as significant.
- The potential inhalation dose comes from the passing plume, which in the area of highest concern is gone within ten minutes.
- First responders should be primarily concerned with protecting the public from groundshine, providing guidance on decontamination, and addressing the inhalation hazard.
- Sheltering in large buildings offers substantial protection from groundshine.
- Since timing the passage of the plume is a complicated process, sheltering to protect against the lesser inhalation hazard is more difficult to achieve.
- Although exposure to groundshine is reduced by quick evacuation, this may be difficult in a dense urban environment. Quickly identifying "hotspots" could prove useful during evacuation.
- Although some people close to the release may require prompt decontamination, urgent decontamination is not needed in the majority of cases.
- The inhalation exposure can be reduced 10 times with improvised respiratory protection (i.e. dry handkerchief).
- If the number of evacuees is very large, do not plan to perform mass decontamination.
- Allow self-evacuees to go home and remove and bag outer clothing before entering their home.
- All strategies involving evacuation, sheltering, phased evacuation, or any logical combination thereof will reduce exposure.

¹³⁶ Musolino, "Emergency Response Guidance," and Harper, "Realistic Hazard Boundaries." It is important to note that at the time of this writing the information provided by Dr. Musolino has not been officially issued by DHS.

¹³⁷ Groundshine, as referred to in this context, is the radiation emitted from radioactive debris deposited on the ground following the RDD explosion.

From the pragmatic point of view of a first responder, the above guidance is largely reasonable and strategically necessary. It is sound, straightforward, and lends well to the development of a logical NYC-specific plan for sheltering-in-place. However, certain issues are seemingly inconsistent and need to be clarified prior to any implementation. For instance, the proposed recommendation for “allowing” potentially contaminated citizens to go home appears problematic given the traditional mission of public safety agencies; especially since the directions also rationally call for prompt decontamination of persons close to the release. Absent proper monitoring with the *Ludlum 2241* survey meter (see Chapter IV), there is virtually no way to determine the extent of contamination on any particular person or group. Hence, providing such blanket permission for self-evacuees conceivably could permit severely contaminated civilians to remain dangerously exposed, creating the potential for incurring additional harm and inadvertent exposure to others. Since protection from groundshine, not the inhalation hazard, seems to be the main concern and the best countermeasure for this hazard is to shelter people in large buildings, it would make the most sense for public safety officials and first responders to discourage civilians from going home, at least until adequate resources are on the scene to permit safe, orderly, and efficient evacuation.

According to the parameters laid out in the recently issued CIMS protocol, and in fulfillment of its core competency for life safety operations at radiological events, the FDNY is responsible for making all tactical decisions regarding structural evacuation (which includes sheltering-in-place). With the exception of some subtle discrepancies, currently proposed FDNY protocols for sheltering-in-place/evacuation in response to an RDD attack are largely consistent with the recommendations proposed by the DHS playbooks project. Perhaps the most significant and notable divergence is that the FDNY has no provision for allowing self-evacuated, exposed victims to go home.

A draft version of the FDNY’s plan for radiological operations provides that sheltering-in-place: is a viable option for protection of civilians outside of the immediate vicinity of the release; is generally not appropriate when high doses of radiation are projected; and may be a temporary action of choice if rapid evacuation is impeded.¹³⁸ On

¹³⁸ New York City Fire Department, “Fire Tactics and Procedures, Emergency Response Plan: Addendum 3, Radiological Operations,” Draft Version (June 2005): 14-18.

the other hand, it states that evacuation: may provide total protection from airborne release if completed before plume arrival; may increase exposure if performed during plume passage, and is appropriate for protection from high exposure rates due to groundshine. Equally important, the bulletin proposes that responding personnel should ensure that victims are directed to a Safe Refuge Area (SRA) and assessed for contamination. However, it does not make a distinction between victims that would have already self-evacuated prior to the first responders arrival and those that would be evacuated by emergency personnel on the scene. Hence, judging from the general bias of the DHS and FDNY directions, it can be expected that the NYC agency most responsible for life safety is poised to incorporate the strategy of sheltering-in-place as a way of accomplishing its mission.

5. FDNY Sheltering-in-Place Survey

Since proposed guidance advocates the value of a sheltering-in-place strategy during the emergency response phase of an RDD event, logic dictates the necessity to closely examine how smoothly such an operation would be in the areas most likely to be attacked: Lower and/or Midtown Manhattan. In view of the fact that it is not possible to re-create the exact conditions that would result in a disaster on the scale put forth by the *National Planning Scenarios*, it is difficult to predict precisely how NYC's first responder agencies would manage the sheltering-in-place aspect of the operation. In an attempt to get a clearer picture of just how well the most vulnerable areas of NYC would fare given official instructions to sheltering-in-place, a basic survey of the FDNY Chief Officers most likely to be tasked with making the tactical decisions at an RDD incident could provide insight into the practicability of the recommended strategy.

In October, 2005, a survey was conducted with the purpose of determining from a first responder's perspective the feasibility for sheltering-in-place for a dirty bomb terrorist attack in NYC, and the areas of Downtown (response area of FDNY Division 1) or Midtown (response area of FDNY Division 3) Manhattan in particular. The survey group included FDNY Chief Officers holding the ranks of Battalion Chief and Deputy Chief, and assigned either to Division 1, Division 3, or Haz-Mat Operations. Out of the 72 sent, a total of 46 Chief Officers responded to the survey, a participation rate of 64%.

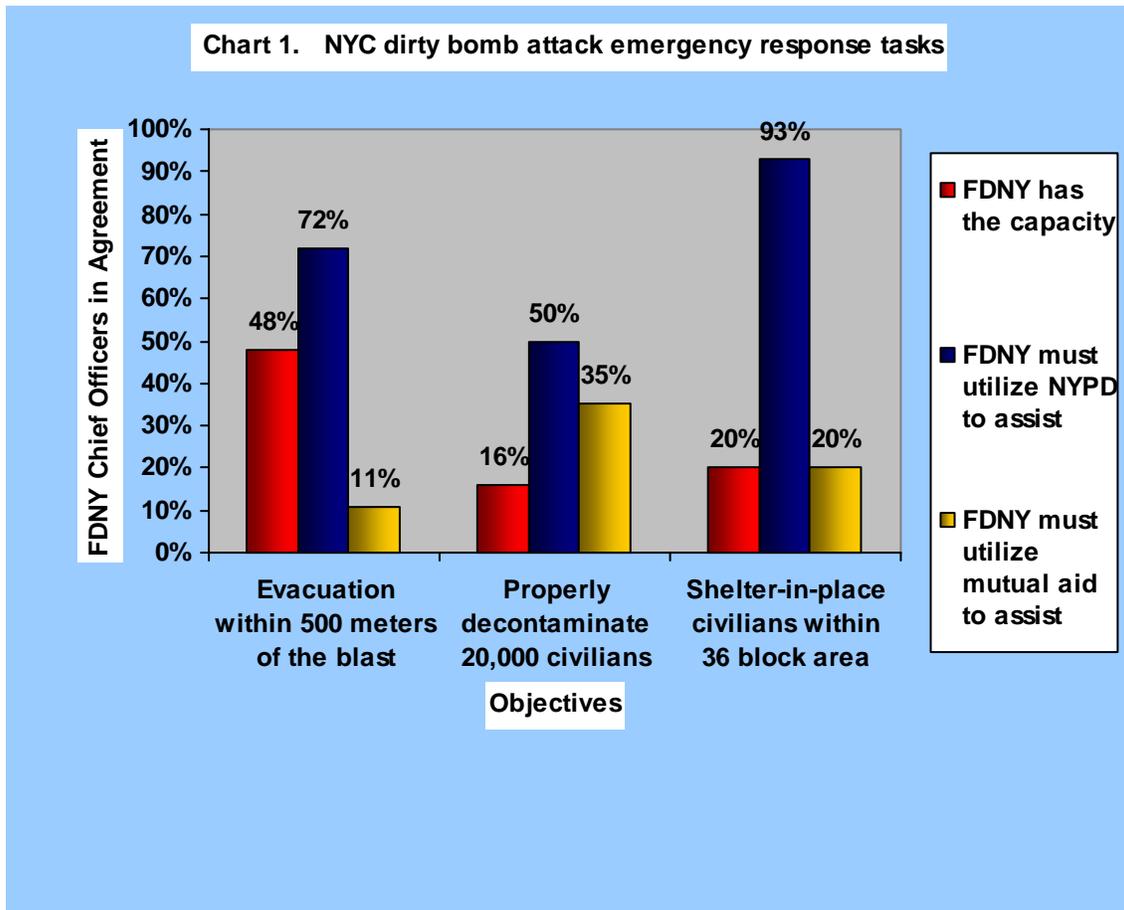
In order to establish baseline input into the decision making process, background information in the form of a scenario was included in the survey utilizing information from the DHS playbooks project, the *New York Academy of Medicine* study, and the CIMS protocol. Meanwhile, the survey also made the aforementioned key assumptions (see subsection 2 earlier in this chapter), conditions taken largely from the RDD scenario depicted in the *National Planning Scenarios*. The respondents were then asked how the FDNY would best handle three emergency response tasks relating to its core competencies, and how it pertained to the scenario given, namely:

1. evacuation of civilians from all buildings within the 500 meter radius of the dirty bomb explosion;
2. decontamination of up to 20,000 civilians following the dirty bomb explosion;
3. sheltering-in-place of civilians inside buildings within the contaminated 36 block area.

Additionally, they were asked to make an assessment of the FDNY's capacity for handling these tasks alone versus utilizing the assistance of the NYPD or mutual aid resources.

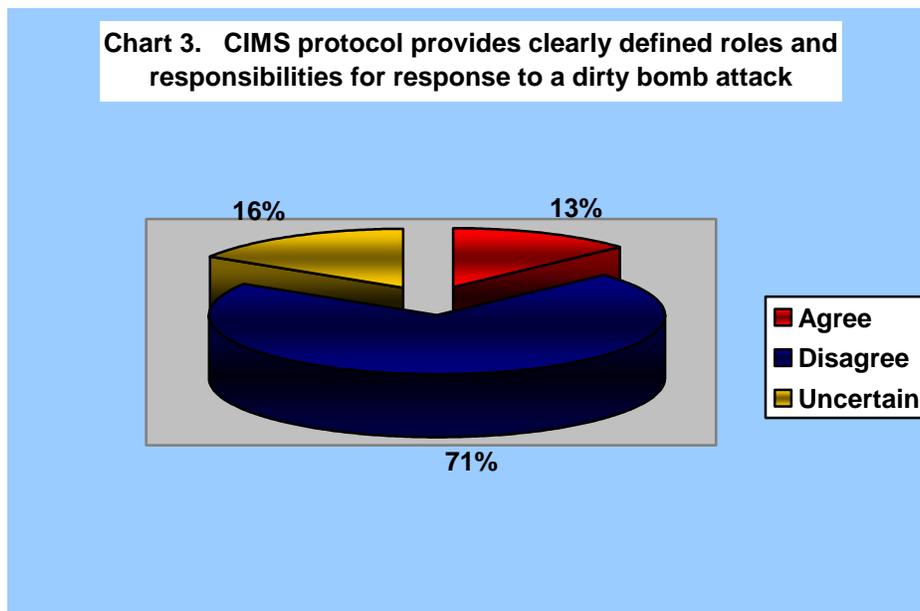
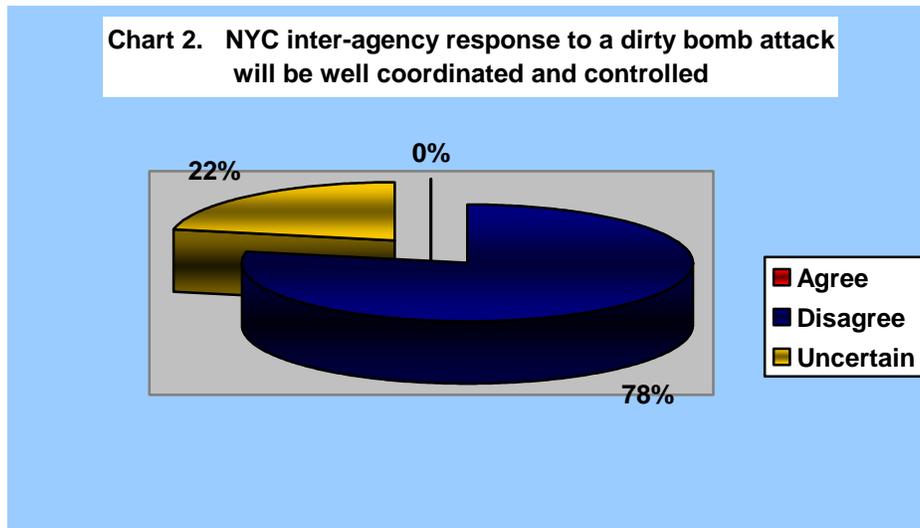
As shown by Chart 1, the results clearly indicate the difficulty the FDNY would experience handling each of these tasks with only its own resources. Assistance from the NYPD was cited by the majority of respondents in evacuation (72%), decontamination (50%), and sheltering-in-place (93%). Comparing each task to the other, it can be surmised that the respondents were more apt to believe that the NYPD was needed most for the task of sheltering-in-place (93%). Moreover, when asked more specifically about the task for which the NYPD would be best deployed, the respondents more widely decided on sheltering-in-place (41%) over force protection (19%), crowd control (19%), area access control (15%), rescue and removal (7%), and decontamination (0%). Even though it was found that the NYPD should assist with the evacuation task in general, more than one-half (51%) believed that NYPD units would best be deployed *outside* the immediate 500 meter area of the dirty bomb explosion until all life safety operations were concluded. Since the majority of respondents either disagreed or were uncertain regarding

the assistance of mutual aid for all three tasks, pre-planning for any role these resources would play in response to a call for support should be limited to tasks not related to the event itself.



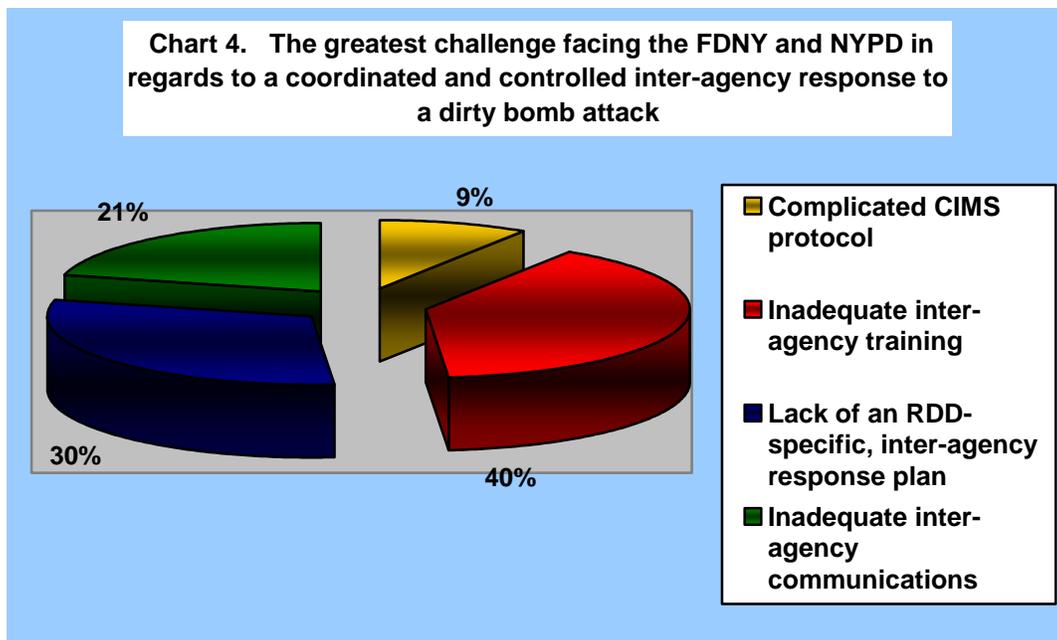
From a purely statistical standpoint, it is quite evident that the critical tasks needed to meet the challenges of a major RDD attack in NYC would entail a comprehensive inter-agency response, in particular the use of the NYPD to assist the FDNY with sheltering-in-place. Unfortunately, however, the data also reveals that the inter-agency component of the operation would be enormously problematic. When asked if the inter-agency response to a dirty bomb attack would be well controlled and coordinated, more than three-quarters (78%) of the respondents disagreed (Chart 2). Lending more credence to this perceived shortcoming is the fact that not a single person in the entire group responded in the affirmative. Evidently, the recently instituted NYC-

specific, incident management protocol could be one of the underlying reasons for this sentiment. The vast majority of respondents (71%) believed that CIMS did not provide clearly defined roles and responsibilities for response to a dirty bomb attack (Chart 3).



Although CIMS protocol clarification is undoubtedly a policy that must be readdressed, the survey further illustrates that it is neither the lone nor the main issue surrounding the anticipated lack of inter-agency coordination. As demonstrated in Chart

4, inadequate inter-agency training (40%), lack of an RDD-specific inter-agency response plan (30%), and inadequate communication (21%) were all cited as being perhaps presenting the greatest challenge to NYC first responder agencies in the dirty bomb scenario. But, it is important to point out that it cannot be determined from the survey exactly how the political ramifications (discussed in greater detail in Chapter VII) leading up to and following the protocol development have influenced any such existing inter-agency training, planning, and communications policy decisions. In any case, Charts 5 and 6 show that nearly all respondents believe inter-agency coordination and control could be improved with more realistic inter-agency training (98%) and an RDD-specific, inter-agency response plan (92%). This high level of acceptance may indicate a willingness on behalf of at least this group of high-ranking FDNY Chief Officers to participate in any prospective inter-agency initiatives proposed in the future.



Finally, 76% of the respondents believed that the sheltering-in-place of civilians could be best coordinated and controlled by collectively employing all of the following:

1. Assigning sheltering-in-place responsibilities to FDNY units as part of life safety operations;
2. Assigning sheltering-in-place responsibilities to the NYPD as part of perimeter security;

3. Relying on public information provided by government officials (i.e. NYC OEM) at the time of the event;
4. Educating building management and the general public on proper sheltering-in-place procedures prior to the actual event.

Chart 5. Inter-agency response to a dirty bomb attack could be better coordinated and controlled with more realistic inter-agency training

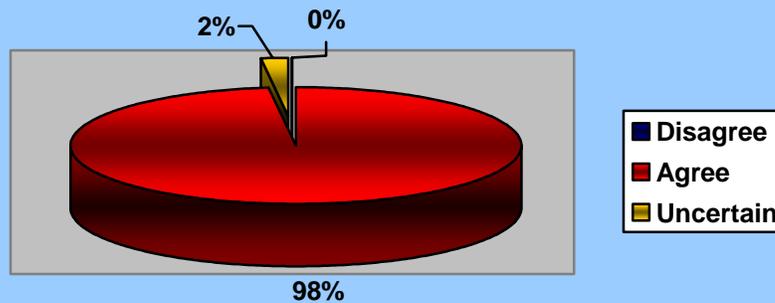
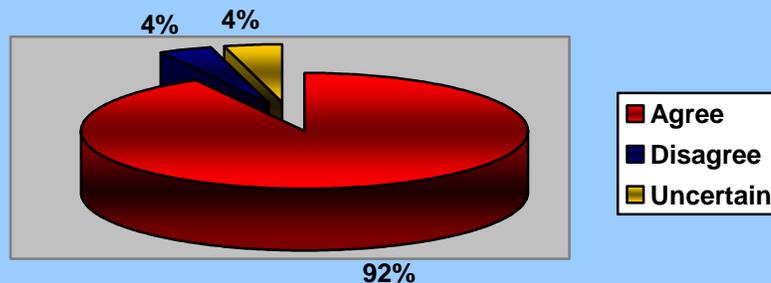


Chart 6. Inter-agency response to a dirty bomb attack could be better coordinated and controlled with an RDD-specific, inter-agency response plan



6. Recommendations

In order to increase the awareness and confidence of the general public, NYC office building management should include in its site-specific sheltering-in-place plans

provisions to maintain the basic needs of occupants: communications, security, food and water. These plans should also include contingencies for providing additional capacity for pedestrians directed to seek shelter inside nearby buildings. So that first responders can become more familiar with the process, procedures should be implemented that require FDNY and NYPD units to be on hand at the periodic, full building EAP drills.¹³⁹ As explained in Chapter V, the efficacy of these measures could also be reinforced during a proposed public/private sector *NYC Public Safety/Terrorism Preparedness Week* initiative.

NYC first responder agencies must address the issue of self-evacuees. Without question, it would be impossible to account for and isolate every contaminated person pending monitoring, decontamination, and medical treatment; however, it would be irresponsible to not develop a plan to do so. Some entirely feasible tactics have been offered as possible solutions. For example, strategically-located buildings could be mapped-out and then identified as either shelters or decontamination facilities; and pre-designated monitoring and decontamination stations or “pinch points” could be established on the Brooklyn, Queens, and Bronx sides of bridges and tunnels.¹⁴⁰ Most importantly, the location of these sites should be made known to all potential first responding Incident Commanders prior to the event occurring so that this information could become part of their own pre-planning efforts.

Perhaps the greatest obstacle that needs to be overcome is each NYC first responder agency not knowing exactly what the other will be responsible for. An RDD-specific inter-agency response plan should be developed that delineates which agency will be responsible for evacuation and which will be responsible sheltering-in-place; and that takes into account the current inventory of resources available for monitoring and decontamination. Once devised, the plan must be realistically practiced by mandating scenario-based, inter-agency drills that are followed up with candid inter-agency

¹³⁹ The proposed FDNY rule provides that “All building occupants shall participate simultaneously in an EAP drill at least once every two years. Such drill shall be based on a specific emergency scenario, which shall be announced at the time of the drill, and shall include a sheltering in place, evacuation and/or partial evacuation.” FDNY, “Office Building Emergency Action Plans,” 21.

¹⁴⁰ Anonymous. This particular information was provided by a highly-trained expert on hazardous materials response in the “additional comments” section of the survey. The instructions related to the sheltering-in-place survey stipulated an assurance of confidentiality.

critiques. The end result of these recommended steps will be more coordinated inter-agency communications, more efficient use of resources, and less duplication of effort.

7. Conclusion

An unprecedented dirty bomb attack on Manhattan could potentially result in numerous hazardous conditions and many more unknown variables, especially given the unpredictability of the general public in response to official instructions. Using the *National Planning Scenarios* as a guide, the assumptions made in its RDD scenario would certainly task the current preparedness efforts of NYC's first responder agencies. Although much has already been done in the way of equipment and capability, a few basic and low cost strategic initiatives can increase NYC's readiness.

Both Federal and local first responder guidance has shown that sheltering-in-place is a necessary aspect of any potential RDD response. Moreover, as explicated in Chapter V, many emergency response Web sites provide the general public with at least some basic, albeit conflicting, guidance for sheltering-in-place. A poll conducted of high-ranking FDNY officials has demonstrated that their department's resources alone would be overwhelmed given the scenario proposed by current Federal guidelines. It also found that sheltering-in-place would be better coordinated if RDD planning and training was more realistic and it involved inter-agency collaboration. Since fostering inter-agency command and cooperation is critical for maintaining control during the aftermath of an RDD attack, this preparedness issue will be further explored in greater depth in the next chapter.

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VII. INTER-AGENCY COMMAND, CONTROL, AND COOPERATION

A. CITYWIDE INCIDENT MANAGEMENT SYSTEM (CIMS) POLICY IMPLICATIONS

1. Introduction

Arguably one of the more controversial case studies on the topic of law enforcement in homeland security is the matter of incident command in NYC, and the relationship between the FDNY and NYPD. Largely the result of a few well-publicized confrontations, local media has portrayed a picture of on-going hostility and tension between these two agencies. However, contrary to popular belief, inter-agency cooperation has been much better than the critics report.

It is worth noting that senior-level officials from both agencies have mostly dismissed these reports as isolated quarrels involving personnel who had exercised poor judgment; and they suggest that this type of behavior does not take place on a daily basis. In fact, nearly all previous conflicts have occurred at those response operations where emergency services were duplicated and responsibility was not well-defined. The great majority of these were relatively small in scale, and the disputes were resolved either at the incident scene or by the respective departmental disciplinary processes.

Yet, it is unrealistic to deny that underlying FDNY/ NYPD inter-agency problems do not exist. For example, the lack of command, control, and coordination on 9/11 was evidenced by two separate command posts and a failure to communicate with each other.¹⁴¹ It is accurately reported that this problem was ultimately a by-product of a cultural barrier created by operational stove-pipes rather than an overt lack of cooperation. Prior to 9/11, even though there was an inter-agency response plan in effect, training for large-scale catastrophic events rarely took place. Hence, this is precisely why each agency operated autonomously; they knew no other way.

The NYC OEM has proactively decided that these coordination issues are best resolved at the policy level, and has requested input from high-ranking officials from all

¹⁴¹ For example, see Final Report of the National Commission on Terrorist Attacks Upon the United States, *9/11 Commission Report*, 1st ed. (New York: W.W. Norton & Company, 2004), 321.

first responder agencies. A CIMS protocol has been proposed to clarify the roles played by these agencies for responding to any conceivable type of incident, large or small. Unfortunately, it has proven to be complicated and confusing, and a poorly designed policy for CBRN/Haz-Mat emergency management.¹⁴²

2. Historical Background

In May, 2004, in preparation for the arrival of the 9/11 Commission, NYC OEM unveiled a draft copy of CIMS. This document was touted as the blueprint for NYC's emergency response plan, thus meeting the Federally-mandated requirement to receive homeland security funding. Over the ensuing several months, all concerned agencies were given several opportunities to provide feedback on the draft to the NYC OEM and cite their own concerns and objections.

A critical point of contention between the FDNY and NYPD was the portion of the protocol relating to CBRN/Haz-Mat responses. The initial draft designated the NYPD to remain in charge as the sole Incident Commander (IC) at all CBRN/Haz-Mat incidents where crime or terrorism was suspected or had occurred; and only until it was determined by them not to be the case, the incident would then be managed under a unified command.¹⁴³ Hence, the NYPD had successfully persuaded the NYC OEM, and city hall, that only they should take initial command of these incidents. They argued that NYC was different than any other place in the country because intelligence reports had shown that the terrorist threat was greatest here, and that the NYPD has largest police department in the country.¹⁴⁴

The FDNY cited the following in opposition to the CBRN/Haz-Mat section of the final draft:

- It is logically flawed;
- It is inconsistent with other protocols in CIMS;
- It contradicts the basic principles of the Incident Command System (ICS) and the National Incident Management System (NIMS) which are used as best practices throughout the country;

¹⁴² Peter E. Hayden (FDNY Chief of Department), in testimony to the City Council, May 9, 2005.

¹⁴³ New York City Office of Emergency Management, "Citywide Incident Management System," Annex A (April 6, 2005): 3.

¹⁴⁴ Raymond Kelly (NYPD Commissioner), in testimony to the City Council, May 9, 2005.

- It disregards the FDNY's proven expertise in Haz-Mat incident management;
- It could be a potential drain on City resources.

A back-and-forth process continued numerous times, with disagreements remaining primarily on the CBRN/Haz-Mat incident command issue. Finally, much to the dismay of the City Council who had been carefully overseeing the development process for several years, the CIMS protocol was signed by Mayor Bloomberg and placed into effect on April 6, 2005.

Obviously displeased with this decision, the City Council had subpoenaed FDNY Chief of Department Peter Hayden to testify and the debate finally came to a culmination on May 9, 2005. At the highly-publicized joint oversight hearing of the City Council Committee on Fire and Criminal Justice Services and the Committee on Public Safety, the City Council had determined that the CBRN/Haz-Mat section of the CIMS protocol was an ill-advised policy, and thus, the long-awaited inter-agency collaborative effort proposed by the NYC OEM had "flopped."¹⁴⁵ By the time all the testimony was presented it was quite evident that the CIMS protocol had, in effect, turned into a struggle for control with the influence of the NYPD outweighing that of the FDNY.

3. Pros

The following items represent the advantages to using the NYPD as the Incident Commander in a CBRN/Haz-Mat Single Command structure:

1. Potential Detection and Interdiction: NYC is unique in the sense that the majority of terror plots against the City had been planned for the relatively small geographic area of the borough of Manhattan. In fact, many consequence management planning models and scenarios use this region as the backdrop for the after-effects of a CBRN attack. The significant threat and vulnerability related to this type of attack has prompted the installation of chemical, biological, and radiation detectors near certain critical locations throughout Manhattan.¹⁴⁶ As technology improves and sophisticated equipment becomes more readily available, the NYPD could conceivably receive an early

¹⁴⁵ Yvette Clark (Council Member and chair person), in testimony to the City Council, May 9, 2005, http://www.nycouncil.info/pdf_files/newswire/05_09_05_cims.pdf (accessed on August 27, 2005).

¹⁴⁶ Ruth interview.

warning as to the presence of these weapons. NYPD counter-terrorism officials would then be well-positioned to take command and control of the ensuing preventive operation.

2. Crime Scene Investigation and Site Management: The quick identification of the terrorists responsible for the Madrid rail system bombings underscores the importance of a timely criminal investigation. As one NYPD union official notes, “Treating [CBRN/Haz-Mat] as law enforcement keeps the City safe because the NYPD is not just focused on the hazardous substance but also is using its intelligence and investigative resources to identify the perpetrators and thereby prevent future events.”¹⁴⁷ The objectives of overall site management and perimeter, traffic, and crowd control are also included as important law enforcement functions in this segment of the NYPD’s emergency response.

3. Force Protection and Site Safety: History has shown that terrorists have used the tactics of near-simultaneous attacks and secondary devices with the intention of targeting first responders. When the type of attack also includes CBRN, the potential consequences could become even more lethal. Thus, any counter-terrorism plan should include measures by law enforcement agencies to ensure that the incident is safe and secure. A strong command presence by the NYPD would protect on-going life safety and investigative operations.

4. Cons

The following items represent the disadvantages to not using the FDNY as an Incident Commander in a Unified Command structure:

1. Haz-Mat and Incident Command Expertise: In every major city throughout the U.S. the fire department is placed in command at Haz-Mat incidents primarily because they possess highly specialized equipment and employ the most qualified and experienced personnel. However, under CIMS, NYC is also the only jurisdiction in the Nation where command of a CBRN/Haz-Mat incident is entrusted solely to the police department. This is in spite of the fact that, historically, 99.9 percent of all Haz-Mat incidents in NYC have not involved crime or terrorism. In 2004, an FDNY Chief Officer was the lone IC at 95 percent of the Haz-Mat incidents to which

¹⁴⁷ John F. Driscoll (NYPD Captain’s Endowment Association), in testimony to the City Council, May 9, 2005.

FDNY Haz-Mat Co. #1 had responded, many of which were large-scale. In contrast, the NYPD had been the IC at only a relatively few, small-scale “white-powder” anthrax threats. Hence, it is quite clear that CIMS does not fully utilize the FDNY’s incident command expertise in Haz-Mat operations.

2. National Incident Management System (NIMS) Inconsistencies: Unlike CIMS, NIMS does not imply that incidents be managed based solely upon potential criminal acts. On the contrary, it states that incidents involving CBRN “represent particular challenges for the ICS structure.”¹⁴⁸ It further provides for a unified command structure at incidents involving many different agencies from a single jurisdiction.¹⁴⁹ Since major CBRN/Haz-Mat events in NYC would almost always involve a multi-agency response, it would be most logical and advantageous to operate under a unified command.

3. Command and Control Issues: Perhaps the most compelling argument against the CIMS protocol is provided by FDNY Chief of Department Pete Hayden. In reference to his “vision of the future” he states,

Public safety is directly connected to the systematic development of a unified command at major, complex incidents and [the] building of [a] mutual system of respectful interaction with each other. Unless our public service organizations can be integrated into a unified command group during terrorist events, where decisions are made with full awareness of the capacities and talents of each of the relevant groups, we are likely to repeat the mistakes of limiting command capacity at the most important times in the lives of the communities we have pledged to serve.¹⁵⁰

4. Information Sharing Issues: As evidenced on 9/11, information sharing is a critical aspect of any major inter-agency emergency operation. For example, Chief Hayden points to the fact that information reported by the NYPD aviation unit that the top 15 floors of the North tower may collapse was never transferred to FDNY commanders. Hence, he portends that “Both organizations developed blind spots that reduced their own capacity to command...We cannot afford this to happen again.”¹⁵¹

¹⁴⁸ U.S. Department of Homeland Security, *National Incident Management System* (2004): 7.

¹⁴⁹ *Ibid.*, 11-12.

¹⁵⁰ Hayden testimony.

¹⁵¹ *Ibid.*

Meanwhile, citing reports from the FBI that a second plane was heading for Washington, D.C., the IC at the Pentagon operation found that “the unified command approach ensured that all responders received important information throughout the critical first hours of the response.”¹⁵²

5. Political Ramifications

Upon review of the initial draft of the CIMS protocol in May, 2004 the *9/11 Commission* had found that, “[CIMS] does not mandate a comprehensive and unified incident command... In our judgment, this falls short of an optimal response plan, which requires clear command and control, common training, and the trust that such training creates.”¹⁵³ More recently, *9/11 Commission* panel member Slade Gorton had expressed his displeasure with the arrangement in a statement given to the *NY Post* following his testimony to the City Council. Thus, by designating the NYPD ranking officer as the lone IC at CBRN/Haz-Mat incidents, the Mayoral-approved CIMS document disregards a critical recommendation made by this influential committee. As recent media coverage regarding the CIMS versus NIMS controversy suggests, this could prove to be a political “football” if future incidents lead to inter-agency conflicts.

Despite the aforementioned inconsistency, the CIMS protocol has apparently been approved by the DHS NIMS Integration Center.¹⁵⁴ This is an extremely important endorsement since eligibility for future Federal funding is contingent upon NIMS compliance. It is even more important politically to Mayor Bloomberg, an outspoken critic on the current formula used to dole out homeland security funding. This has prompted him to go on record and forcefully state, “We’ve made the decision. And now everybody is going to get on board and make that decision work.”¹⁵⁵

6. Policy Recommendations

1. Conduct Quarterly Inter-agency Review Meetings: Although CIMS provides for a joint after-action review, it is only conducted upon request of an agency or

¹⁵² James Schwartz (Chief, Arlington County, Virginia Fire Department), in testimony to the City Council, May 9, 2005.

¹⁵³ *9/11 Commission Report*, 322.

¹⁵⁴ Joseph F. Bruno (NYC OEM Commissioner), in testimony to the City Council, May 9, 2005.

¹⁵⁵ Mike McIntire, “Bloomberg Says Fire Chief Must Support Emergency Plan or Leave,” *New York Times*, May 11, 2005, B7.

if recommended by the NYC OEM. The FDNY has proactively instituted a CIMS After-Action Report (AAR) system to document all noteworthy inter-agency emergency operations. It is suggested that NYPD do the same. These reports should then be addressed on a quarterly basis by a joint after-action review team. In effect, this will settle any and all disagreements before they lead to a lack of confidence and mistrust.

2. Increase the Role of the NYC Office of Emergency Management (OEM): It became evident at the City Council oversight hearing that if NYC's first responder agencies could not agree to a workable strategic document under normal circumstances, it is unlikely that they will be able to do so at the time of an actual CBRN/Haz-Mat event. The on-scene NYC OEM representative should be empowered to clarify the inevitable confusion and settle incident command disputes. This would provide immediate accountability for CIMS compliance.

3. Mandate Regular Inter-agency Training Using Incident Command System (ICS) Principles: CIMS provides for ICS training but does not specify its frequency. ICS is a tool, and like every piece of emergency equipment it needs to be checked periodically to ensure that it is functioning properly. An inter-agency training schedule should therefore be developed and strictly adhered to.

4. Establish Parameters for Protocol Revision: As previously noted the principle of unified command for a multi-agency incident is clearly and indisputably the national standard. It has been suggested that the CIMS protocol is "a living program [which] will be updated in the future to reflect lessons learned..."¹⁵⁶ It would therefore be beneficial, from both a public safety and political standpoint, for policymakers to set guidelines for a shift in that direction.

7. Conclusion

By its very nature, a terrorist attack involving a CBRN weapon will result in an extremely complex incident, one that will necessitate a well-coordinated and integrated response involving first responders from the NYPD and FDNY. As numerous experts have testified, a successful operation is predicated on the timely sharing of critical information and the sound and proven principles put forth by incident command system

¹⁵⁶ Bruno testimony.

standards. The essential law enforcement functions of responder protection, site security, and evidence collection should be carried out simultaneously with life safety operations under a unified command structure as provided for in NIMS. With these principles in mind, it is strongly recommended that NYC public safety officials prepare for the eventuality of a catastrophic CBRN event and take the necessary steps to revise various sections of the CIMS protocol.

VIII. CONCLUSIONS

A. STRATEGIC PLAN – INCREASING NYC’S “DIRTY BOMB” PREPAREDNESS

1. Specific Strategic Goal

Whether it involves fighting fires, apprehending criminals or some other type of emergency response, the overarching mission for all first responder agencies is, first and foremost, to protect life and property. Since 9/11, prevention of, and response to, various types of terrorist attacks have been added to the top of this list of priorities. More specifically, the *National Preparedness Goal* (NPG) has identified 15 scenarios that all levels of government must prepare and plan for.¹⁵⁷ An RDD attack is included as one of those; and because of its relatively high probability for occurrence, it is a threat that NYC public safety officials must immediately address. Therefore, the most effective strategic idea for increasing preparedness is to ensure that NYC first responder agencies’ improve upon several critical RDD counter-terrorism capabilities, and the corresponding task responsibilities, outlined in that important document.

2. Fundamental Issues

How can NYC adequately prepare for a “dirty bomb” attack? One widely-recognized publication on the topic accurately suggests “To reduce the risks of this [type] of terrorism, efforts must be made to...devote adequate resources toward educating the public and preparing to manage the consequences of such an attack.”¹⁵⁸ Fortunately, NYC’s first responder agencies are well-positioned to carry out these and other recommended tasks without detracting from their traditional duties. However, completion of each task will require a committed, collaborative effort between these public sector agencies and their private sector counterparts. Moreover, whereas increasing RDD preparedness will not require much in the way of capital investment; it will call for a shift in organizational culture and a change in leadership mind-set.

The internal environment within the NYC first responder community is such that preparedness efforts have been significantly enhanced in certain respects, and hindered in

¹⁵⁷ U.S. Department of Homeland Security, *National Preparedness Goal: Draft* (December 2005): D-1 – D-2.

¹⁵⁸ Ferguson, *Four Faces*, 300.

others. For example, both the FDNY and NYPD have been able to utilize additional Federal funding to bolster their equipment, technology and capability. This level of competency should go a long way toward satisfying the mandated RDD preparedness goal. However, the politically-motivated CIMS initiative has proven to be controversial and divisive. At any future RDD attack, this could potentially lead to command and control issues similar to those experienced on 9/11.

The external factors affecting RDD preparedness are primarily related to the Federal requirements and the availability of additional funding. Homeland Security Presidential Directive (HSPD) – 8 states “Federal preparedness assistance will support State and local entities' efforts including planning, training, exercises, interoperability, and equipment acquisition for major events as well as capacity building for prevention activities such as information gathering, detection, deterrence, and collaboration related to terrorist attacks.”¹⁵⁹ Given that NYC officials have spoken out repeatedly about the inequality of the current formula for homeland security funding allocation, first responder agency compliance with the provisions of the NPG should be a major motivating factor in planning. Because NYC is particularly vulnerable to an RDD attack, it should focus on the “risk-based target levels of capability” that are specifically applicable to that scenario.¹⁶⁰

By its very nature, preparedness for an RDD attack will encompass NYC’s first responder agencies core values of protecting of life and property. Although relatively few people would be killed by the immediate effects of radiation, the long term health effects on those unnecessarily exposed would be difficult to determine. It is this unknown risk and the public’s inherent fear of radiation that would cause wide-spread panic. Furthermore, since NYC, particularly the areas of Downtown or Midtown Manhattan, contains numerous key financial institutions and an abundance of highly-priced real estate, it is often referred to as the “Financial Capital of the World.” A successful RDD attack on the City would affect the local, regional, and national economies on a scale many times greater than 9/11. Hence, NYC public safety officials have a responsibility to

¹⁵⁹ George W. Bush, *Homeland Security Presidential Directive (HSPD): 8*, Washington, D.C.: Government Printing Office, December 17, 2003, <http://www.whitehouse.gov/news/releases/2003/12/20031217-6.html> (accessed February 18, 2006).

¹⁶⁰ DHS, *National Preparedness Goal*, 7.

implement RDD-specific prevention and response strategies that could better prepare its first responders for protecting its citizens and preserving its critical infrastructure.

The following key stakeholders have a particular interest in seeing that NYC enhances its RDD preparedness:

- NYC citizens – A better prepared first responder work force will be able to better serve the people in the communities they are sworn to protect.
- NYC first responders – As NYC employees, first responders are in a prime position to defend NYC and protect their own livelihoods.
- Private sector entities – Working closely and collaboratively with private industry will ensure that the recommended public sector preparedness strategies are seamlessly implemented.
- Regional communities – Surrounding jurisdictions largely depend on the economic strength and viability of the NYC economy. Also, regional collaboration is identified as a National Priority for achieving specified target capabilities.¹⁶¹
- Federal, State, and local governments - As mentioned above, DHS is tasked with the implementation of HSPD-8 in order to support the preparedness efforts of the State and local governments.

To obtain maximum effectiveness each one of these stakeholders must participate in carrying out the tasks and capabilities needed to achieve the goal of preparedness.

3. New Lines of Business

DHS has provided guidance on the preparedness requirements of HSPD-8 with the establishment of National Priorities.¹⁶² In full compliance with these priorities, the following new and existing strategies must be implemented by first responder agencies in order to increase NYC's overall RDD preparedness:

- Secure a commitment for the advancement of radiation detection technologies;
- Institute a *NYC Public Safety/Terrorism Preparedness and Education Campaign*;
- Develop an effective RDD-specific shelter-in-place plan for NYC;
- Improve coordination and cooperation with more frequent and realistic inter-agency training, and continuous review of CIMS.

¹⁶¹ DHS, *National Preparedness Goal*, 15.

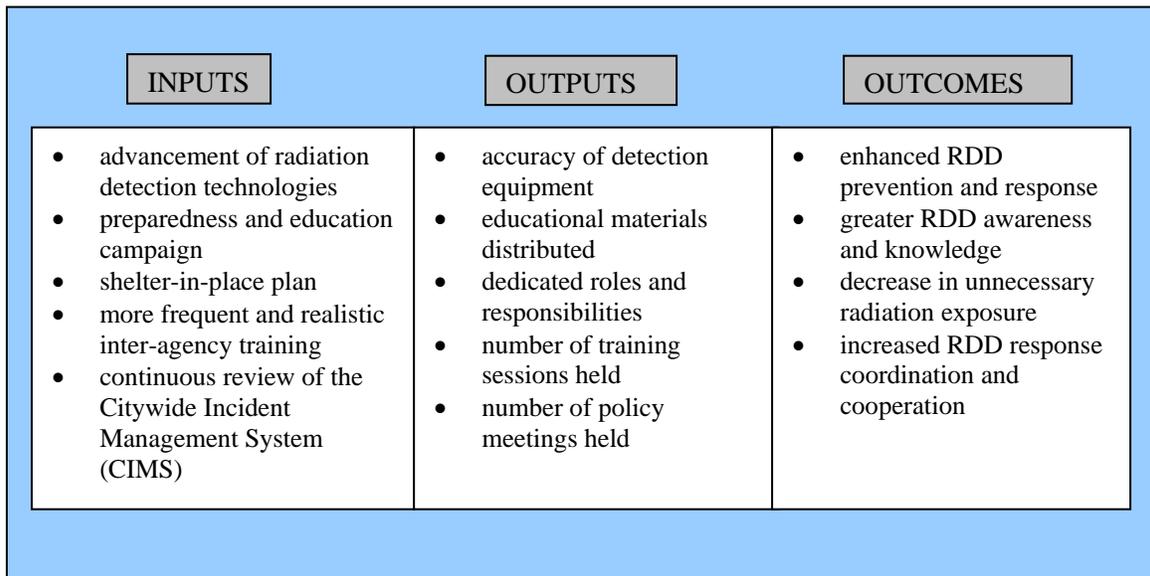
¹⁶² *Ibid.*, 13-20.

What is it that makes an RDD preparedness plan such a “valuable” strategy for NYC first responders? First, because subject matter experts have determined that an RDD attack is the type of WMD event most likely to occur in the relatively near future, the preparedness measures outlined above must be taken immediately. Next, preparing for RDD prevention and response, in order to protect the citizenry from its adverse health and economic effects, has overarching implications for many key stakeholders. Finally, a well-prepared cadre of first responders and a well-informed general public could conceivably deter terrorists from planning to strike NYC with this type of catastrophic attack.

4. Inputs, Outputs, Outcomes

To further implement the RDD strategic plan, it is necessary to closely examine the requirements of the capabilities-based NPG. The desired outcomes related to homeland security that NYC is supposed to achieve are delineated in the seven National Priorities. By comparison, each of the outcomes listed in the model shown in Figure 2 can be categorized as being applicable to at least one of those seven listed in the NPG.

Figure 2. Logic Model (Outcome Sequence Chart) for NYC’s RDD Preparedness



(From: Harry P. Hatry, *Performance Management: Getting Results* [Washington, D.C.: Urban Institute Press, 1999], 33.)

Since catastrophic terror attacks are extremely rare occurrences and, more specifically, an RDD attack has not yet occurred, measuring preparedness success by analyzing actual performance is not possible. However, general conclusions can be drawn on the overall commitment made to RDD preparedness by examining first responder agencies' compliance with the following measurements of output:

- a decrease in the number of false readings as indicated by laboratory testing of the various radiation detection devices in use;
- the total number of “customers” in Manhattan reached with the message of RDD preparedness as indicated by surveys and poll numbers;
- the development of an inter-agency shelter-in-place plan that is acceptable to all concerned parties;
- the total number of large-scale, inter-agency RDD training sessions held annually;
- the total number of policy meetings on the effectiveness of the CIMS protocol held annually.

5. Strengths, Weaknesses, Opportunities, and Threats (SWOT)

In order to properly plan for an increase in RDD preparedness, it is helpful to perform a basic SWOT analysis (Figure 3) of NYC's first responder agencies' ability to prevent and respond to an attack. By taking into consideration the current internal and external environments affecting these agencies, specific conclusions can be drawn to address the strategic gaps that need to be filled. As Bryson notes, “[An] important outcome of a [SWOT] analysis may be specific actions to deal with challenges and weaknesses, build on strengths (including distinctive core competencies), and take advantage of opportunities (including improving performance on key success factors).”¹⁶³

¹⁶³ John M. Bryson, *Strategic Planning for Public and Nonprofit Organizations: A Guide to Strengthening and Sustaining Organizational Achievement*, 3rd ed. (San Francisco: Jossey-Bass, 2004), 127.

Figure 3. NYC’s RDD Preparedness SWOT Analysis



Four strategic issues emerge from the RDD preparedness SWOT analysis performed in Figure 3. Using a “direct approach” for identification purposes, they are: ¹⁶⁴

- What is the best use of the current radiation detection technology and how can the overall RDD prevention measures be improved?

¹⁶⁴ Bryson, *Strategic Planning*, 161-166.

- How can NYC’s first responder agencies best relay critical information to the general public?
- Is a sheltering-in-place strategy feasible given the current level of public awareness and inter-agency cooperation?
- Can long-standing inter-agency issues surrounding command, control, and cooperation be overcome in order to develop a comprehensive, joint response plan?

6. Benchmarking

Arguably, the concept of “preparedness” is inherently subjective in nature. For example, it leads to the questions, “How do we know that we are prepared? How is preparedness measured?” Fortunately, the NPG has delineated that the Universal Task List (UTL) be used to help guide Federal, State, and local agencies through the prerequisites called for by DHS for achieving the preparedness standards for each of the 15 planning scenarios.

The UTL facilitates requirements analysis by providing a template and a list of possible tasks that serve as a starting point for assessing what is required to respond to an event. The training community can use it to assist in exercise design, to aid in prioritizing training needs, and to serve as a template for evaluation. During a response, the UTL serves as a tool a manager can use to help organize the effort.¹⁶⁵

Hence, the applicable sections of the UTL for the corresponding RDD scenario could be used as the benchmark to assess NYC’s level of preparedness.

Because an RDD attack would certainly require a significant inter-agency and multi-jurisdictional response over a period of months, it would be extremely difficult to collectively quantify the tasks for each responding agency. However, since NYC’s first responder agencies would play a major role in the initial 24 hours, or Emergency Stage, of an RDD attack, it is necessary to benchmark their progress using an integrated approach. The NYC organizations that would have the most significant impact on the outcome of the emergency operation include the NYPD, FDNY, NYC OEM, DOHMH, and NYC Department of Environmental Protection (DEP).

¹⁶⁵ U.S. Department of Homeland Security, Office for Domestic Preparedness, *Universal Task List Manual: Draft*, Version 1.0 (July 31, 2004): 2.

The criterion for data collection is laid out fairly extensively in the UTL. It is important to note that, while each task should be completed to the fullest extent possible, it is not logical to require that all involved agencies be responsible for participating in each one. In certain categories, a particular agency would have multiple roles, while in others no role at all. In those situations where it is unclear which agency would perform a specific task due to duplicative core competencies, an on-scene NYC OEM representative would resolve any discrepancy. For this reason, it would make the most sense to delegate to NYC OEM the responsibility for all data collection at an operation, drill, or training exercise. NYC OEM should be equally responsible for ensuring that each one of the required tasks as outlined on the UTL are carried out in an efficient and timely manner.

This proposed benchmarking plan has not been agreed to or accepted in any way, shape, or form. Therefore, in order to achieve maximum effectiveness, it would be necessary to produce a Memorandum of Agreement (MOA) signed by all affected parties and sent to the Mayor's office for approval.

7. Implementing the Plan

The one thing that is obviously clear when utilizing the UTL for meeting NYC's RDD preparedness goals is that no one first responder agency can handle the entire mission alone. Since a successful and efficient conclusion to this seemingly daunting event will require an unprecedented inter-agency response, it will necessarily call for an unparalleled collaborative pre-planning effort on behalf of all the aforementioned stakeholders. However, the challenge in reaching the objective of "deterrence through preparedness" lies in removing organizational barriers with a "big picture" plan that will reduce casualties and saves lives. The solution to this problem is for leadership personnel from both public and private sector entities to develop a durable *Integrated RDD Preparedness Plan* that is carefully crafted in accordance with Federal and local guidelines.

In order to "drive the plan" in the right direction, NYC's first responder agencies should begin by analyzing the Target Capabilities List (TCL) of the NPG.¹⁶⁶ Using the TCL in the RDD planning process would create "value" by providing policymakers with a guide to assess precisely which tasks specific agencies are capable of handling, and

¹⁶⁶ DHS, *National Preparedness Goal*, 8-12.

then identify the gaps and overlaps that exist. The initial objective would be to provide the citizens with the most protection and safety in the most cost-effective manner possible.

Undoubtedly, this is the stage of the process that will be met with the most dissent and resistance. As a general rule, NYC public sector agencies have historically shown a resistance to change, especially when there is the perception that in doing so a certain degree of authority would be conceded. The strategy of implementing an *Integrated RDD Preparedness Plan* can be properly executed only if the following four key organizational hurdles are overcome – political, motivational, cognitive, and resource (Figure 4).¹⁶⁷

8. Strategic Initiatives

The following four initiatives should be implemented by public and/or private sector leaders in order to overcome key organizational hurdles and further the development of the proposed *Integrated RDD Preparedness Plan*:

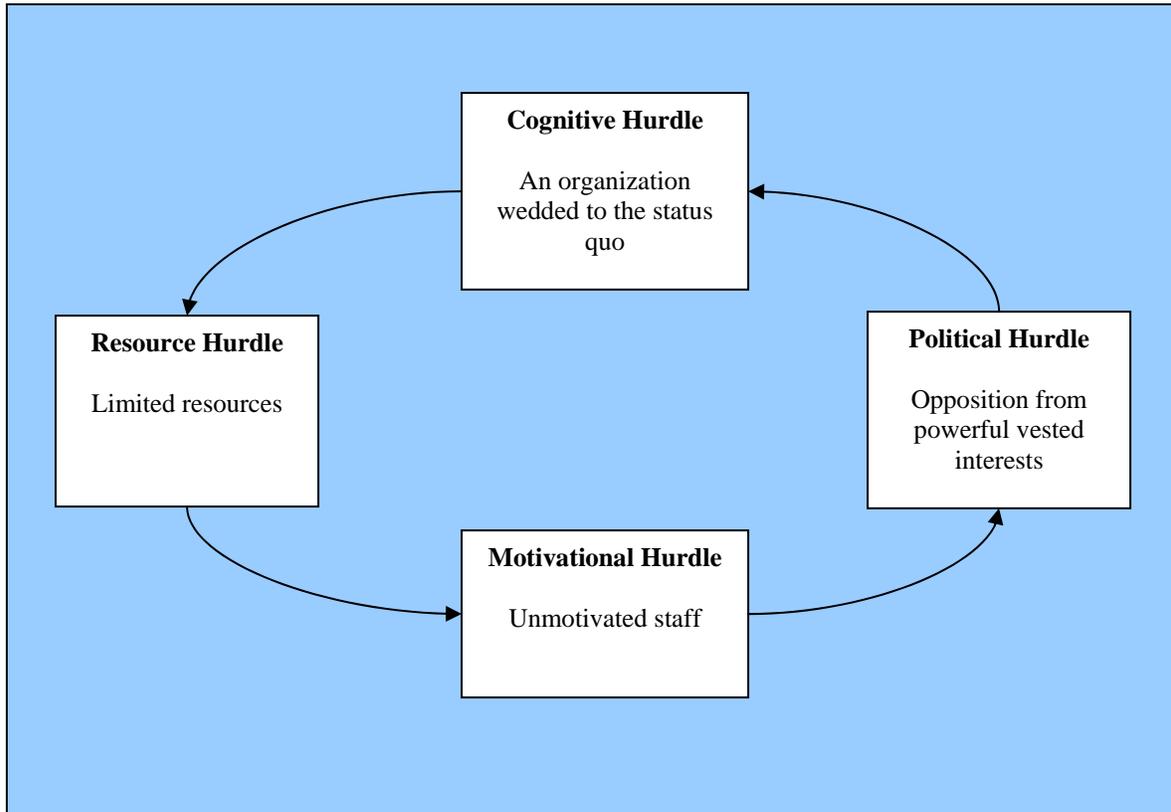
1. Draft a Memorandum of Agreement (MOA) requiring the participation of all first responder agencies in the development of a regional, inter-agency RDD preparedness plan.

The first step is to finally put politics aside and require that leaders, both agency heads and union officials, formally acknowledge that each agency has an important role to play. Arguably, this concept may be thought of as overly simplified and otherwise already implemented; but, the reality of the situation is that NYC's main first responder organizations, the FDNY and NYPD, have traditionally been reluctant to concede overlapping, task-specific areas of responsibility. From one mayoral administration to the next, lead roles have changed irrespective of the fact that the core competencies of each of these agencies have generally remained the same. Hence, as the federally-mandated requirements of DHS are imposed upon State and local jurisdictions, NYC's first responder agencies should realize the gravity of the threat and seize the opportunity to fully agree to work collaboratively. They should formulate regional, inter-agency/jurisdictional preparedness plans; not only for an RDD attack, but for each one of

¹⁶⁷ W. Chan Kim and Renee Mauborgne, *Blue Ocean Strategy: How to Create Uncontested Market Space and Make the Competition Irrelevant* (Boston: Harvard Business School Press, 2005), 147-169.

the 15 planning scenarios. Without mandatory compliance with this first step, the political hurdle that has resulted in age-old cultural barriers and organizational stovepipes will never be overcome.

Figure 4. The Four Hurdles to NYC’s RDD Strategy Execution



(From: Kim, *Blue Ocean Strategy*, 150.)

2. Develop collaborative programs that create opportunities for private sector entities to participate in public sector RDD preparedness planning.

The second step is for public sector leaders to design programs that will motivate the preparedness efforts of the entire first responder workforce. Since a successful RDD attack would have far-reaching implications for the entire workforce in NYC, private sector leaders should be invited to play a key role in the both the prevention and response aspect of the public sector preparedness plan. In of itself, the simple act of garnering

private sector involvement would instill “disproportionate influence” on the public sector’s acceptance of the need for an increase in RDD preparedness.¹⁶⁸

The suggested programs are easily applied and relatively low cost. Manufacturers of radiation detectors should regularly monitor and evaluate the practical use of these devices, and continually strive for improvements and technological advances. Security management personnel of large buildings and major corporations should be actively engaged in the development of a sheltering-in-place plan and public awareness/education campaign, and should encourage the participation of all affected employees. Local media should be involved and briefed on the critical importance of relaying proper information to the general public. Collectively, the implementation of these programs would result in a well-informed and actively engaged private sector workforce which, in turn, will effectually remove the motivational hurdle leading to overall RDD preparedness.

3. Draft a Memorandum of Understanding (MOU) requiring the participation of all first responder agencies in periodic RDD training exercises.

The third step is for public sector leaders to agree to mandated periodic RDD drills and training exercises. In order for these NYC’s first responder agencies to fully comprehend their actual level of preparedness, it is vitally important that this training be realistic. In general, both the FDNY and NYPD are well-trained and highly-motivated public safety organizations, arguably among the most proficient in the Nation. Objective critiques of these RDD training exercises will reveal firsthand just how dependent each agency must be on each other given the eventuality of an actual attack. Conceivably, these agencies would acknowledge the need for more collaboration, and jump the cognitive hurdle toward the strategic goal of increased preparedness.

If resistance is met while drafting this MOU, it would be helpful to have all high-level NYC public safety officials meet as a group in one room to view the Home Box Office (HBO) docudrama “Dirty War.” Widely recognized as being a real-life depiction of an actual RDD attack on the city of London, this film would likely create a powerful impact in the minds of those in the position of making strategic decisions. As

¹⁶⁸ Kim, *Blue Ocean Strategy*, 151.

unconventional a tactic as this may seem, it could be exactly what is needed to change the leadership mind-set regarding NYC's preparedness for this type of event.

4. Develop and adopt a NYC-specific, inter-agency RDD response plan.¹⁶⁹

The fourth and final step is for public sector leaders to create a City-wide database of RDD response capability, and devise an inter-agency response plan based upon the current pool of resources. Since 9/11, many counter-terrorism measures have been taken in NYC with respect to equipment, technology, and capability; however, that is only "half the battle." At this point it is unclear exactly how many trained personnel from the various agencies (FDNY, NYPD, and DOHMH) are equipped with how much and which types of radiation detection equipment.

Every year each one of these agencies invests heavily in radiation training and equipment without knowing the others capabilities and with no idea if it is, or is not, in fact sufficient enough. A unified response plan based upon identified levels of equipment and training would reduce duplication of effort, meet the DHS requirement of building regional capability, and allow leaders to redirect scarce resources. Once a determination is made, more capital could then be devoted to cutting-edge radiation detection technologies and periodic full-scale inter-agency training exercises. Thus, an inter-agency response plan would allow policymakers to remove the commonly problematic resource hurdle by efficiently diverting Federal funding from the duplicative resource "cold spots" to the innovative resource "hot spots."¹⁷⁰

9. Alternatives

A viable alternative to the preceding set of recommendations would be to create a new, independent NYC Office of Homeland Security. In a city with a population of roughly 8 million people, and a first responder workforce comprised of 37,000 and 13,000 employees in the NYPD and FDNY respectively, the sheer number of people to protect, and resources to manage, certainly justifies the establishment of a new bureaucracy. Minimally staffed by impartial and non-affiliated homeland security experts, one principal mission of this new organization would be to develop, implement,

¹⁶⁹ Stephen V. Musolino, PhD. (Brookhaven National Laboratory), interview with the author on November 3, 2005.

¹⁷⁰ Kim, *Blue Ocean Strategy*, 156.

and exercise strategies that would ensure NYC is fully prepared for an RDD attack, and the other scenarios specified in the UTL. This Office would be tasked with providing the “big picture” oversight that is necessary to develop collaborative best practices for the public and private sector, and making certain that all Federal requirements are met. In essence, it would act as the facilitator responsible for removing the aforementioned organizational hurdles that are endemic to NYC’s first responder agencies.

Another option would be to maintain the status quo in regards to the current strategy or lack thereof, and instead institute an apolitical and non-partisan NYC OEM with more power and authority to settle inter-agency disputes. The line of reasoning for this, it could be argued, is that spending scarce resources on being fully prepared for an RDD event is a strategy that plays right into the terrorist’s ploy of draining the budgets of Federal, State, and local governments. Since 9/11, each NYC first responder agency has enhanced their capabilities, increased their equipment, and developed their own plans to handle this type of attack. Perhaps this is all that one could reasonably expect from a jurisdiction like NYC with so much inherent risk.

10. Conclusion

It must be emphasized that the inputs needed to achieve the desired outcomes for RDD preparedness require only a relatively small capital investment. Also, at the heart of the matter is the need for “tipping point” leadership; the type that is willing to recognize that the entire problem is greater than the sum of its parts.¹⁷¹ In other words, present and future leaders must recognize that one integrated plan is generally more reliable than several plans separately executed by different agencies.

The NPG suggests that every jurisdiction need not be equally prepared for all types of catastrophic events, but instead must focus on those types of attacks that are considered more likely to happen given the current threat and vulnerabilities.¹⁷² Experts believe that an RDD attack is the type of WMD attack most expected to occur. In terms of economic and psychological damage, a successful attack would be NYC’s equivalent of Hurricane Katrina but with far greater national implications. Given these parameters, NYC public safety officials must do all that is necessary to get ready for its inevitability.

¹⁷¹ Kim, *Blue Ocean Strategy*, 148.

¹⁷² DHS, *National Preparedness Goal*, D-3.

B. PROBLEMS FOR FURTHER RESEARCH

The overall purpose of this thesis is to critically assess the preparedness of one specific local jurisdiction for one certain type of event, and from the viewpoint of one particular homeland security discipline. Given these constraints, it primarily addresses just a few noteworthy prevention and response issues, and offers recommendations that could potentially reduce casualties and save lives. However, any type of CBRN terrorist attack on a major U.S. city, including one involving a dirty bomb on NYC, would likely result in an extremely complex incident and create significant challenges from many different perspectives. The problems highlighted in this thesis should therefore be considered a starting point, and a framework for future research.

In order for NYC, and other large cities, to be adequately prepared for an RDD attack, it is critical that they be able to fully recover from the adverse effects in its aftermath. Underscoring one of the more notable obstacles a community would encounter following a significant RDD event, the *National Planning Scenarios* finds that the process of decontamination and cleanup would be both lengthy and costly.¹⁷³ Meanwhile, in apparent attempt to compensate for these remediation difficulties, recent guidance provided by DHS “would allow cleanup standards that in some cases would be far less stringent than what is required for Superfund sites, commercial nuclear power plants and nuclear waste dumps.”¹⁷⁴ These competing objectives have prompted divergent opinions between government officials advocating less stringent standards and environmental watchdog groups calling for more restrictive federal requirements.¹⁷⁵ Hence, local government officials and private sector entities, incorporating substantial citizen involvement, must carefully and deliberately develop RDD remediation strategies specifically designed for NYC. Not until these plans are solidified with pragmatic solutions to the aforementioned controversy will NYC achieve overall RDD preparedness.

¹⁷³ Homeland Security Council, *National Planning Scenarios*, 11-5 – 11-6.

¹⁷⁴ H. Josef Hebert, “Government Has 'Dirty Bomb' Cleanup Guide,” *SFGate.com*, January 4, 2006, <http://sfgate.com/cgi-bin/article.cgi?file=/n/a/2006/01/03/national/w155750S54.DTL> (accessed February 9, 2006).

¹⁷⁵ Hebert notes that the president of one watchdog group critical of the new guidelines accuses DHS of “proposing a nuclear Katrina, a formal policy of allowing the public to be exposed to massive radiation doses from a dirty bomb while the government does nothing to protect them.”

The complexity of NYC, with its critical financial infrastructure, densely populated areas, and high threat level, demands that its first responders be sufficiently prepared for other types of catastrophic terrorist attacks as well. More specifically, NYC could benefit greatly from candid assessments of its preparedness for chemical, biological, and nuclear attacks. While some of the ideas explored and suggestions put forth in this thesis are largely applicable, the prevention and response measures unique to these other types of attacks pose additional challenges. For example, further critical analysis must be performed on NYC's strategies for handling the capability-specific priorities of medical surge and mass prophylaxis; interoperable communications; CBRN detection, response, and decontamination; and information sharing and collaboration. Objective recommendations on how first responder agencies could best implement each one of these preparedness strategies in an integrated and coordinated fashion, will further enhance NYC's level of readiness.

It must be expected that a CBRN attack on NYC would result in a major multi-agency response requiring the efforts of other key homeland security-related disciplines. Various local level organizations specializing in the fields of law enforcement, fire suppression, public health, emergency medical response, and emergency management all play important roles in the prevention, protection, response, and recovery aspects of preparedness. An in-depth appraisal of the CBRN policies and procedures currently in place for each one of these agencies would provide public safety officials with a broader and more comprehensive view of NYC's overall ability to manage the risk presented by these catastrophic types of events.

In many ways the vitality of NYC is positively correlated to the overall strength of the Nation; therefore, protecting against the dire consequences of major terrorist attacks must remain at the forefront of any preparedness goal. The astute recommendations provided by a wide variety of local experts could be used to develop collaborative strategies that would lessen the impact on the City and further fulfill the national mission. Thus, NYC's public and private sector leaders should, on behalf of all their key stakeholders, encourage and support further research on each of the aforementioned critical issues.

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LIST OF REFERENCES

- Ante, Spencer E., Amy Barrett, and Paul Magnusson, "New York Takes Another Hit." *BusinessWeek Online*, September 19, 2005.
http://www.businessweek.com/magazine/content/05_38/b3951012.htm (accessed January 19, 2006).
- Atran, Scott. "Mishandling Suicide Terrorism." *The Washington Quarterly* 27, no. 3 (Summer 2004): 67-90.
- Bowman, Steve. "Weapons of Mass Destruction: The Terrorist Threat." *Congressional Research Service* (March 7, 2002).
- Bryson, John M. *Strategic Planning for Public and Nonprofit Organizations: A Guide to Strengthening and Sustaining Organizational Achievement*. 3rd ed. San Francisco: Jossey-Bass, 2004.
- Bush, George W. *Homeland Security Presidential Directive (HSPD): 8*. Washington, D.C., Government Printing Office, December 17, 2003.
<http://www.whitehouse.gov/news/releases/2003/12/20031217-6.html> (accessed February 18, 2006).
- Butler, Adrienne S., Allison M. Panzer, and Lewis R. Goldfrank. *Preparing for the Psychological Consequences of Terrorism: A Public Health Strategy*. Washington, D.C.: The National Academies Press, 2003.
- Chalk, Peter, Bruce Hoffman, Robert Reville, and Anna-Britt Kasupski. *Trends in Terrorism: Threats to the United States and the Future of the Terrorism Risk Insurance Act*. Santa Monica, CA: RAND, 2005.
http://www.rand.org/pubs/monographs/2005/RAND_MG393.pdf (accessed January 3, 2006).
- Davis, Lynn E., Tom LaTourrette, David E. Mosher, Lois M. Davis, and David R. Howell. *Individual Preparedness Response to Chemical, Radiological, Nuclear, and Biological Terrorist Attacks: A Quick Guide*. Santa Monica, CA: RAND, 2003. http://www.rand.org/pubs/monograph_reports/2005/RAND_MR1731.1.pdf (accessed January 20, 2006).
- Federal Emergency Management Agency. "Are You Ready? An In-depth Guide to Citizen Preparedness."
http://www.fema.gov/pdf/areyouready/areyouready_full.pdf (accessed January 19, 2006).
- Ferguson, Charles D., and William C. Potter, with Amy Sands, Leonard S. Spector, and Fred L. Wehling. *The Four Faces of Nuclear Terrorism*. Monterey, CA: Monterey Institute for International Studies, 2004.

- Ferguson, Charles, and Kaleb Redden. "Facing the Inevitable: Arm Public with Facts on Dirty Bomb Defense." *DefenseNews.com*, February 9, 2004.
<http://www.defensenews.com/sgmlparse2.php?F=archive2/unknown/atpc9647816.sgml> (accessed January 20, 2006).
- Final Report of the National Commission on Terrorist Attacks Upon the United States. *9/11 Commission Report*. 1st ed. New York: W.W. Norton & Company, 2004.
- Gittrich, Greg. "Al Qaeda Plot Targets Us," *Daily News*, August 2, 2004.
<http://www.nydailynews.com/front/story/218255p-187749c.html> (accessed January 3, 2005).
- Harper, F. T., S. V. Musolino, and W. Wentz. "Realistic Radiological Dispersal Device Hazard Boundaries and Ramifications for Early Consequence Management Decisions." *International Journal of Risk Assessment and Management* (forthcoming).
- Hatry, Harry P. *Performance Management: Getting Results*. Washington, D.C.: Urban Institute Press, 1999.
- Health Physics Society: Position Statement. "Guidance for Protective Actions Following a Radiological Terrorist Event" (January 2004).
<http://hps.org/documents/RDDPAGs.pdf> (accessed January 28, 2006).
- Hebert, H. Josef. "Government Has 'Dirty Bomb' Cleanup Guide." *SFGate.com*, January 4, 2006.
<http://sfgate.com/cgi-bin/article.cgi?file=/n/a/2006/01/03/national/w155750S54.DTL> (accessed February 9, 2006).
- Hoffman, Bruce. *Al-Qaeda, Trends in Terrorism and Future Potentialities: An Assessment*. Santa Monica, CA: RAND, 2003.
<http://www.rand.org/pubs/papers/2005/P8078.pdf> (accessed February 21, 2006).
- . *Inside Terrorism*. New York: Columbia University Press, 1998.
- . *Testimony: Lessons of 9/11*. Santa Monica, CA: RAND, 2002.
<http://www.rand.org/pubs/testimonies/2005/CT201.pdf> (accessed February 21, 2006).
- Horowitz, Craig. "Anatomy of a Foiled Plot." *New York Magazine*, December 6, 2004.
<http://newyorkmetro.com/nymetro/news/features/10559/index.html> (accessed January 19, 2006).
- Jones, Gary L., and Laurie E. Ekstrand. "Customs Service: Acquisition and Deployment of Radiation Detection Equipment." *U.S. General Accounting Office* (October 17, 2002). <http://www.gao.gov/new.items/d03235t.pdf> (accessed June 19, 2005).

- Keller, Bill. "Nuclear Nightmares." *New York Times Magazine*, May 26, 2002. <http://query.nytimes.com/gst/abstract.html?res=F20D15FB3E5C0C758EDDAC0894DA404482> (accessed January 19, 2006).
- Kelly, Henry. Testimony before the Senate Committee on Foreign Relations on March 6, 2002. Federation of American Scientists. <http://www.fas.org/ssp/docs/030602-kellytestimony.htm> (accessed January 19, 2006).
- Kim, W. Chan, and Renee Mauborgne. *Blue Ocean Strategy: How to Create Uncontested Market Space and Make the Competition Irrelevant*. Boston: Harvard Business School Press, 2005.
- Kingsbury, Nancy R. "Review of Studies of the Economic Impact of the September 11, 2001, Terrorist Attacks on the World Trade Center." *U.S. General Accounting Office* (May 29, 2002). <http://www.gao.gov/new.items/d02700r.pdf> (accessed January 3, 2006).
- Lasker, Roz D. "Redefining Readiness: Terrorism Planning Through the Eyes of the Public." *The New York Academy of Medicine* (2004).
- Leonhardt, David, and Motoko Rich. "Slowing Is Seen in Housing Prices in Hot Markets." *New York Times*, October 4, 2005. <http://www.nytimes.com/2005/10/04/realestate/04reals.html?pagewanted=2&th&emc=th> (accessed October 4, 2005).
- Lipton, Eric. "U.S. to Spend Billions More to Alter Security Systems." *New York Times*, May 8, 2005.
- Looney, Robert. *Strategic Insight: Economic Costs to the United States Stemming From the 9/11 Attacks*. Monterey, CA: Naval Postgraduate School Center for Contemporary Conflict, 2002.
- Lugar, Richard G. "The Lugar Survey on Proliferation Threats and Responses" (June 2005). <http://lugar.senate.gov/reports/NPSurvey.pdf> (accessed October 17, 2005).
- Makinen, Gail. "The Economic Effects of 9/11: A Retrospective Assessment." *Congressional Research Service* (2002).
- McDonald, Joseph C., Bert M. Coursey, and Michael Carter. "Detecting Illicit Radiological Sources." *Physics Today* (November, 2004): 36-41. http://homeland-security.pnl.gov/pdf/raddetectors-physics_today_nov_04.pdf (accessed January 19, 2006).
- McDougall, Christopher. "Reasons They Haven't Hit Us Again." *New York Magazine*, December 6, 2004. <http://newyorkmetro.com/nymetro/news/features/10560/index.html> (accessed January 19, 2006).

- McIntire, Mike. "Bloomberg Says Fire Chief Must Support Emergency Plan or Leave." *New York Times*, May 11, 2005.
- Medalia, Jonathan. "Terrorist 'Dirty Bombs': A Brief Primer." *Congressional Research Service* (April 1, 2004).
- Musolino, S. V., and F. T. Harper. "Emergency Response Guidance for the First 48 Hours after the Outdoor Detonation of an Explosive Radiological Dispersal Device." *Health Physics* 90, No. 4 (forthcoming).
- National Council on Radiation Protection and Measurement (NCRP). "Advising the Public about Radiation Emergencies." NCRP Commentary No.10, November 30, 1994.
<http://www.ncrponline.org/Commentaries/NCRP%20Comm%20No.%2010.pdf>
 (accessed January 20, 2006).
- New York City Fire Department. "Commissioner's Message." Department Order No.1, Supp. No.1, January 4, 2005.
- New York City Fire Department. "Fire Tactics and Procedures, Emergency Response Plan: Addendum 3, Radiological Operations." Draft Version (June 2005).
- New York City Fire Department. "Office Building Emergency Action Plans." 3 RCNY §6-02 (2005). http://nyc.gov/html/fdny/pdf/rcny/rcny_6_02_proposed_rule.pdf
 (accessed December 10, 2005).
- New York City Fire Department. "Operational Guidelines for Radalert 50 Radiological Monitor, Fire Tactics and Procedures: Hazardous Materials 11" (December 22, 2003).
- New York City Office of Emergency Management. "Citywide Incident Management System." Annex A (April 6, 2005).
- Parachini, John V. "Putting WMD Terrorism in Perspective." *The Washington Quarterly* 26, no. 4 (Autumn 2003): 37-50.
- . "The World Trade Center Bombers: 1993." In *Toxic Terror: Assessing Terrorist Use of Chemical and Biological Weapons*, ed. Jonathan B. Tucker, 185-206. Cambridge, MA: The MIT Press, 2000.
- Rapoport, David C. "Perceptions and Misperceptions of Religious Terror." Unedited paper contributed to the International Conference on Countering Terrorism through Enhanced International Cooperation.
- Taylor, Eric R. "Are We Prepared for Terrorism Using Weapons of Mass Destruction." *Cato Institute: Policy Analysis*, no. 387 (November 27, 2000).
<http://www.cato.org/pubs/pas/pa387.pdf> (accessed January 19, 2006).

- Uphoff, Kelly. "Osama bin Laden's Mandate for Nuclear Terror." *JINSA Online*, (December 10, 2004). <http://www.jinsa.org/articles/print.html/documentid/2762> (accessed January 19, 2006).
- U.S. Department of Homeland Security. *National Incident Management System* (2004).
- . *National Preparedness Goal: Draft* (December 2005).
- . Office for Domestic Preparedness. *Universal Task List Manual: Draft*. Version 1.0 (July 31, 2004).
- . *Working Group on Radiological Dispersion Device (RDD) Preparedness, Medical Preparedness and Response Sub-Group* (May 1, 2003). http://www1.va.gov/emshg/docs/Radiologic_Medical_Countermeasures_051403.pdf. (accessed January 20, 2006).
- U.S. Department of Justice. Federal Bureau of Investigation. *Terrorism in the United States: 1997*. <http://www.mipt.org/pdf/TerrorismInUS1997.pdf> (accessed January 19, 2006).
- U.S. Department of State. *Patterns of Global Terrorism: 1995* (1996). <http://www.mipt.org/pdf/1995pogt.pdf> (accessed January 3, 2005).
- . *Patterns of Global Terrorism: 1997* (1998). Under *1997 Global Terrorism: The Year in Review*. <http://www.mipt.org/pdf/1997pogt.pdf> (accessed January 19, 2006).
- U.S. Homeland Security Council. *National Planning Scenarios*. Version 20.2 Draft (April 2005).
- Weedn, Victor W. "Public Information and Risk Communication in Times of Crises." In *A Little Knowledge: Privacy, Security, and Public Information after September 11*, 57-69. New York: Century Foundation Press, 2004.

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