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Local law enforcement's initial role in response to a radiological dispersion device attack

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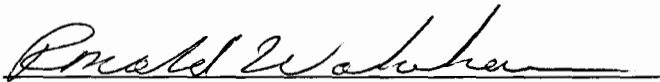
ABSTRACT

Today the potential exists for a terrorist organization to use a Radiological Dispersion Device or a dirty bomb within the United States. The results of such an attack could be catastrophic to the affected population. The response by law enforcement must be calculated and planned.

To properly analyze the law enforcement's role in a radioactive incident a qualitative approach was taken. A determination must be made prior to an attack to discern what kind of training will be necessary, what equipment will be required, and what response procedures need to be in place to ensure a safe and efficient response.

Law enforcement must understand that the essential components of any radiation response protocol are to analyze the situation, secure the area, notify the required agencies and protect the general population. Training and equipment needs must be fulfilled. Law enforcement must always keep in mind a radiological attack is a crime, and proper police procedure must be established to ensure the security of the crime scene and preservation of evidence. Research shows that local law enforcement agencies must have a usable radiation response protocol which can be used in the event of a radiological release.

I certify that I have read this thesis and find that, in scope and quality, it satisfies the requirements for the degree of Master of Disaster Science.



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**LOCAL LAW ENFORCEMENT'S INITIAL ROLE IN RESPONSE TO A
RADIOLOGICAL DISPERSION DEVICE ATTACK**

By

ANDREW ROBERT HOEHL

A Thesis

Submitted to the Graduate Faculty

of the University of Richmond

in Candidacy

for the degree of

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I. INTRODUCTION

THE RESEARCH QUESTION

With the development of terrorism as a major problem in modern society, law enforcement has had to adapt to a rapidly changing environment. They now not only have to train to handle the normal daily activities of police duties but also have to be prepared to handle a wide variety of other threats. These new threats are based upon the belief that terrorists will use any tool at their disposal to conduct an attack upon the United States.

One of the most disconcerting types of attacks is the use of a radiological dispersion device or dirty bomb. This device would release radioactive particles into a particular environment.

Local law enforcement is tasked with many roles during such an attack, especially in those critical first stages. With that in mind, they must be prepared to respond to an attack. The following questions must be answered to gauge what role law enforcement must play and if they are ready to do so.

- What are the complexities of a radiological attack?
- What are the tasks they will be required to perform?
- What are the specialized training and equipment requirements for a law enforcement response?
- What role will law enforcement assume during the response and recovery phase?

RESEARCH OBJECTIVES

- Develop an understanding of radiological preparedness and planning so local law enforcement can gauge their preparedness level.
- Ascertain the level of knowledge that should be expected from local law

enforcement in regard to a radiological attack.

- Assess the needs and wants of local law enforcement for preparation and training.
- Identify what type of information is needed on radiological response operations for local law enforcement.
- Assess if the federal government can provide adequate support to local law enforcement for preparedness and response.
- Determine the areas of assistance needed from the federal government in the following areas: education, training, crisis management, incident command.
- See what the needs are for radiological equipment such as radiological survey instruments, monitors and personal protective clothing and equipment.

With law enforcement having such an immediate and critical role, it is imperative that they understand the many components and complexities of radiological response operations (FEMA 1990).

Although the federal government has a host of specialized teams and assets that would be brought to bear in the aftermath of such an attack, most of these assets would not arrive for several hours, and in some cases, several days (DOE 2007). Until locally based federal agencies such as the FBI arrive on scene, the beginning stages of the response to a radiological attack would be the responsibility of the Incident Commander, along with state emergency response agencies, local police and fire agencies.

The federal government has the primary responsibility for preparing all levels of government for a response to a radiological weapon's attack. While local and state governments are undoubtedly responsible for preparing their respective jurisdictions for a radiological attack and all other forms of disasters, it is the federal government

that has been given the mandate by Congress to assist communities with preparedness and response (HSPD-5 & HSPD-8).

OVERVIEW

For decades there have been the dire predictions from the federal government, academia, and private research institutions about the threat posed by radiological terrorism. The federal government has made progress in organizing and creating agencies to handle such an event. Toward this end, the Department of Homeland Security's National Response Framework provides a template for the federal government's response to such an incident. This of course does not govern law enforcement at the local level as there are limited guidelines on what a local law enforcement agency should do in the event of attack (NRF 2007).

Based on current law enforcement doctrine, law enforcement officers will serve primarily in a defensive posture. They will be tasked with missions such as reducing or preventing the loss of life and, destruction of private property, maintaining order, and providing a myriad of other support services during this time.

In the fall of 1999, the Hart-Rudman Commission finished a year-long assessment of the gravest near and long-term threats to American national security. At the very top of this list was nuclear/radiological terrorism (USCNS 1999). Given the profusion of readily obtainable radioactive "loose sources" throughout the world and stockpiles of poorly controlled fissionable nuclear materials located in failing nation-states, there is little question why the national security experts convened under Hart-Rudman rated nuclear terrorism as our country's most significant threat (Ferguson and Potter 2004).

Since the findings of the Hart-Rudman Commission the "World at Risk" study found that of biological agents are now the top threat faced by the United States. But

the report does reaffirm the significance of the threat of the radiological attack (World at Risk 2008).

A radiological terrorism attack would likely come in one of two forms of ionizing radiation weapons. The first method would be as rudimentary as a conventional explosive "salted" with quantities of a radioactive isotope. This type of weapon is referred to as a Radiological Dispersal Device (RDD) or dirty bomb. The second would be the detonation of nuclear munitions.

The explosive results of an RDD attack would be less severe than a nuclear detonation, but the results could be just as catastrophic. The RDD will cause death and long-lasting injuries, create panic, fear, and contaminate the environment for the long term causing substantial direct and indirect economic loss (CSIS 2000).

To protect the nation from an attack The National Strategy for Homeland Security states it is to guide, organize, and unify homeland security efforts. The strategy has the following four goals:

- Prevent and disrupt terrorist attacks.
- Protect the American people, our critical infrastructure and key resources.
- Respond to and recover from incidents that do occur.
- Continue to strengthen the foundation to ensure our long-term success.

(Homeland Security Strategy 2007)

With that in mind, emergency responders must prepare for the contingency that such prevention efforts may fail; that terrorists may indeed detonate one of these weapons in an American city. If such an attack were to occur, one category of first responder would be thrust into the middle of the incident response – the local law enforcement officer. This is the person who is already deployed in the field and who will be on duty no matter when or where an attack would take place.

If a dirty bomb is detonated in the United States, it is the emergency responder who will be the first on scene; in many cases that will be the local police officer or firefighter. He or she will have to quickly analyze the situation (size up) and report conditions on the ground. Officers will also have to establish security and continue the sharing of information so the jurisdictional authorities can coordinate the overall response. An incident of this magnitude will activate the Multi-agency Coordination Center (Emergency Operations Center [EOC]) where the local emergency manager can coordinate the support activities and quickly report needs to the state and communicate protective action recommendations quickly and effectively to elected officials, the media, and the public (DOE 2000).

The urgencies stated above amplify the need for law enforcement officers to be properly trained and equipped to handle an attack. They will need help from state and federal agencies. However, in that period of time before other agencies arrive, they are on their own. During that time difficult decisions must be made and training must take over. Gordon M. Sachs states that responders must make some difficult decisions:

"The first instinct for emergency responders at any incident is always to rush in and save as many people as possible; however, in a terrorist-related incident, there are many factors to consider. Can the victims be saved? Was an agent of some type released? If it was, will responders have the means to detect it? Will their gear provide adequate protection? These are but a few of the questions that we must become accustomed to asking when responding to terrorist-related incidents. There is no reason to allow civilians to suffer needlessly; neither can there be any reason to send responders haphazardly into unknown and dangerous environments (Sachs 2003, pp. vii-viii)."

These questions are just some of the thoughts considered by the first arriving police officers on the scene of a dirty bomb attack. They must have the proper confidence in their training and equipment to do the job safely and effectively.

The primary responsibilities of law enforcement, arriving on scene of a dirty bomb attack should be to recognize the threat, minimize exposure, ensure the safety of victims, safeguard the scene, and report to command so proper highly specialized units may be brought to the scene to deal with the threat. Police must also remember to minimize their own exposure to these agents. Those who rush into a scene are likely to become victims themselves adding to the problem (Henry & King 2004).

SIGNIFICANCE OF STUDY

The purpose of this study is to enlighten and inform law enforcement in the event of a dirty bomb attack. There is a need to develop an understanding of what the realistic expectations are for a local law enforcement agency if a radiological attack occurs. A dirty bomb attack is a very real probability and it is the duty of local law enforcement to train and prepare for such an event.

I chose this particular type of incident based upon professional and academic experience. I have found during my law enforcement career that I have had no training on my role as a police officer if a dirty bomb attack were to occur. Additionally, the purpose of this study is not only to provide myself with the information but to be able to assist other officers and agencies in understanding their roles as well.

II. LITERATURE REVIEW

A major problem is that the United States is vulnerable to a RDD terrorism event due to the nature of our society. Currently local and state governments in concert with public health agencies are drafting and updating emergency response plans regarding radiological events (accidental & intentional) that include responsibilities for law enforcement. Yet, police officers are unaccustomed to

working with radiological agents or responding to radiological incidents and have little if any experience in this area.

Law enforcement must be ready to take immediate and comprehensive action once they arrive. Whether it is to block off intersections to allow for security of the area or if the focus is to assist in search and rescue efforts, it is the responsibility of each officer and supervisor to know what role they should play during the situation and how to react. They must also know what type of equipment is needed.

A key problem is that the police who will be called upon to initially respond to a dirty bomb may not be adequately trained to work effectively in that type of environment. They lack the highly specific technical training and expertise required to recognize and deal with the unique threats posed by such an event. Many also lack the special tools, gear, and protective equipment that may be required during a radiological event (Henry & King, 2004). In accordance with the Code of Federal Regulations, 29 CFR 1910-120, Hazard Waste and Response Operations, specified protective equipment must be donned to operate in the hazardous environment. Failure to do so is not only a violation of the federal statute, but exposes emergency responders to undue risk.

In the initial stage of the incident, local law enforcement along with local fire departments will be in control of the crisis. Unfortunately, federal support for the first-responder community has lacked a comprehensive and cohesive strategy since the first large-scale program of financial and training assistance was authorized by Congress in 1996 (Scardaville & Spencer 2002). Post 9/11, local agencies are now receiving assistance through federal grants but every year the rules in regard to assistance change. Each local community must meet certain federal guidelines to

receive Homeland Security funding to obtain this much needed training and equipment. These guidelines govern what a locality can and cannot receive.

In its third annual report to Congress, the *Advisory Panel to Assess Domestic Response Capabilities for Terrorism Involving Weapons of Mass Destruction* highlighted a number of problems. In its survey of state and local first responders, the commission found that the majority of first responders who participated in federal training programs found them to be beneficial but also noted that the programs were unable to train or equip enough personnel (Gilmore Commission 2001). Additionally, the *Gilmore Commission* found that one of the primary barriers to first responders' participation in federal training programs was their lack of knowledge about what types of training programs were available to local law enforcement agencies (Scardaville & Spencer 2002).

The RAND Corporation did a comprehensive review of the September 11, 2001, attacks entitled *Protecting Emergency Responders: Lesson Learned from Terrorist Attacks*. The review covers the needs for the proper equipment when responding to a disaster. Although the attacks on the World Trade Center did not include a radiological contaminant, it was a terrorist event causing mass death and destruction. The toxic fumes that filled the air for the days, weeks and months following the attack illustrated the uses and limitations of equipment needed for a dirty bomb attack. The most obvious equipment problem is that of personal protection equipment (PPE). Personal protection clothing and equipment is defined as having the capability to protect responders, from the effects of chemical, biological, and radiological agents as well as blast and incendiary devices.

It is noted that from the experiences at these 9/11 attack sites; it is clear that there were significant shortfalls in the way responders were protected. Many

responders suggested that the PPE even impeded their ability to accomplish their missions (Jackson et al. 2002).

The study found that personnel had not been properly trained in the operations and limitations of PPE that was being used nor was it of the caliber needed to sustain longevity in that type of a situation. Protective clothing and respirators exhibited serious shortcomings in that many equipment systems are incompatible which led to them not being used at ground zero. Also, first responders reported that equipment was not comfortable enough to allow extended wear during demanding physical labor that was called for at the site of the attack (Jackson et al. 2002).

Another element to consider is communications. Law enforcement personnel must be able to talk to each other. There must be a command and control structure set up that allows all of the various first responders - police, fire and emergency medical services (EMS) - to work together in those first crucial hours and days. Radio communication is at the core of this issue. It was during the 9/11 attacks, especially in New York City, where law enforcement could not talk with each other. The New York Police Department (NYPD) couldn't communicate with all of their people, let alone the Port Authority Police Department (PAPD). Within the NYPD, the Emergency Service Unit (ESU) had the most effective communication system because of their small size and specific job function (9/11 Commission 2004). Proper radio communication equipment must be utilized by all responders. Although the federal government has developed and implemented programs for communications interoperability, the problem of inadequate communications among and between different emergency responders still exists today.

Many local communities because of their limited size and budgets will not have the ability to cope with a radiological attack. They will have to rely heavily on the fact that the state and federal government are prepared to respond. Local HAZMAT teams and the local healthcare sector will only be able to do so much. In order to fully understand what the dangers are a radiological attack, one must understand the dangers of such an attack.

RADIOLOGICAL ATTACK TYPES

There are two types of major attacks one must be concerned about when it comes to a radiological incident. They are radiological and nuclear. Any attack that has one or both of these elements could have a devastating affect on a community. The Federal Emergency Management Agency (FEMA) describes these two types in the following manner:

- **Radiological Dispersion Device (Dirty Bomb):** "Terrorist use of an RDD—often called 'dirty nuke' or 'dirty bomb'—is considered far more likely than use of a nuclear explosive device. An RDD combines a conventional explosive device—such as a bomb—with radioactive material. It is designed to scatter dangerous and sub-lethal amounts of radioactive material over a general area. Such RDDs appeal to terrorists because they require limited technical knowledge to build and deploy compared to a nuclear device. Also, the radioactive materials in RDDs are widely used in medicine, agriculture, industry, and research, and are easier to obtain than weapons grade uranium or plutonium (FEMA 2008)."

"The primary purpose for a terrorist to use an RDD is to cause psychological fear and economic disruption. 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 (FEMA 2008, paragraph 2)."

"The size of the affected area and the level of destruction caused by an RDD would depend on the sophistication and size of the conventional bomb, the type of radioactive material used, the quality and quantity of the radioactive material, and the local meteorological conditions—primarily wind and precipitation. The area affected could be placed off-limits to the public for several months or much longer during cleanup efforts (FEMA 2008, paragraph 3)."

- **Nuclear Blast:** "A nuclear blast is an explosion with intense light and heat, a damaging pressure wave, and widespread radioactive material that can contaminate the air, water, and ground surfaces for miles around. A nuclear device can range from a weapon carried by an intercontinental missile launched by a hostile nation or terrorist organization, to a small portable nuclear device transported by an individual. All nuclear devices cause deadly effects when exploded, including blinding light, intense heat (thermal radiation), initial nuclear radiation, blast, fires started by the heat pulse, and secondary fires caused by the destruction (FEMA 2008, paragraph 1)."

The fact that a terrorist organization may use one of these weapons has been feared for decades. Today there is a mounting realism that countries such as Pakistan, Iran, North Korea and former Soviet Union states could be sources for radioactive and nuclear materials or devices to support terrorist operations. Terrorists could obtain the material from a variety of sources to create these

weapons. The need for enhanced security and monitoring of these facilities is critically important.

Another threat also posed is the intentional release of radiological material from a nuclear power plant. A terrorist organization could use a nuclear power plant as a weapon, in a way similar to terrorists crashing airliners into the World Trade Center towers so they would collapse. Destroying a reactor could achieve the same result as setting off a dirty bomb.

The local economy, infrastructure and population would be devastated by any one of these occurrences. While it is impossible to predict the exact toll on the community there are many factors to be considered. These could include: size of the weapon, amount of release (to include an accident), wind direction, population present, emergency planning and response, preparation of the local health community, number of hospitals, etc. Therefore, communities must be ready for any event.

RADIATION TYPES AND CHARACTERISTICS

The Health Physics Society (website) describes the following radiation types and their characteristics.

Alpha Radiation: Alpha radiation is a heavy, very short-range particle and is actually an ejected helium nucleus. Some characteristics of alpha radiation are:

- Most alpha radiation is not able to penetrate human skin.
- Alpha-emitting materials can be harmful to humans if the materials are inhaled, swallowed, or absorbed through open wounds.
- A variety of instruments has been designed to measure alpha radiation. Special training in the use of these instruments is essential for making accurate measurements.

- A thin-window Geiger-Mueller (GM) probe can detect the presence of alpha radiation.
- Instruments cannot detect alpha radiation through even a thin layer of water, dust, paper, or other material, because alpha radiation is not penetrating.
- Alpha radiation travels only a short distance (a few inches) in air, but is not an external hazard.
- Examples of some alpha emitters: radium, radon, uranium, thorium.

Beta Radiation: Beta radiation is a light, short-range particle and is actually an ejected electron. Some characteristics of beta radiation are:

- Beta radiation may travel several feet in air and is moderately penetrating.
- Beta radiation can penetrate human skin to the "germinal layer," where new skin cells are produced. If high levels of beta-emitting contaminants are allowed to remain on the skin for a prolonged period of time, they may cause skin injury.
- Beta-emitting contaminants may be harmful if deposited internally.
- Most beta emitters can be detected with a survey instrument and a thin-window GM probe (e.g., "pancake" type). Some beta emitters, however, produce very low-energy, poorly penetrating radiation that may be difficult or impossible to detect. Examples of these difficult-to-detect beta emitters are hydrogen-3 (tritium), carbon-14, and sulfur-35.
- Clothing provides some protection against beta radiation.
- Examples of some pure beta emitters: strontium-90, carbon-14,

tritium, and sulfur-35

Gamma and X Radiation: Gamma radiation and X-rays are highly penetrating electromagnetic radiation. Some characteristics of these radiations are:

- Gamma radiation or X-rays are able to travel many feet in air and many inches in human tissue. They readily penetrate most materials and are sometimes called "penetrating" radiation.
- X-rays are like gamma rays. X-rays, too, are penetrating radiation. Sealed radioactive sources and machines that emit gamma radiation and X-rays respectively constitute mainly an external hazard to humans.
- Gamma radiation and X-rays are electromagnetic radiation like visible light, radiowaves, and ultraviolet light. These electromagnetic radiations differ only in the amount of energy they have. Gamma rays and X-rays are the most energetic of these.
- Dense materials are needed for shielding from gamma radiation. Clothing provides little shielding from penetrating radiation, but will prevent contamination of the skin by gamma-emitting radioactive materials.
- Gamma radiation is easily detected by survey meters with a sodium iodide detector probe.
- Gamma radiation and/or characteristic X-rays frequently accompany the emission of alpha and beta radiation during radioactive decay.
- Examples of some gamma emitters: iodine-131, cesium-137, cobalt-60, radium-226, and technetium-99m.

The responding officers must also know the difference between signs and

symptoms of an attack.

- **Signs:** Indicators that can be observed by the responder without necessarily communicating with the victim. Vomiting, seizures, coughing, and drooling are examples (Drielak & Brandon, 2000).
- **Symptoms:** Sensations that are experienced by the victim and must be expressed by the victim because they may not be readily visible to another person. Symptoms may include dizziness, vision impairment, headaches, and nausea (Drielak & Brandon 2000).

The damage caused to the human body depends on the amount of and type of radiation the body is exposed to during the incident. Radiation can affect people in different ways making it difficult to determine what dose is needed to be fatal. Acute Radiation Syndrome can occur after exposure to a high dose of radiation; this causes the body to shut down. The increased risk of cancer is a primary concern of those exposed to radiation (USNRC 2009).

UNDERSTANDING RADIOLOGICAL AND NUCLEAR WEAPONS

A Radiological Dispersal Device (RDD) otherwise known as a dirty bomb is made with a conventional explosive that is wrapped with radioactive material. The materials used to create a dirty bomb can be found worldwide. These materials are routinely used in industrial and medical applications. An oil probe or a radiotherapy machine contains radioactive material (CSIS 2000). Even with the abundance of material available only a fraction of it contains enough to make a dirty bomb, but is cause for serious concern (Ferguson et al. 2006).

There is a debate over what the potential impacts of a dirty bomb attack would be on a population. The Federation of American Scientists states in regard to the effects of a small dirty bomb attack that it could cause the evacuation if not

abandonment of an area of approximately forty city blocks. If decontamination was not possible this area could remain abandoned for decades (FAS 2005). The real threat, which does not appear to be disputed, is the tremendous psychological effect and the political impact it will carry (Ford 1998). There is no doubt the terrorists fully understand the psychological effects which is why a dirty bomb would be deemed a "weapon of choice" among terror groups (Medalia 2004).

RADIATION AND THE PSYCHOLOGICAL IMPACT

There may not be a better weapon for a terrorist organization to use than radiation. The use of a dirty bomb by a terrorist organization would cause catastrophic psychological damage. A RDD attack could cause a residual fear in the population about their safety and the safety of their environment due to possible physical contamination, their own exposure to radiation, and the long-term effects of radioactive fallout (Ferguson et al. 2004). Society would be overrun with fear. If thousands of Americans were killed it would destabilize the public confidence in government and its ability to protect them. The economic impact would be enormous and could force the country into a very turbulent period.

Just the word alone, radiation, produces fear. Since the United States first set out to build an atomic/nuclear bomb during World War II, radiation has been feared. The Cold War came next and decades of warnings about the dangers of nuclear war and the after effects of radiation. The fear of radiation is well grounded in the fact that radiation exposure can cause cancer and birth defects. Radiation is invisible and undetectable without specialized equipment. This only adds the notion of fear of this weapon. The terms "nuclear," "radioactive," and "deadly," all contribute to instilling an initial feeling of fear regarding radioactive materials (Johnson 2006).

With the fear that will be instilled in the public after a radiological attack it is

anticipated that the number of people requesting to be tested for exposure to radiation will be much higher than those that have actually been exposed (Harrington & Jensen 2006). This theory is supported by the number of citizens that reported suspected anthrax when a white powder was observed in the winter months of 2001. The fear of radiation grows each time an accidental release occurs. In 1987 there was an accidental release of Cesium-137, a radioactive material in Goiania, Brazil. Although only five died and 244 were found to be contaminated more than 100,000 thought they might have been exposed (NBC 2008). Panic and fear were widespread in that area after the release.

Not only will the civilian population fear a radiological attack, so will the first responders, particularly law enforcement. They must be prepared to operate effectively following a radiation attack. They must be properly equipped with personal protective equipment. They will have to rely on local hazardous material personnel and their detection equipment. Those officers on the front line must also understand the real hazards of radiation and must be mentally prepared to handle it.

The psychological effects of a terrorist attack are far reaching. There must be an understanding of what those effects will be on the civilian population as well as on first responders. With radiological terrorism it is important to know that psychological effects will be significant whether or not there are mass casualties. "It is imperative that the public be psychologically immunized against the radiological attack threat, through an extensive public education campaign that leads citizens to understand: (1) that such attacks rarely pose immediate threats to life; (2) that the decision to shelter or flee will depend on the circumstances of the event and that minimizing risk to personal health will depend on rapidly receiving and adhering to guidance from government authorities, and; (3) that proper treatment can greatly reduce long-term

health effects in many cases (Ferguson et al. 2004)."

Because of the widespread and long-lasting threats posed by a radiological event it is imperative the local community be prepared to mitigate, prepare, respond and recover after a radiological release event, no matter the cause of it.

THE DISASTER MANAGEMENT CYCLE

MITIGATION. The first phase of the disaster management cycle is mitigation. "Mitigation is those activities designed to prevent or reduce losses from disaster. It is usually considered the initial phase of emergency management. Examples include land-use planning to limit or prevent development in floodplains, building codes to reduce losses from earthquakes and hurricanes and fires, dams and levees to prevent flooding, and designing buildings to facilitate surveillance to lessen the likelihood that terrorists can plant bombs (Waugh 2000, p. 49)."

Mitigation for a dirty bomb attack is difficult. Trying to prevent a terrorist attack is not like trying to prevent the flooding of an area by applying land management techniques. You cannot build a levee that will stop a dirty bomb attack. The best hope for the use of mitigation is to prepare for known elements. For example, Richmond, Virginia, has two nuclear power plants within a very short distance (about a one-hour drive) to the community. Mitigation can be applied here by use of regulatory guidelines. Response plans can be made. With a known factor, like a nuclear power plant, the community can effectively mitigate against the chance of an accidental leak.

There are several major target types that a terrorist may want to strike. When these targets are identified, it provides emergency planners the ability to put mitigation strategies into play to prevent an attack or minimize damage. The following chart is a list of likely terrorist targets (Heyer 2005):

Most Likely Terrorist Targets		
Government offices	Military installations	Landmark buildings
Events with high populations	Abortion clinics	Post offices
Power facilities	Water supplies	Corporate Headquarters
Police stations	Train terminals	Bus terminals
Airports	Tunnels	Bridges
Fuel depots	Cruise ships	Other critical infrastructure and/or key resources

Source: (Heyer 2005)

Mitigation must also include planning elements and early detection strategies. The best way to mitigate an attack is to stop it before it happens. Law enforcement, at all levels, plays a critical role in this step. Law enforcement should focus on activities related entities to detect, examine, probe, investigate and conduct operations related to potential terrorist activities (OCP 2008).

The other key factor in preventing an attack is the actual detection of radiological materials. The ability to stop a RDD event starts with the early detection of the import, transport, manufacture or release of the materials. The focus should be placed on training, communication, and coordination with the intelligence community (OCP 2008). Efforts are continuing to develop the needed the technologies to detect these types of RDD's. The placement of detection equipment must also be brought into consideration. Recognizing the most likely places these materials will enter a country or region will be the key in the mitigation strategy.

Mitigation is only the first step in being ready for a dirty bomb attack. Emergency managers will face many tough decisions about how to properly mitigate against an attack they cannot predict. Emergency managers must rely on history and proper analysis to make the accurate choices in using mitigation techniques.

PREPAREDNESS. "Preparedness is planning how to respond in an emergency or a disaster, and developing capabilities for a more effective response. Examples include training programs for emergency responders and the public, warning systems, disaster communication systems, and contingency planning (Waugh 2000, p.49)." "The purpose of preparedness is to anticipate problems in disasters so that ways can be devised to address the problems effectively and so that the resources needed for an effective response are in place beforehand (Mileti 1999, p.215)."

Preparedness for a radiological attack or accident must be of high importance to a local community. The ability to be able to effectively plan for such an event will pay dividends for the community if such an event ever occurs. In today's world the chance of an attack on a specific community in America is still a comparably small one. However, as time passes the chance of another attack on American soil increases. Any area where a large number of casualties could result must be considered a target.

The CDC (website) recommends the following to ensure preparedness and prevention:

- Maintain a public health preparedness and response cooperative agreement that provides support to state health agencies who are working with local agencies in developing coordinated bioterrorism and radiological release plans and protocols (CDC 2007).
- Establish a national public health distance-learning system that provides radiological terrorism preparedness training to health-care workers and to state and local public health workers (CDC 2007).

- Disseminate public health guidelines and performance standards on radiological terrorism preparedness planning for use by state and local health agencies (CDC 2007).

In order to be prepared for a dirty bomb attack, law enforcement must be able to recognize the signs of an attack. There are many early-warning indicators of a radiological attack. In all but the largest cities, detection equipment may not be available. All first responders should consider whether an attack might have taken place if any of the following are noticed. According to a 2005 report by Robert Heyer the following are key warning signs:

- Unusual numbers of people dying in an area, or from strange causes.
- Unusual numbers of sick or dying animals, birds or fish.
- Lack of insect life where it should be seen.
- Unusual numbers of people in an area complaining of blisters/rashes, nausea, disorientation, difficulty in breathing, convulsions, localized sweating, conjunctivitis (reddening of the eyes), erythema (reddening of the skin), or any irregular symptoms.
- Strange colored smoke coming from the area of a detonation.
- Explosions that seem to do very little damage or which release an unusual amount of smoke, or leave droplets of liquid in the area, or fragments covered with liquid or droplets.
- Unusual appearance of any liquid droplets, particularly where there should be none.
- Abandoned aerosol sprayers in the area of sick people.
- People reporting unusual odors or tastes.
- Unexplained mists or hazes in urban area.

- Sudden or unexplained appearance of low-lying clouds.
- Unidentified, low-flying aircraft--particularly crop dusters--over a populated area.

Preparedness is the most important step in the disaster management cycle for local communities. This phase includes needed planning and training for a dirty bomb attack. Neither of the remaining two phases can go well for emergency managers and responders if they have not adequately prepared.

RESPONSE. "Response is the immediate reaction to disaster. It may occur as the disaster is anticipated, as well as soon after it begins. Examples include mass evacuation, sandbagging buildings and other structures, securing emergency food and water, covering windows, providing emergency medical services, search and rescue, firefighting, and restoring public order to prevent looting (Waugh 2000, p.49)."

As with all disasters, the initial response will come from the local community. In this case, that means the local healthcare sector and adjoining agencies that have HAZMAT teams will be the first responders along with your front line fire, police and medical personnel. The actions of these first responders, their training, planning and preparedness will directly determine how successful the response to an attack or a radiological release will be.

A primary responder from the federal government for a radiological attack will be the CDC. The CDC (website) recommends they take the following actions in response to such an attack:

- Assist state and local health agencies in organizing response capacities to rapidly deploy in the event of an overt attack that might be the result of a covert attack.

- Ensure that procedures are in place for rapid mobilization of CDC terrorism response teams that will provide on-site assistance to local health workers, security agents, and law enforcement officers.
- Establish a national pharmaceutical stockpile to provide medical supplies in the event of a terrorist attack that involves radioactive agents.
- Establish a national electronic infrastructure to improve exchange of emergency health information among local, state, and federal health agencies.
- Implement an emergency communication plan that ensures rapid dissemination of health information to the public during actual, threatened, or suspected acts of radiological terrorism.
- Create a website that disseminates radiological preparedness and training information, as well as other related emergency information, to public health and health-care workers and the general public.

The first responder will have much to think about when responding to a radiological attack. The most critical consideration is the safety the responders themselves. Protective clothing and respiratory protection at the appropriate level of safety must be used. Personal Protective Equipment (PPE) should be worn whenever a radiological incident is suspected. Responders must remember the time-distance-shielding rule for protection. Responders should spend as little time as possible in the hazard zone, keeping distance from the contaminated area. They should shield themselves from the hazard at all times. And decontaminate as soon and as thoroughly as possible. The effectiveness of a first responder is compromised when

they become a casualty themselves (Heyer 2005). The first responder must keep in mind that he or she can be of no assistance if they fall victim to the attack.

All facets of the government will aid in the response to an attack. Numerous groups will be required in the response phase to complete the mission. According to a 2008 study by the Virginia Office of Commonwealth Preparedness these are the key groups used in response to a radiological attack are:

- Firefighting Operations/Support
- Urban Search and Rescue
- Emergency Public Information and Warning
- Mass Care (Sheltering, Feeding, and Related Services)
- Structural Damage and Mitigation Assessment
- Economic and Community Recovery
- Public Safety and Security Response
- Critical Resource Logistics and Distribution
- Responder Safety and Health
- Emergency Operations Center Management
- On-Site Incident Management

The federal government will come to the aid of the local community and bring with it its' vast resources. The downfall is that it will take time to get these resources in place. But with proper preparedness by all levels of government, the response phase will show that the training and planning, if done right, will pay off in the end.

RECOVERY. "Recovery is those activities that continue beyond the emergency period to restore lifelines. Examples include providing temporary shelter, restoring power, critical stress debriefing for emergency responders and victims, job assistance, small business loans, and debris clearance (Waugh 2000, p. 49)."

The recovery phase is a difficult one to gauge for a community. The variables are dependent upon the type and size of an attack or release. In some cases only minor, localized damage will occur and recovery will speed along. However, if the incident is large in scope, a myriad of potential problems arise. Areas may have to be evacuated for long periods of time. Water and food systems could be contaminated for an undetermined time. Even in a small attack the cleaning of buildings may take weeks. As an example, the U.S. Congress was shut down nearly a week alone after the Anthrax attacks in 2001 (CNN.com 2001).

Recovery will not be easy. Cleanup won't be as simple as rebuilding a home, clearing streets or restoring power. Many radiological agents can last for long periods of time, decades even, and represent a continuous hazard to the community. The recovery operation in Chernobyl is still ongoing today, more than twenty-three years after the radiation accident at the nuclear power plant. Recovery will be a great unknown until, sadly, a major radiological or dirty bomb attack occurs in the U.S.

III. METHOD

In order to analyze the appropriate role of law enforcement in response to a radiological or dirty bomb attack, a qualitative study was warranted. The goal was to answer the research questions that had been developed to determine what the role of a law enforcement officer is during a dirty bomb attack. The research was divided into four sections that would allow me to analyze each particular part of the research. The research necessitated a thorough review of existing literature and extant documents to identify what, if any, standards exist.

Section 1

The literature and extant document review focused on evaluating current radiological attacks types. Next, the different types and characteristics of radiation

were examined. Additionally, definitions or terms or phrases associated with a radiological attack were discussed. The purpose of this section is to establish a base of knowledge on how radiation works and why a dirty bomb attack would be so destructive.

Section 2

Section 2 of the research consisted of forming an understanding of what a dirty bomb can do and how it affects law enforcement. To do this, literature was reviewed that showed the psychological impact on not only victims but first responders. After establishing the affects of a dirty bomb on society I used a review of the disaster management cycle to identify strategies of each stage. This allowed for showing how all four phases (mitigation, preparedness, response and recovery) relate to the role of a law enforcement officer.

Section 3

Section 3 is the collection of data. The results were gathered by examining governmental reports, professional journals, federal, state and local documents, official websites, and newspaper and magazine articles. In order to properly define the role of law enforcement officer during a dirty bomb attack, the research had to be conducted in the following categories:

- Phases of radiation response.
- Responding to a dirty bomb attack.
- Law enforcement in the contaminated area.
- Training; past, present and future.
- Safety devices and equipment needs.
- Other responding agencies.

Section 4

The purpose of Section 4 is to provide an analysis of the results. This section reveals what the research indicates the role of the law enforcement officer should be in the event of a dirty bomb attack. The section examines if there is a clearly defined role for law enforcement, what that role is, if a model exists, if there are accepted protocols, and finally, what recommendations can be developed to further define these issues.

Limitations

Since there has never been a dirty bomb attack on U.S. soil, there is no existing research identifying what law enforcement did right or wrong during the event. This left only being able to look at previous WMD incidents, using other forms attack, and comparing other post-event analysis to this research.

IV. RESULTS

The role law enforcement assumes in various disaster scenarios has been continually updated since the events of September 11, 2001. That singular event forced the law enforcement community to take a critical look at existing response programs and develop a systems approach for the future. It is widely accepted terrorist groups will continue to attempt to obtain radioactive material with the goal of attacking targets in the U.S. Consequently, response assets must be ready. Law enforcement will be the first on the scene where decisions made in the initial stages of the incident will contribute greatly the overall success of the response effort. They must be given the capability to detect radiological materials and be provided with timely technical information and evacuation advice (McBroom 2002).

Law enforcement can anticipate a radiation event occurring in several scenarios:

- Industrial accidents during normal day-to-day handling, or transportation of

radioactive materials.

- Intentional sabotage of storage or transportation vessels containing radioactive materials for malicious purpose. This may include nuclear facilities such as, power plants, or industrial facilities (Ferguson et al. 2004).
- Detonation of a tactical nuclear weapon such as nuclear artillery shells, land mines, "suit case" bombs, etc. Tactical nuclear weapons from the former Warsaw Pact countries arsenal could theoretically be used conventionally by terrorist groups if they fall into the wrong hands (Ferguson et al. 2004).
- The distribution of radioactive materials via a dirty bomb (Radiation Dispersal Device). A dirty bomb is radioactive material packaged with explosives for the intended purpose of spreading radiation (Health Physics Society 2005).
- Improvised Nuclear Device (IND): the formation of a nuclear-yield reaction that can be an improvised weapon with acquired nuclear materials, or modification to a U.S. or foreign nuclear weapon (Health Physics Society 2005).

PHASES OF A RADATION RESPONSE

To help define the role of law enforcement in response to a radiological or dirty bomb attack it is essential to understand the three phases of response under that particular scenario (DHS 2008). According to the Department of Homeland Security (DHS, Preparedness directorate; Protective Action Guidelines 2006, p. 176) these phases are defined as the early phase, intermediate phase and the late phase. Below is a summary of each phase based on DHS descriptions:

1. Early Phase The first phase is referred to as the "Early Phase" which is the emergency phase. This period starts at the onset of the emergency and can range in time from several hours up to several days. During the early phase, the initial protective actions by public safety personnel, such as fire, law enforcement and EMS,

will be taking appropriate actions such as isolating the scene, denying entry and identifying the nature of the incident.

Additional actions including sheltering populations in place, potential evacuation, initial treatment, transportation and decontamination of victims, scene stabilization and public health protective actions will occur during the early stages of the incident measured in hours (DHS 2006). "The first people likely to respond to a radiation emergency are the same law enforcement, firemen, hazardous materials teams, emergency medical technicians who respond to other emergencies (NCRP 2006, webpage press release)."

2. Intermediate Phase The intermediate phase will overlap with the early phase but is usually assumed to begin once the initial control and protective action decisions have been made. During this time, more technical information is gathered regarding field measurements of total exposure and specific characteristics of the radioactive materials involved. The timeline for the intermediate phase is assumed to be weeks to months until the protective actions of the incident are concluded. This phase will overlap with the final phase of the incident where initial considerations for recovery and cleanup actions are considered (DHS, 2008). The role of law enforcement becomes more traditional during this phase.

3. Late Phase The late phase is the final phase of the radiation incident. During this phase actions will be taken to reduce the radiation levels in the environment and make way for recovery of the affected area from the incident. In this period, there is no longer an "emergency situation." The collaboration of community, regional and federal leaders will be essential to the restoration of the site to encompass sound decisions in making cost-effective decisions. As currently provided by EPA standards, twice the background radiation levels is considered

"contamination." During the recovery stage of a radiation incident, it may become cost prohibitive to clean up a large area to such an exact standard, requiring the input of community stakeholders to make choices based on sound scientific data (DHS 2008). By this time law enforcement personnel would have returned to normal operations and would only be used on a requested basis from a monitoring agency.

RESPONSE TO A DIRTY BOMB ATTACK

Response to a radiation accident differs from response to a radiological terrorist attack. Accidents generally happen in radiation facilities where there is resident expertise and pre-planned response guidelines for specific releases of known materials. Often there is a sufficient time in anticipation of the accident to activate pre-developed response plans (*Federal Register* 71, no. 1, 2006). Radioactive materials involved in accidents are generally well identified and the hazard is immediately known once an accident occurs. Both the transportation routes and location of fixed facilities for large radioactive sources are located in areas where accidents, generally, will impact the least amount of people (*Federal Register* 71, no. 1, 2006).

Conversely, terrorist attacks will be intentionally committed in areas where the largest impact will occur. The radionuclide or quantity will not be immediately known and will remain unknown until responders arrive on scene with appropriate equipment to evaluate the hazard. Protective actions will be needed immediately. Without a specific radiation response plan, emergency workers may find themselves over-committed in the contaminated area, becoming contaminated and exposed to harmful radiation levels. "Response techniques, therefore, must be modified so that emergency responders are able to protect themselves while saving as many lives as possible (Ferguson et al. 2004, p.91)."

- Defining the exclusion zone is the most important first response, and a simple alarming dosimeter is the most useful piece of equipment for initial radiation response (Conca & Reynolds 2006).
- By following emergency response protocols for radiation that are aligned with nationally recognized standards for allowable dose rates to radiation for emergency response, first responders can operate safely in the initial phase of a radiation incident (Conca & Reynolds 2006).
- The greater the dispersion of material, the greater the affected area, but the lower the radiation dose rate (Conca & Reynolds 2006).
- Individuals with no significant physical injuries should not be significantly contaminated (Conca & Reynolds 2006).
- Firefighting PPE will be sufficient protection for alpha and beta radiation, nothing will be practical to wear to protect from gamma radiation. Utilizing time distance and source shielding is the most practical approach to protection from gamma radiation (Conca & Reynolds 2006).

Early detection is critical, but the radiation dose monitoring of first responders is also important to ensure their doses are kept within safe ranges during the incident.

The early notification and accurate assessment of a radiological event is absolutely paramount in the management of a radiation emergency. Most fire agencies throughout the country have dosimeters at their disposal to detect radiation in the atmosphere. However, many law enforcement agencies do not have this technology in use. They are reliant on others to inform them of an attack and then acquire the needed detection devices after an incident response has begun. The procurement and distribution of radiological dosimeters to the area law enforcement

agencies is essential. Law enforcement in most cases will be the first arriving emergency resource on scene. Therefore, they need to have the early radiation detection capability to ensure the proper protective actions and notifications are made during the initial stages of a radiation incident. Law enforcement agencies, especially those in high risk areas around the country, must have and deploy dosimeters to all front line personnel.

There are several basic tasks a law enforcement officer must complete when responding to a dirty bomb attack (Drielak & Brandon 2000). They are:

- Scene assessment.
- Site security.
- Stopping further harm from occurring.
- Aiding the injured.
- Initiating a criminal investigation.
- Assisting other agencies in performing their duties.
- Restoring order and public confidence.

There will be many things for the initial responding personnel to think about prior to and after they arrive on scene of a dirty bomb attack. Below is a list of recommendations by Steven Drielak and Thomas Brandon (Weapons of Mass Destruction, Response and Investigation 2000, p. 199-200) for what types of information should be gathered by communication officers, and what types of protocols first responders and supervisors should follow:

Communications:

- Determine whether the incident has occurred, is ongoing, or is a threat.
- Obtain as much information about the situation as possible including the following:

- What types of materials are involved?
- How many people are affected?
- What are the signs and symptoms of the injured people?
- Has there been a fire or explosion?
- What is the exact location of the incident?
- Assign sufficient personnel, including supervision, to the initial response.
- Make other notifications as requested by response personnel.

First Responders:

- Approach the scene from an upwind and uphill direction.
- Park vehicles a safe distance from the scene and keep access routes open for other emergency traffic.
- Be alert for the possibility of secondary or additional devices.
- Do not touch or otherwise handle any suspect devices or materials.
- Restrict access to the scene.
- Identify and record those leaving the scene.
- Avoid contact with contaminated victims.
- Request additional assistance, including specialized resources such as bomb squads and HazMat teams as soon as possible.
- Assist in the evacuation of the danger area.
- If the material is identified, refer to the appropriate guide in the *North American Emergency Response Guidebook*.
- Isolate the affected areas and victims.
- Assist in directing victims to decontamination or triage areas.
- Provide security for the scene.

Supervisors:

- Establish a command post in conjunction with other agencies.
- Notify appropriate investigative personnel.
- Request sufficient manpower and resources to secure the perimeter.
- Maintain strict accountability of law enforcement personnel at the scene.
- Designate a staging area for law enforcement resources.
- Begin assigning positions within the ICS.
- Designate a media area.
- Establish an incident log to document all actions taken.
- Ensure the appropriate notifications have been made.

RECOGNITION OF DEVICES

All law enforcement officers should have a working knowledge to recognize a RDD attack before, during and after an incident. There is a great likelihood that officers will be called upon to search the area to determine if any other devices are present.

Detection devices should be made available to law enforcement personnel. Detection devices available are things such as canines, chemical agent detectors, direct reading instruments and radiological detection equipment.

When searching for a suspected RDD an officer should keep the following in mind (Drielak & Brandon 2000, p. 26-27):

- Do not touch or otherwise disturb anything they consider to be suspicious; secure the immediate area and call for expert assistance.
- Do not become complacent while searching.
- Do not stop searching or become less vigilant when a suspicious item is located; there may be several well hidden devices.

- Those conducting the search should not use devices such as radios and cell phones.
- The search should be conducted in a methodical manner so that no area is overlooked.
- Do not overlook obvious locations where a device may be located.

SCENE SECURITY

When a dirty bomb attack takes place, a crime has been committed. A top priority for responding law enforcement personnel will be to ensure the preservation and security of the crime scene. The scene will be divided into three areas. The first is the hot zone or restricted zone. The second is the warm zone, otherwise known as the limited access zone or contamination zone. The third zone is the cold zone also known as the support or safe zone.

The restricted zone will be for personnel who are equipped with the proper PPE. Personnel entering this zone would include rescuers of victims, investigators, HAZMAT personnel and those needed to render the device safe (Drielak & Brandon 2000).

The limited access zone will also require the use of PPE. Decontamination will take place in this zone. Here entrance and exit corridors will be established for entrance into the restricted zone (Drielak & Brandon 2000).

The support zone will be the last area of restricted access and does not require PPE. The command post and support operations will be in this zone. Things included in this zone may include staging areas, media area, and medical facilities (Drielak & Brandon 2000).

The outer layer of scene security for law enforcement begins in the support zone. This is similar to any other crime scene, just on a larger scale. All personnel

entering this area should be identified and documented to preserve the crime scene. This process will continue as personnel continue through all other zones. Having a secure scene is critical to the investigation of the incident. A secure scene will accomplish the following objectives (Drielak & Brandon 2000, p. 48):

- Prevent potential witnesses and/or suspects from leaving the scene.
- Preserve evidence in place.
- Prevent others from entering a dangerous scene.
- Provide a safe working environment for other emergency response personnel.
- Limit the spread of radiological material beyond the scene.

Once the scene security is established, the criminal investigation can begin. The scene and the victims should be treated with the same degree of attention to details as all other types of violent crime. Suspects and witnesses should be identified. Preservation of the crime scene should become a priority (Drielak & Brandon 2000).

CONCERNS FOR LAW ENFORCEMENT IN THE CONTAMINATION AREA

Law enforcement will have to constantly remind themselves of the dangers they are facing when responding to an attack. First responders should employ the protection principles of time, distance, and shielding with regard to encountering victims and the scene. There are many immediate dangers to consider such as victims may be contaminated and that can pass from victim to responder. Rescuers may have to enter the restricted zone to retrieve victims and must be properly protected. There may be structural damage in the area the device was detonated. Secondary devices may also be present.

MEDICAL TRIAGE AND TREATMENT. Law enforcement personnel will have many tasks to perform during a radiological incident, some of which will be outside the scope of traditional law enforcement. Besides handling security and crime scene

control first responding officers will have to assist fire and medical personnel in the performance with medical triage, treatment and transport of radioactively contaminated patients.

The International Atomic Energy Agency (IAEA) states that in virtually all cases there will be little or no health risk to response personnel provided the follow personal protection guidelines. There should not be a health hazard to medical staff treating or transporting of contaminated persons provided that they protect themselves against the inadvertent ingestion of radioactive material; this is accomplished by the use of normal barrier methods (use of surgical gloves and mask) and actions to prevent the spread of contamination (e.g., to cover the patient in a blanket or sheet), and removal and storage of outer clothing (International Atomic Energy Agency 2004).

The national standards stated by the U.S. Department of Transportation, Emergency Response Guidebook, states under "First Aid," "the need to address medical considerations primarily in radiation incidents. Medical problems take priority over radiological concerns; use first aid treatment according to the nature of the injury; Do not delay care and transport of a seriously injured person; Injured persons contaminated by contact with released material are not a serious hazard to health care personnel, equipment or facilities; and Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and prevent spread of contamination (U.S. Department of Transportation 2004, p. 83)." This priority of medical treatment for radiological victims over decontamination is well defined in guidelines at the international, national and state levels. Training and cooperation at the local level for emergency responders will be a key element of developing a regional response protocol that properly addresses contaminated

patient issues. Adhering to this set of guidelines is yet another responsibility local law enforcement will have to take on post attack.

CONTAINMENT OF EXPOSED PERSONS. During the aftermath of a dirty bomb attack, collection centers will have to be established to house exposure victims. This presents another challenge for law enforcement personnel. They will have to function as site security for these centers. That will require stretching already thin resources.

The containment centers will most likely be schools or other larger buildings that have been pre-established by emergency planners. Law enforcement will have to coordinate with fire and EMS personnel to make sure emergency response plans are followed. Law enforcement's will be responsible for the following:

- Site security; controlling access to the facility and not allowing victims to leave.
- Logistics; making sure the needed supplies can get access to the facility.
- Traffic; making sure routes are open so victims can be brought to the facility.
- Crowd control; ensuring victims or others don't overrun or overflow the facility.
- Self monitoring; making sure they have proper equipment on site so they don't become victims as well.

TRANSPORTATION

Transportation is another task of law enforcement when responding to an attack. This can be broken down into two categories: transport of officers to and from the scene and medical evacuations. If an incident involves a large number of victims, transportation routes must be established to move the victims to medical facilities. Traffic control must be established as early in the incident as possible. Staging areas should be established to prevent the scene from getting congested with vehicles. Once control of the transportation is lost it can be very difficult to get

back.

Law Enforcement Transportation. The most immediate way to respond to a dirty bomb is by the use of police vehicles. Depending on the locality that is attacked there could be anywhere from ten to five hundred vehicles flooding an area in a very short period of time. Supervisors must be aware of this and make plans for staging areas and traffic control points prior to an attack. Initial responding officers must be cognizant of a defensive posture and ensure they are not in a downwind hazard. Proper placement of the ICP is crucial. The ICP must be placed uphill, upwind or upstream to avoid the hazard. The ICP and staging areas must also be able to move to adapt to the situation. For police officers their vehicle is a mobile storage unit and office. All of their PPE and other needed supplies will be attached to their vehicle, making it a primary need of first responding officers.

Medical Evacuation. During a dirty bomb attack, the number of victims could vary greatly depending on the size of the device used. Like many incidents involving WMD, there may be far more victims than first responders. This includes ambulances to evacuate the wounded out of the containment zone or from triage centers to hospitals. Because of this, it is very likely that law enforcement vehicles will be used to transport the victims. This is not unheard of for law enforcement and many agencies already train to evacuate down officers.

When tasked with transporting victims of a radiological incident, police officers should already have training on precautions. In almost all cases, the immediate transport of patients, whether contaminated or not, will not be delayed for decontamination actions provided that there is not a chemical component to the contamination. (Chemically contaminated patients will be decontaminated prior to treatment or transportation. Unlike radiation contamination, chemical contamination

does potentially pose a primary hazard of cross-contamination to medical care providers) (Bushberg et al. 2008). After using police vehicles for transportation, exposed victims and equipment, the victims will need to be surveyed for radiological contamination/exposure levels prior to being released from duty or reassigned.

Law enforcement will also assist in working within the framework of community planning that should have been in place prior to the attack. This allows for the use of buses or trucks to transport the victims in addition to medical vehicles. This will decrease or eliminate the need to use police vehicles for victim transportation purposes.

DECONTAMINATION

Although not a function of law enforcement, decontamination is yet another issue they will have to deal with at an attack scene. Many officers may have been exposed to radiation and not even know it. Many will continue to carry on with their duties unaware. Officers should be trained in decontamination techniques so they are familiar with what will occur after an exposure to radiation.

Decontamination procedures will depend on the type, size and scope of the attack. Incident specific considerations may include, but are not limited to, weather conditions, ambient temperature, additional hazardous materials/hazards associated with the incident, the logistical concerns of decontaminating large volumes of people in an expedient manner, and the geographic magnitude of the area of involvement.

According to the US Department of Energy (MERTT 2006), the following functions may be required of law enforcement officers while assisting fire and medical personnel during the initial response phase to the disaster:

- Provide First Aid.
- Remove clothing if appropriate.

- Wrap patient in a blanket to minimize contamination.
- Only expose areas required to assess and treat patient.
- If necessary, cut and remove the patients clothing away from the body being careful to avoid contamination to the unexposed skin.
- Properly contain all removed clothing by placing it in a sealable bag.
- Continue to reassess and monitor vitals while in route to a medical facility.
- Contact with the patient may result in transfer of contamination, so change gloves as necessary.

TACTICAL OPERATIONS

Although often not thought of, tactical operations may be critical during an incident. For example, a suspect may be hiding with another device ready to detonate. Depending upon the situation, a tactical operation might have to be undertaken inside the restricted zone. Many tactical or SWAT teams train for and have the needed equipment of this type of operation.

For a tactical operation to take place, teams will already be working at a disadvantage. They will be wearing cumbersome PPE that will interfere with the weapons and tactics often used. Therefore, emphasis should be placed on securing the premises as quickly as possible and removing any subjects immediately. Tactical operations inside the restricted should include a detailed briefing of things to be on the lookout for and things not to do. Teams should be looking for booby traps; and should be advised to avoid touching switches or opening unnecessary doors. They should be precluded from using items that produce sparks or flames. They should go around containers and not move those (Drielak & Brandon 2000).

Specialized equipment will have to be utilized during an operation in a restricted zone. Some of these items include: fire extinguishers, first-aid kits, less

lethal weapons, dosimeters, explosion-proof lights, disposable clothing, thermal imaging devices, video cameras, video equipped robots, fans, special vehicles, medical antidotes, and "safe" radios (Drielak & Brandon 2000).

TRAINING FOR LAW ENFORCEMENT

Today there are more training and equipment options available to law enforcement for a response to a radiological attack than ever before. Training is offered by both federal and state governments in addition to local "in-house" training. The main sources of training for a response to a dirty bomb attack are through the network of schools and courses delivered by the federal government. The best and most complete training is offered by the Department of Homeland Security. The Training Exercise Integration Office within the Department of Homeland Security manages a consortium of "Training Partners" to provide ten categories of responders, with the best and most up-to-date training available. The "Training Partners" include the Center for Domestic Preparedness (CDP); the National Center for Biomedical Research and Training (NCBRT), Louisiana State University (LSU); the National Emergency Response and Rescue Training Center (NERRTC), Texas Engineering Extension Service (TEEX); the Energetic Materials Research and Testing Center (EMRTC), New Mexico Tech Institute of Mining and Technology (NMIMT); and the National Center for Exercise Excellence (NCEE), Nevada Test Site (NTS), University of Hawaii, National Disaster Preparedness Training Center, and Transportation Technology Center, Inc. (TTCI), and the National Center for Emergency Response to Surface Transportation. These seven members constitute the National Domestic Preparedness Consortium (NDPC).

Additional training in this initiative is provided by: Community Research Associates (CRA); US Army Dugway Proving Ground (DPG); the International

Association of Fire Fighters (IAFF); the Naval Post Graduate School (NPS); the National Sheriff's Association (NSA); General Physics Corporation (GP) at Pine Bluff Arsenal (PBA); Science Applications International Corporation (SAIC); George Washington University (GWU); Michigan State University (MSU); National Terrorism Preparedness Institute (NTPI); International Association of Campus Law Enforcement Administrators (IACLEA); and International Association of Chiefs of Police (IACP) (DHS 2008).

These "Trading Partners" offer different levels of training to law enforcement officers based on the specific job function the officer performs. For example, the Center for Domestic Preparedness (CDP) offers hands-on specialized training to state and local emergency responders in the management and remediation of radiological and other WMD incidents. Located at the former home of the U.S. Army Chemical School at Fort McClellan, Alabama, the CDP conducts live chemical agent training for the nation's civilian emergency response community. The training emergency responders receive at the CDP provides a valid method for ensuring high levels of confidence in equipment, procedures, and individual capabilities (DHS 2008).

The Louisiana State University Academy of Terrorist Education (the National Center for Biomedical Research and Training) provides training to local law enforcement agencies and focuses its efforts on the delivery of the Emergency Response to Terrorism: Basic Concepts for Law Enforcement Course, and the development and delivery of the Emergency Response to Domestic Biological Incidents Course (DHS 2008).

The Texas A&M (National Emergency Response and Rescue Training Center) delivers a set of courses to prepare state and local officials for the threat posed by weapons of mass destruction. Courses are developed and designed to provide each

specific segment of the emergency response community with the tools needed to accomplish its role in the event of a WMD incident. Additionally, Texas A&M has developed an Interactive Internet WMD Awareness Course for emergency responders. Texas A&M also provides technical assistance to state and local jurisdictions in the development of WMD assessment plans (DHS 2008).

The U.S. Department of Energy's Nevada Test Site (National Exercise Test and Training Center) conducts large scale field exercises using a wide range of live agent stimulants as well as explosives. NTS develops and delivers a Radiological/Nuclear Agents Course (DHS 2008).

Of all of these, The National Center for Biomedical Research and Training at Louisiana State University offers the most complete courses for basic law enforcement needs. The other partners offer excellent training for law enforcement officers and can go beyond the basic needs of the front-line officer responding to a WMD attack. The programs offered by this center provide an effective way to train local law enforcement with the most up-to-date training on responding to WMD incidents. The center offers a variety of programs that cater to local law enforcement in jurisdictions of all sizes. The programs are offered at different levels and are all geared to the front line responders. Courses offered include: Law Enforcement Prevention and Deterrence of Terrorist Acts, Emergency Response to Domestic Biological Incidents, Weapons of Mass Destruction Tactical Operations, Public Safety WMD Response – Sampling Techniques and Guidelines, Operational WMD Response for Law Enforcement, Weapons of Mass Destruction Advanced Tactical Operations, Utilizing Computer Aided Management of Emergency Operations, Weapons of Mass Destruction Tactical Commanders and Preparedness and Response

to Agricultural Terrorism, and Integrated Response to Incidents of WMD (NCBRT 2008).

EQUIPMENT NEEDED FOR A DIRTY BOMB ATTACK

Protection levels are mandated in CF 29-1910-120 which are federal and OSHA statutes. CFR 40 EPA provides similar mandates. Additionally, The Centers for Disease Control and Prevention (CDC) offer numerous recommendations for equipment based on the type of threat environment that is encountered. They direct that use of Personal Protective Equipment (PPE) be based on a level system. The levels are A to C.

Level A is the highest level for using the maximum amount of PPE to include fully encapsulating non-permeable splash protective suits and self-contained breathing apparatus (SCBA). This is geared to hazardous materials teams and would not likely be used by law enforcement. However, if law enforcement personnel are trained as HAZMAT Techs it would benefit the community as means of early detection and reporting in case of an attack.

Level B (the minimal level of protection for entering an environment of an unknown hazard) puts the first responder in protective clothing designed to provide protection against liquid and aerosolized chemicals and use of an SCBA.

Level C requires protective clothing and the use of an air-purifying respirator (APR), more commonly known as a protective mask. Law enforcement currently operates on the basis of Level C protection. The protective equipment is made up of a Tyvek suit (a chemical protective coverall) and a gas mask with different filters to provide protection against different types of chemical and biological agents (29 CFR 1910-120 1997).

Research suggests that the standard for law enforcement today is Level C protective equipment. Level C provides a recognized level of protection for the contamination reduction zone where law enforcement may be stationed. Level C PPE consists of a full-face respirator, chemical protective clothing, chemical protective gloves and foot covers. It is also important that the responder know the limitations of the protective suit. This make up of protective equipment and should provide all the protection the first responding police officer should need (US Army Solider Biological and Chemical Command 2003).

Communication is another area in which equipment needs were reviewed. Research found that local law enforcement must have the ability to communicate with each other through radio channels and have plans for a unified command post. For example, during the 9/11 attack on the Pentagon, the Arlington Police Department's pager system did not work efficiently with many pages not getting to essential personnel (Arlington County AAR 2004). A true and tested communication system is a necessity. Having extra radios, fax machines, and computers will aid in the response.

Vehicles were found to be the last type of equipment that was needed in a response to WMD attack. Law enforcement must have the necessary type and number of vehicles for response or, at a minimum, have access to them. The types of vehicles needed should include buses, four wheel drive vehicles, ATV's, tactical team vehicles, and prisoner transport vehicles. In addition, command and control vehicles allow for consolidation of a command post. Plans should be in place to decide where to assemble, store, acquire and locate needed transportation for law enforcement (IACP Project Response 2006).

ADDITIONAL RESPONDING AGENCIES

State Assistance. Local law enforcement will not go it alone during a disaster of this magnitude. Federal agencies will play a key support function for tasks extending beyond the abilities of local law enforcement. State resources will also come to bear in the response and recovery operations. State departments of health, emergency management, state police, emergency medical services and civil support teams will all play important roles.

Primarily, state police agencies will assist local law enforcement with traffic control, scene security, and command and control issues. Many states also have HAZMAT teams stationed at various locations within the state. In many cases they may become first responders. State departments of health and medical services will also be called upon to respond and assist during an attack. Hospitals and other state maintained health organizations will be prominent during the incident. Because each state varies in how it responds to an attack, only general assumptions can be made about response without detailing each individual state's plans and organization.

Federal Assistance. Local law enforcement will need to coordinate with numerous federal agencies during the initial phase of a dirty bomb attack. Officers on the scene should have some idea of who those agencies are and what functions they perform because many of the responding federal agencies will be unknown to front line officers.

Department of Energy (DOE). Most of these agencies will be from the Department of Energy (DOE), under the National Nuclear Security Administration (NNSA).

Possible responding agencies from DOE and NNSA are:

- Atmospheric Release Advisory Capability (ARAC)

- Accident Response Group (ARG)
- Federal Radiological Monitoring and Assessment Center (FRMAC)
- Nuclear Emergency Support Team (NEST)
- Radiological Assistance Program (RAP)
- Radiation Emergency Assistance Center/Training Site (REAC/TS)

RAP, with areas of expertise including assessment, area monitoring, air sampling, exposure and contamination control is usually the first NNSA responder for assessing the emergency situation (DOE 2005).

Department of Homeland Security (DHS). According to NRF NUC 1, the DHS is responsible for the overall coordination of all actual and potential types of incidents of national significance, including most terrorist incidents involving nuclear materials. The National Response Framework (2008) (formerly the National Response Plan [2002]) under the Nuclear/Radiological Incident Annex (NUC-1) lists different types of incidents and which corresponding federal agency would be responsible for coordinating the response:

- Terrorism - DOD or DOE if occurrence happens on their facility or material under their control; NRC if material is licensed by the NRC or a contract with the state.
- For all other terrorism, DHS is the coordinating agency.
- Nuclear Facilities - DOE or DOD if it is their facility; NRC if licensed or agreement with state; unlicensed or not owned by a federal agency, the EPA becomes the coordinating agency.
- Transportation - DOD or DOE for their material; NRC for their material; DHS/USCG for materials in coastal zones for materials not licensed or owned by a Federal agency; all others are under the coordination of the EPA.

- Space Vehicles - NASA or DOD; DHS/USCG if not managed by DOD or NASA; all others, are the responsibility of the EPA.
- Weapon accident - depending on custody at the time of incident is either the DOD or DOE.

Federal Bureau of Investigation (FBI). The FBI is the primary agency for the federal government in regard to law enforcement response. FBI agents from local field offices will be among the first federal representatives to arrive and in some cases, may act as first responders. The FBI has a Hazardous Materials Response Unit (HMRU) which has sampling, detection, and identification capabilities that can be used. They have the ability to collect forensic evidence at a radiological crime scene. They also maintain Evidence Response Teams (ERT) that will be dispatched to assist in the investigation.

Federal Emergency Management Agency (FEMA). FEMA will be the lead agency for DHS during a radiological response. FEMA is responsible for coordinating supplemental federal resources, including the Urban Search and Rescue Teams (USAR). These teams will be able to aid in the location and recovery of victims if the attack involved destruction to structures. In addition, FEMA would likely solicit assistance from the other agencies listed below.

Department of Health and Human Services (DHHS). DHHS can provide health and medical expertise so needed after a dirty bomb attack. DHHS has Metropolitan Medical Strike Teams (MMST) positioned around the country to respond quickly if an attack takes place. They can assist with agent identification and detection, decontamination of patients, triage, and medical treatment. The CDC is a component of DHHS. The CDC can provide technical consultation and can provide response support for state and local health agencies.

Department of Defense (DOD). The DOD does not just coordinate activities of America's armed forces, it also supports civil authorities in recovering from multiple, catastrophic WMD attacks that occur within our borders (DOD, 2005).

In order to better support operations within the United States, the DOD created National Guard Civil Support Teams (CST) in 1998. Although listed under the DOD, CSTs are considered state assets under control of the governor. The mission of the CSTs is to deploy rapidly and support local agencies during a WMD incident. A CST will assist in determining the nature and extent of an attack and provide technical knowledge and assistance (GlobalSecurity.org 2008). CSTs' are of valuable assistance to civil authorities in the event of an incident involving weapons of mass destruction in the United States (GlobalSecurity.org 2008). These teams provide a bridge between federal and local authorities to allow for a better response to a radiological incident. Additionally, the DOD will be able to access many of its other resources to assist, such as providing medical teams, air/ground transportation, scene security, supply delivery, command and control facilities and communication equipment.

Some of the other units available from the DOD are (Drielak & Brandon 2000, p.73):

- US Army Technical Escort Unit (TEU): Field sampling, monitoring, recovery, rendering safe, and decontamination.
- US Army Military Research Institute for Infectious Disease (USAMRIID): Technical consultation, biological assessment and identification.
- US Marine Corps Chemical Biological Incident Response Force (CBIRF): Rapid response force, agent identification, hazard prediction, decontamination, medical treatment, and security.

GUIDELINES FOR A FEDERAL RESPONSE

Over the last two decades the federal government has revamped much of the way it plans for and responds to a disaster or terrorist attack. One of the biggest changes was the development of the Department of Homeland Security. The Department of Homeland Security (DHS) is responsible for overall coordination of all actual and potential "Incidents of National Significance," including terrorist incidents involving nuclear material (NRF 2008). This is done in accordance with Presidential Directive-5 and is described more fully in the National Response Plan. Federal response to any specific incident is based on the local agencies' ability to respond, identify the amount of material involved, the extent of the impact to the environment on populations and the overall magnitude of the incident (NRF [NUC-2] 2008).

Local agencies should also understand that federal agencies can respond without the request of the state within their own statutory authority. Federal agencies will do this in order to assess hazards associated with a radiological event and to decrease time lags in the notification process. A National Defense Area (NDA) or National Security Area (NSA) can be established by the DOD, DOE or to safeguard classified information. The area involved will fall under federal control for reasons of national security (NRF [NUC-5] 2008).

The National Response Framework dictates how federal agencies will respond and work during a time of disaster (DHS 2008). NRP establishes protocols to help protect the nation from terrorist attacks and other natural and manmade hazards; save lives; protect public health, safety, property and the environment; and reduces adverse psychological consequences (DHS 2008). All incidents are to be handled at the lowest level possible by the jurisdiction having authority. Any incident that rises to the "level of national significance," DHS will serve as the operational and/or

resource coordinator for federal support to the on-scene incident command (DHS 2008).

NIMS and ICS

The key element in any successful disaster response involves having a set of standards and guidelines established before catastrophe strikes. The federal template is called the National Incident Management System (NIMS). NIMS "provides a nationwide template enabling federal, state, local and tribal governments and private-sector and nongovernmental organizations to work together effectively and efficiently to prevent, prepare for respond to, and recovery from domestic incidents regardless of cause, size, or complexity (FEMA 2004, website)." Not only are all federal agencies guided by NIMS, but so are state and local jurisdictions.

On February 28, 2003, President George W. Bush issued Homeland Security Presidential Directive/HSPD-5. This is the foundation for three basic plans to establish a unified command and control structure, detailed below.

First, a National Response Framework was established to deal with and protect the country from natural or manmade disaster. Next, a National Incident Management System was drawn up to train and prepare America's first responders and others for disaster response. Finally, under NIMS an Incident Control System (ICS) was structured as an on-scene command and control structure.

HSPD-5 also called for a timetable for setting up NIMS and getting it in working order and out to the states. NIMS provides a set of guidelines for command and control that each federal, state and local agency must follow. Employees of these organizations are given classes on NIMS and are required to demonstrate knowledge of the system. In many cases police officers and firefighters are given pocket guides to illustrate how NIMS is structured. Additionally, federal funds for state and local

agencies are now tied to NIMS compliance.

Each agency, whether it is federal, state or local has to operate uniformly when a disaster strikes. With that in mind, the federal government set out to establish a new set of standards everyone can follow. This did not apply to just government organizations, it applied to private industry and non-governmental organizations as well.

Other government agencies and private organizations have adopted the use of an Incident Command System (ICS). These organizations have recognized that the concept works and compliance with those protocols can only benefit them. Although they are under no mandate to create an ICS plan, most have set up guidelines or standards within their organizations that mimic the standards set forth in NIMS.

V. ANALYSIS AND CONCLUSIONS

A dirty bomb attack will most likely be an attack of terrorism. This could include the use of a radiological dispersal device, a radiation proximity device or a release of radiation from an established facility. A dirty bomb will arguably exceed the capabilities of local law enforcement's ability to adequately handle the incident. The local police will focus on isolating the area, identifying the hazards associated with the emergency, scene security, traffic control, assisting with transporting the seriously injured, and reporting their needs for state and federal resources support.

Law enforcement will assume a variety of roles during a dirty bomb attack. They are not just going to be first responders in the traditional sense. The presence of law enforcement will be required for the duration of the incident. Although many of the tasks they are responsible for are typical police functions, many others are going to be outside the normal functions performed on a daily basis.

A plan must be in place before an attack occurs. Pre-planning and prior

coordination of local, state and federal resources to mitigate the incident should be addressed in a radiation response protocol. The coordination of initial response through recovery of affected infrastructure and population centers can help to ensure the most effective use of resources and enhance the efficiency of emergency operations.

A regional radiation response plan will ensure an effective response plan including, triage, treatment, decontamination, transportation of victims, and collaboration with regional, state and federal agencies in a fiscally responsible manner. The improved treatment and transportation of contaminated patients will improve the survival profiles of victims and reduce the likelihood of agencies being held liable for failure to respond, protect emergency personnel, and treat victims in the aftermath of a radiation event to a level that meets recognized industry standards.

Proper protective equipment is a must if officers are going to survive an attack and then continue to perform in its aftermath. Law enforcement will need to be provided with dosimeters to alert them of high radiation concentrations. This equipment will need to account for both the long-term dose monitoring while working in the contaminated environment and warning personnel when predetermined thresholds of exposure have been exceeded. Again, ensuring officers are equipped with PPE should be a top priority for any law enforcement agency. The level of PPE needed will vary depending on the assignment of each officer. Agencies should maintain a variety of this equipment. At a minimum, the purchase of a small number of detection/dosimeter devices should be required to equip frontline personnel.

The equipment should be readily available to be deployed to responding personnel during the initial stages of an incident. This should be a key element in the

any response protocol for local law enforcement. The deployment of the proper equipment may be realigned amongst personnel having the greatest risk of exposure to radiation during the incident. Those at risk of greatest exposure can be defined as personnel having response responsibilities in the exclusion zones, including resources such as HAZMAT response teams, decontamination personnel, medical response resources, or tactical elements of law enforcement. Protective equipment may also be distributed to support zone personnel such as perimeter security, transportation assets and command staff.

In the event of an attack, the incident commander (in concert with his safety officer) will determine the appropriate level of PPE in the hazardous environment. For law enforcement that recommendation will most likely be that a Level C suit (a protective suit, gloves, boots and a gas mask) be worn. For officers conducting tactical operations, a Level B or even a Level A suit may be required. In the future law enforcement agencies should look toward SCBA gear and lighter, more user-friendly protective suits. This will allow for easier storage of equipment in agency vehicles. Mainly, it will allow officers operating in the area to be comfortable while performing tasks.

Communication will play a vital role in the response effort. Agencies must have systems that can work together or have plans for a unified command center where information can be exchanged, redundancy of resources minimized, and plans put into action. Radio communication is the primary means of communication. Every officer should be equipped with a portable radio. Additionally, all officers should have a "card" with them that shows which channels on the radio are to be used and what assignment each radio channel maintains. Portable communication towers and relay equipment should be brought to the scene in case the device knocked out power or a

pre-existing communications tower is in the area. If possible officers should be assigned cellular phones as a back-up form of communication. Radio systems in place must also be able to be "patched" with other responding agencies. This will allow all officers working the field to communicate, no matter what police agency they work for.

Vehicles are another consideration for law enforcement. Each agency should have a pool of vehicles available for use during a dirty bomb attack or at least have locations or plans to obtain the necessary transportation. Buses, mobile command centers and all-terrain vehicles will be among the most needed during an incident. Vehicle staging areas should be set up to reduce traffic and prevent the congestion of the roadways near the incident. Ideally officers will have needed PPE and other equipment in their vehicle with them before an incident occurs.

Training of law enforcement personnel prior to an incident is a must. Even if the best equipment available, it will do no good if officers are not trained how to use it. Radiation awareness and operational levels of training combined with the study of policies related to responding to a radiation emergency will be required. Training must also address the element of fear. The knowledge of radiation and understanding the response protocol will go a long way to reducing that fear in responding officers. The utilization of recognized national training programs facilitated by federal agencies in radiation response will ensure consistency of information across response disciplines and between localities.

Training sites are located throughout the country which offer the best and most comprehensive training available today. The Training/Exercise Integration Office for the Department of Homeland Security provides a consortium of "Trading Partners" working together to provide training to local law enforcement on all WMD issues.

These different programs, federal training centers and many connected with major, well respected universities, offer flexible training programs both at their facilities and in local jurisdictions. Local departments should be made aware of these programs and routinely send officers to these different types of training. Although it may not be possible to send every officer in a department it would be wise to at least send frontline supervisors. Upon return to their respective agencies, they can pass along the knowledge gained to other personnel.

The role of the law enforcement officer during a dirty bomb attack is not easily defined. There are so many unknowns about the type of devastation that will be caused depending on the size and location of the attack. There is no prior attack to analyze and use as a baseline for comparison. Based on the research conducted, officers will perform the following tasks in response to an RDD attack:

- Site security
- Traffic control (controlling access to and from scene, keeping roads clear)
- Tactical operations
- Command and Control (in concert with other responding agencies)
- Transportation
- First Aid/assist with triage
- Security at support sites
- Crime scene preservation
- Investigative assistance (FBI will assume primary role)
- Perform normal police functions in unaffected areas
- Create and maintain staging areas
- Report needs and situation to command center

During an attack a police officer will have to wear many hats but the primary goal of

the individual police officer will be to preserve life.

Local law enforcement agencies should plan for the future. Principles learned and followed for a response to a radiation attack will be able to be used in response to other types of WMD incidents. Agencies must not become complacent because an attack has never taken place. The time and place of an attack cannot be predicted. A strike could occur in rural America, at a nuclear power plant, or in a major city using a dispersion device. All agencies in the country should routinely send personnel to training courses related to an RDD attack. All officers within in agency should have at least a basic knowledge of what an RDD attack is and the response protocols. Often not thought of is supplying officers with dosimeters or radiological detection devices. Since frontline officers will be the first to respond, it would only make sense they have this capability. Agencies should plan to have access to the variety of vehicles that will be needed. Local law enforcement agencies must take the initiative and plan now how to respond to an RDD attack and not be caught unprepared in the event an attack does take place in their community.

Law enforcement agencies and officers will undoubtedly be pushed to the extreme if a dirty bomb attack takes place in their jurisdiction. No one agency can be solely responsible for the mitigation, planning, response and recovery from such a devastating type of attack. Planning, training and equipping those front-line men and women will be critical to achieving a successful outcome. Certainly law enforcement officers dread the day when they might have to put that training to the test. But when that day comes, officers should be confident that they have the knowledge, skills, plan, training and equipment needed to respond and work in such a horrible and unforgiving environment.

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DEFINITIONS

- **Electromagnetic radiation:** Defined by the modular emergency response radiological transportation training program (MERRTT) as visible light, heat, radio waves, and microwaves which are low level radiation energy which is referred to as non-ionizing radiation.
- **High-energy radiation is referred to as ionizing radiation.** Ionizing radiation is of sufficient energy to eject an electron from an atom, thereby changing the electron configuration of the atom and thus its chemical properties. This is the initiating event that can ultimately lead to biological damage and the potential adverse health consequences of ionizing radiation.
- **Radiation physical half-life (Tp1/2):** The time required for a quantity of a radionuclide to decay (i.e., transform) by one-half. Some radionuclides have a Tp1/2 of a few hours (e.g. Tc-99m used widely in Nuclear Medicine- Tp1/2=6 hrs), or many years (e.g. Cs-137 used in instrument calibration facilities Tp1/2=30 yrs and U-238 found in nature Tp1/2= 4.5 billion years (FEMA 2002).
- **Radioactive material:** Any material that spontaneously emits ionizing radiation (GSA 1978).
- **Radioactive contamination:** Radioactive material where it is not intended (FEMA 1990).
- **ALARA:** Acronym for "as low as (is) reasonably achievable." Means making every reasonable effort to maintain exposures to ionizing radiation as far below the dose limits as practical, taking into account the state of technology, the cost of incremental reductions in dose, and other societal and socioeconomic considerations, regarding the utilization of radioactive material in the public interest (FEMA 1990).
- **Total Effective Dose Equivalent (TEDE):** The sum of the internal and external doses of radiation exposure (FEMA 1990).
- **Inverse Square Law:** The relationship that states that electromagnetic radiation intensity is inversely proportional to the square of the distance from a point source. Thus reducing the distance from a radiation source by 1/2 increases the exposure rate four times. The same law works in reverse, whereby increasing the distance from a radiation source by a factor of 2 reduces the exposure rate four fold (FEMA 1990).
- **Fissile Material:** Any material in which neutrons can cause a fission reaction. The three primary fissile materials are uranium-233, uranium-235, and plutonium-239 (FEMA 1990).
- **Low Specific Activity (LSA):** Radioactive material with limited amounts of radioactivity relative to the amount of the material. An example would be uranium or thorium ores, mill tailings or contaminated earth (FEMA 1990).

- **Special form radioactive material:** Can be either a single, solid piece of material, or a sealed capsule that can be opened only by destroying the capsule. Special form material is considered to be non-dispersible during accident conditions. Special form material should not be confused with "Special Nuclear Material" which is plutonium, uranium-233, or uranium enriched in isotopes uranium-233 or uranium-235 (NRP2004).
- **Surface contaminated objects:** Solid object that is not radioactive in of itself, but has radioactive contamination on its surface (NRP 2004).

APPENDIX

AAR – After Action Report
APR – Air Purifying Respirator
ATV – All Terrain Vehicle
CBRN – Chemical, Biological, Radiological, Nuclear
CBIRF – US Marine Corps Chemical and Biological Incident Response Force
CDC – Centers for Disease Control
CDC – Centers for Disease Control and Prevention
CDP – Center for Domestic Preparedness
CIA – Central Intelligence Agency
DNDO – Domestic Nuclear Detection Office
DGP – Dugway Proving Ground
EMS – Emergency Medical Services
EOC – Emergency Operations Center
EOP – Emergency Operations Plan
ERT – Evidence Response Team
ESU – Emergency Services Unit
FBI – Federal Bureau of Investigation
FEMA – Federal Emergency Management Agency
FTIR - Fourier Transform Infrared Spectroscopy
GRPI - Greater Richmond Partnership Incorporated
GP – General Physics Corporation
GWU – George Washington University
HAZMAT – Hazardous Materials
HMRU – Hazardous Materials Response unit
HSPD-5 – Homeland Security Presidential Directive 5
HSPD-8 – Homeland Security Presidential Directive 8
IACLEA – International Association of Campus Law Enforcement Administrators
IACP – International Association of Chiefs of Police
ICS – Incident Command System
IED – Improvised Explosive Device
MAC - Multi-Agency Coordination
NCBRT – National Center for Biomedical Research and Training
NCEE – National Center for Exercise Excellence
NDPC – National Domestic Preparedness Consortium
NIOSH – National Institute for Occupational Safety and Health
NMIMT – New Mexico Institute of Mining and Technology
NIMS – National Incident Management System
NRF – National Response Framework
NPR – National Response Plan
NSA – National Sheriffs Association
NTPI – National Terrorism Preparedness Institute
NTS – Nevada Test Site
NYPD – New York City Police Department
OCP - Office of Commonwealth Preparedness
OEM – Office of Emergency Management
OPGW - Organization for the Prohibition of Chemical Weapons
OSHA – Occupational Safety and Health Administration
PAPD – Port Authority Police Department

PBA – Pine Bluff Arsenal
PPE – Personal Protective Equipment
RDD - Radiological Dispersion Device
RUCS - Regional Unified Command Structure
RRT - Regional Response Teams
SAIC – Science Application International Corporation
SCBA – Self Contained Breathing Apparatus
TEEX – Texas Engineering Extension Service
TEU- US Army Technical Escort Unit
USAMRID – US Army Military Research Institute for Infectious Disease
USAR – Urban Search and Rescue
VDACS - Virginia Department of Agricultural and Consumer Services
VDEM – Virginia Department of Emergency Management
WMD – Weapons of Mass Destruction