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Publisher's Message

By Martin Masiuk

All too often, we learn a lesson the hard way when we start to believe that, "Since it hasn't happened, it probably won't happen." And from that the loss of competency follows. There are no easy answers when planning for an "unthinkable" disaster, but a lot can be learned by continuing the discussion. DomesticPreparedness.com is an information service for the many communities engaged in prevention, mitigation, preparedness, response, and recovery. In today's world, where threats and technology are constantly changing and emerging, the practitioners at all levels must have the opportunity to share and exchange critical lessons learned.

DomPrep is taking on the challenge of fully engaging its readers, listening to their expertise, and sharing that valuable knowledge with the world. Without losing the strong tradition and reputation built over the past 15 years, DomPrep is raising its own bar and asking readers to take a more interactive approach to preparing the nation for any disaster.

This issue is the first of a new publishing paradigm – start with a thought-provoking article, conduct a flash poll of the readers, then follow on with a podcast of subject matter experts, and provide analysis of key findings, then keep the discussion going through social media. This process will better engage and give a greater voice to emergency planners, responders, receivers, volunteers, local-state-federal authorities, and the private sector as they plan their work. In several issues in the upcoming year, DomPrep will implement this model based on reader suggestions and participation.

DomPrep readers face difficult – and sometimes "unthinkable" – scenarios everyday. Together as a community with a common preparedness mission, information can be shared, lessons can be learned, and gaps can be bridged before the next disaster. I look forward to receiving your comments and ideas.

Sincerely,

Martin (Marty) Masiuk
publisher@domprep.com

About the Cover: The symbolic mushroom cloud following a nuclear blast is widely recognized by the public, but many are unaware of the true devastation and effects of radiological fallout that would follow.

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Editor's Notes

By Catherine Feinman

The Cold War era was a time of heightened tensions between the world's superpowers, increased awareness of and propaganda about weapons of mass destruction, and elevated fear of the "unthinkable." To U.S. citizens at that time, "Duck and Cover" was more than just a civil defense slogan. In the years since the end of the Cold War, much has changed in the global threat environment. Threat levels – or at least the perceptions about various threats – rise and fall in waves. Lulls in actual terrorist attacks sometimes cause a psychological shift in the population from preparedness to complacency.

Craig DeAtley leads this issue of the *DomPrep Journal* by shedding light on a threat that may be out of the spotlight, but has not gone away – a nuclear detonation in a major metropolitan city. The first 72 hours following a nuclear blast are critical as survivors face many challenges – communication, evacuation, sheltering, response, and incident command. Much has changed over the past five years in planning, exercising, and healthcare preparedness, but how much is the question that this article raises.

A flash poll received more than 70 responses from DomPrep readers who answered this question and raised additional concerns of their own. "Preparing for the Unthinkable" summarizes these responses. DeAtley took the dialogue one step further to address these concerns and gaps by reuniting subject matter experts who had warned of the dangers in 2009 and addressed the issues that are still as real now as they were five years ago.

Stuart Cameron reminds everyone about the lessons learned during the development of nuclear devices – planning and sheltering plans should not be forgotten. Vayl Oxford and Richard Schoeberl recognize the growing complexity and level of danger that still exists and, in some ways, is worsening. Lessons learned over the past few decades, key findings from the Nuclear Security Summit, and five critical steps could each help mitigate the current nuclear threat to the nation.

Radiological threats caused by nuclear detonations, power-plant meltdowns, and dirty bombs are not always well understood. Courtney Gavitt saw firsthand how fast inaccurate information could travel among participants at the 2013 Boston Marathon. Even knowing the threat, the public may not understand the devices available to detect the threat. Joseph Trindal shares information about unmanned aerial vehicles and how they can enhance response capabilities. In Illinois, Curtis Hawk and Shay Simmons understand the risks and consequences of a radiological incident and share lessons learned from state exercises.

Regardless of the type of attack or disaster, the National Guard stands ready with Civil Support Teams to help during the planning and responding stages. Gordon Hunter removes the misconceptions that arose from a March 2014 DomPrep report on this valuable asset that should be in every local jurisdiction's toolbox.

Rounding out the issue is an article by Joseph Cahill that addresses the tough situations that emergency responders may have to face – preparing patients and their families to receive the "bad news." The role of responders is to save lives, but responders also must be prepared for the times when "lifesaving" efforts are not enough.

The "Day After Disaster" – Revisited

By Craig DeAtley, Viewpoint

In 2009, the History Channel ran a movie called the "Day After Disaster," which was about the detonation of a suitcase nuclear device in the nation's capital. Over the course of nearly 90 minutes, various experts provided commentary on what the consequences might be for this type of terror attack, not just for the District of Columbia and the national capital region but also for the nation as a whole. Among the implications mentioned, hospitals and other healthcare facilities would face tremendous strain.

Magnitude of the Incident

If an event like this were to actually occur, the consequences would be unlike any before in the United States. Some sobering details in the movie highlighted the challenges that the remaining part of any city's healthcare infrastructure, the adjoining region, and the national response system would face:

- Five thousand or more persons in the 0.6-mile epicenter (Zone 1) would be "vaporized," including first responders whose assignments place them near the nuclear device at the time of detonation. The blast also would destroy buildings and other tangible items within this zone.
- Ten thousand more people would die from the "flash of light" that would occur seconds after the initial explosion; and 15,000 additional people would be seriously injured from blast-wind debris and scalding heat – including some with temporary and permanent "flash blindness."
- The subsequent mushroom cloud that would occur a short time later and create a fallout zone of approximately 20 miles would kill and injure thousands more.
- The resulting electromagnetic pulse would sever power to electronic equipment, including but not limited to: airplanes in the sky; vehicles on the ground; and biomedical equipment such as intravenous pumps, ventilators, and electrocardiogram monitors.

Planning & Exercising

As with all other types of disasters, preplanning and training for this type of incident would be critical for doing the "greatest good for the greatest number of people." For decades, government planning has occurred at various levels and has been exercised in classrooms and simulation laboratories, but often in secret without involving all members who may be directly affected – for example, the healthcare community. Few communities have conducted well-integrated and realistic functional exercises to rehearse their response to a situation that would last longer and be more devastating than most incidents they are likely to confront.

The healthcare system in the nation's capital is now addressing this issue by having a multidisciplinary task force write a response plan template to assist all healthcare facilities in designing their own plans. Later in 2014, the District of Columbia's Emergency Healthcare Coalition will present a two-day seminar to establish a clearer understanding of all the issues the coalition members will face, and realistically lay out how local, regional, and federal assets will come together in an effective response.

Healthcare Facility Struggles

Hospitals and other healthcare facilities within 0.6-1 mile of ground zero (Zone 2) would sustain moderate structural damage. Those facilities just beyond 1 mile (Zone 3) would sustain light damage. All of these facilities would confront conflicting priorities, including the need to treat their own injured staff and patients as well as incident survivors who eventually make their way to these hospitals. First responders – police, fire, and emergency medical services – likely would not respond to assist these survivors until hours or days later, when radiation levels have begun to subside and the environment is safe enough for the responders to conduct their lifesaving efforts.

As the hours and days move forward, hundreds of thousands of survivors would seek medical care,

which would put unparalleled pressure on available healthcare facilities and clinicians to not only treat the large number of burned and traumatized patients but also manage acute radiation sickness, a condition not seen by many clinicians. Laboratories would face challenges in running the blood tests needed in order to manage these patients. In addition, the demand for ventilators, medications, and critical-care beds would necessitate the still-functioning facilities to employ their modified delivery of critical-care services plan in an effort to optimize the use of scarce resources. Mass-fatality plans also would be tested.

Hospitals in Zones 2 and 3 also would find themselves trying to quickly assess the damages to structures and infrastructure. Restoring lost water, power, and phone lines to a hospital is normally a utility company priority. In this situation, however, lengthy delays are likely and hospitals will have difficulty sustaining temporary workarounds. Staffing shortages caused by injury, death, or spontaneous resignation would exacerbate issues related to the absence of or damage to the needed infrastructure and quickly exhaust equipment and supplies. For all of these reasons and more, the affected healthcare community would require immediate and extensive support from their regional, state, and federal partners.

The detonation of a suitcase nuclear device makes for more than a scary movie. Its serious consequences mandate that healthcare systems – not just their government partners – take a realistic look at their readiness plans and training to determine if they are prepared for the day after a disaster.

Craig DeAtley, PA-C, is director of the Institute for Public Health Emergency Readiness at the Washington Hospital Center, the National Capital Region's largest hospital; he also is the emergency manager for the National Rehabilitation Hospital, administrator for the District of Columbia Emergency Health Care Coalition, and co-executive director of the Center for HICS (Hospital Incident Command System) Education and Training. He previously served, for 28 years, as an associate professor of emergency medicine at The George Washington University, and now works as an emergency department physician assistant for Best Practices, a large physician group that staffs emergency departments in Northern Virginia. In addition, he has been both a volunteer paramedic with the Fairfax County (Va.) Fire and Rescue Department and a member of the department's Urban Search and Rescue Team. He also has served, since 1991, as the assistant medical director for the Fairfax County Police Department.

Preparing for the Unthinkable

By Catherine Feinman, Editorial Remarks

Despite planning scenarios that predict the dire consequences of a 10-kiloton nuclear detonation, the actual results are still unimaginable. An April 2014 flash poll of DomPrep readers suggests that political leaders have given up on the unthinkable nuclear threat and that dusty old civil defense manuals may be the best solution for addressing the nation's lack of readiness. In the first 72 hours following a nuclear blast in a major metropolitan city, survivors would face many challenges – response, leadership, evacuation, health-system readiness, collaboration, and communication. Five years after the filming of the History Channel's "Day After Disaster" in 2009, the nation's level of preparedness for a nuclear attack remains questionable. In fact, more than 90 percent of respondents reported that the nation is not prepared for such an attack (Figure 1). This article is a compilation of the anonymous responses shared by emergency planners, responders, and receivers.

The 10-kiloton nuclear detonation scenario outlined in the National Response Framework is for most people "beyond comprehension." Any low-probability, high-consequence incident is difficult to fully prepare for because there is no, or very little, historic data to use when predicting the magnitude and effect of such disasters. An aging infrastructure could lead to an even larger geographic area of destruction and disruption of critical resources.

Response Efforts & Leadership

The location and severity of the incident also makes it difficult to accurately predict and plan for a nuclear detonation. As a result, the responses may vary significantly in different metropolitan areas – for example, Louisiana's response to Hurricane Katrina in 2005 compared to New York and New Jersey's responses to Hurricane Sandy in 2012. Even when larger cities have access to information and conduct trainings, the knowledge and skills often do not spread to smaller cities and towns.

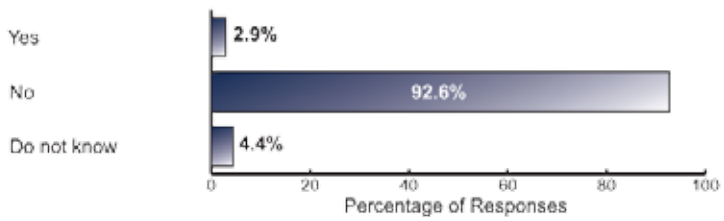
A high-consequence incident in a major metropolitan city may require regional response efforts and resources from surrounding smaller jurisdictions, so they all need to be

at the table during the planning process. Unfortunately, if one or more widespread detonations occur, then outside resources also would be in high demand, thus reducing the quantity of resources that would be available under normal operating conditions. In some circumstances, private companies as well as city and county agencies may choose to restrict sending supplies and personnel to avoid depleting their resources in anticipation of another attack.

Although the U.S. Department of Homeland Security (DHS) has yet to implement an improvised nuclear device (IND) strategy across the agency and between federal agencies, the federal government has made some progress in centralized planning since 2009, for example:

- DHS, Strategy for Improving the National Response and recovery from an IND (Improvised Nuclear Device) Attack, March 2010
- National Security Staff and Office of Science and Technology Policy, Planning Guidance for Response to a Nuclear Detonation, 2nd Edition, June 2010.
- DHS, Response and Recovery Knowledge Product: Key Planning Factors for Recovery From a Radiological Terrorism Incident, September 2012
- Federal Emergency Management Agency, Improvised Nuclear Device Response and Recovery – Communicating in the Immediate Aftermath, June 2013
- Report to the Chairman, Committee on Homeland Security and Governmental Affairs, U.S. Senate, Nuclear Terrorism Response Plans, September 2013

Figure 1:
In the first 72 hours following a nuclear blast in a major metropolitan city, survivors would be faced with many challenges – communication, evacuation, sheltering, response, and incident command. Scenario 1 (Nuclear Detonation – Improvised Nuclear Device of the National Response Framework was depicted in the History Channel's "Day After Disaster" in 2009. Five years later, is the country prepared for a nuclear attack?



The U.S. Department of Defense may be the only agency with the personnel, equipment, training, logistics, and command structure to manage this type of attack, but all agencies and organizations would play a role in protecting their cities. The Rad Resilient City Initiative, published in September 2011 by the Center for Biosecurity of UPMC (now the UPMC Center for Health Security) in Baltimore, Maryland, laid out a plan with a checklist of seven actionable items to help cities and regional partners prepare for radioactive fallout:

- Obtain broad community backing and understanding of nuclear incident preparedness to sustain the program over time;
- Conduct an ongoing public education program to inform the public about the effects of a nuclear detonation and how they can protect themselves;
- Enable building owners and operators – from individual householders to skyscraper managers – to assess shelter attributes and to teach others;
- Strengthen the region's ability to deliver actionable public warnings following a nuclear detonation through well-chosen technologies and organizational procedures;
- Establish a rapid system for mapping and monitoring the dangerous fallout zone to specify which residents need to take what protective action;
- Develop planning strategies and logistical capabilities to support a large-scale, phased evacuation; and
- Integrate, test, and conduct training on the above elements of a comprehensive fallout preparedness and public warning system.

After years of model development, some agencies may have a better understanding of the likely effect of an urban nuclear detonation, but most local governments still do not understand those consequences. DHS has invested millions of dollars in grant funds to upgrade New York City's ability to respond to – or possibly prevent – a nuclear threat or attack, but most cities are not nearly as prepared.

Regardless of the agency or organization, leadership is an ongoing concern, especially where politics and popularity may carry more weight than skills and knowledge. Effective leaders bring together both the public and private sector stakeholders. However, many current partnerships do not include private physicians or many of the private companies that should be at the table. Without solid private-industry buy-in, some assets may not be available at the most critical times. In the case of a nuclear or radiological incident, any lack of solid planning and business continuity models would expose significant gaps in planning and response.

Special Concerns & Healthcare Readiness

Lessons learned and training during the Cold War are still relevant today. Unfortunately, many of those who are familiar with those emergency management lessons and trainings are beginning to retire in large numbers. Now may be a good time to "dig out some of the training manuals and books we learned from in the 60s, 70s, and 80s." Excluding some advancement in radiation treatment, much of the information about effects of radiation and nuclear devices have not changed significantly over the past few decades.

Evacuation is another area of concern, as unpredictable factors such as debris and wind direction would affect the ability of communities to evacuate. Large metropolitan cities would have to rapidly move large quantities of people – including those with special needs who may or may not have plans for care or evacuation. Children and other vulnerable populations raise additional evacuation concerns. For cases when evacuation could exacerbate the situation, all populations must be aware of and trained on when and how to shelter in place.

Survey respondents also reported gaps in healthcare preparedness. All levels of management must be informed and trained, which may include the need for training mandates and/or standards for leaders. Individual healthcare agencies require sufficient funding and a high level of commitment to prepare for the large roles that they play in emergency preparedness – coordinating, planning, and exercising. Unfortunately, these agencies often must focus on their busy day-to-day operations, thus delaying preparedness priorities. Even when regional mass casualty and mass fatality plans are in place, integrating them with healthcare agencies can be problematic. Providing enough guidance to create effective and responsive healthcare coalitions may help close the gap.

When agencies must choose between the many priorities they face, there is little or no time to train specifically for low-probability, high-consequence threats such as a nuclear detonation. It may be difficult to retain or reinforce the lessons learned over time even if training is available. The preparedness levels of sectors within each jurisdiction vary greatly from prepared to unprepared (or underprepared). A thorough risk and threat analysis would help identify the tasks within each sector that require immediate or delayed attention.

Information Sharing & Communication Disruptions

Some information is available only on a need-to-know basis, but that should not be the case when preparing for or responding to a nuclear or radiological attack. The fear of such attacks, coupled with lack of accurate

TABLE 1:
For each of the six key topic areas, how prepared is the nation if a nuclear/radiological attack were to occur in one of the major metropolitan cities?

	Prepared	Somewhat Prepared	Somewhat Unprepared	Unprepared	Do not know
Evacuation	0.0%	21.4%	28.6%	50.0%	0.0%
Cooperation/partnerships with neighboring jurisdictions	1.4%	38.6%	38.6%	18.6%	2.8%
Communication/information sharing	2.9%	32.9%	28.6%	31.4%	4.2%
Regional/national response	1.4%	40.0%	34.3%	20.0%	4.3%
Health system readiness/training	0.0%	21.4%	28.6%	48.6%	1.4%
Leadership	0.0%	21.4%	34.3%	41.4%	2.9%

information, would produce additional fear and concern and would change the dynamics of the incident response. Compounding the situation, communication systems may become inoperable during a disaster. A nuclear blast could even compromise redundant communication systems.

Most people in the United States are dependent on cellphones, Internet, and other electronic forms of communication, but are not prepared for technological disruptions. An electromagnetic pulse could cause a catastrophic failure of the power grid. For critical infrastructures that use microprocessors – for example, transportation, communication, and utilities – restoring capabilities could become a lengthy and costly process. Jurisdictions should consider improving the physical protection necessary to prevent an electrical grid collapse that, in turn, would hinder regional assistance and recovery efforts.

Exactly how a nuclear attack would affect the nation is uncertain and some of the survey responses were grim:

- "Working in the field, what I see in preparedness does not comfort me."
- "I think all 'bets' could psychologically be off the table."
- "I believe we are all on our own."
- "We would truly be screwed!"

On the other hand, "If it is a one- or two-device detonation, then the U.S. infrastructure is still in place for assistance. It would be severely damaging and economically disruptive, but the U.S. would get through it. Think of New Orleans after Katrina."

As most emergency managers already know, there is no simple answer to the question, "Is the nation prepared for a nuclear attack (or any other catastrophic incident)?" However, equipped with the skills to facilitate, communicate, plan, make decisions, and lead, emergency managers should be able to maximize the commitments that various agencies, organizations, and even individuals make to the emergency management process to answer confidently, "We are as ready as we can be."

Catherine Feinman joined Team DomPrep in January 2010. As the editor, she works with writers and other contributors to build and create new content. With more than 25 years experience in publishing, she previously served as journal production manager for Bellwether Publishing Ltd. She also serves as an emergency medical technician, firefighter, secretary of the Citizen Corps Council of Anne Arundel County and City of Annapolis, and a Community Emergency Response Team trainer.

Lessons Learned – Nuclear Devices & Nuclear Threats

By Stuart Cameron, Emergency Management

On 16 July 1945, the scientists assigned to the Manhattan Project culminated years of work when they detonated a plutonium weapon in the New Mexico desert and ushered the world into the age of atomic weapons. The implosion weapon used during the "Trinity Test" was one of two designs developed during the project: (a) an implosion weapon with plutonium in its core; and (b) a gun-type weapon that used highly enriched uranium (HEU).

Nuclear Devices – Fissile Material & Design

During the Manhattan Project, the implosion weapon was more challenging to design as it required that a conventional explosive force uniformly and rapidly crush or implode a plutonium core to create a supercritical mass when triggered. Conversely, the design of the gun-type weapon was more intuitive; with two subcritical pieces of HEU on either end of a tube or gun barrel, one piece would explosively shoot down the tube and collide with the other to create a nuclear detonation. Although the gun-type design was inefficient and largely replaced by an implosion design using HEU, it still remains an option for creating a crude, inefficient, yet functional, improvised device for a terrorist group with access to a sufficient amount of HEU.

The most challenging element of the Manhattan Project was the production of the fissile material – HEU and plutonium – for the atomic weapon core. Enriching uranium involves processing natural uranium to separate uranium-235 (U-235) from uranium-238 (U-238). Natural uranium is approximately one atom of U-235 for every 139 atoms of U-238. Enriching uranium to weapons grade requires that the material be approximately 90 percent U-235 and, as such, is a large-scale industrial process that requires a variety of equipment and multiple production phases.

Plutonium, though, does not exist in nature. It is manmade in a nuclear reactor by bombarding uranium with neutron particles, then extracting the plutonium and separating the other materials. This process also is industrial in scale and difficult to undertake. Obtaining special nuclear materials in the quantities needed to make an atomic weapon is an impediment to building a nuclear device, but the physics behind making a crude device for someone who possesses the necessary materials is not as complicated as many would think.

The United States designed these weapons with 1940s technology. It is very unlikely that a terrorist group could produce special nuclear material on their own; however, very limited quantities of these materials have been available on the black market. As nuclear weapons proliferate in more countries, especially those with less-stable governments and those that have supported terrorist activities in the past, the likelihood that fissile materials may fall into the hands of a terrorist group may increase.

Modeling the Nuclear Threat

The probability of nuclear terrorism in a U.S. city may still be lower than threats by other attack methods, but the potential consequences merit serious preparations. Modeling efforts conducted by the federal government have resulted in detailed guidance regarding what a ground-level detonation of a crude nuclear device might look like in a modern U.S. city. These results depict a much different scenario than what would have occurred had the former Soviet Union launched an attack against the United States during the Cold War. The weapons that would have been launched by the Soviets would likely have been sophisticated thermonuclear devices with yields measured in megatons (millions of tons of TNT), rather than a crude atomic weapon with a yield measured in kilotons. Cold War weapons would likely have detonated at an altitude referred to as the optimal height of the blast – that is, where the blast effects would cause the greatest amount of damage to a given target.

Modeling efforts had to derive this information because there have been few nuclear tests at ground level and none within the confines of a modern city with steel and concrete buildings. Sturdy, well-constructed buildings would mitigate many of the immediate effects of the detonation, but the proximity to the ground would result in much higher levels of dangerous fallout than if the same device were detonated in the air. Although

these factors would minimize the immediate effects of an improvised nuclear attack compared to a Cold War-type attack, the casualties would still be much greater than any previous single event in U.S. history.

These new modeling efforts helped a federal interagency committee led by the executive office of the president create a 2010 document, entitled "Planning Guidance for Response to a Nuclear Detonation," which clearly explains what the aftermath of an improvised nuclear detonation might look like. This document provides a logical way to understand the consequences and to assist in building a proper response strategy. Federal planning guidance assumes that terrorists most likely would use a low-yield, 10-kiloton nuclear device. This is consistent with the Federal Emergency Management Agency's (FEMA) National Planning Scenario One: A 10-kiloton improvised nuclear device detonated within a major metropolitan city.

One of the overarching concepts in the planning guidance document is the need to identify three distinct damage zones: the severe damage zone, the moderate damage zone, and the light damage zone. Modeling can provide only general guidance as to the geographic dimensions of these zones because no real-world testing is available. Authorities would only be able to identify the damage zones after an incident by conducting a visual inspection of the overall infrastructure damage.

The temporary blindness caused by the bright flash of light after the detonation would likely result in widespread automobile accidents, plane crashes, and other nonblast-related casualties across a wide area. There also would be a release of a strong electromagnetic pulse (EMP), which has the potential to destroy or damage electronics in the immediate area of the blast and hamper the ability to communicate. The effect of an EMP during a ground-level detonation likely would be much less severe than it would be during a high-level, above-ground detonation, but this effect may complicate communications into and out of the affected area.

The vaporized materials combined with the radioactive particles created during the nuclear detonation would travel high into the atmosphere in the resulting mushroom cloud. These materials will travel into the upper atmosphere, cool, solidify, and eventually fall back to earth – the "dangerous fallout zone" – resulting in radioactive fallout particles similar in size to grains of salt or sand. Ground-level winds are not an accurate predictor of the winds in the upper atmosphere, which can vary substantially in direction and speed from those on the ground. Modeling in U.S. cities using actual weather conditions at different times of the year has revealed various patterns and directions of travel for fallout, making advanced predictions difficult. Standard plume modeling software used to track a chemical release would not accurately predict the deposition of the fallout.

The dangerous fallout zone is not mutually exclusive to any of the damage zones, but rather overlaps the three damage zones to some degree. Dangerous fallout may extend miles beyond the light damage zone and less dangerous fallout may travel long distances. Highly radioactive particles would begin to descend within about 15 minutes of the detonation; so prompt protective actions may be necessary to avoid receiving a lethal dose of radioactivity. Fortunately, the radioactivity in these particles would decay rapidly – more than 50 percent of the radiation from these particles would be released in just the first hour – and the exposure rates would fall dramatically over a relatively short period of time. Therefore, minimizing exposure to fallout particles until assessments are complete is critical to survival in areas that may contain unsafe levels of radiation.

The Best Defense – Planning & Sheltering

Unlike during the Cold War, fallout shelters are generally not pre-identified. There likely would be no advance warning for the public to shelter, rather they would initially be on their own to determine that a nuclear detonation had occurred. For those close to the detonation, this determination could be difficult, as clouds of dust and debris would obscure visibility. Resisting the urge to simply flee the area would be challenging, but remaining outdoors in the dangerous fallout zone could be immediately dangerous to life and health.

Developing response plans and educating responders as well as the public in advance about the aftermath of a nuclear detonation are critical to saving lives. Survival rates may be low for those caught near the detonation site, but proper response and preplanning could potentially save thousands of other lives in the

immediate aftermath. A public education plan and prescripted public information messages, developed well in advance of an attack, could help protect the public from the unseen dangers caused by exposure to radioactive fallout.

Since it will take time to identify, map, and communicate the dangerous fallout zone, survivors must know how and where to seek adequate temporary shelter. The best shielding generally is in the cores of well-constructed buildings or below ground. Responders should quickly analyze and assess the radioactive conditions to determine whether an area is safe to work in or it is safer to continue sheltering. Since radiation is undetectable without proper instrumentation, adequate equipment that can detect and display elevated levels of radioactivity should be readily accessible across and around a city for rapid assessment before any incident – much like the fallout shelters stocked with instrumentation during the Cold War era.

Although the probability of a nuclear detonation occurring in a U.S. city is lower than other types of terrorist attacks, the dire and unique consequences from this type of incident make advance planning critical to a comprehensive all hazards preparation strategy. Should a nuclear incident occur, immediate actions must be taken at the state and local levels to save lives until federal assets can respond to the affected area. Even when federal agencies immediately mobilize resources, the state and local agencies must be prepared to take appropriate response actions to avoid unnecessary deaths.

Stuart Cameron is a 29-year veteran of the Suffolk County (New York) Police Department and currently serves as the assistant chief of patrol. He spent more than a decade overseeing the operations of the department's Special Operations Commands. He also supervised numerous tactical assignments, barricaded subjects, bomb squad call outs, large crime scene searches, and hazardous material incidents. He has been involved in the development of national level procedures and homeland security training and has been an active instructor on topics related to homeland security and public safety. He is a subject matter expert on the role of law enforcement in the defense against radiological and nuclear terrorism and chaired a committee that developed the concept of operations for the Securing the Cities Program.

The Emerging Nuclear Threat Environment

By Vayl Oxford, DoD

Preparing for a low-probability, high-consequence event is a difficult proposition, especially for incidents involving nuclear weapons. Yet, those affected by the 9/11 attacks and those responsible for responding in the post-9/11 threat environment recall the sense of urgency and unity of effort that went into preventing similar incidents on U.S. soil. It has been difficult in recent years to generate the passion and consistency of effort that occurred immediately after 9/11. Preparing for such incidents today is complicated because memories of the trauma and vulnerability felt in 2001 are fading for several reasons:

- The time since the 9/11 attacks and the lack of any subsequent attacks have created a sense of complacency.
- A growing number of U.S. residents were either very young or not yet born in 2001, which makes the attacks less relevant to them.
- The phenomenon of a war-weary country – resulting from the wars in Iraq and Afghanistan – leads to a rejection of the idea that the world is a dangerous place and the nation must be vigilant against future aggression.

National Security Implications

Because of the growing complexity and level of danger, jurisdictions in the United States are facing unparalleled challenges. Although history shows that the United States responds well to threats, it also suggests that the actions usually are in response to, rather than aggressively anticipating and preventing, an attack. It is time to heed the evidence and work diligently to prevent the catastrophic and unaffordable consequences of a nuclear attack.

Three principal factors and their national security implications point to an emerging threat environment unlike any before:

- The dissolution of nation-state control and the changing conditions in the Middle East and North Africa (MENA);
- The consequences of troop withdrawal from Afghanistan and Iraq; and
- The impact of Iran's nuclear program and its future status as a nuclear weapons state.

Each factor challenges U.S. application of its elements of national power – for example, diplomacy, military options, and intelligence collection.

The Dissolution of Nation-State Control

The MENA region is transitioning to an environment where ethnic and cultural values are more important than loyalty to a national government and its control. The unrest in Egypt, Syria, Libya, and elsewhere is likely just the beginning of a larger migration of affinities to cultural interests, followed by years or decades of unrest in places like Jordan, Lebanon, Bahrain, and Iraq. This sectarian violence represents a struggle for power that could have dramatic results, including the potential for redrawing national borders based on historical and cultural lines. Meanwhile, terrorist groups and freedom fighters are using these struggles to seek additional influence and power.

The case in Syria is of particular importance and serves as a benchmark for what the future holds. In a 7 February 2014 speech at the Wilson Center, U.S. Department of Homeland Security Secretary Jeh Charles Johnson stated that Syria is a homeland security concern and cited the potential for the freedom fighters to export their skills and ambitions to various parts of the world, including the United States. If the Assad regime survives, internal brutality likely would continue but, more importantly, those groups that support the regime – including Iran/Hamas, Lebanon/Hezbollah, and Russia – could emerge with increased status and influence. If the regime collapses, civil war would prevail for many years and create an environment for terrorist groups to expand their footprint, get "lost in the noise" of the broader conflict, and have greater access to resources and expertise.

The erosion of nation-state control and authorities across the MENA region challenges all elements of

U.S. national power to adopt diplomatic approaches and cope with the various formal and informal government agencies. When intelligence collection and analysis capability stretch beyond capacity, they demand innovative ways to monitor a growing number of potential trouble spots. The changing environment also offers opportunities for terrorist groups and resurgents to gain access to resources by becoming "less visible" and integrating into the new societal "norm."

The Consequences of Troop Withdrawal

Concurrent with the dynamic changing environment across MENA is the troop withdrawal from Afghanistan and Iraq, which likely will have tangible and intangible impacts. In fact, there is evidence showing that troop withdrawal actually can reduce U.S. influence in the region. Iraq has quietly allowed Iranian support to the Assad regime by permitting use of its airspace.

Three principal factors and their national security implications point to an emerging threat environment unlike any before.

Expected fallouts from the combined withdrawal include the loss of situational awareness across the region and the degradation of military response options due to reduced force strengths on the ground. Senior military officers have expressed concerns about losing situational awareness that, in turn, will limit the U.S. capability to keep terrorist groups off guard and to disrupt operations. Similarly, some former senior intelligence officials have cited the decline in intelligence service cooperation with the United States, which has diminished intelligence collection and analysis.

Predicated on these fallouts, terrorist groups will have greater freedom to regroup, acquire resources, and gain momentum in planning and executing attacks. In a 28 December 2013 *Washington Post* article, U.S. intelligence experts predict that, "The gains the United States and its allies have made during the past three years are likely to have been significantly eroded by 2017, even if Washington leaves behind a few thousand troops and continues bankrolling the impoverished nation." In addition, "The National Intelligence Estimate, which includes input from the country's 16 intelligence agencies, predicts that the Taliban and other power brokers will become increasingly influential as the United States winds down its longest war in history."

The Impact of Iran's Nuclear Program

Iran's nuclear weapons program poses a separate set of challenges for the U.S. national security strategy. Although negotiations continue to press for reversing the program, past behavior suggests little progress because Iran has studied the sanctions process in North Korea and has learned accordingly. On 29 January 2014, the Director of National Intelligence James Clapper stated before the Senate Select Committee on Intelligence that Iran is within a year of producing a nuclear weapon should it decide to do so and improving its ballistic missile capabilities. The critical question is whether Iran would make that decision or be content in the near-term to stay in a breakout mode. In either case, this presents serious concerns for the global strategic balance and international norms.

The situation is compounded by U.S. policies to reduce its stockpile and to seek a "global zero" trajectory for nuclear weapons worldwide. Meanwhile, extended deterrence assurances are receiving increasing skepticism as other nations express concern about U.S. commitments. These reactions could drive others to reconsider their own nuclear ambitions. In fact, a 2013 public poll in South Korea revealed that 70 percent of South Koreans wanted the return of U.S. nuclear weapons to the Korean Peninsula or that South Korea should develop its own capabilities.

The combination of Iran's nuclear program and the U.S. strategic posture could lead other countries like Saudi Arabia, Egypt, and Japan to reconsider their specific security needs and nuclear options. This could further erode U.S. credibility and present serious challenges for the Nuclear Nonproliferation Treaty. From a terrorism perspective, Iran would represent the first nuclear-weapon-capable state with a direct nexus to terrorism and thereby posing a serious asymmetric nuclear threat to the United States and others. This would be a game changer with respect to traditional U.S. nuclear deterrents and national security strategy.

Critical Steps for Mitigating The Emerging Nuclear Threat

Five critical steps are necessary for mitigating the possible consequences of the emerging threat and geopolitical environment:

1. Develop a whole government approach to combat the expanding adversary and threat base, including:
   - Balancing and integrating the foreign and domestic security agendas. In the post-9/11 environment and with the establishment of the Department of Homeland Security, the United States has yet to develop integrated strategies, plans, and budgets addressing national threats. To date, the two security agendas remain uncoupled and are planned independent of each other.
   - Developing joint interagency campaign plans, concept of operations plans, and operational plans to clearly describe departments' and agencies' roles and responsibilities and respond to nuclear threats.
   - Conveying to state and local authorities the roles they would play in a nuclear crisis.
   - Examining and implementing options to expand the bandwidth of intelligence collection and analysis capabilities to account for a growing adversary base and, concurrently, streamline information sharing across the federal level, state, and local levels.
   - Developing mechanisms to share situational awareness information across the executive branch of government.
   - Conducting top-down, senior-level exercises to evaluate the effectiveness of the plans and identify gaps in capabilities as well as issues with the authorities.
2. Prepare for and enhance capabilities to defeat asymmetric threats and better integrate assets, capabilities, and information sources both inside and outside the contiguous United States.
3. Take action to better understand the cultural values, motives, and intentions of a diversified geopolitical environment in order to dissuade potential hostile intent and to better assess the threat space.
4. Rethink the national security policy structure to include consideration of re-establishing a structure similar to the Homeland Security Council to not only facilitate the planning, budgeting, and integration of foreign and domestic security strategies, but also to achieve better integration across many domestic agencies.
5. Restore defense and homeland budgets that are based on integrated foreign and domestic needs.

In summary, the world has become both more complex and dangerous and the nuclear threat is likely to adapt to this new environment. Now is not the time for complacency. Bold action and sustained national leadership are necessary to prevent a catastrophic nuclear attack on the United States.

Vayl S. Oxford is the national security executive policy advisor at the Pacific Northwest National Laboratory (PNNL). Before joining PNNL, he spent a short time in private industry after 35 years of public service. His career highlights include serving at the Department of Homeland Security (DHS) from October 2003 to January 2009, where he held the positions of policy advisor to the undersecretary of science and technology, acting director of the Homeland Security Advanced Research Projects Agency, and the first director of the Domestic Nuclear Detection Office. Before DHS, he served as the director for counterproliferation at the National Security Council and chaired the interagency working group for Operation Iraqi Freedom. From 1987 to January 2002, he held several positions within the Defense Threat Reduction Agency and its predecessor organizations (Defense Special Weapons Agency, Defense Nuclear Agency). He also held several positions in the U.S. Air Force.

Nuclear Weapons – A Growing Security Threat

By Richard Schoeberl, Law Enforcement

Since the events of 9/11, the U.S. government has been concerned about whether al-Qaida has acquired the materials needed to construct a nuclear device. In a press conference in Prague, Czech Republic, on 5 April 2009, President Barack Obama called nuclear terrorism "the most immediate and extreme threat to global security." A year later, on 11 April 2010, Obama stated at a meeting in South Africa, "We know that organizations like al-Qaida are in the process of trying to secure a nuclear weapon – a weapon of mass destruction that they have no compunction at using."

International Agreements & Disagreements

On 24-25 March 2014, the Netherlands hosted the third Nuclear Security Summit since 2010. At the summit, 58 world leaders discussed the vital efforts needed to reduce the looming risks of nuclear terrorism and reached an agreement to prevent terrorists from acquiring material that could be used to make a nuclear weapon. Other actions called for minimizing the civilian use of highly enriched nuclear fuel in an effort to prevent al-Qaida – or similar terrorist organizations – from obtaining nuclear or radiological capabilities. Although the international effort of the summit cannot eliminate the danger, it will diminish the threat of a nuclear attack.

"Security is always seen as too much until the day it's not enough." –William H. Webster, Debate on National Security Versus Personal Liberty, University of California, Santa Barbara, 3 March 2002

The utmost risk to the world is when countries do not recognize the threat of nuclear terrorism and simply do not take preventive action. World leaders at the summit acknowledged that many challenges remain and stressed the need for increased international cooperation to ensure that highly enriched uranium (HEU), plutonium, and other radioactive substances do not end up in the hands of terrorist organizations.

The United States and Russia agreed on nuclear terrorism – to a point – and set aside their differences over Ukraine to support the summit's final declaration designed to improve nuclear security around the world, as did other nations – including China, France, Germany, and Britain. In a press release following the summit, Obama stated that, "Russia's actions are a problem. They don't pose the number-one national security threat to the United States. I continue to be much more concerned when it comes to our security with the prospect of a nuclear weapon going off in Manhattan."

Although the government of the Netherlands hailed the summit as "a major step towards a safer world," Russia, China, and 16 other countries disapproved of some proposals set forth by the United States, Netherlands, and South Korea to integrate United Nations nuclear agency security guidelines into their countries' national rules. Regardless of guidelines and initiatives sought at the summit, terrorist organizations could hypothetically construct a rudimentary – albeit devastating – nuclear bomb if they had the fissile resources required and the technical knowledge.

Fissile Materials & Dire Warnings

Keeping material safe at both civilian and military sites remains a concern, but not a priority, to all nations. More than 120 research and isotope production reactors that exist around the world still use HEU for fuel or targets – many of them with very modest security measures. According to a Nuclear Threat Initiative report conducted in 2013, negligence was the chief cause in 73 incidents in which radioactive substances reportedly went missing. The report suggested that a lot of effort on a global scale is necessary to improve security surrounding radiological material.

According to the Fissile Materials Working Group, an estimated 2,204 tons of highly radioactive materials exist at hundreds of locations in 25 countries. Although military agencies have secured much of the material, a considerable amount is stored in less-secure civilian

locations – factories, hospitals, and other places that have much less security than military installations provide. In an inexpensive and crudely constructed device, terrorists could use conventional explosives to disperse radiation from these radioactive sources and contaminate densely populated areas.

As of December 2012, according to a 2013 report of the International Panel on Fissile Materials, 33 countries had at least 1 kg of HEU in their civilian stockpiles, including several Western states and others such as Pakistan, Uzbekistan, Kazakhstan, and Belarus. About 27 nations use HEU for different types of research and other reactors, with Russia having the majority. In 2013, a senior United Nations (U.N.) official advised Reuters that nuclear and radioactive materials were commonly misplaced and "the information the U.N. atomic agency receives about such incidents may be just the tip of the iceberg." Lack of security coupled with a lack of reporting equals negligence.

Lessons Learned

In December 2013, Mexican authorities reported the theft of a truck transporting an extremely dangerous radioactive material – cobalt-60, typically used in radiotherapy, sterilization, and industrial tools such as leveling devices – from a hospital in Tijuana to a radioactive material storage facility near Mexico City. Although large sources of cobalt-60 can sanitize foods – gamma rays kill bacteria but do not damage the product – according to the U.S. Environmental Protection Agency, the radioactive matter prove detrimental to the population if released into the environment. According to a 2011 report by the Congressional Research Service, bombs prepared with cobalt-60 "pose a threat mainly because even a fraction of a gram emits a huge number of high-energy gamma rays, which are harmful whether outside or inside the body."

During the Nuclear Security Summit in 2012, Yukiya Amano, the International Atomic Energy Agency director general, stated that materials like cobalt-60 could be used with conventional explosives to create dirty bombs, which could cause massive damage, panic, and serious environmental and economic consequences. According to the 2013 Nuclear Threat Initiative report, which tracked publicly reported incidents involving nuclear and other radioactive materials, increased policy emphasis is necessary for improving the security of radioactive materials in transit.

National regulatory policies differ. Training, best practice applications, and simple improvements to end-user training and awareness could significantly decrease the number of incidents – including terrorists acquiring material – occurring in transit. In 2013, nearly one-third (29 percent) of all documented missing radiological material (153 incidents), involved material in transit.

Denis Flory, deputy director general of the International Atomic Energy Agency, said in an interview with Reuters that, "Even if [small quantities of radioactive material] can't be used for making a nuclear weapon, they can be used in radioactive dispersal devices, which is a concern." Detonating a nuclear device that contains just an apple-sized amount of plutonium in a highly populated area could instantly kill or wound hundreds of thousands of people, according to the Nuclear Security Governance Experts Group.

Over the past decade, countries around the world have taken considerable actions to improve their nuclear security. However, according to a March 2014 Harvard Kennedy School report, entitled "Threat Perceptions and Drivers of Change in Nuclear Security Around the World," there is room for improvement. To diminish the risk of nuclear theft, *all* countries with nuclear weapons, HEU, or separated plutonium should:

- Require facilities and transporters with nuclear weapons, HEU, or separated plutonium to protect these items against three scenarios: (a) a modest group of well-armed and well-trained outsiders; (b) a well-placed insider; and (c) both outsiders and an insider working together, using a broad range of possible tactics;
- Require these facilities and transporters to have well-equipped, well-trained professional armed-guard forces onsite that are capable of defeating the design basis threat, which is a main factor when designing physical protection systems for nuclear facilities and is formalized through the threat assessment process;
- Put in place a comprehensive suite of measures to protect against insider threats;

- Implement material control and accounting systems adequate to detect and localize any theft of weapons-usable nuclear material;
- Put in place effective nuclear security and accounting rules, and give regulators the authority, independence, expertise, and resources to implement them effectively;
- Carry out regular, realistic tests of the performance of nuclear security systems, including force-on-force exercises;
- Ensure that all operators have the resources and plans to sustain effective nuclear security and accounting;
- Review each site where nuclear weapons, HEU, or separated plutonium exist and remove these items from any site where the costs and risks of their presence outweigh the continuing benefits; and
- Institute programs to assess and improve the security culture, and to exchange and learn from best practices.

Key Findings From the Nuclear Security Summit

The 2014 Nuclear Security Summit established new agreements among nations by pulling together results from the earlier summits and combining them with the most recent to set the following guidelines:

- The smaller the amount of nuclear material, the smaller the risk. The countries represented at the Nuclear Security Summit have agreed to keep the quantities of nuclear material as low as possible, and to reduce them wherever possible. Countries that use highly enriched uranium or plutonium as fuel for power generation will limit the quantity involved as much as they can.
- The agreements cover not only material that can be used for making nuclear weapons (HEU and plutonium), but also other radioactive materials, such as low-enriched uranium, cobalt-60, strontium-90, and caesium-137. Many of these materials have useful applications in hospitals, industry, and research, but should have the same security because they also can be used with ordinary explosives to make a dirty bomb.

- Participating countries will implement the guidelines of the International Atomic Energy Agency (IAEA). In addition to the agreements in the final communiqué, 35 countries have agreed to incorporate the IAEA guidelines into their national legislation. The guidelines will be binding on these countries, which also will engage IAEA teams to assess the security of nuclear materials.
- Nuclear forensics is an important tool for tackling criminal misuse of nuclear materials and for identifying the origin of nuclear material and the route it has taken.
- The participants have laid the basis for efficient and sustainable nuclear security architecture, consisting of treaties, guidelines, and international organizations. The IAEA plays a pivotal role in this regard. An important new element is the agreements on the steps that countries can take to enhance confidence in each country's nuclear security measures. Greater mutual trust will allow cooperation that is even more efficient and make it easier to assess the level of security of the world's nuclear material.
- With regard to industrial uses of nuclear materials, government and business must work together. Law, without businesses and institutions being hampered by unnecessary rules, must govern the security of nuclear material.

Countries have granted teams of international experts to evaluate security procedures for nuclear material – both in storage and in transit. These actions will ensure that security assessments will be based on international standards and further ensures the value of the measures taken.

Traditionally, the emphasis has been on safety in transport, but now there is a recognized need to address security as a priority. Groups such as al-Qaida may have relatively poor capabilities in such techniques, but their intention to develop these capabilities has been clear from the beginning; and the consequences potentially could be devastating.

Protection of material is important both in transit and in storage – whether considering the truck stolen in Mexico containing cobalt-60 or another embarrassing incident, on 28 July 2012, when an elderly nun and two peace activists broke into a defense facility in Oak Ridge, Tenn., where uranium for atomic bombs is stored. The reality is that major incidents like these remain the principal reason or driving force for nuclear security enhancements. In fact, many countries will continue taking a reactive approach, naively waiting for an incident to occur before making any improvements to nuclear security measures.

Countries now need to pursue more proactive measures and actively look to find and fix impending security vulnerabilities, as opposed to learning from a looming potential disaster. As stated by former Director William H. Webster of the Federal Bureau of Investigation during a debate at the University of California on 3 March 2002, "Security is always seen as too much until the day it's not enough."

Richard Schoeberl has more than 17 years of counterintelligence, counterterrorism, and security management experience, most of it developed during his career with the Federal Bureau of Investigation, where his duties ranged from service as a field agent to leadership responsibilities in executive positions both at FBI Headquarters and at the U.S. National Counterterrorism Center. During most of his FBI career he served in the Bureau's Counterterrorism Division, providing oversight to the agency's international counterterrorism effort. He also was assigned numerous collateral duties during his FBI tour – serving, for example, as a Certified Instructor and as a member of the agency's SWAT program. He also has extensive lecture experience worldwide and is currently a terrorism and law-enforcement media contributor to Fox News, Sky

The "Dirty" Details About Explosive Devices

By Courtney Gavitt, Viewpoint

One year ago today, 15 April 2013, I was among the many who were stopped by race marshals at mile 25.5 of the Boston Marathon course. The frustration, confusion, and even anger of the growing crowd of runners, halted just moments from Boylston Street, was evident. Having only run a few miles of the race in support of a friend, I was not exhausted nor fueled by adrenaline and, thus, quickly realized the potential gravity of the situation unfolding at the finish line. My hobby of running had suddenly collided with my profession of chemical, biological, radiological, nuclear, and high-yield explosive (CBRNE) preparedness and response.

As dozens of emergency responders sped through neighborhoods lined with spectators, it was clear that this was not an ordinary medical emergency or traffic incident. Mutterings of "an explosion" began as that worst-case scenario unfolded. Text messages with friends waiting near the finish line confirmed that the explosions were not fireworks, nor planned events gone awry. In the absence of any information or instructions from race officials, these "facts" heightened suspicion that an improvised explosive device (IED) had been detonated near the finish line and there was a potential for additional targets and explosions. Despite the danger, many runners waited less than half a mile from the deadly blasts until law enforcement officials confirmed that the race was over and requested that all runners clear the streets.

Rumors and misinformed reports soon surfaced – including news broadcasts of additional bombs and explosions throughout the city – that continued for days after the event. Of particular concern were reports that erroneously referenced the IEDs as "dirty bombs," which most commonly describe certain radiological dispersal devices (RDD) and denote a radioactive property that technically and theoretically is more damaging than IEDs. An article published in May 2013, by *Bulletin of the Atomic Scientists* examined how the scenario in Boston would have been significantly different if the IEDs had been dirty bombs.

Basic Concepts of Complex Devices

For appropriate emergency response efforts, it is imperative that the media distinguish an IED from a dirty bomb attack and accurately convey that information. Promoting awareness of this topic to media outlets and the public, though, requires that law enforcement officers, emergency response officials, and public health personnel also be familiar with both the common and unique technical characteristics of each type of threat.

In simple terms, RDDs include radioactive material and IEDs employ myriad conventional explosives with no radioactive material; various forms of IEDs are defined in the National Improvised Explosive Device Prevention and Preparedness Act of 2008. Each is notorious in its most popular form – the "explosive-driven dirty bomb" (an RDD) and the "roadside bomb" (an IED, described in detail by *The Washington Post*) – although equally dangerous versions of each device exist. The dispersion of shrapnel – including ball bearings and nails – from the pressure-cooker bombs used in the Boston attacks may have been the reason the IEDs were erroneously labeled as dirty bombs. However, the word "dirty" in this context exclusively identifies radioactive material.

Emergency responders, media outlets, and the public are all susceptible to even greater danger when media outlets convey inaccurate information.

Although all dirty bombs are RDDs, not every RDD is a dirty bomb. In fact, RDDs need not be explosive devices at all, but rather can be any device that disperses radioactive material. In addition to explosion, methods of dispersion include: (a) contamination of large areas using a crop duster; (b) introduction into a food or water supply; or, more rudimentarily, (c) placement of a device in a high-traffic area. Even without the use of a device, according to the Department of Homeland Security's Protective Action Guides for RDD and IND Incidents, response efforts should treat any dissemination of radioactive material as an RDD.

Radiological & Nuclear Factors to Consider

Experts often suggest that, depending on the size and type of device, the greatest harm likely will occur from the blast of an explosive RDD, rather than by exposure to radiation. This comment, however, fails to factor in additional casualties when first responders are unable to immediately triage and treat exposed and contaminated victims.

In Boston, for example, video and photo evidence showed dozens of law enforcement, emergency responders, and even unharmed bystanders rushing to the aid of victims – three people killed and 260 injured by the explosions. Several accounts credit on-scene tourniquets and other immediate – formal and informal – medical attention for saving lives. Had radiation been present and detected, many of these immediate efforts would have been considerably complicated or ceased because of the threat to responders' health and safety. Although it is likely that the explosion of an RDD poses the greatest risk of immediate injury and death, the presence of radiological material directly increases that risk by limiting lifesaving efforts.

An improvised nuclear device (INDs) is another type of device that is commonly associated and confused with RDDs because they both contain a radioactive element. Radioactivity, though, is perhaps the only technical commonality of the two weapons; the radioactive materials, properties, processes, and impacts differ dramatically. In its "Code of Conduct on the Safety and Security of Radioactive Sources," the International Atomic Energy Agency (IAEA) identifies 16 radionuclides commonly used in medical, industrial, and research capacities that could pose a threat for radiological dispersal.

According to a report by the National Research Council, four of these – cobalt-60, cesium-137, iridium-192, and americium-241 – pose a significant risk in the United States, where they are widely used in civilian applications. On the other hand, by definition, an IND contains special nuclear, or "fissile," material – plutonium, uranium-233, or uranium enriched in the isotopes U-233 or U-235 – that do not occur naturally in the environment and are subject to

extensive safeguards, making them difficult to acquire and traffic illicitly. For this reason, the threat of an IND attack by a nonstate actor may not be as plausible as the threat of an RDD.

If an adversary state or terrorist group were able to create and detonate an IND, it would likely be far more destructive than an RDD scenario. Unlike an RDD, an IND produces a nuclear explosion, which is characterized by an intense flash of light, extreme heat, a blast wave, and prompt radiation. Such radiation would be acutely lethal for an extended distance, whereas that produced by an RDD would cause concern for chronic risks rather than immediate harm. If, due to poor design, construction, or lack of expertise, the IND fizzles – meaning the weapon does not achieve nuclear yield because fission does not occur – the results then would resemble those of an RDD explosion.

Emergency Response In a Radiological Event

Many resources exist to inform emergency planners and responders about radiological and nuclear incidents. In the United States, primary government-issued resources include:

- Environmental Protection Agency's 1992 Protective Action Guides Manual for both nuclear and radiological incidents and the 2013 revised draft Protective Action Guides Manual;
- Department of Homeland Security, Federal Emergency Management Agency's 2008 Planning Guidance for Protection and Recovery Following RDD and IND Incidents;
- The White House, National Security Staff and Office of Science and Technology Policy's 2010 Planning Guidance for Response to a Nuclear Detonation; and
- The Centers for Disease Control and Prevention's 2007 Population Monitoring in Radiation Emergencies: A Guide for State and Local Public Health Planners.

Although by no means inclusive of all available resources pertaining to emergency response to a radiological event, these resources provide valuable information to aid response efforts for an RDD or IND attack. A coordinated response, with all stakeholders being aware of the differences between IEDs, RDDs, and INDs, would help reduce the risks and consequences to life and property following any radiological, nuclear, and/or explosive incident.

Courtney Gavitt, MS, is an analyst at Gryphon Scientific where she focuses on chemical, biological, radiological, nuclear, and high-yield explosive (CBRNE) consequence management in support of the Federal Emergency Management Agency. As a Nonproliferation Graduate Fellow at the Department of Energy (DOE), National Nuclear Security Administration (NNSA), she contributed to U.S. interagency export control and interdiction efforts designed to curb proliferation of CBRNE weapons and dual-use materials. She served as part of the U.S. delegation to the Proliferation Security Initiative and supported DOE's Australia Group representative. Before working at NNSA, she was a contractor at the U.S. Department of Homeland Security Customs & Border Protection. She holds an MS in biodefense from George Mason University.

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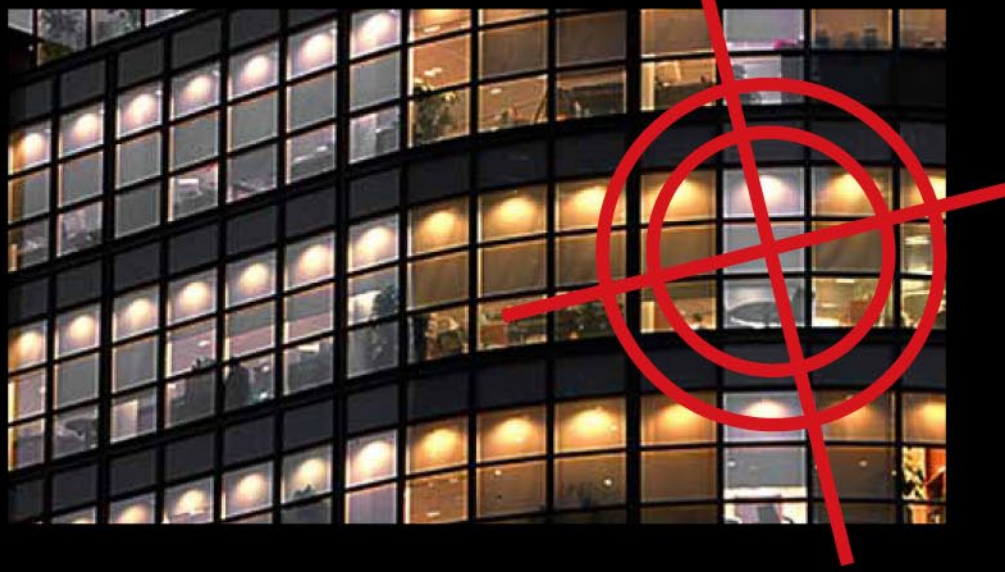

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Radiological Detection – A Strategy for Changing Public Opinion

By Joseph Trindal, Law Enforcement

Changing dynamics in unmanned aerial vehicle (UAV) technology for the law enforcement community has the potential for rapid growth. Once public perception of UAV deployment by police agencies moves beyond the inaccurate idea of military application, state and local police agency use will become commonplace. UAVs are currently used in civilian law enforcement missions for border security and have a limited but proven record of efficient support in other emergency service missions. An important, yet often overlooked, public safety UAV application is radiological threat detection at major events. The use of personal radiation detectors (PRDs) by law enforcement officers has become a widely accepted best practice for early threat detection. Some agencies even deploy PRDs for daily police patrol operations.

UAV technology offers a variety of law enforcement, public safety, fire situational awareness, wilderness search and rescue, hazardous material mitigation and response, and many more applications for broad multidisciplinary, community-based support.

Integrating radiation sensors as a public safety payload configuration for UAV deployment is a current capability with future benefits for local law enforcement. Sensors carried overhead at major events can provide protective threat intelligence faster and over a larger area than ground-based sensor/detector deployment, either on police personnel or at fixed locations. This form of threat intelligence collection and analytics is significantly enhanced with the application of video surveillance on the same elevated UAV platform. UAV deployment of radiological sensors is more cost effective than assigning the resources necessary to achieve the same level of ground coverage. UAV radiological sensors should not replace ground-based capabilities; rather, the UAV application is a value-added enhancement.

UAV public safety operations supporting law enforcement efforts offer economies of scale as police resources decrease. The UAV combined sensor/surveillance asset enhances the effectiveness of ground-based police response personnel by providing real-time mobile positioning of a potential threat. A UAV configured for this application could remain overhead to provide commanders geospatial references for officers on the ground to intercept and mitigate or thwart a suspected threat. The integration of UAV assets together with ground-based police personnel engaged in protective public safety missions is a growing opportunity for police agencies.

Unmanned Aerial Vehicles & Response Capabilities

Acknowledging the value of UAVs, public safety applications can greatly assist police agencies in overcoming negative public perception of their use. Recently, a number of local police agencies reported that they have postponed plans to acquire UAV capabilities amid public opinion backlash. Generating public support is a fundamental strategic step in acquiring UAV technology. As such, formulating the justification in a context of threat prevention and efficient criminal interdiction may be beneficial.

As police agencies plan to acquire and deploy UAV capabilities, there is a wide range of integration elements to consider. UAV deployment requires integration with agency-, event-, and incident-specific command and control structures. When assets are configured for radiological sensor application, agencies should consider integration with the multidisciplinary, interagency response capabilities – for example, a UAV deployment in support of a major sporting event. UAV-configured sensor detection coupled with a ground response for adjudication requires one level or degree of command coordination.

However, it is vital that agencies plan beyond the level-one response.

If the source is an active, nondispersed radiological threat, a broader interagency response may be required. UAV surveillance capability may remain a very important asset to the incident command activities at both the operational and tactical levels. However, certain conditions such as the detonation of a dirty bomb may require an immediate change in UAV operations to avoid worsening the situation. This is only one simple example of the complex contingencies that local community emergency service agencies should consider when developing integrated plans for using the future UAV assets to enhance their operations.

Broader Opportunities With Radiological Sensors

Focusing on relevant local strategies for "selling" the concept of UAV applications in support of public safety responsibilities, such as radiological sensor deployment, could help police agencies overcome adverse public perception. Additionally, the interagency value of UAV technology for fire situational awareness, wilderness search and rescue, hazardous material mitigation and response, and many more applications provides vast opportunities for broader multidisciplinary, community-based support. As local budgets continue to affect the staffing of emergency services agencies, technological solutions such as UAV deployment with sensor and surveillance capabilities can be a cost-effective solution to satisfy the high demand for public safety during a period of diverse and dynamic threat conditions.

Joseph Trindal is president and founder of Direct Action Resilience LLC, where he leads the company's portfolio of public and private sector preparedness and response consulting, training, and exercise services. He also serves as president of the InfraGard National Capital Region Members Alliance. He retired in 2008 from the U.S. Department of Homeland Security, where he had served as director for the National Capital Region, Federal Protective Service, Immigration and Customs Enforcement. In that post, he was responsible for the physical security, law enforcement operations, emergency preparedness, and criminal investigations of almost 800 federal facilities throughout the District of Columbia, Northern Virginia, and suburban Maryland. He previously served, for 20 years, with the U.S. Marshals Service, attaining the position of chief deputy U.S. marshal and incident commander of an emergency response team. A veteran of the U.S. Marine Corps, he holds degrees in both police science and criminal justice.

Civil Support Teams 101 – Removing Misconceptions

By Gordon Hunter, National Guard

On 21 March 2014, DomPrep published a report entitled "Support to Local Authorities (When They Are Overwhelmed)." The findings from that report regarding use of the National Guard Civil Support Teams (CSTs) to support local authorities were surprising and, in some ways, disheartening. To remove misconceptions, local, state, and federal response agency partners must understand the options for potential integration with their local CSTs.

Background Information

The CST concept originated from the White House concerns about potential bioterrorism in 1998. Teams were initially established, one per Federal Emergency Management Agency region, with the goal of covering major metropolitan areas. Currently, the scope has expanded to 57 teams in total, one per state and territory – with California, New York, and Florida having two teams in each due to geographical concerns.

Each team, which brings additional capability to response agencies and incident commanders, is composed of 22 full-time Air and Army Guard personnel using state-of-the-art equipment and training. This composition is important for two reasons:

- Full-time personnel are available around the clock without needing to be mobilized like traditional National Guard forces; and
- The National Guard Bureau (NGB) fully funds the CSTs, which makes these no-cost assets available to partner agencies.

These teams originally were chartered to identify, assess, and advise on known or suspected situations involving weapons of mass destruction. However, following the response to Hurricane Katrina and the authoring of the 2006 National Defense Authorization Act, the mission set expanded to include natural and manmade disasters.

This expansion is critical, as one of the standout responses in the report indicated that CSTs are only

viable for weapons of mass destruction (WMD) or hazardous materials (hazmat) missions. This is an unfortunate view because the teams can be useful in a multitude of emergencies and are more than just groups of hazmat technicians. One example is the 2013 Boulder County flooding in Colorado, where CST communication assets became forward command posts allowing initiation of rescue operations into Lyons.

CSTs also have supported nontraditional missions such as the Hawaii team monitoring downwind plumes from volcanic activity and the Iowa team mounting small crafts to help locate flood-displaced tanks and materials. The teams are modular, with incident commanders able to request capabilities instead of bringing all 22 personnel, eight trucks, and three trailers to every incident. The CSTs possess a wealth of on-scene analytical capability, multiple communications platforms capable of bridging gaps in response networks and, most importantly, ready and trained personnel with extensive experience.

Teams also can assist with pre-event planning and monitoring, trans-event security (as tested during the Boston Marathon), and post-event reviews and assessments. Much of the CST mission with regard to WMD has shifted focus from response to standby missions, providing an extra layer of detection for event organizers and incident commanders.

Of course, teams also are available and maintain a keen edge of readiness for the original mission of counter-WMD. Often, teams are not engaged in traditional hazmat responses unless local assets are insufficient

because hazmat missions are the purview of local, county, and state agencies, which are trained, funded, and equipped to respond to such incidents. Elected officials, however, should not deem traditional hazmat unnecessary owing to availability of the CST.

Notification Thresholds & Requests for Assistance

The CST mission is to augment and assist – rather than undermine the authority and power of – partner agencies. One other concern highlighted in the DomPrep report is the way to determine a threshold of notification. As such, it is best to phrase the threshold of notification as, "Given all your years in the fire service/law enforcement, if what you are seeing doesn't feel right in your gut, that's when you want to call." Local responders know best what is and is not considered a "normal" incident for their jurisdictions and, barring agreements already made with the CST for traditional calls, should seek to employ the team when the situation goes beyond normal. Most importantly, when in doubt, call. The CST will be responsive and help determine the best force package to meet the need, ranging from telephonic consultation to full-mission profile/full team response.

Other viable concerns include: availability of the team, response time, geography covered by the CST, and the CST's release for the mission. All of these are best addressed pre-incident by training together, at a minimum by sharing briefings about capabilities and exchanging business cards. CSTs are funded to conduct exercises every year and are more than able to set up, run, evaluate,

and/or participate in exercises ranging from tabletops to full-scale exercises with partner agencies.

One respondent indicated that, since the CST was not part of routine hazmat response, the CST was not often integrated into regional exercises. In this case, it may be worth having the CST provide observer/controller personnel for an exercise to enable senior responders to train with their personnel. In addition, CSTs can provide hands-on training with new equipment when responders do not have the funding for training or upkeep. Most CSTs across the country also have authorization from their chains of command to respond when requested without formal notification – the exact parameters vary from state to state and should be addressed directly with the CST.

To establish these lines of communication, the county or state emergency managers would contact the National Guard J3 (or the director of military support). They can provide direct phone numbers to the CST for establishing a formal or informal meet-and-greet. Most, if not all, CST commanders would willingly share their phone numbers with incident commanders to streamline informal notification and requests for support. The CSTs do maintain a busy training schedule but will make every effort to support responders who are asking for help, whether for an incident, training, or simply a question on a new piece of detection gear.

Although it is understandable that there may be some misconceptions on the use of CSTs in support of local responders, especially as threats and missions evolve, it is important to learn more about this valuable resource. Ultimately, the CSTs are another tool in the toolboxes of the local, state, and federal responders and, like any other tool, familiarity makes for ease of use. Often, a simple phone call asking for a "CST 101" briefing can lead to productive partnerships that support the mission everyone shares – protecting the lives and safety of communities.

Gordon Hunter is the deputy commander of the 8th weapons of mass destruction civil support team (WMD-CST) in Colorado with more than 8 years' experience within the CST community. He is a graduate of the U.S. Air Force Academy (B.S. Civil/Environmental Engineering) and Naval Postgraduate School (M.A. Homeland Security) and has served as a security forces officer and civil engineer in the Air Force and Air National Guard for 23 years. He also serves as the 8th CST explosives/energetic chemistry subject-matter expert and WMD/CBRNE (chemical, biological, radiological, nuclear, and high-yield explosive) advisor to the state adjutant general.

Illinois – Lessons From a Radiological Incident Exercise

By Curtis Hawk & Shay Simmons, State Homeland News

The State of Illinois leads the United States in number of nuclear power reactors, with 11 active and one decommissioned; therefore, planning at the state and local levels for radiological accidents is a necessary and ongoing process. Annually, the Illinois Emergency Management Agency (IEMA) conducts exercises with several jurisdictions, including the county that houses a nuclear facility and those designated as support counties, which would have a role in an emergency response. These exercises follow the requirements outlined by the Illinois Plan for Radiological Accidents (IPRA) – a cooperative effort among state agencies, local governments, and private organizations – to ensure swift and effective evaluation, as well as the required response and recovery coordination, of any radiological incident. During the November 2011 IPRA drill, responders from McLean County had the opportunity to test their plans and training.

McLean County, approximately 120 miles southwest of Chicago, is the largest county in the state – 1,184 square miles, with a population of 169,572 according to the 2010 census. Although size and demographics classify it as rural, with 89 percent of the county being farmland, the county has access to assets that are not normally available to rural jurisdictions – for example, the Illinois office and corporate headquarters for State Farm Insurance Company, two universities (Illinois State University and Illinois Wesleyan University), and two heavy manufacturing plants (Bridgestone-Firestone and Mitsubishi).

Since 1969, the county also has the McLean County Disaster Council, which includes member representation from the public and private sectors, healthcare facilities, faith-based organizations, nongovernmental organizations, and academic institutions. The council meets bimonthly, conducts an annual full-scale training exercise, and has contributed over the past 45 years to an elevated emergency awareness and cooperation among local agencies.

A 2011 Example of an Ongoing Preparedness Effort

Planners for the 2011 exercise included personnel from: the county emergency management agency, Illinois State University, the Town of Normal, the McLean County Health Department, the McLean County area emergency medical services, and the American Red Cross of the Heartland. The Federal Emergency Management Agency (FEMA)/IEMA plan for the two-day exercise included multiple other organizations in four counties: DeWitt County, where the Clinton Nuclear Power Plant is located; and designated support jurisdictions of Macon, McLean, and Piatt.

Organizers asked McLean County responders to demonstrate their ability to support the target capabilities of emergency public safety and security responses, which included:

- Distribution of dosimeters;
- Emergency worker radiological exposure management;
- Establishment of traffic and access control posts within the 10-mile emergency planning zone; and
- Ability to conduct evacuee and emergency worker monitoring, registration, and decontamination of both equipment and vehicles.Functions not exercised but that would be critical during an IPRA response were first aid, responder respite, and radiation dose assessment. Public information functions also were not included in the exercise.

McLean County Health Department was not initially included in the list of local participants. However, together with Animal Control Director Marshell Thomson and Assistant Administrator Catherine Coverston Anderson, the Health Department saw this as a rare opportunity to exercise certain functions, including population monitoring and companion animal decontamination. McLean is among the few counties in Illinois where animal control responsibilities fall under the authority of the Health Department and

Thomson, in particular, wanted to evaluate the ability of her staff to respond to a public health emergency.

Director of Environmental Health Thomas Anderson offered personnel to assist with dosimeter distribution and portal monitor set up, both of these possible new support roles for the Health Department. Traditional environmental health activities – disease prevention, food safety, and drinking water and sewage treatment – would be limited during an emergency response, leaving environmental health personnel available to support the activities related to: radiological monitoring, decontamination station assembly, and prevention of further radiological contamination. This support also would augment IEMA and its local resources.

The Illinois Plan for Radiological Accidents is a cooperative effort among state agencies, local governments, and private organizations to provide swift and effective evaluation, as well as the required response and recovery coordination, of any radiological incident.

Planning & Exercising a Community

As planning with local agencies progressed, McLean County participants learned that IEMA would have only a few personnel on hand to act as role players to walk through the portal monitor and population monitoring stations. IEMA accepted the offer of volunteers and recruited a dozen members of the Retired Senior Volunteer Program at the local YWCA. Population-monitoring forms included in the Community Reception Center toolkit were adapted for county use.

The Community Reception Center was established at Horton Field House in the university athletic area. Portal monitors were well-positioned to allow "contaminated" role players to enter directly into the building for showers, and then proceed to the population monitoring area. The interior of the Field House enhanced crowd control and ensured that no role player passed through to the American Red Cross shelter and respite area without completing the decontamination and screening processes.

The Town of Normal Fire Department began vehicle decontamination in a parking area adjacent to the Field House. Animal Control set up between the vehicle decontamination area and the Field House and, as the exercise progressed, it was determined that this activity would require a more suitable location, away from the vehicle decontamination. As this was a chilly, windy day in early November, no animals actually went through the decontamination process, but Animal Control was able to simulate for FEMA/IEMA their ability to register animals and instruct owners on proper decontamination procedures.

Participants learned a number of valuable lessons during this exercise, including the need for better signage and for more staff at animal decontamination and the population screening station. Environmental health observers were able to assist public works personnel and firefighters in tracking the flow of wastewater from the exercise and assess the potential effect on local residents.

There have been no full-scale exercises involving the support counties since 2011, and none are scheduled for the immediate future. However, the information collected from this exercise will be submitted during the upcoming (2014) McLean County plan review. In the event the State of Illinois ever has to execute the IPRA, McLean County will be better prepared to respond quickly and effectively.

Curtis Hawk (pictured) is the director of the McLean County Emergency Management Agency. A native of McLean County, he has been with the agency for 16 years.

Shay Simmons has been the emergency preparedness coordinator for the McLean County Health Department since September 2009. She is currently the secretary of the McLean County Disaster Council.

Death – Breaking the Bad News

By Joseph Cahill, EMS

One of the hardest tasks for a paramedic or emergency medical technician is telling family members that their loved ones have died. Emergency medical services (EMS) staff often are competitive by nature and, although outcome is a poor way to judge the efforts of an emergency responder, it is often how responders perceive it.

Building Credibility & Managing Expectations

Set up for this task begins when EMS staff arrive on scene, even before assessing the patient. At all times, EMS staff must build credibility with the patients and their families by demonstrating that they are professional, skilled, and serious about the tasks that they must perform. Television and movies – where a patient's survival is based on the needs of the plot rather than on reality – affect the public's perception of EMS, so it is important to manage expectations.

The steps for preparing a family for the death of a cardiac arrest patient are similar to telling a patient that he/she has a terminal illness. EMS staff can set realistic expectations by conveying the direness of the situation and telling the family the truth: "Your family member is gravely ill, the heart has stopped, and he/she is not breathing, but we will do everything we can." Families may expect the patient to receive immediate transport to the hospital, but EMS staff can reassure them that the ambulance is bringing the "emergency room" to the patient, thus shortening the delivery of advanced care. The nature of first response often dictates the setting and timing of an encounter, so it is critical for staff to recognize what they can and cannot control.

In cases where the patient has a low likelihood of survival or when emotions are high, it is often advisable to move the family members to another area or room. Although it is never good to surprise someone with bad news, delaying the news does no good either. Following are some key points to remember:

- Whenever possible, have the family members sit and, as long as it can be done safely, sit or crouch to look them in the eyes. Eye contact with family members is important because they may interpret looking away as a sign of guilt or concealment.
- Get quickly to the point with a short transition.
- Give details, never hide facts, and repeat details given at the beginning, "The heart has stopped and he/she is not breathing."
- Do not use euphemisms. Under stress, people have trouble understanding complicated concepts; EMS staff must ensure that the family clearly understands the information they convey.
- Most importantly, treat the patient and family with respect and honesty, and maintain the patient's dignity. The simple and time-honored act of covering a body with a sheet may seem "old fashioned," but it becomes more relevant in a world where everyone has a digital camera with an Internet connection in their pockets.

EMS teams build credibility not only by doing a professional job, but also by being honestly intent on giving patients the best chance of survival. When the EMS team controls the family's expectations from the beginning and properly assures the family that the patient is receiving the best care possible under the circumstances, family members can begin to prepare – with a minimal element of surprise – for the moment when EMS staff must officially deliver the bad news.

Joseph Cahill is the director of medicolegal investigations for the Massachusetts Office of the Chief Medical Examiner. He previously served as exercise and training coordinator for the Massachusetts Department of Public Health and as emergency planner in the Westchester County (N.Y.) Office of Emergency Management. He also served for five years as citywide advanced life support (ALS) coordinator for the FDNY – Bureau of EMS. Before that, he was the department's Division 6 ALS coordinator, covering the South Bronx and Harlem. He also served on the faculty of the Westchester County Community College's paramedic program and has been a frequent guest lecturer for the U.S. Secret Service, the FDNY EMS Academy, and Montefiore Hospital.

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