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RADIATION

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Editor's Notes

By James D. Hessman

Scientific progress is a mixed blessing. The same awesome discoveries that led to the wartime use of what were initially called atomic bombs also provided peace-loving nations all over the world a virtually unlimited supply of nuclear power that could be used for strictly peaceful purposes. But that was before Chernobyl and, more recently, Fukushima. Radiation therapy and dental X-ray machines also have helped tens of millions of people around the world live longer, healthier, and more productive lives. But even those miracles of modern medicine are sometimes dangerous.

Richard Schoeberl leads this month's roundup issue of *DPJ* with a warning as timely as tomorrow's headlines. His chilling and well-substantiated report focuses on: (a) missing stockpiles of weapons of mass destruction that could fall into the hands of various terrorist groups; (b) the numerous threat warnings that these weapons represent a clear and present danger to many countries around the world; and (c) the growing need to secure nuclear facilities and tighten controls on radiological and nuclear materials.

Stephen Jolly follows Schoeberl with a not very comforting report on radioactive dangers that may exist in unexpected places; nuclear power plants and medical facilities are just two examples. Janette D. Sherman and Joseph J. Mangano point out that a "Fukushima-like threat" exists at the Indian Point nuclear reactor plant – just 25 miles upstate from New York City. Accurate and timely information must be shared and integrated into the emergency response plans in order to mitigate such disasters.

The distinguished authors of two other articles discuss costs (another very dangerous subject these days). Craig DeAtley provides an itemized list of what it actually cost several Washington, D.C., hospitals to cope with a staged medical emergency at the fictitious "Wally's Warehouse." Of course, he also notes that dealing with a real-life mass-casualty incident would be even more expensive. Audrey Mazurek and Raphael M. Barishansky point out the huge additional costs of dealing with future emergencies (radiological incidents in particular) as well as the expanding role of public health agencies during such incidents. To effectively cope with an incident resulting in mass destruction, the responsibilities must not only be clearly defined, but also realistic.

Also in this month's printable issue are three ad hoc features by: (a) Joseph Trindal, who focuses special attention on the dangerous combination of espionage and the public reaction to the lone actors perpetrating such crimes; (b) Ryan Hay, who comments on hazardous material dangers by reviewing the costs and uncertainties involved in the decontamination process; and (c) Joseph Cahill, who discusses another unique danger: the ubiquitous, but sometimes treacherous, grain silos that dot the nation's rural landscape.

Clay W. Biles rounds out the issue with an insightful and inspiring commentary on today's new corps of Federal Air Marshals, who – along with passengers and business travellers – have adopted and will follow the "Let's Roll" attitude of the 9/11 Shanksville heroes. The ultimate goal is to prevent any potential terrorist takeover of an aircraft, whether on the ground or 30,000 feet in the air.

About the Cover: The "Doomsday" image of a nuclear countdown clock surrounded by/engulfed in a glowing radioactive inferno [iStock photos] vividly captures the difficult and dangerous dilemma now facing the nation's, and world's, military & political leaders: Is it possible to develop and use nuclear power for strictly peaceful purposes without suffering at least some adverse and potentially cataclysmic consequences?

The Pursuit of Nukes: No Job for Amateurs

By Richard Schoeberl, Law Enforcement

There has been considerable debate in recent years on the threat level to U.S. and allied national security, to public safety, and to global economic stability posed by acts of terrorism, particularly those involving a CBRNE (chemical, biological, radiological, nuclear, and/or high-yield explosives) incident. Moreover, because threats linked with any of these types of attacks is constantly evolving – several known terrorist groups have been working to acquire CBRNE materials and other groups possess the expertise needed to build such weapons – continued preparedness must be the highest defense priority of the United States and its allies.

Since the early 1970s, terrorist groups have been vigorously searching every way possible to build or buy weapons of mass destruction (WMDs) in one form or another. U.S. government intelligence dating back to 1997 has many times identified al-Qaida as the fundamental group pursuing a long-term and persistent approach to not only acquiring, but also developing, WMDs that can be used in a mass-casualty terrorist attack.

Declassified Central Intelligence Agency (CIA) reports from 1997 indicate that Osama bin Laden's intention to carry out hostile acts against the United States in the Persian Gulf region "could be abetted strongly by access to WMD material." The CIA concluded, among other things, that bin Laden was "taking steps to develop the capability to use weapons of mass destruction – possibly involving chemical agents and biological toxins as well as nuclear material – for terrorist operations, or may plan to give these substances to supporters [of the al-Qaida ideology]." Other CIA reports during the same time frame indicated that bin Laden also was "exploring the possibility" of mounting operations with WMDs developed and built by other organizations. That option developed, apparently, after bin Laden had learned of rogue groups attempting to sell uranium.

An Evolving & Still Growing Threat

CBRNE terrorism is not a new threat. But it is one that has evolved rapidly since the end of the Cold War, and will certainly continue to evolve for the foreseeable future. It is well known to intelligence agencies throughout the entire world that literally hundreds of tons of nuclear material were left unsecured after the fall of communism in the former USSR. The immense and very real threat posed by nuclear terrorism might well come in the form of terrorist organizations acquiring nuclear weapons, which are currently available on the criminal black market, or from pilfering uranium from exposed nuclear facilities and using it to build their own makeshift nuclear device. In a 2004 Associated Press report, Pakistani journalist Hamid Mir quoted bin Laden's then deputy, Ayman al-Zawahri, as saying that, "If you have $30 million, go to the black market in central Asia, contact any disgruntled Soviet scientist, and a lot of … smart briefcase bombs are available."

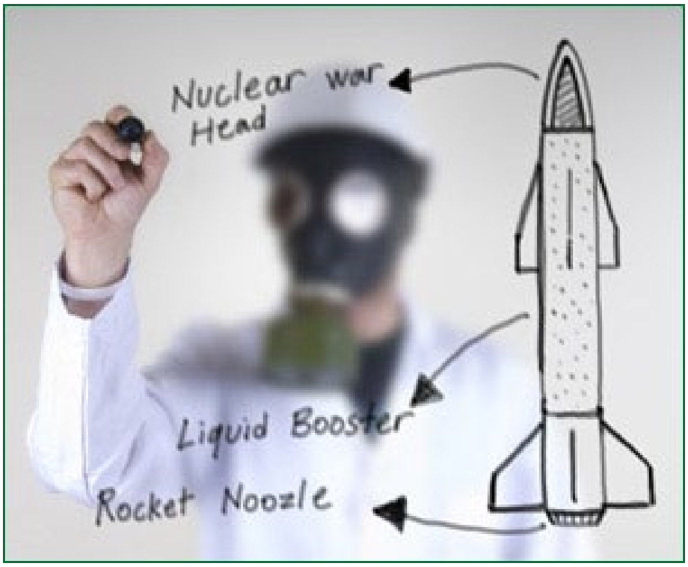
There have in fact been more than 2,000 confirmed cases of unlawful trafficking of nuclear and radioactive materials in the past two decades, according to the International Atomic Energy Agency (IAEA). In addition, more than a hundred incidents of theft and other unauthorized activities involving nuclear and radioactive material are reported to the IAEA every year. "Some material goes missing and is never found," according to Yukiya Amano, director general of the IAEA, in a Reuters article published on 1 July 2013.

That same month, at a conference on enhancing global nuclear security efforts, Amano warned of possible terrorist attacks involving radioactive material. "The threat of nuclear terrorism is real, and the global nuclear security system needs to be strengthened in order to counter that threat," he continued. Obviously, if a "dirty bomb" is detonated in any major metropolitan city, and/or there is confirmed sabotage at a nuclear facility, the consequences could be devastating.

More troubling than these fairly recent reports were disclosures that the A.Q. Khan network – a nuclear trading organization – had in 2003 illicitly sold critical nuclear technologies to North Korea and other states of "proliferation concern." Those illegal transfers were strong evidence of the serious gaps in international export controls that now threaten the peace of the entire world. Former Pakistani nuclear scientist Abdul Qadeer Khan reportedly directed those transfers, and later used a similar network to supply Libya, North Korea, and Iran with designs and materials related to uranium enrichment. Even more alarming is the fact that the London-based International Institute for Strategic Studies revealed, in a May 2007 report, that "at least some of Khan's associates appear to have escaped law enforcement attention and could ... resume their black-market business."

Tracking & Securing Nuclear/Radiological Materials

According to various other reports, al-Qaida also unsuccessfully sought nuclear weapons assistance from the A.Q. Khan network. Although that effort failed, al-Qaida did receive partial help from at least one other group in Pakistan. Among the scientists who may have provided at least some help to the al-Qaida representatives were retired Pakistan Atomic Energy Commission



scientists, long-time rivals of Khan, and two high-ranking Islamic fundamentalists – Sultan Bashiruddin Mahmood and Chaudiri Abdul Majeed. According to a 2005 report by the Commission on the Intelligence Capabilities of the United States Regarding Weapons of Mass Destruction, al-Qaida "had established contact with Pakistani scientists who discussed development of nuclear devices that would require hard-to-obtain materials like uranium to create a nuclear explosion."

These reports, and an abundance of other evidence, are taken very seriously at the highest levels of the U.S. government. A 2008 news transcript shows that, when then-U.S. Secretary of Defense Robert Gates was asked, "What keeps you awake at night?" his reply was short and to the point: "The thought of terrorists getting a weapon of mass destruction." A 14 March 2012 report issued by the U.S. Government Accountability Office (GAO) confirmed that the United States continues to encounter gaps in the accounting for and evaluation of security efforts designed to safeguard and protect U.S. nuclear material overseas – at least partly because of problems related to nuclear cooperation agreements.

Even more troubling, perhaps, is the fact that the GAO apparently determined that the agencies responsible for reviewing foreign partners' security are not doing so systematically. The report acknowledged that there probably had been at least some "fragmentation and overlap among … U.S. programs that played a role in preventing and detecting the smuggling of nuclear materials overseas." Not incidentally, the same report also indicated that a vital concern in the effort to combat the proliferation of CBRNE elements is that no one federal agency has been assigned the lead role to direct the combined efforts of at least a half dozen or so agencies.

Radiological Dispersal Devices – An Even Greater Threat

The GAO also reported that, in addition to direct nuclear incidents, a significant threat to U.S. national security comes from sealed radiological sources, which are radiological material (including cobalt-60, cesium-137, and strontium-90) that has been sealed in metal to prevent its dispersal. Such sources are routinely used worldwide for many legitimate purposes in various medical, industrial, and agricultural applications. Because many countries do not methodically account for the radiological materials they possess, the total quantity legitimately in use worldwide is unknown. If specific types and quantities of these materials were acquired by terrorist organizations, they could be used to construct radiological dispersal devices. Commonly known as "dirty bombs," such devices combine radioactive material with conventional explosives and are considered by many experts to be far more likely to be used in a future incident than a nuclear explosive device.

The potential terrorist use of a dirty bomb is plausible because, unlike a nuclear device, the building of a dirty bomb requires only limited technical understanding both to build and to deploy. Because the loss of life from exposure to radioactive materials and shrapnel associated with a dirty-bomb explosion could be considerably larger and more devastating than the after-effects of a conventional explosion, such bombs could incite a massive public panic, adversely affect economic commerce, and necessitate costly decontamination measures. According to the Nuclear Security Governance Experts Group, even "an apple-sized amount of plutonium in a nuclear device and detonated in a highly populated area could instantly kill or wound hundreds of thousands of people."

Of course, the success of a dirty-bomb attack would hinge on a number of other crucial factors as well, including but not limited to the following: the type of radioactive material used; the size of the particles emitted; how easily they would scatter; the overall volume of the material and explosives used; and the weather conditions in the target area at the time of the attack. On the other hand, an explosive device is not necessarily needed to carry out a radiological attack. Even small amounts of Polonium-210 (an alpha emitter) – spread into a community's water supply, for example – are considered very deadly, extremely toxic, and relatively easy to smuggle (because Polonium-210 emits only short-range radiation).

"Loose Nukes" & Other Concerns

The senior leadership of al-Qaida has demonstrated an unrelenting commitment to steal, buy, and/or build its own WMD. As a candidate for the U.S. Senate in 2004, Barack Obama frequently spoke of the need to keep "loose nukes" out of the hands of terrorists and rogue nations. Later, in a 2008 presidential campaign ad, he asserted that, the "single most important national security threat [the United States faces] is nuclear weapons falling into the hands of terrorists." As president, though, he has stated a number of times, particularly since the death of bin Laden, that: (a) al-Qaida is now "a shadow of its former self"; and (b) its capabilities have been "severely diminished." Although bin Laden's career with al-Qaida has ended, many followers of his ideology live on. The new leader of al-Qaida, al-Zawahri, an Egyptian whose location has eluded U.S. and allied intelligence officials, recently issued several messages of his own on jihadi websites to the followers of bin Laden.

On 30 July 2013, a particularly ominous message was posted from al-Zawahri to President Obama. That message, translated by the jihadist website monitoring service SITE Intelligence Group, asserted that: "You fought us for 13 years. ... Did we soften or toughen up? Did we back out or advance? Did we withdraw or spread out?" The transcript continued with a direct message from al-Zawahri to his followers: "I call on every Muslim in every spot on Earth to seek with all that he can to stop the crimes of America and its allies against the Muslims – in Palestine, Iraq, Afghanistan, Yemen, and Mali, and everywhere."

Al-Qaida's pursuit of WMDs obviously has not diminished, nor has the organization's threat against the West. The possibility that terrorists might steal or illegally acquire highly enriched uranium or plutonium and use those materials to create a makeshift nuclear device remains a continuing concern to U.S. national security.

The anthrax letters that killed five people and sickened 17 shortly after the 9/11 terrorist attacks indicate that new WMD attacks against the United States are plausible at any level. Those attacks, as well as the bombs detonated at the Boston Marathon on 15 April 2013, demonstrated that even a relatively small-scale attack could prompt a disproportionate amount of terror and public panic. Although biological weapons may be more easily obtained and more likely to be used than nuclear or radioactive weapons, there are nonetheless several ominous facts that cannot be easily dismissed: (a) al-Qaida is still attempting to acquire a WMD in some form; (b) more than 2,000 confirmed cases of unlawful trafficking of nuclear and radioactive material have occurred in the past two decades; and (c) several credible reports suggest that both Syria and Libya have lost (or sold) a number of missing WMD components.

President Obama said in a speech on 6 April 2010 that, "The greatest threat to United States and global security is no longer a nuclear exchange between nations, but nuclear terrorism by violent extremists and nuclear proliferation to an increasing number of States." It can be safely assumed that terrorist organizations will not stop their relentless plans to inflict harm and spread fear throughout the world. As such, it is particularly important for all nations to heighten and maintain physical security at their nuclear facilities, expand current security efforts and tighten control of nuclear materials, account for all nuclear and radiological materials in their possession, strengthen their combined efforts to combat nuclear and radiological proliferation, and be as fully prepared as possible to mitigate the major risks that still remain.

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 News, al-Jazeera Television, and al-Arabiya.

Radioactive Sources – An Invisible Hazard

By Stephen Jolly, Emergency Management

The 2011 earthquake and follow-on tsunami disaster in Fukushima, Japan, highlighted both the impact a radiological disaster can have on the local community and the inability of even the best emergency managers to effectively plan for such incidents. In order to properly plan and respond to disasters, emergency managers must be fully aware of where, specifically, radioactive materials can be found within their communities.

Among the primary sources of radioactive materials, and probably the best known by the general public, are nuclear power plants. Because these plants are often owned and operated by private power companies, they usually have their own emergency managers and plans. By closely coordinating with the company's emergency management division, therefore, community and/or state emergency managers can learn what those managers know about radioactive hazards and the proper responses needed to cope with various hazards or other problems the power plant may experience. Nonetheless, as was demonstrated at Fukushima, an unexpected nuclear power incident can very quickly overcome the capabilities of local responders, and assistance from higher levels of government may be required.

An additional concern is that most nuclear waste is typically stored, at least temporarily, at or near the nuclear power plant producing the waste. As the plants are refueled, the spent fuel is stored in on-site facilities until it can be transported to a long-term storage facility. Most low-level waste also is stored on-site, which represents an additional hazard that must be taken into account during and after an on-site fire, flood, or other crippling disaster.

Although not necessarily widespread, smaller research and test reactors can be found at many local colleges and universities; very few of them, however, are even close to the size of the reactors in civilian power plants. For example, the reactors at the Calvert Cliffs Nuclear Power Plant in Lusby, Maryland, have a collective power capacity of approximately 870 megawatts; the capacities of smaller test reactors, though, typically fall within a range of less than one megawatt up to about 20 megawatts – but average approximately 1.8 megawatts. A major concern is that those responsible for the smaller reactors may not have the support of a designated response team – or even the plans needed to cope with an unexpected emergency situation. Therefore, emergency managers should be aware of the facility's plans and response capabilities, and take them into consideration when devising their own disaster response plans for nearby communities.

Medical & Industrial Sources of Radiation

The most likely sources of radioactivity that would be encountered by responders and receivers in most local jurisdictions are the systems, devices, and equipment used in and by the medical community. Radioactive sources are used in a variety of procedures ranging from radiation therapy in the treatment of cancer and clogged blood vessels to diagnostic uses in imaging body parts or determining bone density. Radioactive sources can be found in a variety of medical facilities – the most likely being fully equipped hospitals, but many doctors' offices also have in their equipment inventory relatively small imaging units and/or radiation therapy devices. In addition to hospitals and medical specialist offices, dental and veterinary clinics may house a few frequently ignored radioactive sources as well. Although the amount of radioactive material found in these machines is relatively small, there are still some risks associated with their use.

In modern nations, many industrial facilities – including shipyards and metal fabricators – have equipment and processes that use radioactive sources. Radiography machines, for example, are used (for the quality assurance of metalwork) to inspect welds and metal parts for defects. Irradiators, frequently used for X-rays and other medical/therapeutic purposes, have a number of other uses – for example, the sterilization of medical supplies, as well as the preservation of milk, fruits, and vegetables – but also expose the products to gamma radiation.

One specific concern regarding medical and industrial radioactive sources is their security. Although there have been no radioactive dispersal devices (otherwise known as dirty bombs) used against the United States, there have been numerous situations involving stolen radioactive material, including but not limited to the following: (a) two radioactive bomb threats reported in Russia, near Chechnya, in 1995 and 1998; (b) 19 small tubes of cesium stolen from the Moses Cone Memorial Hospital in Greensboro, North Carolina, in 1998; and (c) a former Russian KGB officer in London assassinated by radiation poisoning in 2006.

A significant example of how stolen radioactive material can be accidentally used occurred in Goiânia, Brazil, on 13 September 1987 when two scavengers entered an abandoned hospital and found a radiation therapy unit. Apparently thinking it would have some scrap value, they took it home and started to dismantle it. Eventually, they freed the radioactive source, but by that time they had already started to personally experience some symptoms of radiation poisoning (including vomiting, dizziness, and radiation burns on their skin). The unit was sold shortly thereafter and further dismantled, spreading the radioactive cesium dust among various friends and family members. Eventually, the incident was discovered – after four people had died and 249 others were significantly contaminated with radioactive particles. Even without any evil intent, there is still a significant danger when radioactive sources are not properly secured.

Nuclear power plants may be the largest but certainly are not the only source of radioactive material. There are types of radiation threats in many communities, even where there are no nuclear power plants.

The Proper Disposal of Radioactive Waste

There are two major categories of radioactive waste: low-level and high-level. The most common is low-level waste – contaminated rags, for example, as well as a varying array of filters, injection needles, medical tubes, tools, and other medical or dental equipment items. The radioactivity of this waste can range from just above the background levels found in nature to higher levels of radioactivity in certain cases such as parts from inside nuclear reactor vessels. Low-level waste comprises 97 percent of the volume, but emits only 8 percent of the radioactivity, of all radioactive waste. Such waste is typically stored on site by the producers of that waste until it has either decayed – and can be disposed of as normal trash – or is shipped to a low-level waste disposal site.

The second category is high-level waste, which consists primarily of spent fuel from reactors. Some countries – for example, France, the United Kingdom, Russia, India, and the United States – reprocess varying quantities of spent fuel, but the processing itself creates additional types of high-level waste. The latter are typically stored at the site that produced them because there are at present (so far as is known) no national or regional repositories that can be safely used to store high-level waste.

This type of radioactive waste is then transported – by truck, rail, and sometimes by purpose-built ships using robust and secure containers – to various areas, fairly distant from highly populated communities, for storage and disposal. Containers made from layers of steel and lead have been used in more than 3,000 shipments of spent fuel with no apparent impact on the containers themselves from the radioactive contents. Low-level waste is transported in containers considered to be appropriate for the levels of radiation found in the waste. As with any other type of hazardous/dangerous material, the transport vehicles themselves are clearly labeled with the name of the hazardous material inside, a common-sense precaution that permits the quick identification of the material when an accident does occur.

Because of the continuing proliferation of radioactive materials throughout many modern nations, emergency responders must be prepared at all times for the possibility of encountering radioactivity – in fires and/or floods and many other types of disasters, both natural and manmade. By always knowing specifically where these materials are stored, emergency planners, responders, and receivers will be much better prepared to cope effectively with an invisible but nonetheless dangerous radioactive threat.

Stephen Jolly has served more than 20 years as a nuclear operator and trainer in the Navy's Nuclear Power program. He was the nuclear training program manager in his most recent post, the nuclear-powered aircraft carrier USS Dwight D. Eisenhower (CVN-69), where he was responsible for the continuous training of more than 350 Navy officers and enlisted personnel. He also serves as an instructor on the Anne Arundel County (Md.) Community Emergency Response Team (CERT).

Nuclear Meltdown – The Need for Timely & Honest Information

By Janette D. Sherman & Joseph J. Mangano, CIP-R

The operator of Japan's stricken Fukushima Daiichi nuclear power reactor was sharply criticized – in a 26 July 2013 article published in the *New York Times* – for delaying news of the release of nuclear contamination into the Pacific Ocean. To keep the highly radioactive nuclear rods and waste cool, the Tokyo Electric Power Company (TEPCO) has been pumping water into the ruins ever since the 11 March 2011 seaquake and tsunami caused the Fukushima nuclear power reactor to meltdown. In the *Times* article, Dale Klein, a nuclear expert hired by TEPCO to recommend "changes in corporate culture," described the reporting lapse as "incompetence rather than a cover-up."

That description may be a bit too kind. Neither incompetence nor the hiding of important information is acceptable to first responders themselves, nor to any group of citizens anywhere in the world who are suddenly exposed to radioactivity, or to those authorities who are responsible for making fully informed life-or-death decisions.

A Fukushima-Like Threat on U.S. Soil

Of particular interest in the United States is the operation of the Indian Point Nuclear Reactor located on the Hudson River 25 miles north of New York City (NYC), the most heavily populated metropolitan area in the United States. A comprehensive study conducted – at the request of the State of New York – in 2003 by James Lee Witt Associates outlined the many risks posed to NYC residents by the Indian Point plant. Those risks include, but are not necessarily limited to: (a) the plant's age (40 years); (b) its proximity to two earthquake fault zones; (c) the on-site storage of a massive quantity of spent but still radioactive fuel; and (d) the complicated if not impossible difficulties involved in planning safe and viable evacuation routes out of the area.

The start of almost any large-scale disaster – whether it be a violent storm, a building collapse, a serious disease outbreak, a major fire, or a sudden flood – requires that decision-making authorities possess timely and accurate information in order to properly place trained first responders and abundant supplies where needed. With a nuclear disaster, however, the presence of high levels of radiation at the source and the dispersal of radioactive isotopes through a much larger area, well beyond Ground Zero, exponentially raise the risk of death, injury, and property damage. Three of the six Fukushima reactors melted down, a fuel pool failed, and there were hydrogen explosions and a large number of fires. As was initially done following the Chernobyl nuclear disaster in Ukraine on 26 April 1986, the Fukushima firefighters poured massive quantities of water onto the reactors' spent uranium fuel rods to prevent and control nuclear reactions.

According to a 30 July 2013 article published by Reuters: (a) an estimated 440+ tons of fresh water are required daily to cool the Fukushima reactors; and (b) about 85 percent or so of the 1,000 tanks in the meltdown area, which collectively hold 380,000 metric tons of wastewater, have already been filled. These hastily constructed tanks are on the reactor property, above sea level, and water runs downhill – in this situation, to the Pacific Ocean.

The Immutable Laws of Physics, Chemistry & Biology

A myriad of nuclear isotopes have been released from the Fukushima plant. Those posing the greatest risk to human life are tritium, strontium, cesium, and iodine, all of which are absorbed by the living tissue of plants, insects, fish, birds, and mammals (including humans, of course). These isotopes move steadily up the food chains: from plankton to invertebrates, fish, and mammals; from plants to insects to birds; and into the plant and meat food chains of humans. The contamination pathways have been well documented since the Chernobyl incident. Unless the laws of physics, chemistry, and biology are rescinded, the basic information about these chemicals has been known for nearly a century, and are addressed individually as follows:

Physics – When uranium is split, as in a reactor or bomb, it releases massive amounts of heat and energy, as well as multiple radioisotopes. Once radioisotopes are released, the process of decay cannot be stopped. It takes approximately 10 half-lives for an isotope to fully decay. Considering the fact that the half-life of both cesium and strontium is approximately 30 years, it will be about three centuries or so before returning to pre-contamination levels. The incineration of the contaminated Fukushima materials is already underway in Japan, but the burning of such materials – whether in an incinerator or a forest fire – spreads the pollution. Moreover, isotopes in air, soil, water, food, plants, or animals cannot be detected by sight, taste, or smell. Radiation-measuring devices can detect the alpha, beta, and gamma emissions of the materials, but only if appropriate tests are carried out – and, when they are, the results are not useful if the information is not released to the public in a timely manner.

Chemistry – All elements, radioactive or not, belong to groups best shown in the Periodic Table of Elements. Radioactive strontium belongs to the same chemical family as calcium and, like calcium, becomes deposited in the bones and teeth of all animals, including humans, fish, and birds. Like potassium, radioactive cesium is deposited in the muscle; radioactive iodine is taken up by the thyroid gland and causes significant damage, particularly to unborn and/or young animals and humans. Decaying isotopes release high-energy radiation that causes damage to the surrounding tissues, including mutations.

Biology – As radioactive isotopes are dispersed over land and water, they eventually become deposited on land and water, but in a non-uniform manner – depending on wind direction, weather, and elevation. Life process of plants results in the uptake of radioactivity, which is released as plants die or become dormant, and leaves fall to the ground, to seep into the soil to be taken up again the next season. In the interim, the fruits, vegetables, and grains eaten by wildlife, livestock, and humans become contaminated. As isotopes fall on both fresh and seawater, they are absorbed by plankton, crustaceans, fish, mammals, etc., and spread throughout the food chain.

Long-Term Consequences

After the Chernobyl disaster, not all of the life systems were actually examined, but all of those that were examined – wild and domestic animals, birds, insects, plants, fungi, fish, trees, and humans – were damaged to some extent, many of them permanently. To dismiss the findings of Chernobyl and to think that life in and around Fukushima will somehow be spared is inconsistent with nearly a century of accumulated scientific data.

The adverse effects already recorded in insects, birds, plants, and animals with relatively short-term life spans is predictive of those with longer life spans. Professors Anders Pape Møller of the University of Paris-Sud and Timothy Mousseau of the University of South Carolina – and many of their Japanese, Russian, Belarusian, and Ukrainian colleagues – have conducted extensive field research at both Chernobyl and Fukushima. At Fukushima, they have documented adverse effects in organisms with relatively short life spans – for example, birds, rodents, and insects (which have completed as many as 25 generations) – that are comparable to the long-term effects seen after Chernobyl. Unlike the organisms studied with shorter life spans, humans are now just entering their third generation since Chernobyl.

The uniqueness of Japan – a relatively small country with a high population density – bears mention. The population density around the Fukushima nuclear plant is greater than the density around Chernobyl. The land in and around Fukushima was, and still is, a major crop-producing area. Moreover, the Japanese diet is high in seafood, vegetables, and rice, and the level of radioactive cesium detected in vegetables and fish continues to increase.

As was demonstrated following a number of other types of disasters – Hurricane Katrina on the U.S. Gulf Coast in 2005, for example – the need for full and prompt information in order to carry out effective evacuations, communications, and medical assistance, and to provide food, water, sanitation, and housing all must be properly addressed and fully integrated. First responders and citizens at large, in other words, need and deserve timely, accurate, and honest information.

Janette D. Sherman, M.D. (pictured), specializes in internal medicine and toxicology with an emphasis on chemicals and nuclear radiation that cause illness, including cancer and birth defects. An author of many scientific articles, she also was contributing editor of, "Chernobyl – Consequences of the Catastrophe for People and the Environment," published by the New York Academy of Sciences in 2009. She graduated from Western Michigan University with majors in biology and chemistry and from the Wayne State University College of Medicine (www.janettesherman.com).

Joseph J. Mangano, MPH, MBA, is executive director of the Radiation and Public Health Project and an author of multiple scientific articles and books, including, "Mad Science: The Nuclear Power Experiment," published by OR Books in 2012, and "Low Level Radiation and Immune System Disorders: An Atomic Era Legacy." He is a public health administrator and researcher who has studied the connection between low-dose radiation exposure and the subsequent risk of diseases such as cancer and damage to newborns.

Hospital Decontamination – High Costs & Limited Benefits

By Craig DeAtley, Health Systems

The primary reason why the Emergency Department of almost any U.S. hospital or other healthcare facility should be ready and able to respond to a hazardous material release is to protect patients, staff, and the hospital's own facilities from avoidable contamination. However, unlike many other patient-care procedures that are performed elsewhere in the hospital that – not incidentally – generate revenue, decontamination drills and exercises are rarely scheduled except for the training considered to be absolutely mandatory.

A recent healthcare system exercise was conducted on 19 April 2013 in Washington, D.C., where eight acute care hospitals responded to the notional release of an insecticide called malathion. That exercise was a reminder to local hospital and public health officials throughout the National Capitol Region about the high costs of patient decontamination training drills.

The "Wally's Warehouse" Incident

The two-day exercise centered on a scenario involving high winds and heavy rain, which culminated in a tornado striking a gas line that subsequently ruptured and ignited. The ensuing fire – at "Wally's Pesticide Emporium," a fictional warehouse containing the malathion – caused the pesticide to be released into the air as well as the ground areas adjacent to the warehouse. The fire itself caused more than 100 injuries – including many from pesticide poisoning – in the warehouse and surrounding neighborhood.

The local fire department provided preliminary care by performing a notional "gross decontamination" of many of the patients before transporting them to the hospital; some of the patients, though, were "rescued" and taken to the hospital in other vehicles. The eight hospital emergency departments participating in the exercise thus received patients who had been either partially or not at all decontaminated.

Some of the patients also had been administered initial doses of Duodote – an antidote for nerve agents – by the emergency medical systems units participating in the exercise. The MEDSTAR Washington Hospital Center (MWHC) was one of three hospitals that set up their own decontamination system and actually decontaminated 35 of the patients who had been transported to the Center.

> *Hospital administrators are faced with numerous complicated decisions every day. One of the most important, though, is how best to handle the decontamination of patients as well as to protect the hospital staff and facilities used.*

Decontamination – Who Does What?

Once it had been determined at the Center that decontamination of some type was needed, the hospital's disaster and hazardous material response plans were quickly activated, and orders were issued that resulted in two types of staffing being mobilized to carry out the patient decontamination. The first group included three nurses and one technician from the emergency department who were given the assignment. Because they were already on duty, no additional costs were incurred. In some hospitals, other staff members within the same hospital who had completed the required site training would also have responded, with no additional costs incurred.

For the Wally's exercise, the hospital also activated its "Team Decon," a select group of 45 well-trained personnel – with varying skills and hospital assignments – who had agreed beforehand not only to assist but also to respond from home when off duty. These on-call personnel are compensated at a set rate of $30 per hour. For the exercise, 10 team members responded, as requested, and participated in the four-hour exercise – at a total initial cost of $1,200. In real-life situations, though, the cost undoubtedly would be much greater because more personnel probably would have been needed.

Pop-Up Tents & Other Decontamination Areas

Most hospitals have at least one or more settings in which to conduct patient decontamination. Tents are a common setting used for this purpose and offer several operational advantages as well. They can quickly be set up in several locations, for example, and used in different but complementary ways. Each tent, though, usually requires the presence of at least two or more staff members – and the set-up time itself varies considerably, depending on the size and type of tent used. During the Wally's exercise, the MWHC itself used three, each with two lanes, at a cost of $18,000 per tent (2009 prices). To add heated water as well as internal heating and/or air conditioning – and in some cases a conveyor system that could be used for non-ambulatory patients – all would incur relatively high additional costs.

Some facilities use trailers that are pre-plumbed and are equipped with two or more shower stations. The advantages provided by the use of trailers include not only their mobility but also the fact that they usually can be operational very quickly. Their disadvantages include the space required for set up, various equipment and other storage requirements, and routine as well as emergency maintenance costs. Most trailers range in price – depending on their size and operational capabilities – from a minimum of $65,000 to $200,000 or higher.

Many hospitals, of course, including the MWHC, already possess the indoor spaces, and associated capabilities, that also cost hundreds of thousands of dollars or more. Once again, the decontamination costs will vary considerably depending on the number of showerheads needed, the type of drainage system employed, and other design and/or operational considerations.

The principal advantage of using such facilities is that the room is always ready and very little, if any, additional preparation is needed to prepare them for the arrival of one or more patients. The MWHC's current indoor shower area, for example, is part of a $2.5-million-dollar room designed as a multipurpose disaster response area. The Ready Room contains a decontamination shower area equipped with four fixed shower heads and a floor drain; however, there is no in-ground storage tank – probably because the cost of installing and maintaining one would be a large additional expense.

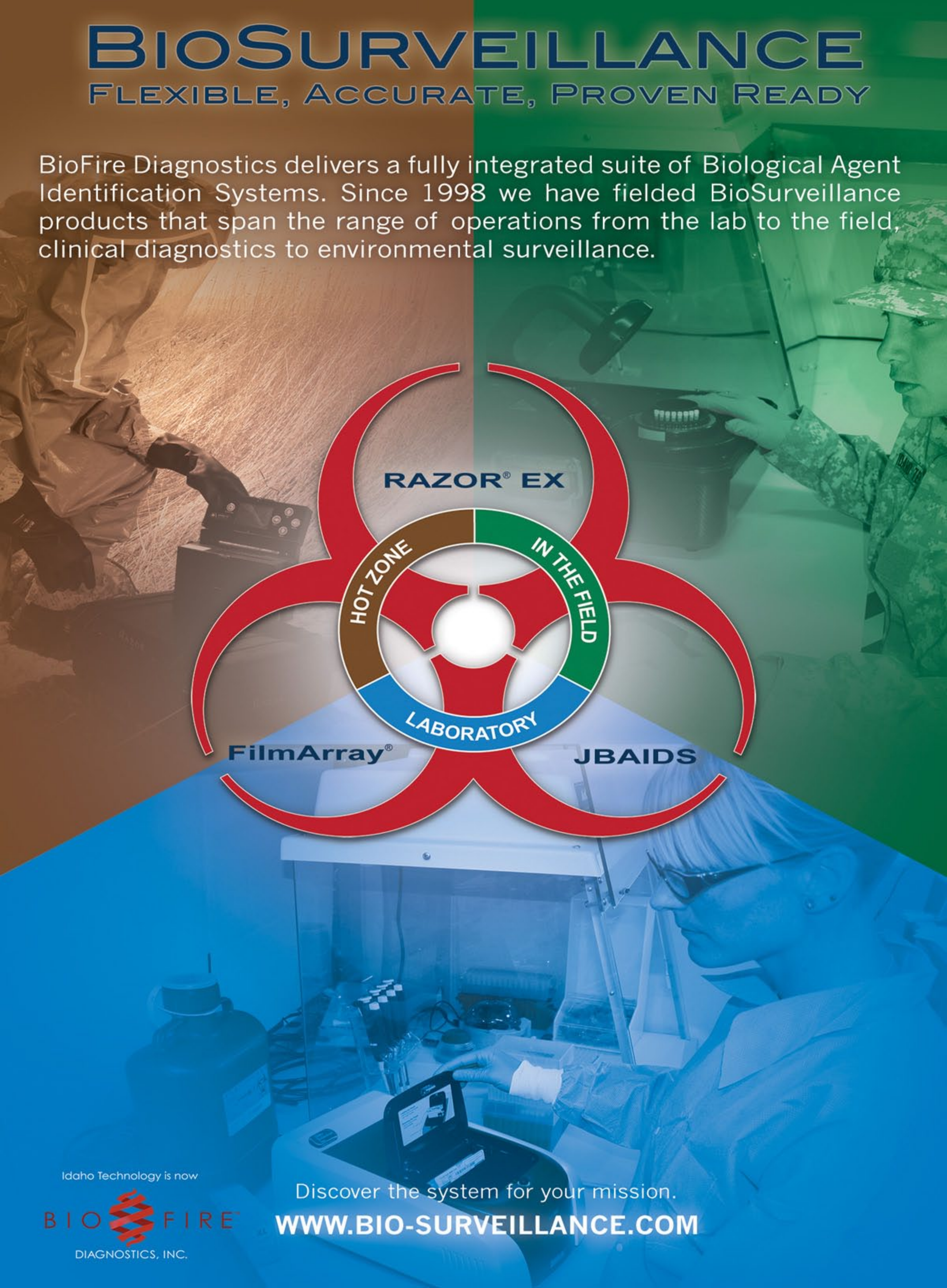
Equipment/Supplies & Other Costs

To meet OSHA (the Labor Department's Operational Safety & Health Administration) "First Receiver" personal protection requirements, hospitals must use Level C ensembles consisting of chemical-resistant boots ($75-$110 a pair), inner and outer gloves ($8), a protective suit ($75-$90 each), and a power air-purifying respirator (PAPR, which cost $1,100 each). Rather than buy all such items individually, some facilities purchase commercially prepared PPE (personal protective equipment) sets at a cost of about $125 each.

Depending on the operational situation involved, a personal radiation dosimeter also may be issued to each decontamination team member to wear, at an additional cost of several hundred dollars each. During the Wally's exercise, MWHC used 14 of its 50 PAPRs and 14 Chem Pak Response kits ($1,750 each). The long-range plans of most U.S. hospitals project a future inventory that allows for multiple PPE change-outs during a response – resulting, therefore, in additional inventory expenses.

The most important variable cost involved in these same projections, obviously, involves the patients who are going through the decontamination process, who must: (a) first have their own clothing and valuables bagged and tagged; and (b) later, during the decontamination process itself, will be using a bar or bag of soap, followed by towels and a gown. The kits containing these items, plus flip-flops for foot protection, cost about $15 each; the MWHC used 35 during the Wally's exercise, for a cost of $525.

The symptoms caused by malathion – and/or other nerve agents – can be treated with the antidotes atropine and 2Pam, which are packaged individually as a Mark I kit or mixed together as Duodote. For the Wally's exercise, more than 100 notional doses of Duodote were administered at a cost of $50 each (more than $5,000).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The hospitals involved in the decontamination process also incur several other costs. One such cost, not easily calculated, is for the water used during the response. In many cases, the water runs continuously and the costs can add up very quickly depending on the number of shower positions being used. Portable basins collect the runoff (the cost varies by size, but can be several hundred dollars), which may be moved by a sump pump ($100) into a bladder (again, varies by size, but is usually several hundred dollars) and then sucked up by a hazardous waste hauler, at a significantly greater cost.

Nighttime operations require lighting – whether fixed on overhangs, erectable (halogen lights on stands cost $79 each), and/or headlamps ($20-$59 each) worn by members of the decontamination team. Among the many other medical/sanitation and/or operational items commonly needed are: radios equipped with throat or ear microphones ($300-$500 each); bullhorns ($100); white boards ($35); large trash cans ($75 each); liquid soap containers ($6 per bottle); buckets ($5); and brushes ($7-$15 each).

The costs associated with a hospital being fully prepared to deal with contaminated patients will vary, of course, depending on the response capability desired or needed. In an era where positive bottom lines are becoming harder to meet, justifying these important, unique, and usually nonrecoverable costs is becoming an increasingly greater challenge. But then again, it takes only one major warehouse fire to fully justify all of the costs involved.

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Insider Threats: A Call for Greater Vigilance

By Joseph Trindal, Cyber & IT

The recent convergence of several politically difficult factors involving the surveillance capabilities and operations of the National Security Agency (NSA) also highlights the need for greater vigilance of so-called "insider" risks. In June 2013, Edward Snowden, an NSA contractor/analyst, was charged with stealing and releasing to the media potentially damaging classified information, which is a clear violation of various sections of the U.S. Espionage Act. While continuing to breach the public trust vested in him, Snowden made his way to Russia, which granted him sanctuary from U.S. prosecution.

The Snowden incident follows a long line of similar breaches. According to a number of media reports, at least eight people have been charged by the U.S. government in recent years with violating the Espionage Act. Those charged include a number of employees and contractors from various government agencies, such as the U.S. Departments of Defense, State, and Justice, as well as NSA and the Central Intelligence Agency.

Unlike the era of the famous trial and executions of U.S. citizens Julius and Ethel Rosenberg in the 1950s, in which public opinion overwhelmingly considered such persons to be traitors, the public opinion about Snowden (and others who have leaked confidential information) is somewhat mixed. According to a 27 July 2013 broadcast by National Public Radio, the arguably mixed public opinion in the United States may have been an influential factor in the decision by Russian President Vladimir Putin to accept the political risk of giving Snowden at least temporary asylum.

Complicating the picture even more is the fact that U.S. public opinion is mixed in the case of U.S. Army PFC Bradley Manning, sentenced in August 2013 to 35 years in prison for having released tens of thousands of documents to WikiLeaks in 2010. Under U.S. law, Manning could be released from prison in less than 10 years.

> *The combination of insider espionage, public sympathy and ambivalence, the proliferation of lone-actor decisions, global publicity, and rapidly expanding cyber capabilities is a dangerous recipe for disaster.*

Espionage: Personal Conscience & Public Opinion

In the Manning case, the defense team argued that the PFC's criminal behavior was an act of conscience. That allegation put Manning more or less in lockstep with Snowden, whose alleged principal motivation – as even President Obama acknowledged in a 9 August 2013 public address – also was his personal and professional conscience.

Public debates over acts of conscience were all but absent during the Cold War espionage cases of the 1950s and 1960s. However, the famous Ellsberg-Russo "Pentagon Papers" trial of the early 1970s was an important turning point for U.S. public opinion. At that time, the American people were increasingly frustrated by the seemingly endless war in Vietnam and the revelation of the classified internal analysis contained in the Pentagon Paper fueled even deeper frustration and distrust in government. Some of the same public perception dynamic is re-experienced today.

Another major insider threat news story receiving global attention is the recently concluded trial of Major Nidal Hasan, U.S. Army Medical Corps, who was convicted and was sentenced to death for killing 13 innocent victims, and wounding 32 others, during a shooting rampage at Fort Hood, Texas, on 5 November 2009. Hasan, representing himself, used the trial as a major public forum to express his own views and "personal conscience" defense.


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Hasan's personal views obviously have had little effect on public opinion in the United States, but resonate strongly in at least a few other parts of the world. In fact, according to a motion filed by Hasan's standby counsel team in August 2013, their client had from the start been "engaging to working toward the death penalty." Martyrdom is a well-recognized method for conveying a message of commitment to a cause. Regardless of whether the 2009 Fort Hood slaughter is viewed as an act of terrorism or workplace violence, the "insider threat" implications are profound and continue to resonate years after the criminal act itself.

Lone Actors: Physical & Cyber Threats

The proliferation of insider threat actors in recent years has not been lost on transnational terrorist organizations. In the spring 2013 issue of al-Qaida's online publication *Inspire*, numerous special messages were focused on instructing and motivating the "lone actor" terrorist. Instructions in the form of an *Open Source Jihad* are specifically designed to facilitate the physical attack methodologies that can be used to exploit the inherent vulnerabilities of free industrialized nations.

Not incidentally, the same source also comments on the value of attracting journalists to al-Qaida's radical cause not only by exposing western government security information but also by providing direct surveillance support. Moreover, according to a 15 August 2013 analysis by the Middle East Media Research Institute, the rebuilding and reconfiguration of Al-Qaida in the Arabian Peninsula (AQAP) in the post-bin Laden era is elevating the Yemeni cell leader, Nasir al-Wuhayshi, as the terrorist plot source of recently intercepted communiqués that led up to, and resulted in, the U.S. shutdown of numerous diplomatic missions throughout the Middle East. Al-Wuhayshi is known to be a strong proponent of lone-wolf attack methods and of further diffusing the radical jihadist cause. The Middle East Media Research Institute credits al-Wuhayshi, in fact, with creation of the AQAP's growing cyber capabilities.

The convergence of these several public opinion trends – in the form of massively damaging insider espionage, growing public sympathy and

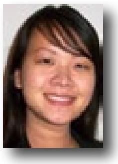
ambivalence, the escalating terrorist calls for lone-actor proliferation, and the global publicity given to extreme insider violent attacks, along with AQAP's strengthened cyber capabilities – should be of significant concern across the public and private sectors. This is particularly so in an age of increasing reliance on information technology.

All of these trends coupled with massive consequences for U.S. security significantly magnify the potential associated risks, thus demanding much greater attention to personnel surety controls and more effective cyber security at all levels within the public and private sectors. Official recognition of these trends should generate the actionable situational awareness needed as a foundation for managing the significant and rapidly growing risks posed by insider threats.

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.

Radiological Emergencies – Public Health Responsibilities/Challenges

By Audrey Mazurek & Raphael M. Barishansky, Public Health



Over the past decade, U.S. public health agencies (local, state, and federal) have seen an increase of responsibility in preparing for, responding to, recovering from, and mitigating emergencies. In addition to planning for responses to naturally occurring disease outbreaks, these agencies are often key partners in responding to weather emergencies, manmade threats, and chemical, biological, radiological, nuclear, and explosive (CBRNE) incidents.

Today, although public health plays mostly a supporting role during such incidents, there is an increasing demand by the federal agencies that fund various Public Health Emergency Preparedness (PHEP) programs – for example, the U.S. Centers for Disease Control and Prevention (CDC), the U.S. Department of Health and Human Services, and the U.S. Department of Homeland Security – for building the additional capability and capacity needed to respond to such events.

More specifically, public health's role during a radiological emergency has been gaining attention primarily because: (a) large metropolitan areas must plan for possible terrorist attacks using such new and/or improved weapons as Radiological Dispersal Devices (RDDs); and (b) political jurisdictions near nuclear power plants, or research centers using nuclear technology, must update or develop their own comprehensive response plans. Both of these requirements have received greater attention since the radiological emergency caused by the meltdown of Japan's Fukushima Daiichi Nuclear Power Plant in 2011.

However, many local jurisdictions are faced with a disconnect between: (a) a more realistic expectation of the capabilities and capacities needed to respond to radiological incidents; and (b) the current and growing realities of reduced funding, stressed workforces, a lack of subject matter experts possessing the technological background needed in these fields, a long history of limited or no training in the same fields, and numerous competing priorities.

Current Public Health Roles & Responsibilities

According to the CDC, the principal public health responsibilities during a radiological emergency include (but are not necessarily limited to) the following:

- Making recommendations to either shelter in place or evacuate;
- Identifying persons contaminated with or exposed to radioactive materials (population monitoring);
- Conducting or assisting with decontamination; and
- Developing the criteria required for entry to and/or operations within the incident site.

These responsibilities are in addition to traditional public health responsibilities – which also must continue, and often are growing in both size and scope. Included on that already long list are: surveillance, monitoring, and assessment of public health/medical needs; ensuring the availability and provision of behavioral health services, public messaging, and disease control; dispensing of medical countermeasures; and monitoring the safety of food. Many health departments also may be requested to assist in such other tasks as triage, volunteer management, and the operation of Community Reception Centers. (After a mass-casualty radiation emergency, as the

CDC has noted on its website, public health professionals play a crucial role at Community Reception Centers in assessing and monitoring people potentially exposed to radiation or contaminated with radioactive material.)

In addition, the activities that already fall under the responsibility of "population monitoring" are immense – and continuing to grow. The CDC defined population monitoring, in an August 2007 report, as "a process that begins soon after a radiation incident is reported and continues until all potentially affected people have been monitored and evaluated" for:

- The medical treatment needed;
- The presence of radioactive contamination on the body or clothing;
- The intake of radioactive materials into the body;
- The removal of external or internal contamination – decontamination, in other words;
- The radiation dose received and the resulting health risk from the exposure; and
- Long-term health effects.

A Heavy Overload of Roles & Responsibilities

Under the Federal Emergency Management Agency's June 2008 Nuclear/Radiological Incident Annex of the National Response Framework (NRF), the CDC has been designated by the Department of Health and Human Services as its lead agency for population monitoring. For that reason, the CDC has the responsibility for, among other things: assisting state, local, and tribal governments in monitoring those affected; decontaminating those who have been exposed; and creating a registry of the persons who were exposed, or potentially exposed, to radiation from the incident. The CDC also must assist state and local health departments in: (a) determining the level of radiation exposure; and (b) monitoring long after the incident for any health effects caused by radiation exposure and/or from the stress of being involved in the incident.

The bottom line is that, according to the NRF, state and local health departments – with some assistance from the CDC – may well be responsible for all of these monitoring activities both during and after a radiological incident. These major and potentially long-lasting responsibilities have understandably raised serious concerns among many public health and public safety professionals.

However, the already stressed public health infrastructures of many communities throughout the nation are struggling each day not only to maintain adequate staff, funding, and the material resources they need, but also to stay updated on new skills and information. Unfortunately, today's public health environment is already not conducive for fulfilling some of the roles and responsibilities that will be asked of the hard-working professionals assigned all of these important duties and responsibilities.

Current Realities: Gaps & Challenges

According to the National Association of County and City Health Officials website, there are approximately 2,700 local public health departments of various types and sizes in the United States. Only a very small number of them, though, are directly affected by nuclear power plants. Moreover, most public health professionals within a 50-mile emergency planning zone of nuclear power plants already have plans in place for responding to an incident involving any of those plants.

Typically, these jurisdictions already: (a) participate in a broad spectrum of planning, training, and exercises – usually funded through federal grants and/or by the power plants themselves; (b) have established the working relationships needed with key response partners; and (c) have on hand the hospital plans required for receiving and treating patients admitted as a result of a radiation incident.

Some of these same health departments, however, do *not* have available the special plans needed for responding to a radiological or nuclear "terrorism incident." Such incidents usually differ from a nuclear power plant operational incident in several ways: (a) There is less warning time; (b) The scale of the incident is typically much larger; (c) There is a larger

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number of potential victims; and (d) Various unknown materials were probably used by the terrorists. For the health departments that do not have any radiological or nuclear terrorist incident response plans immediately available, and/or have not developed the close working relationships with other jurisdictions responding, the harmful effects could be even more devastating.

Additional Duties, More Training & Less Funding

In addition to the significant planning – unrelated to radiological emergencies – already occurring within PHEP programs specific to biological attacks and region-specific hazards (e.g., hurricanes, wildfires, and earthquakes), health departments are now being asked to meet the requirements set forth in CDC's March 2011 Public Health Preparedness Capabilities. For many jurisdictions, complying with the 15 PHEP Capabilities requires adding multiple hazard-specific annexes – including one for radiological emergencies – to their current All Hazards Emergency Response Plans.

These plans also must be maintained and updated, and may require additional training and exercises as well. However, because of limited resources, competing priorities, and the requirement to deal with other potentially large-scale hazards, health departments throughout the nation have necessarily become much more selective in developing and carrying out their various training and exercise plans.

Training, equipment, and resources are just three factors involved in the assignment of public health roles and responsibilities during a radiological emergency – and must be both realistic and clearly defined.

Jurisdictions that are not within the 10-mile emergency planning zone of a nuclear power plant or not one of the four major U.S. metropolitan jurisdictions – Chicago, Illinois; Los Angeles County, California; New York City; and Washington, D.C. – that receive specific PHEP funding from the CDC, are probably not, for the reasons cited above, participating in any training or exercises specific to radiological responses. Nonetheless, they would still be required to respond to any radiological incident that does occur.

Limited Understanding But Fewer Training Opportunities

Responding to sudden emergencies and planning for such a wide range of hazards are still relatively new responsibilities for many public health professionals. In addition, the PHEP staff members of most health departments already attend various trainings, participate in exercises with a broad spectrum of external partners, and respond to all actual emergencies. Other health department staff, who are focused primarily on carrying out the tasks of traditional public health service agencies and organizations, also have a very heavy workload.

According to a 2010 survey by the National Association of County and City Health Officials, only about 65 percent of the nation's health departments have emergency preparedness staff – and the average number of PHEP staff is 0.5 full-time employees. Moreover, there usually are no full-time CBRNE professionals, health physicists, or subject matter experts in most local health departments. State health departments may employ health physicists who could be called upon during a radiological event; however, those same physicists may not be available during a major incident or event.

There also may be some health department staff available who have had training in responding to a radiological event – environmental health as well as medical staff, for example. However, the numbers vary depending on both the public health infrastructure in the jurisdiction and the role assigned to public health professionals during a radiological event. The bottom line is that, because of the exponential increase in different types of CBRNE incidents coupled with the limited time available, the training required to deal with such incidents is often not a high priority.

Trained Professionals, Good Equipment & Advance Planning

Fortunately, public health professionals have started to become truly active partners and increasingly important players in the first responder communities. But they still do not receive the same level of training, funding, and other resources usually available in more traditional first responder agencies. This gap becomes more apparent when one considers the types of equipment – dosimeters, Geiger-counters, portal monitors, and thyroid uptake scanners – needed for population monitoring. At present, many public health professionals do not possess and/or know how to use much of that equipment. The lack of training and resources, as well as limited participation in exercises focused on CBRNE events, will make some public health staff uncomfortable and possibly unwilling to respond to a radiological incident.

The next logical step for most health departments, therefore, might be to take a more honest look at their own capacities and capabilities specific to the types of incidents that might reasonably be anticipated. One reality that must be kept in mind is the delicate balance between: (a) fully understanding the difficulties involved in resolving current problems; and (b) not overstressing PHEP programs and the people who work in them. There are various tactics that a health department can use to avoid such situations, for example:

- Requesting that existing exercises funded and planned by other agencies take into account the radiological response aspects of those exercises;

- Participating in free online training and webinars offered by federal agencies, professional associations, and universities – including CDC's own "Public Health Planning for Radiological and Nuclear Terrorism" and "Radiological Terrorism: A Tool Kit for Public Health Officials";

- Using existing capabilities and other resources – for example, mutual aid agreements and regional resources – to help leverage responses during a radiological event;

- Working with county, regional, and state partners to more clearly define a smaller role for public health during a radiological emergency, and incorporating that information into a countywide plan – for example, because many health departments do not possess their own decontamination capabilities, it should be specifically noted in the plan that only hazmat teams or firefighters may be assigned to decontamination duties.

Clearly, the roles of public health agencies in emergency planning and response have expanded exponentially in the past decade. Therefore, to help ensure an effective response to any hazard, public health leaders should: (a) know the types of emergencies that a department may face; (b) fully understand their department's own capacity and capabilities; (c) be able to effectively prioritize the material resources and the time required for planning, training, and exercises; (d) leverage existing resources to ensure that, if possible, they can be used for responses to many types of emergencies; and (e) work closely with both traditional (e.g., fire, police, hospitals) and nontraditional (faith-based and volunteer organizations, the private sector, and academia) partners.

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Raphael M. Barishansky, MPH, is the director of the Office of Emergency Medical Services (EMS) for the Connecticut Department of Public Health. Prior to establishing himself in this position, he served as chief of public health emergency preparedness for the Prince George's County (Maryland) Department of Health and as executive director of the Hudson Valley Regional EMS Council, based in Newburgh, N.Y. A frequent contributor to the DomPrep Journal and other publications, he can be reached at rbarishansky@gmail.com.

Special Decontamination Considerations: Bridging the Gap

By Ryan Hay, State Homeland News

On 28 March 1979, the worst nuclear power plant accident in U.S. history occurred in Reactor Two of the Three Mile Island generating station (on the Susquehanna River, near Middletown in southeastern Pennsylvania). Since that time, onsite and offsite guidelines and requirements for emergency preparedness plans covering nuclear power plants have provided a framework for local and state emergency management officials and emergency responders. Throughout the United States, plans for the evacuation, the decontamination (decon), and the sheltering of persons within the emergency planning zones surrounding nuclear generating stations are scheduled regularly and frequently audited by state and federal officials.

Although these plans pre-identify the objectives necessary for a unified response to the release of radioactive material, they usually do not specify the tactics by which the agencies involved are to meet those objectives – many of which require continuous planning and exercising. However, the decontamination of large groups of evacuees may, in certain jurisdictions, involve some unique challenges. The special considerations reviewed below are not specific to radiological incidents but, rather, are among the typical challenges that may face any hazardous materials response team (HMRT), or hospital decon team, when treating and/or decontaminating a patient following a chemical, biological, radiological, nuclear, or high-yield explosive (CBRNE) incident.

Following exposure to hazardous materials, decontamination must be swift to prevent further injuries and other difficulties. Delaying the process because of an inability to secure a firearm or to decontaminate service animals should be avoided.

The First Priority: Saving Officers

Law enforcement officers (LEOs) are often the first arriving responders at incident scenes, which poses a significant threat for them to unknowingly become contaminated by a hazardous substance. Moreover, because of the increasingly common occurrence of chemical suicide attempts across the country, LEOs may find themselves trying to rescue an unconscious person from an enclosed area, not knowing the chemical threat that might be waiting. Similarly, clandestine labs, both mobile and fixed, present a myriad of other chemical and explosive threats to LEOs. In a radiological emergency scenario, it is possible that a number of LEOs may be among those evacuated from the emergency planning zone who require immediate decon.

In these and certain other scenarios, a LEO who is contaminated will need emergent decontamination, which requires that the HMRT or hospital decon team follow the plans in place for securing and safeguarding any and all weapons. However, it can be safely assumed that many LEOs will not readily surrender their weapons to unknown, or even known, first responders or hospital staff without prior assurance that the weapons will be in the custody of another LEO. Additionally, HMRT and hospital decon staff may not know the procedures required to handle and/or secure weapons – for example, firearms, tasers, and OC (commonly known as "pepper spray").

To address these and similar issues, a best practice was established in Lehigh County, Pennsylvania, where the county's Special Operations Team also serves as a regional HMRT and as the Lehigh County Emergency Management Agency's urban search and rescue team. Working together, those jurisdictions have planned, exercised, and implemented a reasonable and well-articulated policy for the on-scene decon of LEOs. The policy calls for the use of a small team of sworn LEOs from a municipal police department to serve as the support staff of the Special Operations Team. These officers are cross-trained and have been nationally certified to the hazardous materials operations level, which meets the requirements of both the National Fire Protection Association (NFPA-472) and the U.S. Labor Department's Occupational Safety and Health Administration.

The officers so designated respond with the Lehigh County Special Operations Team and, thanks to their cross-training, are able both to operate in the decon line and to, if and when necessary, take custody of fellow LEOs' weapons, render them safe, and properly secure them. The support staff also retains and maintains its own small cache of supplies – including Level-B tactical and non-tactical personal protective equipment, self-contained breathing apparatus, and specialized firearm lockboxes. In the event that an officer is in critical medical condition and requires emergency decon, procedures also are in place to secure his or her entire gun belt in a sealed lockbox while the team is administering the expeditious decon needed.

This procedure has been exercised, implemented in actual responses, and evaluated as effective. Because of the diverse number of threats – already present or projected – combined with the all-hazards approach that responders must now follow, integration of the HMRT with local law enforcement is critical for success in the field. Hospital decon teams must consider their operations and policy development for decontaminating any LEO presenting at the Emergency Department who is potentially contaminated.

The same HMRT/LEO partnership also can be expanded from the hazardous materials operations level to include training at the hazardous materials technician level, which would include sampling and the collection of evidence in the "hot zone" of an active crime scene. Although the decon aspect of the LEO support role in the HMRT is in its infancy, it not only has already yielded positive results in Lehigh County but also has shown that there is considerable room for expansion.

Service Animal Decon

Often overlooked is the decon of the special needs population itself, specifically those members with service dogs, which also have to be properly planned for and exercised. Evacuees of the emergency planning zone, or any area affected by a CBRNE event, requiring decontamination may also present to a reception center with their pets. Although most decon efforts primarily focus on human evacuees, plans also must be in place to decontaminate pets when needed.

Service dogs, in particular, must be decontaminated expeditiously and placed back into service to ensure the safety of the humans they serve. Best practices include ensuring that cooperative service animals are decontaminated with their owners, or concurrently with their owner in an animal-specific decon line. Regional teams known as county (or community) animal response teams or state animal response teams are trained to both shelter and care for animals during disasters. Integration of these teams with the local HMRT is critical for the successful and safe decon of animals.

Best practices regarding the use of the county/state animal response teams include outfitting the teams with animal-specific decon supplies, cross-training team members to the hazardous materials operations level, and integrating animal decon into mass evacuation and decon exercises. Ideally, the animal response team will provide animal crates, muzzles, harnesses, etc., to support and expand the capabilities of the decon operation in place. Additionally, these teams often have members with specialized training in small and large animal handling and care. Frequently, these teams include licensed veterinarians. Using regional resources such as county/state animal response teams is a crucial step toward ensuring an appropriate multidisciplinary approach to decontamination.

Plans originally developed for radiological emergency preparedness often can be adapted for all-hazard uses. The fundamental principles and foundations used to guide the evacuation and/or decon of humans and animals during and after a radiological incident also can be used to develop plans and policies for decon during any CBRNE incident. The keys to a successful multidisciplinary approach are cross-training, frequent exercises, and periodic program reviews. Whether it is a field HMRT or a hospital decon team, the frequent collaboration with partner public and private agencies will almost always help ensure future incident success.

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Staple Foods, Grain Tonnages & Daring Rescues

By Joseph Cahill, Fire/HazMat

Grain is the most common food item in most American diets. Whether the grain is corn, barley, wheat, or something more exotic, transporting it from the farm to the dining room table is a massive undertaking by any standard of measurement – and includes many stops along the way – the first of which, usually, is a massive grain silo.

There are three principal risks involved in the operation of silos: entrapment, the possible presence of toxic gas, and various mechanical hazards. The ability to plan for and carry out a successful grain-silo rescue, however, requires: (a) a highly specialized skill set and the use of equipment that is usually not available on standard fire or rescue units; and (b) a unique combination of confined-space maneuvers and specially designed entrapment/extrication gear.

Modern silos are much more than simple albeit outsized storage cylinders. Today's typical silo is fitted, for example, with at least one large auger, positioned at the bottom of the silo, to facilitate the movement of grain from the silo to a truck or train car. The auger is specifically designed to draw grain from the bottom of the silo and, by doing so, let gravity push the grain above further down in the silo. However, this same self-feeding arrangement also creates a steady flow of grain, in large quantities, that can easily create a "quicksand" effect for anyone inside the silo who is standing on top of the grain.

Harnesses, Rescue Tubes & Breathing Apparatus

To mount a grain-silo rescue, the first priority, of course, is the safety of the rescuer(s); harnesses are a must and respiratory precautions should be used as needed. Preventing the grain from crushing the person being rescued is the next priority. That person also should be harnessed as quickly as possible; at the same time, the power to the auger (and any other equipment in the silo) should be disconnected to prevent the victim from being drawn even deeper into the grain.

To maintain an open airway to the person trapped inside the silo, rescuers must clear the grain as quickly as possible from around that person's face and upper body. A five-gallon plastic bucket, with the bottom cut out – or a commercial rescue tube – can be placed over the victim's head. Because the grain in the silo consists almost entirely of dry particles, simple shop vacuums can be used to remove any grain inside the tube or bucket.

The bucket and/or rescue tube both serve the same purpose: to keep the grain from filling in and clogging the breathing space being cleared by the rescuers. Without such barriers, the grain would naturally collapse, like a flow of sand, into the space being cleared.

As is true of almost any other confined spaces, the air in a silo can become a hazard in itself by building up potentially toxic gases and/or explosive powder – created by fermentation of the grain itself – or by decreasing the volume of oxygen in the air. In fact, according to the U.S. Department of Labor's Occupational Safety & Health Administration, there were 503 grain-elevator explosions in silos throughout the United States in the period from 1976 to 2011.

Fortunately, there are now some high-tech systems available for testing the gas inside silos, particularly

for oxygen content and contaminants. In addition, depending on the specific hazardous conditions involved, respiratory protection systems for the rescuer(s) as well as the victim also are available. Powered Air Purifying Respirators (PAPRs) and Self-Contained Breathing Apparatus (SCBAs) are the systems most commonly used.

Avoiding Dangers, Risks & Hazards

The mechanical gears and systems used to move the grain into and out of silos also can be dangerous. As with many other types of machines, human arms, legs, and/or other body parts can quickly and easily become entangled in the moving parts of the equipment. In an entanglement situation, the safety of the rescuer must be the highest priority. It also is important to fully understand the type of equipment involved and its moving parts because energy can often become trapped when equipment is obstructed, but then quickly released while the victim is being disentangled.

As with other types of risks and hazards, prevention is almost always the best, least complicated, and least expensive strategy. Any person who enters a silo must be both: (a) fully trained in the safe methods of doing so; and (b) wearing or carrying the safety equipment required. Moreover, to fully and properly prepare for that unfortunate day when "things" suddenly go wrong, there is a continuing need for specialized rescue services, specifically including well-trained rescue personnel and the equipment they need for dealing with this unique but nonetheless dangerous hazard.

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Passenger Air Travel – When the Bullets Run Out

By Clay W. Biles, Transportation

The student candidates had a brief moment of clarity during the second phase of a two-phase Federal Air Marshal class in 2008 when an instructor said, "I keep plenty of extra ammunition and magazines in my bag, just in case. … [But] don't get caught" doing the same thing. The instructor was referring to a policy, which is still in effect, that limits the amount of ammunition that could be carried by a federal air marshal on mission flights.

This raises a serious question, "What happens if and when the marshal runs out of ammunition – 30,000 feet up?" Of course, if that were to occur, calling for a time-out during combat would obviously not be a viable option. Something more would be needed.

Instilling Awareness in Air Marshal Candidates

Air marshals must be prepared at all times – both physically and mentally – to take action, usually through the intelligent use of some well-articulated counter-terrorist engagement tactics. Depending on the hiring demand, multiple trainings for air marshals are conducted each year by the Federal Air Marshal Service and the Federal Law Enforcement Training Center. Topics of those trainings include hand-to-hand combat tactics, firearms skills, behavioral recognition, and aircraft-specific tactics. For the class mentioned above, however, there was only a single one-hour course that focused on mental preparation, including establishment of the proper mindset for what could be an extremely perilous assignment. In 2008, at the start of the course, an unidentified middle-aged man – hunched over and looking very nonthreatening – walked to a podium at the front of the fairly large classroom and started a PowerPoint presentation.

After the projected title appeared, the "presenter" turned around and slowly moved toward the students. He approached one of them, who was sitting in the first row but not totally focused on any potential danger. Suddenly, and without warning, the presenter pulled a hatchet from behind his back and slammed it into the desk where the candidate was seated. The presenter then stepped back and pulled a knife from the shaft of his walking cane and yelled at the candidate, "Get up!" But the candidate was frozen in place and could not move.

> *Eternal vigilance, cool thinking, special training, and a proper mindset – all are among the primary keys to protecting the airways from unexpected terrorist attacks.*

That lesson later served as a vivid reminder to all members of the class about staying alert and being ready *at all times* to expect the unexpected. After graduating from the academy in 2008, the new air marshal recruits started flying missions to various areas of the world. Because the teams passed one another so frequently – one group entering a country while another group was departing – much of the mystique of the Federal Air Marshal Service started to slowly fade away.

There was another reality the now much more experienced students had to face. For most of them, part of the initial mystique they experienced in their training days was the notion that air marshals had the highest firearms qualification standard of all of the federal government's law enforcement agencies. If that had been true in the past, it certainly was, and is, no longer the case – nor is it necessarily the most important qualification for those protecting an aircraft and its passengers.

Collaborative Efforts at 30,000 Feet

Today, although the Federal Air Marshal Service still uses the same qualification standards that were used when air marshals first carried revolvers – from the 1960s to the 1980s – many current candidates are better qualified to meet today's more complex security requirements. They are eager to learn, physically fit, and diverse enough in appearance to blend in well with other passengers.

Their mindset is also considerably different, as is the collective mindset of most passengers. Ever since the 9/11 terrorist attacks – during which a mere handful of relatively small terrorist teams took control of four large passenger aircraft and used three of them as explosive WMDs (weapons of mass destruction) – U.S. air marshals and the American people have taken the safety and security of aircraft and the people onboard much more seriously than ever before in the nation's history.

For air marshals, the most obvious change is in their training. Unlike firearms skills, which can be taught and improved in both the classroom and on the firing range, there is much greater emphasis on operational security and, most important of all, common sense. Both are much more difficult to teach, but the lessons learned from 9/11 and other hijackings, both before and since that infamous date, have helped immensely to instill the higher skill sets now needed. This is particularly true when the bullets run out and the air marshals have nothing left but their training, stamina, and individual as well as collective mindsets to keep them – and the aircraft's passengers and crew – alive.

Stonycreek, Shanksville & Uncommon Valor

Passengers and crew members also have proved to be invaluable in responding to actual or attempted terrorist attacks. Since the 9/11 attacks in 2001, both of those groups also have developed their own collective mindsets – one of determination to never permit "another 9/11" takeover to occur. The first and still best example of this new national mindset occurred on 9/11 itself, when the passengers and flight crew took control of United Airlines Flight 93, which ultimately crashed in a meadow in Stonycreek Township near Shanksville, Pennsylvania. All post-crash evidence suggests that those aboard Flight 93 were determined to save the lives of their fellow citizens on the ground – probably in the Washington, D.C., area – even if doing so meant losing their own lives.

Those passengers already knew – because they had been listening on their headsets about the attacks on the Twin Towers and the Pentagon – that the moment had come to act, before their own aircraft was used as another flying bomb. In essence, therefore, the bullets had run out for the passengers and crew onboard Flight 93. They had nothing to fight with but their own collective mindset and their determination to stop a threat to not only the aircraft and their own lives, but also to many other potential victims on the ground.

The lesson is clear: Preparedness at 30,000 feet is not necessarily about who had the best score for his or her firearms qualification, who could run the fastest, or who is in the best physical condition. And it also does not include sleeping on the flight (after having had too many drinks the night before, perhaps) or being complaisant after taking the same "uneventful" flight perhaps a hundred times before. In other words, when the air marshal's bullets run out, *everyone* – all hands on board the aircraft – has a personal responsibility to protect the aircraft. And, by doing so, to protect those on the ground as well.

The lesson learned should never be forgotten: Air marshals, passengers, and crew members should continually ask themselves how prepared they would be if a hijacking, in-flight bombing, or other potentially disastrous incident were to occur while they are onboard. There may or may not be air marshals on every passenger flight to, from, or within the United States – but there are flight crews (and usually passengers) on each and every flight. Combating terrorism in the skies is therefore not simply the job and duty of air marshals, but requires the vigilant and proper mindset of everyone onboard.

Clay W. Biles, a former U.S. Federal Air Marshal, served in that capacity from 13 April 2008 to 30 May 2013. He received the Distinguished Honor Graduate Award for his air marshal training class, and from 2011 to 2012 served as the lead firearms instructor for the Service's San Francisco Field Office. He is a former U.S. Navy corpsman, Stanford Medical Center researcher, and bodyguard (for President Hamid Karzai of Afghanistan).