Hazardous Materials Emergency Preparedness Response Curriculum Guidelines

Appendix C:

Special Topics

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Issues in Hazardous Materials Incident Recovery/Cleanup

The addition of objectives that address tactical considerations for minimizing the recovery/cleanup process has merit for several reasons.

Improved Handling of the Incident

The fundamental priorities for all emergency responders who respond to hazardous materials incidents are first, protecting life, second, protecting the environment, and last, protecting property and equipment.

Because protection of the environment is second only to the protection of life, the tactical considerations used to handle a hazardous materials emergency must be selected based on the overall effect those tactics will have on the environment.

In formulating tactical considerations aimed at minimizing impact to the environment, in many situations the emergency responders are simultaneously improving the recovery potential and minimizing the cleanup that is required. For example, an incident commander or hazardous materials group supervisor may choose to erect a portable sump to catch a leaking flammable liquid. This particular tactical action will:

- Prevent the spread of the flammable liquid into the environment, thus increasing the level of protection to he environment and minimizing the amount of environmental cleanup required;
- Reduce the hazards of the incident by allowing pooling of the material, thereby reducing the surface area that can evolve flammable vapors;
- Facilitate an improved recovery of the product by having a vacuum truck recover the spilled flammable liquid directly from the portable sump; and
- Allow for recycling of the recovered product, thus reducing the costs to the spiller.

The tactical decisions of the incident commanders and hazardous material group supervisors can negatively affect both the environment and the recovery and cleanup process. The failure of an incident commander or hazardous materials group supervisor to make the correct decision is usually the result of lack of experience in alternative methods. It is common for incident commanders and hazardous materials group supervisors to use techniques based on their structural fire-fighting or flammable liquid and gas fire-fighting methods. These generally involves using water or foam, each of which provides a medium for increasing the size of the spill, spreading the spill, and increasing the damage on both the environment and the recovery/cleanup process.

Unless terminal objectives are identified, incident commanders and hazardous materials group supervisors will make tactical decisions that negatively affect both the environment and the

recovery and cleanup process. Instructional materials used to increase the skills of incident commanders and hazardous materials group supervisors should provide the basis for identifying and using the proper tactical decisions.

Emerging Legal Trends

Another significant reason for using tactical considerations that minimize the impact on the recovery/cleanup process is the legal trend occurring in cost recovery litigation. Because the costs involved in handling a hazardous materials incident are routinely assessed against the spiller, lawyers defending spillers has developed tactics to provide relief to the spiller. This relief attempts to have some of the recovery and cleanup costs transferred from the spiller to the emergency responders when it can be demonstrated that the tactics used by the emergency responders resulted in increased costs.

For example, an incident commander or hazardous materials group supervisor might choose to allow a leaking hazardous material to enter a storm drain instead of attempting to dike the product to keep the product above ground. As a result, the spiller now must have a cleanup company remove the product from the storm drain at a considerable cost. In the ensuing litigation, the attorney for the spiller demonstrates the difference between the actual costs incurred as a result of the actions taken by the emergency responders and those that would have been incurred had the emergency responders kept the product from entering the storm drain. In scenarios of this type, the courts are ruling, with increasing frequency, that the spiller is only responsible for the costs of the recovery/cleanup resulting from the emergency responders used nationally recognized practices. The difference between the actual cost and the costs assessed against the spiller are then transferred to the emergency response agency.

Although this type of litigation action is occurring primarily in bellwether States like California, it is gaining recognition as a litigation technique that can be used effectively for defending and reducing the recovery and cleanup costs assessed against spillers. In addition, this type of litigation is resulting in the actions taken by emergency responders coming under increasing scrutiny to attempt to find errors and omissions that may be used to obtain relief for spillers.

Emergency responders are no longer exempt and protected from legal action when it can be shown that the negative outcomes resulting from their actions can be defined as contributory negligence.

Increasing Enforcement of EPA Regulations

Another purpose for identifying response/recovery terminal objectives that will lead to the development of training in this area is the increasing enforcement by EPA of the Resource Conservation and Recovery Act (RCRA). RCRA clearly states that, after an emergency ends and the recovery and cleanup process begins, emergency responders are no longer exempt from compliance with the requirements of RCRA. As a result, after the emergency has ended, emergency responders must comply with RCRA or face a potential of a fine for noncompliance. An example is a situation where the emergency responders elect to sweep up an absorbed hazardous material that should be disposed of in a proper waste disposal site. Instead, the emergency responders choose to take the absorbent containing the regulated hazardous material and dispose of it in a common landfill dumpster.

The recovery/cleanup objectives have been defined to:

- Identify tactical considerations that minimize the effect of hazardous materials spills on the environment;
- Identify tactical considerations that minimize the financial impact on the recovery and cleanup process;
- Provide training that will protect emergency responders from litigation resulting from using improper tactics, based on past practices, in situations in which using more proactive techniques would have greatly reduced the cost of the recovery and cleanup; and
- Provide training that will protect emergency responders from litigation resulting from their engaging in practices that are not in compliance with RCRA.

How Recovery and Cleanup Tactical Considerations Are Driven by the Risk/Benefit Analysis Process

In addressing the tactical considerations that affect recovery and cleanup, the initial size-up and risk/benefit analysis of the tactical considerations identified early in an incident can have a major impact on the recovery/cleanup process later in the incident.

A quality risk/benefit analysis begins by assessing what the outcomes would be if the emergency responders did absolutely nothing and allowed the incident to go through natural stabilization. The emergency responders must ask themselves at this time, “If I do nothing, what are the outcomes?” In time, the incident will stabilize, and the outcomes will possibly include the loss of life, negative impact on the environment, and damage or loss of property and equipment.

After the emergency responders have identified the outcomes of natural stabilization, the next question they should ask themselves is, “Can I change the outcomes of natural stabilization?” If the answer to this question is “No,” the emergency responders should only isolate the hazard area, deny entry, and protect people, the environment, and adjacent property and equipment from exposure.

If the answer is “Yes,” then the next question to ask is, “What is the cost of my intervention?” At this time the emergency responders must clearly identify the cost of their intervention in terms of potential loss of life and negative effect on the environment and weigh that cost against the possible benefits of intervention.

If the risk/benefit analysis is conducted correctly, the tactical considerations used in tactical application should have a minimal effect on the recovery and cleanup process. If the risk/benefit analysis is either not conducted or is not conducted properly, the outcomes will have a major negative impact on life, the environment, property and equipment, and the recovery and cleanup process.

Trainees shall identify the negative effect on the recovery and cleanup process resulting from the following:

- Failure to catch a leaking hazardous material to prevent it from spreading into the environment.

- Failure to dike a leaking hazardous material to prevent it from spreading into the environment.
- Failure to dam a hazardous material that has entered a waterway to prevent it from spreading downstream into the environment.
- Failure to a redirect a leaking hazardous material away from a waterway to prevent it from entering the waterway and spreading downstream and affecting the environment.
- Failure to a redirect a leaking hazardous material away from an environmentally sensitive area to prevent it from entering the environmentally sensitive area and negatively impacting the environmentally sensitive area, e.g., a wetland.
- Failure to use absorbent materials to control a leaking hazardous material to prevent it from spreading into the environment.
- Engaging in foam application operations that result in spreading the spill when the product should have been allowed to continue to burn or fuel should have been added to the fire to increase the fire's temperature, e.g., pesticide fires.
- Engaging in fire extinguishing operations that allow water to become a vehicle that spreads the spill before having confinement operations in place.
- Engaging in fire extinguishing operations that allow water to become a vehicle that spreads the spill when the product should have been allowed to continue to burn, such as a burning aterial that cannot be extinguished by water.
- Engaging in dilution operations, in an attempt to neutralize a corrosive, and allowing the water to become a vehicle that spreads the corrosive before having confinement operations in place.
- Engaging in dilution operations, in an attempt to neutralize a corrosive, and allowing the water to become a vehicle that spreads the spill without recognizing that the volume of water needed to truly dilute the spill cannot be managed by the emergency responders (e.g., to dilute one gallon of a corrosive with pH of 1 to a pH of 6 requires 111,110 gallons of water).
- Failure to protect the environment, by using salvage covers or visqueen to cover exposed soil, when redirecting a spilled material into a ditch or other area being used as a catch basin or holding pond.
- Failure to segregate spilled oxidizers from spilled fuels, such as diesel fuel, to prevent a chemical reaction that results in an ignition and subsequent negative impact on the environment from the intensity of the fire or the spattering that may occur.

- Failure to segregate spilled materials that have oxidizing characteristics from spilled fuels, such as diesel fuel, to prevent a chemical reaction that results in an ignition and subsequent negative impact on the environment from the intensity of the fire.

Terrorism and Illicit Use of Hazardous Materials: First Responder Training Issues and Ramifications

Introduction

Terrorism is defined as the unlawful use of force or violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political, or social objectives. Domestic terrorism involves groups or individuals whose terrorist activities are directed at elements of the United States government or population without foreign direction. International terrorism involves terrorist activities committed by groups or individuals who are foreign-based and/or directed by countries or groups outside the United States or whose activities transcend national boundaries.

In the aftermath of the attacks of September 11, the nation's emergency response community has been increasingly concerned about the risks posed to responders by hazardous materials-related weapons of mass destruction. The basic principles of safe response to incidents involving chemical, biological and radiological agents are generally the same as for any dangerous hazardous materials incident. However, the health risks to responders, the unique criminal dimensions to the incident that must be accommodated in the response, and the nature of some of the more esoteric chemicals and biological agents that might be involved in such an incident all require special attention to ensure a safe and effective response.

The challenge to emergency responders of being ready to respond to incidents stemming from terrorist attacks has been present for many years, well pre-dating the dramatic events of September 11 and the more recent national Antrax incidents. For example, between the years 1980 and 1995, Federal Bureau of Investigation (FBI) statistics report a total of 249 terrorist incidents that occurred in the United States. The February 20, 1993, bombing of the World Trade Center in New York City and the April 19, 1995, bombing of the Alfred P. Murrah Federal Building in Oklahoma City, Oklahoma, illustrated several years ago that terrorism can occur any where within the United States. On March 20, 1995, the nerve agent sarin was released into the Tokyo, Japan subway system by a Japanese cult. This terrorist incident resulted in 12 fatalities and at least 5,510 injuries. One hundred thirty-five of the responders were injured after direct and indirect exposure to the nerve agent. Within the United States, incidents involving biological agents have been documented in major metropolitan areas as well as rural locations. These incidents have occurred on both the east and west coasts as well as central parts of the United States.

In addition to terrorist acts, other criminal uses of hazardous materials - such as clandestine drug labs or illegal dumping of hazardous materials- pose an equally challenging threat to emergency responders and to the communities they serve. For example, incidents involving hazardous materials and hazardous wastes have threatened public health and the environment resulting in efforts to enhance control of these materials. Federal, state and local governments have adopted standards and legislation in an attempt to reduce the risks to the public and the environment. The

controls adopted have increased the complexities and costs of storage, transportation and disposal of these materials.

The Challenge to Public Sector Responders

Intentional releases of hazardous materials due to acts of terrorism or other criminal activities pose a unique challenge to public sector responders who respond to hazardous materials emergencies. Such intentional releases include, but are not limited to, illegal manufacture of drugs, improper disposal of hazardous materials and wastes, improvised explosive devices, manufacture and release of chemical agents and toxins, culture and dissemination of biological agents, and secondary events targeting public sector responders.

Responders to such incidents who are trained to traditional hazardous materials response competencies may encounter unique exposure risks, emergency control challenges, unusual materials, and complex mass casualty situations that are beyond their experience and current training. For example, public sector responders have been trained traditionally to identify hazardous materials based on outward warning signs and detection clues. However, at incidents involving terrorism or other criminal use of hazardous materials where there is attempted deception about the materials involved, clues such as occupancy location, container shapes, markings, and colors may not be consistent with traditional hazardous materials training. Consequently, rapid identification of the materials and type of problem may be difficult.

Responders to incidents involving terrorism may encounter unusual chemicals or biological agents or unusual uses of those hazardous materials that have not been addressed thoroughly in current hazardous materials training. For example, nuclear response training for first responders has traditionally been for major catastrophes (i.e., nuclear war and power plant emergencies), and not for small isolated terrorist events. As a second example, the high risk chemical and biological agents that might be involved in terrorist incidents may require unusual protocols and procedures for patient decontamination and treatment that are not addressed in current EMS training. As an additional example, some of the materials that may be involved have unusual dispersal characteristics that responders may not be trained to accommodate when determining of safe perimeters and public protection/evacuation requirements at the incident.

Current training for community emergency planning and preparedness strategies and existing response plans use risk predictions based upon known vulnerabilities and hazard identifications, such as commodity flow studies, fixed facility storage of material, etc. This allows responders to plan for the response prior to an emergency and to assess whether the response capability and resources in the area are sufficient to meet potential emergencies. However, terrorist and other illicit acts involving hazardous materials may occur in untraditional locations that are not normally thought of as high risk hazardous materials locations, such as public gathering places or remote transportation areas. As a result, current protocols for allocating response resources and preparing for hazardous materials emergencies may not allow sufficient response capability for terrorist-related hazardous materials emergencies.

Finally, hazardous materials emergencies involving terrorism or other illicit use of hazardous materials may involve additional and unusual risks to responders beyond those presented by the hazardous materials themselves. Public sector responders may be at additional risk due to secondary releases targeted at responders, primary releases that intentionally create extremely high risk rescue situations, and even to primary releases targeted at public response facilities.

The Challenge to Public Sector Response and Planning Organizations

Public sector response and planning organizations should examine all facets of their response system to ensure preparedness for response to incidents of terrorism and illicit use of hazardous materials. This review should include existing plans, operating procedures, equipment, training and exercises.

Plans should include:

- Consistency and interface with plans from all levels of government, specifically the Federal Response Plan (FRP) and the FRP Terrorism Annex;
- Presidential Decision Directive 39, specifically examining responsibility for crisis management and consequence management in their community;
- Unified command operations with all levels of government; and
- Thorough, in-depth plans for response to mass casualty chemical incidents.

Operating procedures should include:

- Command post operations including command post security, responder accountability, and on-site responder identification;
- Protection against secondary explosive devices and other secondary events;
- Responsibility for and support to crime scene operations, evidence collection and chain of custody; and
- Emergency decontamination at mass casualty chemical incidents.

Equipment should be evaluated to ensure appropriate protection and detection of nuclear, chemical and biological agents (NBC). Existing training, including annual refresher training, for all responders should be enhanced to include competencies for response to incidents involving terrorism or other illicit use of hazardous materials. Finally, agencies should identify a person or persons within their organization as their point of contact for issues regarding terrorism and the illicit use of hazardous materials. These persons should interface with appropriate response agencies to include EMS, fire, haz mat, and law enforcement.

Training Strategies

Training for public sector employees who respond to hazardous materials emergencies at the Awareness, Operations, Technician, EMS, and Incident Commander levels should include thorough instruction to prepare those responders to safely and efficiently respond to hazardous materials emergencies involving terrorism or other illicit use of hazardous materials.

This additional hazardous materials response training can be accomplished either through additional courses or through enhancement of current hazardous materials courses. Extensive grants are being provided by the Department of Homeland Security to state and local organizations to support the training of responders. In addition, The Department of Homeland Security, the Department of Defense, the Department of Justice, and the United States Public Health Service provide in depth training and logistical support to assist public sector response organizations in preparing local responders to better prepare for terrorist-related hazardous materials emergencies.

The National Fire Protection Association has released standards for the integration of terrorist-related response as part of the national competency requirements for hazardous materials response, and this integrated approach is also reflected in the U. S. Fire Administration's curriculum strategies for terrorist-related training. As an alternative approach, the Office of Domestic Preparedness in DHS has issued draft guidelines for terrorist-related training for responders that treats WMD response training as separate from hazardous materials training, to be taken by responders in addition to taking hazardous materials training. The ODP Consortium of training schools provide a full set of stand-alone courses and curriculum materials supporting this approach.

For many training providers, insufficient resources and limited access to responder training time may render impractical the use of additional, supplemental responder training courses addressing terrorism competencies. In that case, training providers may wish to consider addressing the needed training through modification to and enhancement of existing courses within their curriculums. As training providers develop updated modules and training resource materials for use in updating existing courses, information on these materials will be provided to HMEP grantees when available.

Hazards to Responders

The following is a brief review of the various biological and chemical agents and the hazards they present to responders, which should be addressed in responder training to better ensure the safety of responders to terrorist-related incidents. The reader is encouraged to also access the many, more detailed references that have become available in print and on the internet regarding these hazards. One such site is: http://www.nbc-med.org/ie40/Default.html which allows downloading three military medical manuals (biological, chemical and radiological) and has an informative news review at the bottom its home page.

The possible routes of entry into the human body are potentially the same for both biological and chemical agents: inhalation, ingestion, injection, and absorption. The general rule for mass decontamination for both biological and chemical weapons is to use plain water, or if available, soap and water. Always check your protocols since they could contain more updated information.

Biological Weapons

These weapons or agents are of special concern because while many responders have had at least a hazardous materials awareness training program, few have had equivalent training in biological agents. Another reason for concern is the delay in recognizing exposure to biological agents – they usually have an incubation period of days to weeks and the responding public safety personnel might not know that they have come in contact with infected victims or with biological weapons substances for some time.

The Centers for Disease Control and Prevention organizes the most hazardous of these agents, which include bacteria, rickettsia, viruses, and toxins, according to a three-category system with Category A being of the most concern. Most of the biological agents manifest themselves in their early phases as flu-like symptoms – which makes them difficult to diagnose, especially during flu season.

Category A Agents

These agents include organisms that are hazardous to responders because they have high mortality rates, can be easily disseminated or transmitted from person to person; and have the potential for major public health impact. In addition, since these agents could possibly cause fear and panic in the American public we will cover them in much greater detail compared to the Category B and C ones.

Anthrax: This is a disease that uses a bacteria to infect humans via their skin, respiratory system, or digestive system. If it is weaponized properly so that the natural static charge is removed and the individual spores are 1 to 5 microns in size this biological agent can be aerosolized quite easily – as was, unfortunately, apparent in the various incidents in 2001-2002 (the U.S. Congress, Postal Service, and American Media, etc.). Prior to these incidents it was believed that the case fatality rate for inhaled anthrax was 90%, even with treatment. The actual case fatality rate was considerably lower. Nonetheless, this agent remains a major concern. Treatment with antibiotics, if started early enough, is often effective. There is a vaccine available as a six inoculation series, but it is generally most effective before exposure.

Botulism: Actually a group of related neuro-toxins this is the most poisonous naturally occurring substance known. It can be disbursed as an aerosol. However, since in its liquid form it is odorless, colorless, and tasteless probably it would be used to intentionally contaminate food or drinks. If your community has a dermatologist's office you probably have a medically pure version of botulinum toxin, known as Botox®, in your community already. The substance is used as a temporary "wrinkle remover." There is an antitoxin to treat botulism, but the antitoxin is not widely available.

Plague: Historically it was the bubonic plague, carried by infected fleas on rodents, which decimated Europe. The more deadly version is pneumonic plague, which results from inhaling these bacteria. While difficult to intentionally produce in this form (as a weaponized agent that can be aerosolized), the resulting pneumonic plague has a very high mortality rate. Treatment with antibiotics, again if begun early enough, can be quite effective.

Smallpox: Declared eradicated by the World Health Organization in 1980 the last case in the United States is variously reported as occurring in 1947 or 1949. Regardless, it has been a long time since we have dealt with this disease. Routine vaccination of American civilians stopped in 1972; while the U.S. military ended vaccinations in the late 1980's. The research indicates that most vaccinated people have a high degree of protection for three years after vaccination, followed by another 7 years of diminishing protection. Based on that data, the current American population has virtually no immunity to smallpox, since most people have not had a vaccination for over 30 years. Ongoing efforts are directed at a multi-phased approach: Phase I consists of vaccinating health and hospital personnel, and Phase II of first responders. Although the President originally announced that voluntary vaccinations of the public would be done it appears that in the absence of an actual smallpox outbreak that will not happen soon. Further comments about smallpox are included in the action planning steps below.

Tularemia: While not nearly as deadly as plague, botulism, or smallpox the reason tularemia is in Category A is its high infectivity. It takes but one of its bacterium to cause infection. While the relative mortality rate of tularemia, compared to smallpox or plague, is low this biological agent could be used to "overwhelm" our pre-hospital and in-hospital health care system with many extremely sick patients. Antibiotics are used in treating tularemia, and work is underway to develop an improved vaccine.

Viral hemorrhagic fevers, such as Ebola: This is actually of grouping of four "families" – arenaviruses, bunyaviruses, filoviruses, and flaviruses. Of these the most troublesome are the filoviruses (which include Ebola and Marburg) and have high mortality rates, high infectivity rates, and no known effective treatments or vaccines.

Category B Agents

The next group of agents include those that have low to moderate mortality rates, are somewhat easy to disseminate; and require improvements to the Centers for Disease Control and Prevention's diagnostic capacity and enhanced disease surveillance. These agents include Brucellosis, E. Coli, Ricin (the castor bean extract), and Q Fever.

Category C Agents

The final group of agents includes emerging pathogens, such as hantavirus respiratory syndrome. These could be used for mass dissemination in the future because of their availability and their ease of production. Although the recent cases of Severe Acute Respiratory Syndrome (SARS) and West Nile Virus seem to be natural occurrences the incidents point out our vulnerability to new viruses.

Chemical Weapons

In the following brief discussion about chemical weapons agents, the reader should bear in mind that to some extent most hazardous materials responders already know a great deal about chemical weapons. That is because historically many of these agents were developed for industrial use. Responders will immediately recognize them because of the industrial chemicals which are their civilian counterparts (the blood agents are cyanides, the nerve agents are organophosphates, etc.). In addition, unlike the biological warfare agents, the chemical ones usually cause signs and symptoms quickly: when you "roll up" to a scene you will often know immediately that you have a serious problem.

The military has organized chemical weapons into five groups of agents: nerve, blister, blood, choking, and irritants. These names were originally believed to indicate the way the particular agent affected the human body. Blood agents were carried by and harmed the blood system, nerve agents were carried by and harmed the nerves, etc. We now know that a sufficient dose of any of these agents will produce a systemic result, but the old names persist. Another misnomer is the use of the term "gases" when discussing these agents. In their natural state they are usually liquids or solids.

Also, note that there are other military agents that are infrequently seen, such as incapacitating agents like BZ (which causes mental disorientation), and vomiting agents like DA, DM, and DC.

Nerve Agents

The organophosphates are common ingredients in pesticides. Their military equivalents, which include Sarin, Soman, Tabun and VX; cause a recognizable set of signs and symptoms which can be remembered by using the acronym SLUDGEM: **S**alivation (excessive oral and nasal secretions), **L**acrimation (tearing of the eyes), **U**rination, **D**efecation, **G**astrointestinal irritation (nausea and stomach cramps), **E**mesis (vomiting), **M**iosis (pinpointing of the pupils). Add "twitching, seizures, and convulsions" to that list and you have the classic signs of high dose contamination via nerve agents. Medical treatment after decontamination includes atropine, diazepam, and pralidoxime chloride (2-PAM).

Blister Agents

These chemical agents include Mustard, Distilled Mustard, Nitrogen Mustard, and Lewisite. The eyes are most susceptible to mustard vapor. The characteristic sign of vessicants or blisters on the skin takes from 2 to 24 hours to develop. Medical treatment after decontamination includes topical antibiotics, fluid replacement, and pain medications.

Blood Agents

These cyanides include Hydrogen Cyanide and Cyanogen Chloride. They cause extremely rapid respiratory and cardiac arrest, in seconds to minutes. Signs and symptoms include dyspnea (difficulty breathing), headache, confusion, decreased vision, convulsions, and coma. Medical treatment after decontamination includes sodium nitrite, amyl nitrite, and sodium thiosulfate (these are all contained in a pre-packaged pharmaceutical group known as the “Pasadena Cyanide Antidote Kit.”)

Choking Agents

These agents include chlorine and phosgene. An indicator of inhalation is a heavy sensation in the chest and difficulty breathing – the beginning of pulmonary edema or fluid in the lungs. Medical treatment after decontamination includes removing the victim to outside of the contaminated area, administering oxygen, and in the case of phosgene diuretics may be given to reduce fluid retention.

Irritant Agents

These agents, including Mace, CS, CN, and OC; are often employed by law enforcement agencies in crowd control situations. Signs and symptoms include a burning sensation on the skin, tearing and pain in the eyes, nausea, and occasionally vomiting. These agents generally do not cause serious short-term or long-term effects. However, a victim with pre-existing severe respiratory disease (such as emphysema) may experience life-threatening results upon exposure. Medical treatment for most other victims after decontamination may include a further decontamination with soap and water, or a baby shampoo and water solution. No other treatment is usually needed.

Alternative Fuels

Background

Since the oil embargo of the 1970's, alternative fuel development for vehicles has gained a greater portion of the market share. In addition, many cities are faced with EPA clean-air standards, expressing the need to convert vehicles to alternative cleaner burning fuels. As legislation , such as the Clean Air Act, starts to become fully implemented and states such as New York and California implement their vehicle emission standards the demand for motor vehicles that operate on fuels other than gasoline and diesel fuel will significantly increase.

Many vehicles today are operating on Liquefied Petroleum Gas (propane), Compressed Natural Gas (CNG), and Methanol or Ethanol fuels. The next major materials in the propulsion market will be electric power and Liquefied Natural Gas (LNG). Personal cars and fleets of all types ranging from taxi cabs, buses, delivery vehicles, and trains are operating today in most major cities and metropolitan areas on fuels other than the standard gasoline or diesel product. Manufacturers of cars, trucks, and buses using new fuels sources is on the increase. The flexible-fueled vehicles (FFV's) can run on gasoline or ethanol, compressed natural gas (CNG), liquefied hydrogen, propane, as well as electric batteries.

All vehicles, whether powered by alternative fuel or conventional gasoline, must be certified by the manufacturer to meet federal motor vehicle safety standards (FMVSS). Even though these standards for safety are met, there has been no method developed to identify the type of fuel the first responder would be faced with.

Challenges for Public Sector Response Training

The new systems pose a wide variety of new concerns to the emergency community of fire, police, and emergency medical personnel. Electric vehicles may be using large quantities of lead-acid batteries or generating electricity of 300 volts. Other vehicles may be using methanol or ethanol fuels which require special extinguishing agents to control fires. Compressed natural gas cylinders of 3,000 pounds pressure are now located in trunks of vehicles and railroad engines are now operating on Liquefied Natural Gas supplies being pulled behind the engine in a special tank car. Filling stations across the nation are installing compressor and cascade bottle fueling systems to fuel the natural gas vehicle. Small trailer mounted cascade systems are being pulled behind vehicles to provide roadside service to those vehicles that run out of natural gas. Utility companies in New York State will soon be marketing home compressors for vehicle owners to refuel their Compressed Natural Gas vehicle in their own garage. The National Highway Transportation Safety Board has found the issue of alternative fuels significant enough to publish a special awareness bulletin alerting responders of the potential dangers of the new fuels.

Emergency response personnel need to be trained to recognize or identify vehicles with alternative fuel systems and be trained in the appropriate safety issues associated with each new fuel system. Since all the systems are using hazardous materials, it is most appropriate that the training be covered under hazardous materials curriculum.

Providers of hazardous materials responder training should develop training or enhance existing training at the Awareness, Operations, Technician and Incident Commander levels with additional material that addresses the following concepts:

- Recognition and identification of alternative-fueled vehicles

- Chemical and physical properties for the various fuels, i.e., LPG, LNG, LH, and electro-chemical cells (batteries)
- Special response procedures and operations needed for each alternative fuel, to include:
    - Personal Protective Equipment (PPE)
    - Suppressant Agents
    - Container Breaches (i.e. fuel or battery leakage)
    - Victim Extrication and Treatment
    - Scene Evacuation
    - Incident Management System (IMS) Special Considerations
    - Mitigation and Clean-Up Requirements
    - The potential for Boiling liquid/Expanding Vapor Explosion (BLEVE)

Carbon Monoxide Response

Fire department units may encounter carbon monoxide in many different situations and incident types. These settings can range from small dwellings to large industrial facilities. CO gas will be produced from all forms of combustion that involve carbon-based fuels. Concentrations will be dependent on the type of fuel and the form or efficiency of combustion. In recent years, these incidents have been on the increase in urban as well as rural areas.

Carbon monoxide is an invisible, odorless, tasteless, and colorless gas that has the same density as air and will not float or sink, but will disperse throughout a structure.

Carbon monoxide gas is a chemical asphyxiant and will replace oxygen in the bloodstream, resulting in suffocation. This gas also has a wide flammable range; from a lower explosive limit of 12.5% in air to an upper explosive limit of 74% in air. It has an ignition temperature of 1128 degrees Fahrenheit. The National Fire Protection Association (NFPA) fire diamond will show CO as a 3 in health, a 4 in flammability, and a 0 reactivity.

The primary hazard of carbon monoxide gas is that of an asphyxiant with relatively low levels producing adverse health effects. These effects can range from mild headache after two hours of exposure to 200 parts per million (PPM) to unconsciousness after 30 minutes exposure to 1600 PPM. OSHA has set a level of no more than 35 PPM as an allowable workplace standard for an 8-hour day, and the EPA has established that residential levels should not exceed 9 PPM over an 8-hour average.

Symptoms from exposure to lower level concentrations include headache, nausea, dizziness, weakness, difficulty breathing, and other flu-like problems. Exposure to high levels will cause cyanosis, hallucinations, angina, and unconsciousness. Any patients suspected of having CO poisoning shall be moved to a fresh environment, placed on high flow O2 and transported to the closest medical facility.

Residential CO problems can normally be traced to problems that include, but are not limited to, the use of gas furnaces, gas dryers, gas stoves, fireplaces, kerosene heaters, bar-b-que's, or vehicle that are running in or near the structure. Indications of incomplete combustion from gas burning appliances include yellow flame, soot build-up on roof vents, and soot build-up on interior walls. All possible sources shall be checked, and certified repair technicians shall be called as necessary. Southwest Gas shall be notified if any signs or symptoms of CO poisoning are exhibited.

Industrial CO problems can be associated with large furnace type operations, large scale equipment that utilize combustion type engines, or leaks from cylinders that contain compressed carbon monoxide gas. Any operation of an internal combustion engine in a confined space without adequate ventilation will create a highly dangerous and life-threatening environment.

Residential CO detectors are available and will sound two types of alerts. The first is a warning chirp that notifies there is a developing or chronic CO problem that will produce a 4-7% carbon monoxide in blood hemoglobin level over time. In the event of a warning signal, the residence should be ventilated, the test button should be pushed, and all possible sources of CO shall be checked and adjusted or repaired. The warning level is set at 60 PPM CO for greater than 66 minutes. The second alert is a full alarm that warns of levels that will produce 8-10% carbon monoxide in blood hemoglobin levels. The detector will alarm at these three points: 100 PPM will trigger an alarm within 90 minutes, 200 PPM will trigger an alarm within 35 minutes; and 400 PPM within 15 minutes.

A full alarm indicates that dangerous levels of CO have been reached and that immediate action should be taken. These actions include evacuation, ventilation, investigation, and denying access until the source of the CO is secured.

Additionally, the increased use of CO detectors has resulted in many local responders (fire, police, and EMS) being burdened with numerous calls but without a clear and definitive standard operating procedure (SOP) and proper training. Many published SOPs conflict with each other. It is reported by American Medical Association (AMA) that CO is responsible for 800 to 1,000 deaths per year and some 10,000 people seek medical attention.

Challenges for Public Sector Responder Training

Most current Awareness and Operations level training programs do not address this issue sufficiently.

Provider of hazardous materials response training should enhance training for the first responder at the awareness and operations levels with material and competency instruction on the following topics:

- CO hazards and toxicity
- Limitations of home detectors
- Limitations of responder carried monitoring devices
- CO recognition and identification, including signs and symptoms of CO poisoning;
- Proper entry procedures and techniques,
- Evacuation, ventilation and source investigation procedures
- CO source control and management
- Post incident action and follow-ups.

Training should also be supported by appropriate standard operating guidelines for first responder A sample of an SOP is provided below.

All CO detector alarms shall be addressed as an emergency until no hazard has been identified. Steps taken shall include, but are not limited to:

- Verify detector is CO type
- Check for CO related symptoms and evacuate structure as necessary
- Check power supply to detector
- Assess scene for CO sources
- Determine need for additional resources: Haz mat or other units for CO meters, utility company, police department, etc.
- *Utility company shall be notified if any signs or symptoms are present.*

Clandestine Drug Lab Operations

During routine emergency responses to fires or other emergencies it is possible that responders will discover the presence of a clandestine drub laboratory. Clandestine drub laboratories by their nature are disguised and are often encountered accidentally in a great variety of situations, including warehouses, store fronts, apartment buildings, single family dwellings, rural outbuildings and even truck trailer accidents. It should be generally understood that response to a clandestine drug laboratory is a hazardous materials incident. These types of incidents may expose you to toxic, flammable, explosive, and corrosive atmospheres. Without proper training, your health and safety are at risk.

Proper personal protective equipment at a clandestine drub lab incident is absolutely critical for avoiding exposure. Structural fire fighting or EMS gear offers little, if any, protection in such situations. In order to be able to recognize when you are inadequately protected, you must be aware of the limitations of your clothing and SCBA. You must understand that clothing which is adequate in one situation may be inadequate or even dangerous in another. No one protective clothing system will protect you from all situations.

In any emergency situation involving clandestine drub labs there is a risk of exposure to toxins; those materials that are capable of causing injury or death when absorbed. Through an understanding of the types of toxins, their effects, the various routes of entry, and specific biological hazards, emergency response agencies can take more appropriate actions to ensure their own health and safety during clandestine drug laboratory operations. In addition, it should be noted that effective clandestine drug lab incident response requires a well-functioning Incident Management System (IMS). Operating without an IMS or without a complete understanding of how an IMS works is inefficient and dangerous to all agencies involved. Listed in the guidelines are the current OSHA and NFPA laws and standards that apply to emergency response agencies who respond to hazardous materials incidents. Below is a discussion of the application of those hazardous materials competencies to the special hazardous materials response challenges posed by clandestine drug lab operations.

Learning Objectives

The following learning objectives *should be the minimum in any* Clan Lab Course. Upon completion of the course, participants will be able to:

- Discuss terminology associated with drug labs (glossary).
- Discuss history of clan labs.
- Demonstrate, through chemical reaction and/or video format, the possible catastrophic results of chemical interactions and reactions.
- Be familiar with the hazards associated with drug lab operations.
- Be familiar with some chemicals found at a drug lab operation.
- Explain the need for a personal protective equipment program for fire, police, and EMS personnel.

- Explain the routes of exposure and toxicological effects of short term exposures (acute) to these precursor chemicals and the possible long term (chronic) effects of clan lab chemicals on the human body.
- Discuss the federal laws and national standards associated with the use of PPE and chemical response programs.
- List common locations of clan lab operations.
- Explain the needs for well-established standard operating procedures within the fire department and between other agencies.
- Describe, through generic standard operating procedures, the operational goals and objectives for each of the following organizations:
    - Fire Department (First Responder)
    - Fire Department HMRT (Hazardous Materials Response Team)
    - Local Police
    - EMS
- Speak to the issue of responsibility for clean-up and termination of a clan lab incident.
- Explain the importance of scene management at a clan lab incident.
- List the common components of an Incident Management System.
- Overview decontamination procedures.
- Overview termination procedures.
- Explain why post-incident analysis and evaluation are necessary elements of scene management.

Competencies

The student will be able to:

- Name at least three general hazards associated with drug lab operations.
- Select from a list of chemicals those most commonly found in drug lab operations.
- Name two catastrophic results of chemical interactions at drug lab operations.
- Describe his/her standard operating procedures for dealing with drug lab operations and name the contact personnel from at least one law enforcement agency that they would most likely deal with.
- Describe at least two key elements of a PPE program.
- Explain the biological side effects of exposures to precursor chemicals used in illicit drug labs and express the possible acute and chronic effects of exposures to these chemical environments.

- Generally describe the overall operational goal and objectives of the following organizations:
    - Fire Department (First Responder)
    - Fire Department HMRT Units
    - Local Police Department
    - EMS
- Describe the need for establishing clean-up and termination responsibilities.

Stimulants

Stimulants are compounds which affect the central nervous system by accelerating its activities. Stimulants are either natural or synthetic. An example of a synthetic would be methamphetamine and a natural stimulant example would be adrenaline.

A. Natural

The first natural stimulant discovered was epinephrine (adrenaline), a substance found in adrenal glands of animals. Its effects were first discovered in 1899.

B. Synthetic

In 1919, a Japanese chemist developed the first synthetic stimulant, methlamphelaime. In 1927, a substance called 1-phenyl 2-aminopropane and its action were first described leading to the further research and development of benzedrine and dexedrine (common drugs used during the late sixties and early seventies for weight control).

Clandestine Drug Labs

The following general information is based on Drug Enforcement Agency (DEA) Special Agent Patrick Gregory's testimony before the California Select Committee on Drug and Alcohol Abuse on November 15, 1985.

On a national average, one of five (or twenty percent) of all clandestine laboratories result in, and/or are discovered through, fires and/or explosives. During 70 clandestine laboratory investigations, ten percent involved agents being confronted by suspects who had fully automatic and silenced weapons and some form of booby traps or explosive devices. In thirty percent of the cases, defendants were using electronic countermeasures, ranging from scanners to sophisticated video monitors to sound sensing devices.

During the course of these investigations, thirteen firefighters and four police officers required medical treatment as a result of exposure to hazardous chemicals and chemical wastes. Minor injuries resulted from exposure to hazardous chemicals and chemical wastes. Because of exposure to caustic, corrosive, carcinogenic, irritating, explosive, and flammable substances encountered at lab sites, every agent has suffered minor injuries including burns, rashes, headaches, light headedness, and nausea.

The first lab seized in California was in 1963 (amphetamine) in Santa Cruz.

- 1984 - 93 labs seized in California
- 1985 - 215 labs seized in California
- 1986 - 325 labs seized in California

Of the 325 labs seized in California, 293 were Methamphetamine. Of those 293 labs, 82.5% were using Ephedrine as the primary chemical.

- 1986 - 509 labs seized nationwide
- 1987 - 489 labs seized in California
- 1987 - 682 labs seized in the United States
- 1988 - Approximately 1,200 laboratories were seized by law enforcement agencies, federal, state, and local police nationwide.

Clandestine Drug Laboratories remain the principle source for methamphetamine. States where most clandestine laboratories appear to be operating are:

- Southern and Northern California
- Florida
- Eastern Texas
- Pennsylvania
- Oregon and Washington
- New Jersey
- New Mexico

Types of Labs and Hazards

A. Extraction Labs

This is where raw plant material is changed into a finished drug by the use of chemical solvents and/or acids. The chemical structure of the drug is not altered. Some examples of this are marijuana to hashish, opium to morphine. Also under this title are indoor or underground confined space marijuana grow farms. Marijuana grow farms have a high rate of booby trap. They grow marijuana in confined space grows so that they can reduce the oxygen levels in the grow area, making the plant produce more sap, which means more tetrahydrocannabinol (THC). This is accomplished by flooding the confined area with either carbon dioxide or propane. Both gases will displace the available oxygen, and, in the case of propane, produce a possible flammable and explosive atmosphere. Without instrumentation, the firefighter has no way of evaluating the hazard, which is O_2 deficient and possibly flammable. If faced with a rescue, these confined spaces should be approached according to OSHA's proposed Confined Space Protocol 29 CFR 1910.146.

B. Conversion Labs

Currently thought to be the most prevalent. In these labs, a raw or unfinished drug product is changed into a finished or refined drug. Here the chemical structure is changed. Examples of this are cocaine base to cocaine hydrochloride (the white powder sold on the streets as cocaine), and cocaine hydrochloride to cocaine sulfate (aka crack or rock cocaine). Numerous flammable liquids, corrosives, acids, and bases, as well as oxidizing agents, are found at these sites.

Public and Private Sector Dispatch: Hazardous Materials Response Issues

Introduction

The role of public safety communication systems in the successful resolution of hazardous materials incidents has, until now, received relatively little attention beyond the U.S. Fire Administration's 1998 Wingspread report. This section will address the following:

- The inter-relationship between public safety communication systems (also known as dispatch systems) and hazardous materials responders,
- The continuing challenges of public safety communication systems,
- The role of public safety communication professional associations, and
- Issues unique to private sector public safety communication systems.

Each of these areas must be addressed if public safety and private sector organizations intend to positively manage their responses to hazardous materials incidents.

Interrelationship between Public Safety Communication Systems and Hazardous Materials Responders

Public safety and private sector organizations that respond to hazardous materials incidents have generally built an enviable record of responding to and managing these occurrences. However, these successes have, in part, been made possible by a hidden host of support services – training, supply, administration, maintenance, dispatch, and so forth. This section only focuses on one such service – dispatch systems – however, public safety and private sector organizations must carefully scrutinize all such support services if effective response and management of hazardous materials incidents is to continue.

An instructive analogy for the inter-relationship between dispatch systems and hazardous materials responders is that of air traffic control systems and airlines. The air traffic control personnel— the controllers — use sophisticated electronic systems to "dispatch", guide, assign alternative plans or routes of travel, activate additional resources if needed, etc., for aircraft. Yet, the work of the controllers occurs out of visual sight of those most actively involved in a given flight – the pilots, and the crew. The passengers, who have no active role in the flight, are analogous to the public; and have little conscious knowledge of the importance of the air traffic controllers to the safety of the flight. Consequently, there is a tendency to forget the important role of such hidden people and systems. The result is that resources for air traffic control equipment, and resources for training for controllers sometimes lag behind that which is actually needed. So too, unfortunately, with dispatch systems. "Out of sight, out of mind" often leads to "out of service" as needed dispatch equipment does not receive the preventative maintenance required, the purchase of new equipment is delayed, dispatcher training is downplayed or avoided, etc. Only by devoting effort and funding to dispatch can we continue to insure success operationally.

The Continuing Challenges of Public Safety Communication Systems

What follows are several pressing issues that effect both public and private sector dispatch systems. In turn, each issue effects hazardous materials response capabilities. Each issue must be dealt with, both in the short term and in the future.

Training

While training is generally recognized as essential for effective performance there has been too little actual hazardous materials orientation training associated with dispatcher – or to use the more modern term, telecommunicator – initial training or continuing education. This is in spite of the outstanding efforts of both the National Fire Protection Association (NFPA) and the Association of Public-Safety Communications Officials International, Inc. (APCO). The NFPA has developed Standard 1061, which is essentially a voluntary compliance guide for the job performance of public safety telecommunicators. Meanwhile, APCO has developed (and in 1996 approved) a complimentary minimum training standard: Project 33, National Public Safety Telecommunicator Training Standard.

The APCO standard recommends, as a minimum, training in each of eight areas:

- Module 1: Roles and Responsibilities
- Module 2: Legal Aspects
- Module 3: Interpersonal Communications
- Module 4: Technologies
- Module 5: Telephone Communications Techniques and Call Processing
- Module 6: Call Classification
- Module 7: Radio Communications (Dispatch) Techniques
- Module 8: Stress Management

These eight modules total forty hours of instruction. However, the APCO Standard does not include an orientation on hazardous materials. But, it lists several optional subjects such as National Crime Information Center (NCIC), Emergency Medical Dispatch, and hazardous materials.

Clearly, the APCO Training Standard will serve to further professionalize the telecommunicator field. Although the lack of required hazardous materials orientation training merits reconsideration, APCO does provide a video program on this subject. This program, entitled “Hazardous Materials Awareness for Dispatchers” includes a wealth of information, such as:

- Hazardous materials identification
- Proper information gathering
- Using the DOT Emergency Response Guidebook
- Response generation guidelines
- Coordination and support functions
- Developing standard operating procedures

Weapons of Mass Destruction (WMD) and Clandestine Drug Lab Incidents

Both of these issues are more fully addressed as separate Special Topics. However, it bears repeating that both of these types of incidents hold special challenges for telecommunicators. First, and often overlooked, is the fact that the telecommunications center itself may be an infrastructure target of terrorists. To prepare for this eventuality requires knowledge of potential threat groups, physical security countermeasures and other methods of "hardening" the facility.

In addition, both types of incidents require specialized knowledge of the types of hazardous materials that may predominate as WMD agents and/or as commonly used chemicals in drug production, whether at extraction labs or conversion labs. Without this knowledge telecommunicators may miss or fail to pass on to responders important "clues" that could potentially effect the outcome of the response.

Since both types of incidents are criminal acts telecommunicators must have knowledge of, and use (as needed), any pertinent evidence preservation (of items such as dispatch logs and tapes) and documentation techniques. In addition, both terrorist groups and illicit drug manufacturers have a keen interest in the activities of public safety. This requires the telecommunicators to practice effective operations security (OpSec), such as maintaining confidentiality of raid information, proper securing of agency and individual public safety personnel contact information (for example, home telephone numbers and addresses of law enforcement officers).

Non-Emergency Number Systems

In order to process the ever-increasing emergency calls communications systems have begun to develop equivalent non-emergency incident systems. Two such systems, using 311 as the non-emergency number, are operational in Baltimore, Maryland, and Dallas, Texas. The actual number selected is immaterial. But, the development of such systems is necessary or emergency requests for assistance – including those that will result in hazardous materials responses – will be delayed.

Funding Issues

Many public safety communication systems are outdated and perennially under-funded. Traditionally, general fund taxes were the source of such systems. Now, however, alternative funding methods such as surcharges on intra-state long distance calls, and directory assistance fees are being implemented.

But, without a firm financial footing no communication system can operate, perform preventive maintenance, invest in the on-going professional development of telecommunicators, research the specifications for new equipment, purchase and install said equipment, etc. Ultimately, this impacts on call dispatch, which impacts on response, including those involving hazardous materials.

Communication Center Management

Telecommunicators, like all other types of workers in structured organizations, have supervisors, who in turn have managers. These people all use managerial systems to accomplish tasks. Given the funding restraints common to many communications centers (see previous sub-issue

about funding issues) the need for efficient and effective management systems and managers is critical.

APCO has worked with the Commission on Accreditation for Law Enforcement Agencies, Inc. (CALEA) to expand CALEA's certification process for communications centers. In the process of becoming certified by CALEA an already excellent public safety communication system should become even better.

Communication Hardware and Software Changes

One of the greatest challenges for communications systems is changing technology. The Federal Communications Commission is now actively researching frequency availability, wireless Enhanced 911 systems, etc. However, for the individual public safety communications system each potential technological change – such as common air interfaces (CAI) to improve interoperability, microwave radio systems, mobile satellite services, etc. – must be analyzed, and if useful, funded, installed, and integrated into the existing system. The task is never-ending. Yet, if not done, or done poorly, the dispatch of emergency calls, including those for hazardous materials incidents, will suffer.

The Role of Public Safety Communication Professional Associations

Anyone reviewing the historical background of American public safety communication systems is immediately struck by the importance of professional associations in the development of these systems. In particular, the Association of Public-Safety Communications Officials International, Inc. (APCO) has played a seminal role in professionalizing the field. Since its inception in 1935 APCO has developed and completed a series of practical projects that have addressed major issues: the "ten signal" cards and other aural brevity methods, frequency coordination, advising the Federal Communications Commission, universal computer aided dispatch standards, etc.

While APCO's role is critical to the success of these systems, it has worked with many other related associations to improve public safety communication. These organizations include the National Association of State Telecommunications Directors, and the National Emergency Number Association. Each of these associations is to be commended. And, each must be challenged to examine its awareness of hazardous materials response issues and develop effective methods to manage those issues.

Issues unique to private sector public safety communication systems

It should be clear that private sector systems share the same continuing challenges – training, funding, communication hardware and software changes, etc. — which were identified earlier in this document. In addition to them, however, there are several other issues that are unique to the private sector that may impact on hazardous materials response. Here are two:

Continuity of Services

Invariably one of the major concerns with any private sector function that was originally performed by government is the long-term survivability of the private company. In an environment where businesses fail – sometimes spectacularly – the concern is quite reasonable. The best indicator of continued endurance is prior successful existence, and the longer that prior existence the better. In addition, the specific track record of the private sector company in other jurisdictions

should be carefully examined. Companies that survive do so for a reason: they're carefully managed.

Confidentiality Concerns

Historically, law enforcement has had to be careful about information that, if it fell into the wrong hands, could compromise an on-going investigation or operation. For example, a planned raid on a suspected clandestine drug laboratory perhaps could require the pre-positioning of fire service hazardous materials personnel and emergency medical units. But the dilemma can be that including the public safety communication center in the planning process is sometimes viewed as increasing the risk of inadvertent release of critical information. Good operations security (OpSec) is a constant concern. When a private company operates the communication center it can increase concerns about OpSec. Only close coordination between the involved agencies, and the building of a track record (discussed earlier in the "Continuity of Services" section) of confidentiality will ultimately change this situation.

Summary

This Special Topic section has attempted to describe what heretofore has been little discussed – the role of communication systems in hazardous materials response. Numerous challenges – for agencies, communication systems, telecommunicators, etc. — were identified. Each of these challenges must be addressed if public safety and private sector organizations intend to positively manage their responses to hazardous materials incidents.

Realistic Approaches to Rural and Frontier Hazardous Materials Risk Management

Introduction

Hazardous materials risk management had early origins as an outgrowth of concern over protection of the public from major disasters and emergencies. Because of need, the natural evolution over time has been to expand the national focus from large, infrequently occurring fixed-facility disasters in heavily populated areas to the more realistic threats of smaller, more commonly occuring transportation and small fixed-facility incidents that are ever-present throughout the nation.

However, many of the principles and concepts of hazardous materials risk management today retain critical presumptions of levels of available resources that are true for large industries and large, well funded communities, but are unfortunately not true for most of the smaller communities nationally. This is a growing national challenge that needs to be addressed. Small jurisdictions, especially rural and frontier communities, do not have the tax base, financial resources or personnel needed to manage their hazardous materials risks in the same manner as larger, more affluent urban and suburban jurisdictions.

Rural and frontier communities nonetheless often have considerable hazardous materials risks that must be addressed, in spite of the limited resources to do so. Transportation accidents, for example, occur along routes that cross rural and frontier jurisdictions with no less frequency (and by some measures with considerably greater frequency) than they cross urban or suburban areas.

What is needed is an alternative approach to hazardous materials risk management that will address these risks while at the same time accommodating the limited resources and other unique parameters and capabilities of rural and frontier communities. The following concepts and strategies are offered to support such an alternative approach, and address an introduction to the unique character of rural and frontier communities as well as proposing realistic strategies for managing hazardous materials risks in these environments. The strategies proposed are drawn from the successful practices of a number of rural and frontier jurisdictions who have undertaken to develop their own unique methodologies for preparing for and responding to hazardous materials emergencies.

The Social Cost of Space

As Americans, we honor space. Even those Americans who live in metropolitan, urban and suburban areas love to speak of wide open spaces and annually vacation in America's hinterland to camp, fish, hunt and hike. However, residents who live permanently in the extremely rural and frontier areas of America often must pay a price for the experience. Sociologists and anthropologists call this price the "social cost of space". This cost is measured in terms of services, accessibility, standard of living, social events and other necessities, which are significantly less available in rural areas than in metropolitan areas.[1]

The underpinnings of the social cost of space are manifest to any visitor to a small town with diminished industry, population, commerce or tax bases. From an emergency preparedness perspective, this cost is reflected in a significant reduction of the services, skilled technicians, bureaucratic organizations, and technological systems necessary to maintain the high level emergency services "standards of care" that urban centers enjoy.

This social cost of space is also reflected in important cultural differences in local management systems, techniques and terminology. These cultural differences drive the style and programs of emergency management and preparedness in rural and frontier communities. The diminished resources and limited time available force all participants to attend only to high priority issues of immediate and very real impact, and there is little tolerance or support for external mandates or requirements that are not seen as having an immediate local importance or impact. To be effective, all local emergency management programs, initiatives, and actions must pass the test of immediate actual relevance to current local affairs or problems before they will be undertaken in rural and frontier communities.

This social cost of space determines the realities of what can and cannot be done in hazardous materials risk management in rural and frontier communities. These realistic limitations give rise to a number of complex questions and issues that need to be addressed, such as the viability of alternative standards of care, alternative levels of acceptable risk, and alternative, more streamlined procedures for hazardous materials risk management and control.

Rural and Frontier Communities: Government Concepts, Definitions and Programs

There are many different definitions used to describe and discriminate between frontier, rural and urban areas. These definitions are used for different reasons by different programs, different federal and state agencies, and different disciplines, and there is no single criteria in use nationally with which everyone agrees. For example, "frontier" and "extremely rural" are defined by population density of ten or fewer persons per square mile by the U.S. Department of Health and Human Services (DHHS), for standards of care analysis purposes. By contrast, the U.S. Bureau of the Census, for the purposes of statistical census analysis, defines "urban" as comprising all territory, population, and housing in areas and places of 2,500 people or more, and defines "rural" as everything else. There are also many definitions in use that depend upon factors other than population size and density, including measures of proximity to and relationship with urban areas, measures of the degree of urbanization, and geographical area classifications by principle economic activity.

Regardless of the definitions used, it is generally understood that there are important differences in the economic, public services, and personal lifestyle characteristics of rural and frontier areas. In addition to having a smaller economic base than urban areas, rural and frontier areas also receive less external financial and services support from federal sources, which accentuates the gap between rural and frontier resource bases and those of urban areas. Because of population served, urban and metropolitan areas have historically been the primary targets of federal programs and activities, including dialogue and input regarding national standards of care and standards regarding affordable minimum levels of service. So rural and frontier areas are often held to unobtainable standards of care requirements that are affordable only with urban-level resources and services.

However, there is a growing understanding of the need to address this challenge nationally. The DHHS and the U.S. Congress have taken the lead in developing the concept of "frontier" status and promoting the need for a separate but adequate standard of care for extremely rural areas.[2]

Many state governments and agencies with extensive rural and frontier areas within their jurisdiction have also been attempting to address these issues. For example, the Montana Disaster and Emergency Services has adopted the frontier designation as defined by the DDHS in an attempt to emphasize the extremely rural nature of most of its counties. To be eligible for DDHS Bureau of Health Care Delivery and Assistance support as a frontier area, the following service area criteria must be met:

- **Service Area:** a rational area in the frontier will have at least 500 residents within a 25-mile radius of the health services delivery site or within the rationally established trade area. Most areas will have between 500 and 3,000 residents and cover large geographic areas.
- **Population Density:** the service area will have six or fewer persons per square mile.
- **Distance:** the service area will be such that the distance from a primary care delivery site within the service area tot he next level of care will be more than 45 miles and/or the average travel time more than 60 minutes. When defining the "next level of care" we are referring to a facility with a 24-hour emergency care, with 24-hour capability to handle an emergency caesarian section or a patient have a heart attack and some specialty mix to include at a minimum, obstetric, pediatric, internal medicine and anesthesia services.[3]

How Much of the United States is frontier and rural, and what is the significance to hazardous materials transportation?

The map delineating frontier areas by county shows that about one third of the geographical area of the U.S. can be categorized as frontier.[4] The map showing non-metropolitan areas and percent rural population suggest that, in addition, well over another third of the U.S. is rural.[5] The combination of these two areas suggest that close to three fourths of the geographical area of the U.S. is frontier and rural.

Although by definition these areas serve a only a minority of the population of the U.S., the fact that most of the U.S. is frontier or rural is of key significance to hazardous materials transportation. It is extremely important to note that, from a hazardous materials risk management perspective, **the majority of all hazardous materials transportation routes lie in rural and frontier jurisdictions**.

It is recognized that past commodity flow studies and other risk assessments have indicated that risk of accident in concentrated urban areas is greater, especially those with a preponderance of fixed facility hazards, and that, by definition, the risks to the population are greater in urban areas. So there has been good justification nationally for past priorities to focus hazardous materials risk management on these threats. However, it must also recognized that rural and frontier areas today present a major un-met national transportation risk and challenge, and that this challenge is greatly accentuated by the diminished resources and lack of infrastructure in rural and frontier communities to support appropriate hazardous materials planning and response.

[1] Prepared by Frederick J. (Fred) Cowie, Ph.D., Montana; with Monty Elder, Oklahoma; and Rayna Leibowitz, Maine

[2] See: A.H. Anderson, "Space as a Social Cost," *Journal of Farm Economics,* Volume 32, No. 3, 1950; and Carl Kraenzel, "Sutland and Yonland Setting for Community Organization in the Great Plains," *Rural Sociology,* Vol. 18 (1953), pp. 344-58.

[3] U.S. Department of Health and Human Services, Public Health Service, Health Resources and Services Administration, Bureau of Health Care and Deliver Assistance, "Primary Care Activities in Frontier Areas - Regional Program Guidance Memorandum 86-10," unpublished memorandum, Rockville, MD June 10, 1986; Laura Summer, "*Limited Access: Health Care for the Rural Poor,"* Center on Budget and Policy Priorities, Washington, D.C., March, 1991; and Congress of the United States, Office of Technology Assessment, Rural Health Care, "*Defining 'Rural' Areas: Impact on Health Care Policy and Research,"* July, 1989.

[4] Congress of the U.S., "*Defining Rural Areas* ....", p 1-3.

[5] Frederick J. Cowie, Ph.D., Montana Disaster and Emergency Services, "*Beyond Rural: Emergency Management in Extremely Rural (Frontier) Areas,"* 1992.

6 DHHS, "*Primary Care ...."*

The Effects of Low Population on Rural and Frontier Response Organizations

In order to develop more effective strategies for rural and frontier hazardous materials risk management, it is critical to first understand the characteristics of local emergency management and response. A typical rural town has a mix of governmental and quasi-governmental groups, including those functional areas related to emergency and hazardous materials response: fire, law enforcement, emergency medical services, public works, public health, emergency management and elected public officials.

Fire: VFD, or Volunteer Fire Department, is the typical fire organization. There might be other types of districts, other names, other acronyms, but what exists, basically, is a group of individuals who volunteer their time to provide the community's fire protection services. They train, on their own time, they fight fires on their own time, and they volunteer time to fund-raising, which is often the only financial support for the response organization. Occasionally there may be a paid Chief, sometimes there are a few paid fire fighters along with lots of volunteers, but the heart of rural and frontier fire-fighting efforts is the volunteer sector, and it is structural.

In tandem with the volunteer structural department there may be a wildland/forestry fire crew and often a county road crew, that fights wildland fires. These crews typically can assist in domestic fire-fighting only in limited support roles. Occasionally, depending upon the geographic location, there may be a nearby military fire fighting contingent or an industrial fire brigade that can lend a hand, but with few bases or industries, these are rare.

This is the frontier fire fighting reality, minimally equipped and trained volunteers, often using hand-me-downs from regional paid departments, who are paged, leave their place of employment, drive to the fire house, take the truck with equipment to the scene, and fight what's left of the fire.

Law Enforcement: Typically, organization consists of very small police departments with small jurisdictional areas, typically within the city limits. These departments work in conjunction with sheriff's offices with large jurisdictions and insufficient staffing. Within the large geographic area of frontier counties, the officer-per-square-mile is minuscule. Given the fact the average population is less than six persons per square mile, many western areas must count on cross deputizing and mutual aid with local game wardens, highway patrol officers and tribal police to supplement local jurisdiction law enforcement officers.

Emergency Medical Services: There is a wide variety of EMS providers in extremely rural areas (volunteer, clinic, private, fire, etc.), but they all suffer from the same problems: lack of money, lack of technicians, lack of equipment and lack of volunteers. Some "hospital runs" can cost a volunteer a whole day's work. Tourists can overload systems set up for locals, drying up the

volunteer base. Higher and more complex competencies make training requirements unmanageable on a volunteer basis.

Public Health: While EPA office personnel may be very familiar with acronyms like RCRA, EPCRA, CERCLA, CAA, CWA, OPA and even OSHA, it is more likely that a rural or frontier county sanitarian or code enforcement officer will be familiar with spending the day inspecting septic tanks and restaurants rather than going through hazardous materials or hazardous waste regulations. Some rural and frontier counties do not have permanent sanitarians. Many counties share sanitarians, some hire them on an as-needed basis. With their overwhelming workload and local customer focus, they have little time for, what from their perspective would seem to be, intrusive and unfunded federal mandates.

Public Works: Public works personnel should be welcomed players at emergency incidents. They are used to working outside, on streets, roads and highways. They have emergency equipment, barricades, etc. Unfortunately, while a county or state may have a great deal of equipment and operators, it is spread out. The result is that very little equipment and personnel are available locally in a small town.

Emergency Management: Emergency management is a low priority in a rural and frontier city or county government. The majority of local emergency managers are part time. Most have many other duties, with other duties being known to include safety officer, coroner, junk vehicle officer and floodplain manager. The number of management courses needed to make a good emergency manager from scratch would use up all of a part timer's hours for two years. Yet, the position is critical to emergency management and hazardous materials risk management activities in rural areas.[6] It might even be said that without an effective local emergency manager, the odds are extremely low for having a good hazardous materials or emergency management program.

Elected Public Officials: County commissioners, mayors and even sheriffs are high among the leadership of local communities. They usually are ranchers, farmers, businessmen, miners, loggers, etc. They are workers, not managers. They have the final say regarding many activities of governmental and quasi-governmental activities, yet they often have little experience to prepare them for their regular governmental duties, and usually lack the qualifications necessary to delve into disasters and hazardous materials emergencies.

Toward Realistic Approaches to Rural and Frontier Hazardous Materials Risk Management

Federal programs, such as EPCRA and other SERC-LEPC initiatives, presume the existence of local emergency planning committees (LEPCs). This theory presupposes the existence of an industrial tax base, paid responders, training on company time, adequate equipment and a variety of other luxuries.

Frontier facts are simple. There are probably no or few paid responders, outdated or nonexistent equipment, no tax base, no time to train and no active local emergency planning committee. The amount of time, effort, and money requisite to produce a trained, equipped, planned and exercised response community is beyond the scope of most rural and frontier communities.

The EPA has funded at least one project designed to address the problems of frontier LEPCs[7], but there are still extensive challenges stemming from the fact that most frontier LEPCs exist only on paper, if even there. The EPA has had some success in creating coordinated hazardous materials response and risk management where none existed, yet this success is geographically intermittent. Much has been done, but the vast majority of the work lies ahead. In rural and

frontier areas, the chances of a truck carrying hazardous materials having an accidental release within the jurisdiction of an active LEPC or within the jurisdiction of a local hazmat team are extremely poor.

Some frontier and rural states have programs and projects designed to develop active frontier LEPCs, but these programs tax the perseverance and creative skills of personnel, because of insufficient staff, time, and resources. The work that needs to be done, needs to be done effectively, efficiently and with a minimum of wasted effort and duplicated efforts.

Some approaches work better than others, some approaches have proven successes, some approaches are worth using while others can stifle any embryonic LEPC development. The following techniques and suggestions drawn from successful practices in rural frontier environments, are presented as possible alternative strategies for rural and frontier hazardous materials training and program management.

Sample Recommended Practices:

An Alternative Approach to Hazardous Materials Risk Management Training in Rural and Frontier Areas

1. Start with Baseline Chemicals, Hometown Chemicals

The greatest challenge in developing a hazardous materials program with volunteers in rural and frontier communities is to make it relevant. Volunteers will not give up an evening, a weekend or a minute to hear about make-believe scenarios or federal mandates. Success, to date, in small towns with volunteers has been by the use of next-door chemicals. Failure has been catastrophic when the emphasis has been on catastrophic events and trainloads of extremely hazardous substances. The fight can't be won with theory, it can be won with facts.

Using a flip chart[8], a skilled facilitator can draw out of the local group the list of chemicals in their town that can hurt them, their kids, their parents, their friends. It does not matter what the list ends up being, because it will be real and it will be a starting place they can relate to and live with, since they do everyday! The baseline chemical list will look something like this:

- gasoline
- diesel
- LPG/propane
- acids/bases
- natural gas
- chlorine
- pesticides/poisons
- explosives
- crude oil
- anhydrous ammonia
- paints/solvents
- household chemicals

This list should be, will be, real to local fire fighters, local responders, local industrial folks. These are everyday chemicals in everyday towns. Luckily for trainers and planners, unluckily for citizens and responders, these pretty well cover the gamut of hazard classes, at least well enough to develop a baseline set of hazards. It is good to point out at this point that we are a chemical-based society, that chemicals are the reason our society is as it is. That is not to say it is good or bad, right or wrong, but that is just how it is. Chemicals are on the roads and rails, because they are destined for facilities in our towns that need them. These are the transportation industries and fixed facilities that hire our friends and neighbors, that support our communities, that make America work. The chemicals are the chemicals of modern life, even in frontier America. Let's look at them:

Gasoline: It's everywhere; flammable liquid; fairly low flash point; kills a lot of people; causes a lot of property damage; comes in large quantities; has recognizable industry names; corner filling stations. Frequent large releases, often to do with highway traffic accidents, or smaller releases due to overfills at delivery sites.

Diesel: It's everywhere; fairly high flash point; large number of small releases due to saddle tanks on trucks involved in traffic accidents.

LPG/Propane: It's the heating fuel of choice in rural, camping and barbecuing America; comes in varying sized containers; distribution sites in or near all small towns; infamous from Kingman, Arizona; associated with BLEVEs; a lot of it on the road; a liquefied-gas, looking for space, air.

Acids/Bases: Lots of acids used in refining and manufacturing; corrosives; eat their way to a more neutral pH; comes in large and small quantities; lot of it on the Interstates.

Natural Gas: Rarely on lists; explodes, burns, asphyxiates; infrastructure often old; releases often caused by backhoes; gathering lines and pipeline facilities.

Chlorine: A killer; basic manufacturing chemical; basic water purification chemical; large and small cylinders; lots of rail cars; municipal swimming pools.

Pesticides/Poisons: Including herbicides, fungicides, etc.; on seed wheat and potatoes, etc.; lots of it on roads at certain times of year; designed to kill; store in co-ops in or near all small towns.

Explosives: Unexploded military ordnance; old nitroglycerine and dynamite; high school chemistry labs; terrorist activities.

Crude Oil: Large quantities; production-area specific; environmentally nasty; very high flash point.

Anhydrous Ammonia: No water content, therefore hydrotropic (water-seeking); corrosive; inhalation hazard; distribution sites in or near all small towns; nurse tanks pulled by pickups.

Paints/Solvents: Everywhere; hardware stores and car parts stores; dry cleaning and automotive; many carcinogenic; flammable liquids.

Household Chemicals: Cleaning products; drain cleaners; charcoal starter; paint thinner; old stuff nobody knows what it is any more, and so on.

It should always be remembered that there rarely are either historical or zoned areas for chemicals in small towns. Hazardous materials distribution points are often in close proximity to residential areas, schools, retirement homes and medical facilities, often downwind in the pathway of prevailing winds. Once the frontier community firmly believes that there are hazardous materials next door, next door to their kids and spouses and parents and friends, then they can be moved to the next step, human pathways for chemicals, good and bad.

Pathway examination is critical to elevating the consciousness of small communities about hazardous materials. It humanizes and personalizes what is otherwise a technical nightmare. Humans intake air or food or liquids in four ways, and they intake hazardous materials in these same four ways, hazardous materials that can maim or kill them. If the emphasis is placed on the humans, the citizens, the responders, the industry employees, there is a much better chance at success, a much higher acceptance ration, than if the left-brain, technical side is overemphasized. [Technically-oriented trainers tend to over-chemicalize hazardous materials incidents, thus the following pathways section may be given first to humanize hazardous materials incidents.]

2. Entrance to the Human Body: Four Pathways

It is critical to emphasize in every way that they, the responders, citizens, industry employees, are the most important things: not chemicals, not management systems, governments, structures or highways. Emphasize that the way their body takes in food, water, oxygen, etc. is going to be the exact same way it takes in carbon monoxide, poison, etc. Prove to them that they have to understand themselves in order to stay safe. Discuss the four pathways, parallel them to environmental area for further emphasis. Show the environmental as a secondary safety problem, long term safety problem, yet a safety problem indeed. **Safety first, and it's their safety!**

1. Inhalation: Breathing, in and out. Have them actually do it forcefully. Explain to them that this is a pathway and that does not differentiate the kind of hazard in that pathway. It could be a corrosive, a poison, an asphyxiant. The results would be different, all bad. Remind them that their body will breath, in and out, automatically. They can't stop the pathway. Environmentally, contrast clean air with air pollution.

2. Absorption: Something on the skin, slowly moving through the skin, past the muscles and into the blood stream. Again, it could be different hazards using the same pathway. Environmentally, this can be compared with percolation through the soil into the aquifer.

3. Ingestion: Eating or drinking is the usual idea. But people don't usually eat or drink hazardous materials straight, but they could be swallowing contaminated saliva. Children could be playing on contaminated dirt. All swallowed material goes into the digestive tract. Environmentally similar to dumping something directly into the stream or river.

4. Injection: Needle injection often comes up, but at incidents it is usually either done via new or old cuts, abrasions, punctures, etc. This speeds up, through a more direct pathway, the entrance into the blood stream. Environmentally similar to a release near a wellhead that siphons material directly into the aquifer.

This creates a good teaching paradigm necessary for good training: Participants identify **both with** their own personal human body functions **and with** the chemicals which exist next door to them, their loved ones and their friends.

3. Personal Protective Equipment (PPE) in Frontier Areas

A person's past history, experiences, and training are far more important in changing behavior at hazardous materials incidents than is new data. Therefore, a trainer or facilitator, in order to be effective and change behavior, must address the standard incident comfort level of the responders, especially in rural and frontier areas. The local responders are not professional data managers used to manipulating abstract concepts. Deal with them where they are. Ask them for examples of personal protective equipment (PPE) they have and what it protects them against. A list might contain some or all of the following. Law enforcement: vests/bullets; latex gloves/blood

borne pathogens. Fire: Bunker gear/some heat and flames; SCBA/airborne hazards. EMS: latex gloves/blood borne pathogens; goggles/blood borne pathogens, projectiles. Public works: leather gloves/scrapes, cuts. Public health: latex gloves. Emergency managers: Hard hats/things that hurt their heads.

Once they are comfortable explaining their PPE (they may have never used this phrase or acronym before), ask them to review the baseline chemicals and the four pathways. Then lead a discussion of PPE for hazardous materials incidents. Let the group come to the conclusion that they virtually have no protection against chemicals, except the firefighters and their SCBA in relation to inhalation hazards. What about simultaneous inhalation and absorption hazards or corrosives? Is the bunker gear really helpful at a hazardous materials incident? Are there false senses of security and protection?

Provide them with an understanding of the four levels, A-B-C-D of PPE according to EPA and OSHA. Have them discuss where they personally fit on the A-D scale, which for the most part is the “street clothes” level. Then gently advise them that their PPE is **distance**, pure and simple. Distance moves their own, individual four pathways away from the chemical processes involved in the incident. They can understand this. They may want to do something. They may want “hands on.” But what they need is to be safe.

4. North American Emergency Response Guide (NAERG) in Frontier Areas

With regards to safety, the most important document in hazardous materials response in rural and frontier jurisdictions is the NAERG. It is an accepted national standard of care. It is that standard against which incident response will most likely be measured by post-incident authorities. It is universally available, it can be adopted and should be adopted as the transportation incident response plan by jurisdictions, volunteer and paid fire departments, law enforcement, EMS, public health, public works and emergency managers, in lieu of oral or non-existent plans. Yet, it is not often marketed well. However, if it is introduced to the response and planning community here, after the baseline chemicals, four pathways and PPE/distance, then it is accepted as a necessary and appropriate guide to initial response, hands down.

Why? Because the appropriate question, after distance is described as personal PPE in frontier areas, is “What Distance?” The answer for NAERG chemicals is in the Guides. Safe distance is the hook to get their interest, then one can do NAERG training. Once they understand how to determine the isolation radius, how far to get people out and how far to keep new people away, then they can proceed to other parts of the Guides: Potential Hazards, Protective Clothing, Fire, Spill or Leak, First Aid, etc. This is a user-friendly, foolproof system. They can be shown the green pages with their isolation and protective action distances and water-reactive tables and the white pages with the data management ideas and narrative sections. But if they don’t see how this is important to them personally, individually, then they will not use it. And the way to get them to use it is to get them to buy into personal safety first, then public safety!

5. Don’t try to sell ICS (Incident Command System)

Use tabletop exercises with realistic scenarios to develop locally-intelligible incident management from the chaotic ground up.

The resistance to management training in general, and ICS training in particular, in rural and frontier areas is legendary and well-founded. Many governmental, managerial and developmental ads have come and gone. Time-restricted local responders don’t want another three-letter acronym to put in the trash with MOB, TQM and MBA. In rural areas, any medium-sized to large incident, especially highway incidents, demands the use of a management system.

Let the incident scenario demand management help, it can do it by itself. Use the five basic operational response areas: fire, law enforcement, EMS, public health, public works.

It has been found that in rural and frontier areas, everything is done with neighbors, mutual aid and outside help. There are just not enough locals to go around. The fire lead may be the local VFD, but there usually are two or three mutual aid VFDs involved, plus a county wildland fire crew and maybe one from state forestry. The law enforcement lead may be the county sheriff's office, but they need help from city police, state highway patrol, game wardens, and in the west, tribal police, FBI and ATF. Public works lead may be either county roads or state highways, but each needs the other and sometimes city street crews' help. One county public health nurse or sanitarian can't handle a big incident, so city or state folks are called in. In addition, local, county and state emergency managers, public officials and industry personnel may be needed.

Let this group of fifteen or twenty agencies, which are necessary to handle a not-uncommon incident, demand a management system and the responders will beg for help. When someone comes to help, don't let them bring tomes of professional looking ICS/NIIMS documents. All a frontier or rural responder or manager needs is the basic concepts: Span of control and a logical differentiation of roles. Roles: Incident Commander (or Unified/Joint Command); Commander support (Liaison, Safety, Public Information); Operational Support (Logistics, Planning, Finance) and Operations (Fire, Law enforcement, EMS, Public Works, Public Health, Other).

Demonstrate that the Incident Commander and the Operations Chief need to be managers, perhaps with an operational specialty, but the emphasis has to be on management skills and not specific operational expertise. Explain the need for perspective, reflection, data management, analysis of the situation. Differentiate decision making from implementation of the decision. Show the need to group functional response agencies (Fire, Law enforcement, EMS, Public Works, Public Health, Other) and that each group needs a control, a lead person.

Once they can see this, then they will become interested in training to ICS, the national standard for incident management. Until they see the need by walking through incident scenarios, however, ICS trainers are wasting time in frontier America.[9]

6. Marketing CHEMTREC, CHEM-TEL, MSDSs and Information Management in Frontier Areas

Once the participants realize the incident scenario might or will involve technical personnel beyond the local responders' defensive operations level, whether they are hazmat team members, emergency room nurses and doctors, or public health nurses or technicians, local responders will see the need for information above and beyond that which NAERG can provide. That is when the trainer or facilitator shows them in the NAERG how to access CHEMTREC and/or CHEM-TEL to get the MSDSs and the manufacturer data needed to learn the chemical specifics often necessary for technical response. Do not get bogged down here in EPA or OSHA regulations, just use a real MSDS from one of the baseline chemicals, like anhydrous ammonia, chlorine or LPG. Keep up the momentum of the training, don't kill it with regulatory confusion.

This is also a good time, since the subject is data management, to discuss data collection and data management. Show them that all incidents require responders and participants to know certain information in order to handle situations properly: exact location, chemical name, container, amount originally in container, amount released, release rate, weather, temperature, wind, responsible party names and numbers, insurance company names and numbers, etc. The group of participants, from the participating agencies and all affected groups, should develop a jurisdictionally-correct checklist. The NAERG pages 2 and 3 are a good start, but the hazmat

team or the clerk and recorder might want different or subsequent information. Put their needs into the system early on.

7. Getting Past Negativity with Frontier Audiences

As a trainer from Idaho once said, what they say is "Ain't got no LEPC! Don't want no LEPC!" Starting from scratch is the hardest thing to do and nothing succeeds like success. These two truisms may seem contradictory, but they are reality on the frontier and in rural areas. The key to success is targeting. No one can bring all jurisdictions up to speed at the same time. That approach beckons disaster. Target efforts to one local jurisdiction, county or small town, where there is one person in some important role (fire, law enforcement, EMS, public health, public works) who can act as a local catalyst. This person should be willing to dedicate work over the next three to five years, because that is what it takes to develop a local emergency hazardous materials response system. Then commit yourself to make trips to that jurisdiction every month for the next year.

Start with two or three awareness courses (using the principles outlined above). Then do a series of successive tabletop exercises, the first one being an orientation, working through the need for a management system (as outlined above). At that first orientation meeting, use a simple oral or one-page hazard analysis system, where the locals decide what are most likely, most locally interesting, most locally important scenarios.[10] Plan to do three or four tabletops, making them sequentially more complex. Never make them more deadly or more complex or more intense than needed to give the local responders **practice** (that's what exercises should be in rural areas, practices, not tests) doing what they are currently equipped and trained to do. Do not go overboard, don't kill everyone, don't plan to fail!

The evolution of frontier exercises has led to the development of a two-hour exercise where four-to-six different scenarios, using baseline chemicals and relevant local data, are given to local teams, consecutively, one every twenty minutes. For each incident, the local teams then must develop incident strategies as well as operational management plans for the functional areas of fire, law enforcement, EMS, public health and public works, as well as plan to interface with the fixed facility or the transporter. This forces the team to think quickly, as a team, and shows them that things that used to take the hours in early exercises where the team was in formational stages, can now be done in a matter of minutes, with an increasing level of professionalism, confidence and competency. Use of this exercise is recommended before moving outside.

8. Moving the Whole Thing Outside: The Field Exercise

Do not have a field exercise until two successive tabletops, using different scenarios, have proven that the local incident management system works. In the rural and frontier areas of America, very few responders will be at the Operations Level II, perhaps half will be at Awareness Level I. Some will have no training whatsoever. Regardless, there will be a dilemma. *The local field personnel will be wanting "hands on" because that's what they are trained to do. That is what they want to do and that is why they volunteered to do all that work in the first place.* It is critical that everyone at all levels of government understands this. The responders, the real field people, want to go outside and play. *On the other hand, the reality is that response should be according to EPA, OSHA and the NAERG. The Incident Commander, the Operations Chief and the Controls/Leads for fire, law enforcement, EMS, public works and public health should understand and should be implementing an NAERG-based response plan that is essentially "hands-off" and "minds-on!"*

No one should be allowed to "play" until a management systems is in place that is based on training, equipment, exercising and planning which in turn are to be based on federal regulations and guidelines. No one should be allowed to go to the field, even to do defensive "hands-on," until the management (IC and Ops Chief, plus Operational Functional Controls/Leads) are sure that everyone in Operations, including all field personnel and mutual aid folks, realize that all "hands'-on" must be in compliance with standards and with the "minds-on" management plan developed in the tabletop exercises. Everyone must realize that field exercises in frontier areas are almost universally defensive exercises. All necessary training should have been accomplished and exercised before a field exercise is undertaken, regardless how much chomping at the bit goes on.

9. Federal Agencies, Regulations and National Standards: Their Roles in Frontier Areas

So far the plan has been to sell safety, planning, exercises and hard work using the principles of commons sense, personal and familial safety and community service. It must be remembered that frontier folks are non-governmental types, volunteers, people who do other things for a living at the rate of 60-80 hours a week. The only way to get them "in compliance" is to work them into it slowly. Sow them the personal win-win, the community win-win, the volunteer-organization win-win, then build on that. It is best not to mention federal regulations early on, for maybe the first six meetings, or six months or a year. Build the trust, build the confidence, build the team, show them how they have been "in compliance" (explain it as "progressive activities toward compliance," which will in fact be the case if one follows the course outlined above), and how they can now accelerate that process. Give them the necessary basics, at a level comparable to the frontier need!

A. OSHA

Start with OSHA 29 CFR 1910.120 and give them the actual five level training regulations. Show them how what they have been doing complies with the regulations. Of course, a trainer could introduce these concepts, briefly and simply, early on in the Awareness Level I training, but do not waste a community confidence-and-awareness-building opportunity, such as an Awareness course, by trying to explain federal regulations. They might throw the Awareness out with the bath water, as it were.

Explain OSHA as the employee safety and health people. Employees here being considered as paid or volunteer, thus incorporating volunteer fire fighters and volunteer ambulance personnel. This is also a good time to address the "hazard communication" concept, the MSDSs system and why and how that system works. It is very helpful later on for them to know this. It is not necessary for them to understand hazard communication in order to obtain an MSDS from CHEMTREC for an ER doctor during an incident. It is necessary for them to understand it to help develop and sell a comprehensive planning effort later on.

B. FEMA

FEMA is best marketed as the citizen's friend, the group that puts back up bridges, repairs roads, promotes and manages flood insurance programs. If OSHA looks after the responders, FEMA looks after the citizens. Emergency managers don't manage flood waters or forest fires or earthquakes, they manage the activities of people.

C. EPA

If the role of OSHA and FEMA are best explained by using the words themselves and not the acronym, then this holds true for EPA as well. The Environmental Protection Agency lets the responders and the citizens know that someone is watching out for the air, soil and water which form the environment in which they exist. Someone is keeping tabs on the hazards at the secondary, environmental level and that somebody is the EPA. Sometimes the EPA acts as OSHA, sometimes it acts in concert with FEMA, but it is basically a regulatory agency designed to keep the environment and its inhabitants healthy.

D. DOT

The U.S. Department of Transportation has a role to play in hazardous materials because the business of America runs on chemicals, manufactured in one place and used in another. The regulations and guidelines are voluminous and well intentioned. What rural and extremely rural responders need to know is for all intents and purposes contained in the NAERG, which in the U.S. is sponsored by DOT.

E. National Fire Protection Association (NFPA)

Firefighters have a group, the NFPA, which develops national standards for various things, including competencies regarding hazardous materials response. While they are not federal regulations, they are national standards, against which response and response planning can be measured, both before the fact and after an incident, by lawyers, judges, juries and regulators. Firefighters should be familiar with NFPA.

F. Emergency Planning and Community Right-to-Know Act (EPCRA) or SARA Title III

EPCRA or SARA Title III brings together many of the hazardous materials initiatives of OSHA, FEMA, EPA and DOT under one roof and provides for the development of an infrastructure for coordinated hazardous materials risk management. That infrastructure is the local emergency planning committee (LEPC) and state emergency response commission (SERC) system. If there has been a coordinated series of viable local exercises and locals understand the NAERG and MSDSs, as well as standard defensive fire fighting and EMS procedures at hazardous materials incidents, and use a basic form of ICS, then SARA Title III's planning and exercising requirements should make complete sense. But do not try to sell SARA Title III first. Sell safety first and the regulation second or third or fourth, it will have far better results.

G. CERCLA, RCRA, CWA, CAA and so on

Let the specialist in these fields, if there are any locally, deal with the niceties of these laws, do on inflict them upon ranchers, farmers, loggers, miners, small business women and men acting as volunteer ambulance drivers and volunteer fire fighters. If there are no local specialists, negotiate with state personnel to supply needed expertise for these areas during complex incidents.

Sample Recommended Practice:

An Alternative Approach to Hazardous Materials Program Management in Rural and Frontier Areas

1. Planning Efforts in Frontier Areas

Plans must be the written version of actual field activities. Until sufficient scenarios have been developed and until sufficient emergency operations procedures have been developed for these incidents and "exercised," then intense planning efforts will produce documents, but not realistic plans. However, once the NAERG has been adopted locally, once the management team concept has been accepted and practiced, once the functional areas under Operations have standard operating procedures for the cooperating agencies, once the response community acts like a team, once industry is taken in as a partner and is not perceived as the enemy, then planning efforts are productive. They help take the team to a higher level, a consistently proactive level, a planning team level. Soon various functional components of the bigger team begin to have their own team spirit. Soon smaller sub-groups, for instance industry and fire, vie to see who can have the most efficient and effective internal operating procedures. Soon the plan is a live organism and not a deadly shelf document.

History has shown several things regarding this approach. One: Awareness courses and sequentially harder tabletops are the best builder of community support for hazardous materials and emergency management planning activities. Two: Once the home fire is started, training, planning and exercising become self-generating and the facilitator can move on to another jurisdiction.

One of the key planning issues facing rural communities, especially those that have developed successful Operations Level II defensive response capabilities, is addressing with the local elected officials their responsibility for providing for Level III and Level IV, hazardous materials technician and specialist support. This aggressive, offensive support is required when the incident needs outstrip the local capabilities. During an incident is no time to address "What do we do when we can do no more?"

Whether the actual answer lies with contracted services of providers on retainer or under contract, or with state or federal or industrial responders, the answer should be in writing. It should be kept current and it should be easily and quickly initiated by the incident commander, without unnecessary delay or need for executive approval. Lack of response capabilities does not eliminate public safety or planning responsibilities on the part of a jurisdiction. This is abundantly clear to regulators, judges and plaintiffs' lawyers.

It is of great concern to rural and frontier hazardous materials risk management personnel that wholesale distribution facilities for anhydrous ammonia and propane, tank farms for flammable liquids, and co-ops with large quantities of pesticides and farm chemicals in or in close proximity to small towns with little or no response capabilities. It must be remembered, that the ability to contract for hazmat response services from a distant urbanized area, with perhaps six or ten hours elapsing before the arrival of the first response truck, does not alleviate the problems caused either by transportation or fixed facility releases in small towns.

2. Training Efforts and Additional Equipment in Frontier Areas

Simultaneous with a higher level of planning efforts comes increased training efforts. The different scenarios have shown responders their weaknesses, their voids, their shortcomings.

They see the real personal and professional need for further training. They begin to ask for more training, a higher level of training, more intense training. People want to become functional team leaders, operational leaders, incident commanders. People want more specific training on baseline chemicals: acids, chlorine, anhydrous ammonia. People want new equipment and the training to use it.

Training monies are often the easiest for agencies to come by, through state or federal training grants. Equipment is harder to find, but industrial benefactors can be found and monies saved through training grants can be reallocated to equipment purchases. A process of continuous, incremental improvement leads to increased planning and training activities.

Hazardous materials response efforts in small towns, where no full team will ever be found due to tax base, population base and industrial base problems, have been known to spur on regional efforts. In certain rural areas, similar closely-located communities have attempted to pool personnel and equipment to field regional teams. These teams plan to train together and come together upon the arrival of the different members to the incident site from four or six surrounding communities.

It may take five years of hard work, but it will never happen if the process isn't started now. It will never happen if everyone, or sometimes anyone, says it can never happen. Yet, it can and has happened, but it takes a logical process, geared to rural and frontier cultural and jurisdictional realities.

One of the most logical and most productive ways to obtain training is to approach the local industry representative, such as a anhydrous distributor, a trainmaster or a tank farm operator, and request set-aside training for local responders or for spaces for local responders at local industry training classes. This not only builds teams and trust, it also facilitates response when incoming industry responders are familiar with local governmental or volunteer responders. It is also a great idea to contact state, regional or national CAER® and TRANSCAER® representatives, railroad training car representatives, petroleum industry representatives, the Chlorine Institute, the state Department of Agriculture or Environmental Quality, EPA, DOT, FEMA and other federal agencies or private organizations to learn about upcoming training opportunities, most of which or free or have but a nominal cost.

3. Building on the Baseline

Once the baseline chemicals are accepted as just that, the foundation of local hazardous materials risk management; when the local PPE supply has grown to a level to handle the hazards involved with baseline chemicals; after sufficient scenarios have been exercised to develop a local incident management system with team members familiar with each other and the ICS system; and at the time the local team is just that, a team, then the time has come to go past the baseline, to build on the foundation.

This can be done, well, very and logically. In the developmental exercise or practice situation with their local scenarios, the facilitator encourages and directs the players to design the scenarios which will allow them to **safely and successfully practice** their parts. Once the fire folks have handled chlorine, acids, anhydrous and flammable liquids successfully sufficient times; after EMS has triaged and transported a variety of standard cases; when law enforcement has proven its mettle with crowd control and traffic jams; sanitarians have managed disposal and road crews have diked and barricaded to their hearts content, then it is time to crank up a notch the different factors involved in the scenarios in order to **stress the seasoned responders** (remember, that early on stress is not the key, practice is) and force them to a higher level. How is that done?

Logically and systematically! It must always be kept in mind that given the local tax base, population base, commerce base and industry base, there is an optimum level of response for that given community. Analysis of the local conditions can result in a fairly accurate determination of **current** and **optimum** response levels.[11] Keep in mind, one does not want to intentionally design a scenario to over stress the local capabilities without simultaneously accounting for mutual aid, state, federal or industrial resources to meet the local need.

Given the above, cranking up the scenario is simple. For law enforcement, it is possible to make the incident a crime scene, using either an environmental crime, a terrorist crime or a dumb crime. For fire, the chemicals can be made more toxic, more flammable, and more corrosive. For fire and EMS the injuries can be more life threatening, the extrication more complex, the interface with the chemicals more intense. For public health, spread some steaks around from a frozen food truck, drop some pesticides into surface water, and cause a more serious aquifer-related problem. For public works, have a need for damming and diking, dust remediation, or extensive barricading. Have some cows and horses affected, fishing or hunting seasons impacted or tourist traffic, if you want to see some real action. But never, **never**, do any of this without both the input from and the concurrence of the affected functions and their associated agencies.

The principle of continual small improvements, which works so well in management activities, works well also in scenario design. Even changing the location of an incident, without actually changing the non-location facts of the scenario, changes jurisdictions, lead agencies and the ICS management folks involved in event. Just remember, this is a team-building exercise, a **practice**, a small piece in a long-term process.[12]

4. The Future of Frontier LEPCs and Frontier HazMat

We should be taking our lead from the people, from the responders in the rural and frontier areas, from those affected by our decisions. The lead should not be coming from the regulators or the legislators. The laws, especially SARA Title III, were designed for the populace and the local responders. The laws and the regulators that enforce them should not become the focus of attention. The goal should remain the same, support of local responders and citizens regarding hazardous materials risk management at the local level. Federal agencies should be looking to the towns, not to downtown. They should be using the knowledge and experience of the successful rural and frontier LEPCs to develop initiatives designed to create more successful ones.

It should be remembered that everything depends not upon regulation and enforcement, but upon finding one local person to take the lead and develop the local team over a period of three to five years. It should be acknowledged that few, less than half probably, of all extremely rural counties will ever achieve successful LEPCs. The goal should be an extremely rural, frontier “standard of care,” which accepts the U.S. DHHS and U.S. Congress reality-based concept of frontier status. And everyone should accept that someone has to act as the skilled facilitator of the local process.

How can the federal government facilitate this local process? **Think outside of the lines!** Perhaps OSHA could promote something resembling enhanced-operations Level II or focused-technician Level III which would easily allow for in-compliance rural responses to acid or chlorine or other baseline releases in extremely rural areas. Remember, the responses will always occur (without the non-existent frontier hazmat team) and they will most often occur out-of-technical-compliance if the standard, the compliance standard, is not flexed. DOT could allow for equipment purchases for basic, non-extravagant items under training grants. EPA, FEMA and DOT, under training grants, could allow for overtime or replacement-time payments for volunteers

(who are losing wages) who are currently donating nights and weekends to all exercises or training. This would do nothing more than make them equal with paid responders. Or perhaps Congress could fund mobile in-state regional response teams for areas (and states) without sufficient tax, population or industry bases.