Chemical Weapons
Improved Response Program
1999 Summary Report

Prepared by
The Chemical Weapons
Improved Response Program

U.S. Army Soldier and Biological Chemical Command
Aberdeen Proving Ground, MD
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Program Director’s Message

Subject: 1999 Chemical Weapons Improved Response Program Summary Report

The purpose of this summary report is to inform members of the first responder and emergency management communities about the on-going activities, initiatives, and lessons learned from the Chemical Weapons Improved Response Program (CW IRP). It is the intent of this program to relay information to these communities that will result in improved procedures, organizations, individual personnel knowledge base, and awareness of equipment capabilities surrounding a weapons of mass destruction (WMD) event. The information and experience shared among members of the national response community will hopefully be used as a tool to better prepare our nation as a whole against the inevitability of the use of chemical agents of mass destruction on U.S. soil.


James K. Warrington
Program Director
Domestic Preparedness Program
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Part I

Introduction

**Domestic Preparedness**
The Domestic Preparedness Program (DPP) was developed to support congressional legislation passed under Title XIV “Defense Against Weapons of Mass Destruction” of the 1997 National Defense Authorization Act. The Department of Defense (DoD) was tasked with several initiatives under this legislation. These included the execution of a training and exercise program, establishment of a hotline, and development of a program to improve the civilian response capability to chemical and biological (C/B) terrorism. In answer to the latter of these initiatives, the Improved Response Program (IRP) was developed to identify and improve systemic deficiencies in the ability of a community to respond to a C/B terrorist incident. Because there are major differences between the C/B agents and the expected response actions, a separate program was developed to study each area. The Chemical Weapons Improved Response Program (CW IRP) began in July 1997 with a workshop designed to establish the infrastructure, goals, and objectives of the program.

The CW IRP developed a series of exercises, entitled Baltimore Exercise (BALTEX), to present participants with information regarding the potential for terrorist use of chemical warfare agents (CWAs). Participants were organized into four functional working groups consisting of emergency response, law enforcement, health and safety, and emergency management. Working through the exercise scenarios, groups developed a list of issues revolving around their response to a chemical event. Groups then formed working committees to develop solutions and recommendations for improving the civilian response capability to these issues.

A summary of the first 18 months of the CW IRP is outlined in the Domestic Preparedness 1997-1998 Summary Report. This report provides a brief synopsis of the exercises conducted under the program to assist the participants in developing key issues that pertain to a response to a chemical weapon(s) of mass destruction (WMD) event. It further outlines the functional groups established to identify and address these issues. Each participant in these functional groups is critical to the success of the program. The report also identifies several technical studies conducted to test and evaluate procedures addressing several of the key issues. The focus of the program during this period was to conduct a series of exercises designed to help identify issues within each of the functional groups.

This 1999 Summary Report represents the major activity of the program for 1999. BALTEX V, a series of demonstrations based on recommended procedures for emergency rescue and mass decontamination that were developed in the Emergency Response Functional Group, concluded 1998. As the program moved into 1999, more emphasis was placed on the efforts of the individual functional groups. Group chairpersons, with the assistance of their committees, developed their own goals and objectives to seek out recommendations for the key issues that they identified. Exercises conducted in 1999 focused on the following two objectives:

- Support the efforts of the individual functional groups to resolve key issues.
- Share information based on the individual functional group efforts.
The technical studies briefed in the 1997-1998 Summary Report were completed and are in the final stages of production. Several additional technical studies were identified and initiated in 1999. The status of all the studies is outlined in Part IV of this report. Additionally, the major issues and program recommendations from each functional group are currently being prepared as the CW IRP Playbook. The technical reports and Playbook provide a comprehensive outline of the recommendations for responding to a chemical WMD event. As these reports are finalized, they are posted to the Domestic Preparedness web page: http://www.nbc-prepare.org.
Part II

Major Activities Summary
A. **Baltimore Exercise (BALTEX) VI**

**Date:** January 20 to 21, 1999  
**Location:** Essex Community College, Baltimore, MD

1. **Introduction.** BALTEX VI was a time-phased tabletop exercise designed to address the long-term recovery and remediation issues following a chemical WMD event. It focused on the issues a community would face reestablishing normal day-to-day operations, sustainment of law enforcement investigations, and long-term patient care.

2. **Background.** Objectives for the exercise were as follows:

- Identify and examine the key health and safety contingency planning and execution shortfalls that are unique to a WMD incident.

- Identify key emergency management planning shortfalls and critical resource allocation, prioritization, and consideration issues unique to a WMD incident.

- Discuss ways to reconcile requirements for protection of a crime scene and evidence with those of rapidly responding to safety needs of the public.

- Continue to review interjurisdictional mutual support compacts or agreements between the city and the counties in the region.

BALTEX VI was divided into the following four modules:

- Background Information and Warning
- Initial Response (Incident to 7 hours post incident)
- Follow-On Response (8-36 hours post incident)
- Follow-On Response and Restoration (36 hours post incident through day 5)

A lead facilitator conducted a situation briefing while supporting facilitators were assigned to each one of the functional groups to support the group chairpersons. As with previous BALTEX exercises, the plenary groups were emergency management, emergency response, health and safety, and law enforcement. Discussion of actions, consequences, and solutions took place in each of the functional groups after each module.

The exercise focused on the response and recovery over a 5-day period following a chemical terrorist incident. It led the participants through the initial incident, the immediate emergency response, the detonation of a secondary device, and the transportation of victims to tertiary facilities, concluding with remediation activities.

The second day of BALTEX VI began with a presentation by Mr. Ray Blakeney from the State of Oklahoma Medical Examiner’s (ME’s) Office. Mr. Blakeney discussed the recovery
and extrication of the deceased from the Alfred P. Murrah Federal Building following the bombing on April 19, 1995. Mr. Blakeney gave a very informative and highly emotional presentation that focused on the key issues involved in processing and identifying the deceased, caring for the emotional needs of loved ones, and the psychological support given to the ME’s staff.

The afternoon of Day 2 began with a presentation by Mr. Paul Marmen of the Oklahoma Emergency Medical Services Children Resource Center. Mr. Marmen addressed the issues related to the children involved in the Oklahoma City bombing. He discussed what happened to the children who had survived and those who died in the explosion. Additionally, he addressed the issues surrounding children who are witnesses to, or victims of, a disaster.

BALTEX VI concluded with Soldier and Biological Chemical Command (SBCCOM) giving an update on the ongoing technical efforts of the CW IRP. A survey was handed out to gather information on the needs for chemical detectors. The information from this survey will be used to select the most appropriate, commercially available detectors for testing live chemical agents.
B. Health and Safety Tabletop Exercise (HSTTX)

Date: April 29, 1999
Location: Dr. Samuel L. Banks Professional Development Center, Baltimore, MD

1. Introduction. HSTTX was the first exercise to address specific issues from within one of the program’s functional groups. The Health and Safety Functional Group developed HSTTX to facilitate in-depth examination of the medical consequences of a WMD event. HSTTX was conducted as a time-phased tabletop exercise.

2. Background. Key objectives of HSTTX were the following:

- Identify the key requirement(s) for establishing, staffing, and operating an Off-Site Triage, Treatment, and Transportation Center (OST\textsuperscript{3}C).
- Identify the roles of local police and fire departments in support of health/medical facilities and operations.
- Discuss ways to improve short- and long-term patient tracking procedures.
- Identify procedures for coordination and conduct of critical incident stress management (CISM) support for the affected population of the city.

HSTTX was divided into the following four modules:

- Background and Initial Response
- Immediate Medical Care
- Follow-On Care
- Long-Term Care and Recovery

A lead facilitator conducted a situation briefing with discussion of actions, consequences, and solutions taking place after each module.

HSTTX focused on the roles, activities, and coordination facing medical care providers, mental health professionals, hospitals, and the health department following a chemical WMD attack. The activities and coordination of the community necessary to support the health and medical communities was incorporated into the exercise. The exercise was pivotal in gaining the private medical community’s support for the program.

Administrative, emergency department (ED), and infectious control representatives from the 14 area hospitals supported the exercise. Dr. Peter Bielenson, Baltimore City Health Commissioner, attended the exercise and emphasized the importance of planning and preparation of all health community agencies for the consequences of a chemical WMD incident.
C. BALTEX VII

Date: May 18 to 19, 1999
Location: Conference Center, Aberdeen Proving Ground (Edgewood Area), MD

1. Introduction. BALTEX VII consisted of a series of presentations by program representatives designed to inform members of the ongoing efforts of each of the functional groups and SBCCOM.

2. Background. BALTEX VII presentations were designed to bring program participants up to date on the issues that each of the functional groups had been addressing over the past year. Each functional group presentation consisted of a mission overview, group composition, and identification of the issues that each was currently studying.

   Functional group chairpersons focused their presentations on the efforts of their group over the past year as well as the major activities planned through the year 2000.

   SBCCOM representatives, supporting each of the program’s technical initiatives, gave a presentation outlining the current status of each study. Presentations were given on the following areas:

   - Firefighter personal protective equipment (PPE)
   - Positive pressure ventilation (PPV)
   - Mass casualty decontamination
   - Chemical detectors
   - Law enforcement and Emergency Medical Services (EMS) PPE

   Day 2 of the exercise included a presentation given by Supervisory Special Agent Carl J. Jensen III of the Federal Bureau of Investigation’s (FBI’s) Behavioral Science Unit. Mr. Jensen gave an informative briefing entitled “Psychology of the Terrorist” outlining an in-depth analysis of the individuals associated with extremist groups and their most likely motivation for using a WMD.
D. BALTEX VIII

Date: October 29, 1999  
Location: Harbor Hospital, Baltimore, MD

1. Introduction. BALTEX VIII was a near-real time emergency response tabletop exercise designed to validate information and procedures developed by the Emergency Response Functional Group.

2. Background. The Emergency Response Functional Group developed the exercise to introduce new participants to the innovative procedures and recommendations that resulted from a series of emergency response technical studies. The studies that BALTEX VIII focused on are the following:

- Firefighter PPE
- Mass casualty decontamination
- PPV
- Law enforcement and EMS PPE

The exercise was divided into the following three sections based on timed response to a chemical WMD incident:

- First 10 minutes of response
- 10 to 60 minutes
- 60 to 180 minutes

Exercise participants consisted of firefighters, EMS technicians, and law enforcement representatives who were not part of the ongoing CW IRP program. Participants included large and small jurisdictions throughout Maryland with additional representation from Washington, DC; Philadelphia, PA; and the state of Delaware.

Members of the Emergency Response Functional Group facilitated each table, consisting of firefighters from mixed jurisdictions supported by one EMS and one law enforcement representative. Exercise messages were provided to participant tables in a realistic time-phased sequence representative of the information flow that an Incident Commander (IC) would expect to deal with in an actual incident. The Emergency Response Functional Group identified 12 elements of response that an IC is responsible for in a chemical incident. Participants were asked to address these elements throughout the exercise.
E. BALTEX IX

Date: November 17, 1999
Location: Gateway Building, Columbia, MD

1. Introduction. BALTEX IX provided the forum for both a series of presentations by functional groups and a brief exercise covering a chemical attack on the city subway. This exercise focused on the challenges facing the emergency responders due to the incident being carried out in an underground, enclosed facility. Functional group representatives presented overviews of the major developments and future plans for their group.

2. Background. Program presentations focused on the following areas:

- Conduct of the Emergency Responder Chemical Exercise (BALTEX VIII).
- Status of the development of the Incident Planning and Management Tools (IPMT) software project being orchestrated through the Emergency Management Functional Group.
- Progress and planning schedule of the CW IRP program awareness videos.
- Upcoming law enforcement activities, including the following:
  - Special Weapons and Tactics (SWAT) PPE assessment testing.
  - Law Enforcement Incident Management Exercise (BALTEX X), scheduled for March 2000.
- Health and Safety Functional Group upcoming exercises on the OST3C.

Dr. Richard Hutchinson of SBCCOM’s Biological Weapons Improved Response Program (BW IRP) provided an overview of the accomplishments and current efforts of the program. Current projects of the BW IRP include a series of field tests of the components of the Modular Emergency Medical System (MEMS). The program is also sponsoring a series of eight specific projects designed to calibrate the biological weapons template developed through their workshops.

Mr. Nelson Fellman, Senior Vice President of Anne Klein & Associates, a national public relations firm in Philadelphia, concluded BALTEX IX with a presentation entitled “Crisis Communications Preparedness.” Mr. Fellman’s briefing focused on the public relations aspect of the Legionnaires’ disease outbreak in Philadelphia in 1976.
Part III

Functional Working Groups
A. Law Enforcement Functional Group

Chairperson: Special Agent James Barry, FBI, Baltimore Office

1. Mission. The Law Enforcement Functional Group identifies issues and proposes recommendations to issues that challenge the effective implementation of law enforcement activities prior to, at the scene of, and immediately following the use of chemical WMD.

2. Background. Special Agent (SA) Barry is supported by representatives of the law enforcement community throughout the Baltimore metropolitan area. Regular attendees include the Maryland State Police; Baltimore City, Howard, Montgomery, and Prince Georges County police departments; Washington, DC, and New York City police departments; the Harford County Sheriffs’ Office; and transportation police departments from the state of Maryland.

3. Projects. The Law Enforcement Functional Group developed a list of key issues pertaining to the law enforcement response to a chemical incident. Through various meetings and studies, they sought resolutions to these issues, focusing their attention on the role of law enforcement and officer safety. These issues and the group’s recommendations are outlined in the CW IRP Playbook. Several key areas are addressed briefly below:

- Law Enforcement Roles. One of the first issues addressed by the group was the roles of law enforcement during a chemical incident response. This included a joint discussion with members of the Emergency Response Functional Group. The groups discussed the normal roles that law enforcement expects to perform, including traffic control, perimeter security, and criminal investigation. In addition, several issues requiring officer presence in the contaminated area were raised. These included crowd control in the decontamination zone, security of personal items from decontaminated victims, and security over contaminated law enforcement equipment including weapons.

Protective Equipment. The group agreed that the majority of law enforcement operations would be conducted in the Warm or Cold Zone. Basic protection for officers operating in these areas was recommended to be Level-C protection. Several styles of Level-C protective suits were tested by SBCCOM to measure the protection afforded by a variety of price ranges of ensembles suitable for law enforcement. These tests were conducted using chemical simulants and were performed with members of the Maryland State Police during routine actions that would be expected of officers on the incident scene. The results of these tests and comparisons of suits and masks are outlined in the report Chemical Protective Clothing for Law Enforcement Patrol Officers and Emergency Medical Services When Responding to Terrorism with Chemical Weapons. This report is briefly described in the Technical Study Initiatives section of this report and can be obtained online at the following Web site: http://www.nbc-prepare.org. Additional concerns surrounding law enforcement PPE include the ability of departments to meet the mask fit requirements of the Occupational Safety and Health Administration (OSHA) as well as funding for equipment and maintenance.
Additionally, there are no negative pressure respirators approved by the National Institute for Occupational Safety and Health (NIOSH) for CWA.

- **Enhanced Training.** As the Law Enforcement Functional Group defined additional roles that departments may need to perform on a chemical incident, it became apparent that additional training was needed to enhance officer safety based on these duties. A comprehensive list of training areas by position is included in the CW IRP Playbook.

- **SWAT Protective Clothing.** The specialized equipment and tactics used by SWAT teams preclude them from wearing the standard ensemble recommended for the patrol officer. SBCCOM and the Maryland State Police Special Tactical Assault Team Element (STATE) identified seven types of protective suits for use by SWAT. Testing is scheduled to be conducted between February and May 2000 on these ensembles. These tests will not only measure the chemical protective qualities of the ensembles during tactical operations but will also be evaluated by the wearers to determine compatibility with standard SWAT equipment and tactics.

4. **Ongoing Issues.** The CW IRP is scheduled to conduct a law enforcement-specific exercise in March 2000 to validate the recommendations of the Law Enforcement Functional Group. This exercise will involve participants from 14 state and local departments from Maryland, the District of Columbia, and New York City.
B. Emergency Management Functional Group


1. Mission. The Emergency Management Functional Group addresses issues related to resource coordination and support, contingency operations planning and execution, logistics coordination and support, and public relations and information.

2. Background. Lt. Muth, an emergency management official for Baltimore County, is the group chairperson. Permanent members include the Baltimore City Emergency Manager, representatives from Maryland Emergency Management Agency (MEMA), the American Red Cross, and Carroll County and Howard County emergency management offices. Other local emergency management office representatives attend when available. The Department of the Army’s Director of Military Support (DOMS) and the Federal Emergency Management Agency (FEMA) send representatives, as required.

3. Projects. The Emergency Management Functional Group has several key projects underway that have been the focus of their efforts over the last year. One of the group’s main objectives has been to produce products that will aid in spreading information in the national emergency management and responder community about the ideas, recommendations, reports, and initiatives that have come out of the CW IRP process. This has been a challenging task and has yielded the following results:

- CW IRP Video Series. Production is underway for four videos that address the lessons learned and recommendations cited in three technical studies. The subject matter for the four videos includes mass casualty decontamination, firefighter personal protective equipment (PPE), positive pressure ventilation (PPV), and a general CW IRP introduction and overview. Each video will be 7 to 10 minutes long and will be designed as training tapes. The first tape is scheduled for national release in the early summer of 2000.

- Chemical Weapons Incident Planning and Management Tool (IPMT). The IPMT is a computer modeling software program that helps a jurisdiction plan for and manage a terrorist chemical incident. The program uses an event modeling technique that allows the planner to project the consequences of an incident based on the type of agent used, target, method of employment, and selected other factors. Other parameters for the program can be tailored to reflect the capabilities and resources of the specified jurisdiction.

- Resource Needs Modeling Tool (RNMT). The RNMT is a software program that helps the emergency planner project and plan for materiel and personnel resource requirements based on a selected scenario. The tool integrates local resources with those available from mutual-aid agreements of regional, state, and federal levels.
This tool is particularly helpful for planning a time-phased matrix of resource support.

• **CW IRP Playbook.** The Playbook offers a synopsis of the unique issues associated with a chemical incident and recommendations for their resolution. The issues are addressed by functional area. Additionally, the Playbook gives insights on future issues and projects being addressed by the CW IRP.

4. **Ongoing Issues.** The Emergency Management Functional Group will continue to address the “tough” issues associated with consequence management of a chemical terrorist event. These include public awareness factors, financial and legal ramifications, and planning considerations for the smooth integration of tiered assets (local to federal) into a disaster situation. Additionally, the group will continue to address how best to spread the word about the program’s successes and recommendations on best practices.
C. Emergency Response Functional Group

Chairperson: Deputy Chief Ted Jarboe, Montgomery County Department of Fire and Rescue Service

1. Mission. The Emergency Response Functional Group focuses on ways to improve the response capabilities of first responders to manage the consequences of a chemical terrorist event.

2. Background. Chief Jarboe has assembled a group of experienced emergency responders from the firefighting and hazardous materials (HazMat) community. Organizations supporting the group’s efforts include Baltimore City, Baltimore, Howard, and Harford Counties; Washington, DC; and Aberdeen Proving Ground fire departments.

3. Projects. Many of the group’s top priorities resulted in technical studies and testing conducted by SBCCOM. These included determining the effectiveness of turnout gear and self-contained breathing apparatus (SCBA) to protect firefighters from CWA, mass casualty decontamination, and use of PPV fans in a chemical response. The key events surrounding the Emergency Response Functional Group are outlined below:

- **Follow-On Firefighter PPE Testing.** These tests were conducted with personnel and equipment from the departments supporting the functional group and included tests on various styles of turnout gear, including used gear, that were not used in the original test (1997).

- **Emergency Responder Chemical Incident Command Exercise.** In an effort to validate the findings of the technical studies, the Emergency Response Functional Group conducted a chemical incident management exercise (BALTEX VIII) in October 1999 that focused on the emergency response issues facing the IC. Representatives attended this exercise from 36 jurisdictions throughout Maryland; Washington, DC; Delaware; and Pennsylvania. Participants included firefighters, EMS, and law enforcement.

- **Supporting Roles of Fire and Law Enforcement.** The group attended a Law Enforcement Functional Group meeting to mutually discuss the supporting roles of fire and police during a chemical WMD incident scene. The meeting was key to presenting the issues facing both departments and developing an understanding of how each side perceived the other’s involvement. The groups parted with a basic agreement on needs and support between the two agencies. These issues are recorded in the respective sections of the CW IRP Playbook.
4. **Ongoing Issues.** The Emergency Response Functional Group continues to focus on key elements of response to effectively manage a chemical incident, save lives, and provide safe operations for responders. Three such efforts currently under study include the following:

- Cold weather decontamination procedures.
- Chemical incident management tools for the IC.
- Casualty decontamination tracking system.
D. Health and Safety Functional Group

Chairperson: Mrs. Irene Lumpkins, Baltimore City Health Department

1. Mission. The Health and Safety Functional Group focuses on the issues that impact the well-being of the community at large and the challenges associated with maximizing the impact of local and regional public health and medical resources.

2. Background. Mrs. Lumpkins draws on the experts from the various medical organizations from the Baltimore region to support the efforts of the group. Regular attendees include members of the Baltimore City Health Department, the Maryland Institute of Emergency Medical Services System (MIEMSS), the Department of Health and Mental Hygiene, and several area hospitals. Additional federal, state, and local health representatives support the group when discussion addresses their areas of expertise.

3. Projects. The group focused their efforts on several key issues facing the medical community. Solving these issues required gaining support from the hospital community to develop a rapid notification system to specify the CWA and treatment protocol, to establish an off-site treatment center, and to train public health nurses, hospital staff, and crisis intervention personnel to respond to a chemical weapons incident.

- **Health and Safety Tabletop Exercise.** The group conducted a medical tabletop exercise in April 1999 (HSTTX, outlined on page 7) to address the key issues identified through the CW IRP. Participants from each of the city’s hospitals attended, as well as members of the Baltimore City Health Department and community agencies that would be involved in responding to a chemical terrorist incident. The exercise was pivotal in defining the issues facing the medical community as a whole, and in identifying the shortfalls in existing plans and procedures. The exercise was a catalyst to obtain hospital support for the group’s efforts and resulted in an agreement to review and revise current disaster plans.

- **Off-Site Triage, Treatment and Transportation Center.** The group agreed that there is a need to provide rapid medical care to the non-critical victims and the “worried-well” while keeping the emergency departments and hospital facilities open for patients requiring more definitive medical care. To avoid unintentionally overwhelming the healthcare system, the functional group developed the concept of an OST³C as a temporary, alternative care facility to support the medical response to a chemical weapons incident. This center, using existing facilities such as middle or high schools, is designed to provide screening and care for patients not requiring immediate transport to a hospital. This concept is under review and the functional group plans to conduct an exercise to validate the functionality of the concept. The functional exercise is scheduled for the summer of 2000.
• **Contaminated Runoff.** The group undertook extensive efforts to obtain a decision from the Environmental Protection Agency (EPA) concerning contaminated water runoff. The EPA responded by citing several references, indicating that a community would not be liable for releasing contaminated water runoff when actions to save lives and protect the public and responders took place under emergency circumstances (e.g., performing rapid decontamination for a mass number of casualties). For a comprehensive understanding of the EPA’s viewpoint, it is necessary to read the letter that is included in the CW IRP Playbook.

4. **Ongoing Issues.** The Health and Safety Functional Group plans to continue revising the OST³C concept by obtaining feedback from a preliminary panel review board, a functional exercise critique, and an external validation process. The health department continues to use the information gained from the CW IRP in its efforts to train hospital providers to respond to a chemical weapons incident and mental health personnel on crisis intervention for family and friends of victims.
Part IV

Technical Study Initiatives
A. Firefighter Personal Protective Equipment

**General Guidelines**

- “Standard turnout gear with SCBA provides first responders with sufficient protection from nerve agent vapor hazards inside interior or downwind areas of the Hot Zone to allow 30 minutes rescue time for known live victims.”
- “Self-taped turnout gear with SCBA provides sufficient protection in an unknown nerve agent environment for a 3-minute reconnaissance to search for living victims (or a 2-minute reconnaissance if HD is suspected).”

1. **Study Objectives.** The primary objective of the firefighter protective clothing assessment (bunker gear testing) was to evaluate the degree of protection against CWAs afforded by standard firefighter protective gear during a quick rescue. Testing was conducted with firefighters wearing SCBA for eye and respiratory protection and bunker gear for skin protection.

2. **Study Overview.** Man-In-Simulant Tests (MIST) vapor tests measure the actual adsorption of agent simulant (methyl salicylate, [MeS] basically wintergreen oil) into human skin by using passive samplers located on 17 regions of the body. The samplers are applied directly to the firefighter’s skin, after which the test subjects dress in standard bunker gear with SCBA. They are then directed to enter a chamber filled with MeS vapor simulant and perform firefighter activities for 30 minutes. Finally, the amount of simulant that is adsorbed into the skin samplers is measured.

MIST vapor tests were conducted at SBCCOM in January and February 1998 using new Polybenzimidazole (PBI) firefighter turnout gear. Verification MIST vapor tests were conducted at the Royal Military College (RMC) in Ontario, Canada, during April and May 1998. RMC served as an independent test facility to validate the vapor tests at SBCCOM. Quick-fix testing was also conducted at SBCCOM to assess improved protection that was offered by turnout gear using on-site modifications to the turnout gear that could be quickly applied using materials available to virtually all firefighters. These quick-fix tests included duct taping the wrist, ankle, and waist closures (conducted in March 1998) and outfitting the firefighter with two plastic trash bags in a raincoat type configuration underneath the bunker gear with all closures taped (conducted in June and July 1998). Tyvek F suits were tested underneath the gear in July 1998.

Follow-on turnout gear testing was conducted from April to June 1999. The purpose of this follow-on MIST was to test other commonly used turnout gear. Used PBI gear, new Nomex® gear, and used Nomex® gear were tested during this follow-on effort. All turnout gear tested during this follow-on effort provided protection as good as or better than the new PBI turnout gear tested during the first phase.
3. **Conclusions.** In July 1998, an Incident Command Research Team consisting of a broad scientific and operational knowledge base, both with general experts and specialized staff, including medical doctors with direct knowledge of the physiology and toxicological effects of chemical agents, emergency responders drawn from government organizations at all levels, and contract research staff was established to ensure standard firefighter operations and procedures were included in the final Incident Command report. Additionally, this team was established to ensure that data were presented in formats and charts operationally useful to the IC and firefighters.

The desired result from this MIST and extensive technical analysis of test data was to identify firefighter protection times while exposed to chemical agent vapors during quick rescues of living victims. The two primary results from this study are included in the General Guidelines above. The first guideline provides the firefighter protected with standard turnout gear with SCBA 30 minutes of protection from nerve agent vapor while rescuing living victims inside a contaminated building. The second guideline is for when the firefighter cannot see or determine whether there are any living victims inside the contaminated building. Therefore, this second guideline assumes a worst-case scenario, where the building is saturated (highest concentration possible) with chemical agent vapor. Even during this worst-case situation, the firefighter protected with self-taped (duct tape) turnout gear with SCBA is provided protection from nerve agent vapor to conduct a 3-minute reconnaissance.

Incident Commanders intending on using the guidelines outlined in the firefighter personal protection report need to review the exposure tables in the report to fully understand the concerns of possible exposure based on agent and concentration levels.

Many additional results are provided in the final report for this test effort, entitled *Guidelines for Incident Commander’s Use of Firefighter Protective Ensemble (FFPE) with Self-Contained Breathing Apparatus (SCBA) for Rescue Operations During a Terrorist Chemical Agent Incident*. These detailed results include increased rescue time (and reconnaissance time) provided by increasing turnout gear protection with quick-fix modifications such as self-taped openings, buddy-taped openings, or wearing a Tyvek suit under turnout gear. Increased protection times are also provided for situations where the chemical agent is known or detected and the type of dissemination device is known. This final report contains comprehensive results in easy to use charts and graphs. Please visit our Web site at http://www.nbc-prepare.org to obtain a copy of this final report.
B. Positive Pressure Ventilation

**PPV Guidelines**

- The use of PPV fans dramatically decreases the interior chemical agent vapor concentration of structures. For example, PPV fans can reduce the vapor concentration by 50% to 70% within the first 10 minutes of use.
- PPV significantly increases the first responders' protection above and beyond the adequate protection provided by standard turnout gear with SCBA when rescuing known live victims.
- Before using PPV, consider the downwind hazard for unprotected people.
- Bigger fans are better. Two fans are better than one. Tilting the fan improves performance.
- Negative Pressure Ventilation (NPV) should be used at buildings where people are present in closed rooms at other locations within the building.

1. **Study Objectives.** The purpose of this study was to conduct a series of tests for measuring the hazard reduction that firefighters or emergency medical personnel can achieve by rapidly employing expedient measures while entering a building in which a terrorist release of chemical agent is known or suspected to have occurred. This testing was conducted to examine near-term measures with which to protect first responders while minimizing the impact upon the rescue mission.

2. **Study Overview.** PPV fans have been employed in fighting structural fires for about a decade. These fans are carried on fire trucks of most fire departments and are used to purge a building of smoke, carbon monoxide, and hot gases. This testing complements the bunker gear testing by employing PPV fans in a simulated chemical terrorist incident to quickly reduce the concentration of an agent in a building before fire and rescue personnel enter for rescue operations. Rescue personnel will wear SCBA for eye-respiratory protection and bunker gear for skin protection. Reducing the vapor concentrations in the building during the rescue operation will reduce the skin hazard to rescue personnel wearing bunker gear, or possibly increase the permitted duration of the rescue operation for these quick rescue scenarios. Phase I of the PPV testing was conducted in August, September, and December of 1998. Phase II testing was conducted during October and November 1998.

This work was completed by SBCCOM as part of the DPP. The PPV testing examined the protection provided to firefighters against CWA by their protective clothing, the firefighter protective ensemble (bunker gear) with SCBA. This testing (known as MIST) determined the physiological protective dosage factor (PPDF) of the bunker gear with SCBA suit ensemble. The PPDF is determined by wearing the suit inside a chemical vapor environment and measuring the ratio of vapor concentration outside the suit to the concentration on the inside of the suit (at several different skin locations). The ratios from the different skin areas are then weighted according to the sensitivity of the skin at each region and summarized to determine the overall PPDF.
3. Conclusions. The first portion of this testing (Phase I) examined the use of PPV fans through scientific testing to remove chemical contamination from a typical building structure. Different sizes and configurations of fans were used in this testing to include the most commonly used PPV fans (16-inch electric and 20-inch gas) along with some larger fans and series combinations with multiple fans. The results of this testing showed that the use of PPV fans can reduce the concentration significantly in building areas that have been contaminated with CWA. These concentration reductions occurred during the first 10 minutes of use (this is a key concept in that it only takes 5 to 10 minutes for a PPV fan to purge the majority of the vapor contamination from a building).

The improvement in the ventilation rate of the building (over the natural rate) followed similar patterns and ranged from 43 times (30-inch gas fan) to 22 times (16-inch electric fans) the natural ventilation rate. An evaluation of the effects on shut interior rooms (interior doors closed) showed that the use of PPV fans drove the tracer gas into closed rooms. Fans used in the Negative Pressure Ventilation (NPV) mode (drawing air out of the building instead of pushing it in) were evaluated and determined to be the preferred method for quick concentration reduction of CWA when interior rooms with closed doors exist in the building because they did not cause the gas to be driven into the rooms.

Protective clothing MIST was performed during the second portion of this testing (Phase II) to examine the improvement provided through the use of the PPV fans during several live rescue mission scenarios. Six operational tests were conducted, each with four firefighters. One test was conducted without using PPV fans as a baseline. The remaining tests were performed using the 21-inch gas fan and the two 16-inch stacked electric fans. These fan configurations were selected because they represent the fans most commonly used during firefighting. The results of this portion of the testing showed that the Combined PPV and Bunker Gear PF increased the firefighters’ protection tremendously when the PPV fans were used.

The final report for this test effort can be obtained online at the following Web site: http://www.nbc-prepare.org.
C. Mass Casualty Decontamination

Principles of Decontamination

- Expect a 5:1 ratio of unaffected/affected casualties.
- Decontaminate ASAP.
- Disrobing is decontamination; top to bottom, the more the better.
- Water flushing generally is the best mass decontamination method.
- After known exposure to liquid agent, first responders must self-decontaminate ASAP to avoid serious effects.

1. Study Objectives. The purpose of the mass decontamination study was to identify and propose solutions to the challenge of effectively and efficiently decontaminating victims, both responder and civilian, of a chemical event.

2. Study Overview. The CW IRP formed a Mass Casualty Decontamination Research Team (MCDRT) to address specific technical and operational issues associated with the performance of mass casualty decontamination after a terrorist incident involving chemical WMD. The research team included a broad scientific and operational knowledge base, both with general experts and specialized staff, including medical doctors with direct knowledge of the physiology and toxicological effects of chemical agents, emergency responders drawn from government organizations at all levels, and contract research staff.

Although HazMat teams have experience and procedures for decontaminating a small number of chemical burn victims, the emergency response community has no formal procedures for decontaminating hundreds of victims. The study was structured to ensure that the solutions recommended considered the impacts of cost, readily available resources, and logistic constraints of local responding organizations and compatibility with current policy and procedures.

3. Conclusions. The MCDRT acquired and reviewed information from more than 200 research papers, books, articles, manuals, and Internet sites. From this effort it was determined that minimal direct research had been performed in the following areas:

- Medical efficacy of specific skin decontamination methods
- Decontamination prioritization and medical triage of a large number of CWA casualties
- Magnitude and nature of potential casualties after a chemical terrorist event

For decontamination to be effective and save lives, it must be conducted as soon as possible. Therefore, firefighters must use resources that are immediately available to them on
the incident scene. Since large amounts of water are generally available, the following methods of water-based decontamination were considered:

- **Water alone.** Flushing or showering, this method uses shear force and dilution to physically remove chemical agent from the skin. Water alone is an excellent decontamination solution.

- **Soap and water.** By adding soap, a marginal improvement in results can be achieved by ionic degradation of the chemical agent. Soap aids in dissolving oily substances like mustard agent. A disadvantage to soap is the need to have a supply of it on hand.

- **Bleach and water.** Bleach (sodium hypochlorite) and water solutions remove, hydrolyze, and neutralize most chemical agents. However, this approach is not recommended in a mass decontamination situation where speed is paramount.

Decontamination by removing clothes and high volume, low pressure (60 psi recommended) water is the most expedient and the most practical method for mass casualty decontamination. Disrobing and showering meets all the purposes and principles of decontamination. Victims should remove clothing at least down to their undergarments prior to showering to eliminate the possibility that agent trapped in their clothes will be forced onto the skin.

The MCDRT explored several approaches to conducting mass casualty decontamination using existing fire apparatus and equipment. The two predominant systems developed are the Ladder Pipe Decontamination System (LDS) and the Emergency Decontamination Corridor System (EDCS). These systems approach decontamination from two variations. The LDS provides the capability to decontaminate the greater number of victims at one time but affords no privacy, while the EDCS provides privacy in the form of covered decontamination lanes but the rate of processing casualties is slowed. These systems were demonstrated by various fire departments supporting the CWIRP during BALTEX exercises. Explanations of these systems and diagrams on setting them up are outlined in the mass casualty decontamination report.

The number of apparent casualties from a chemical agent terrorist incident may exceed emergency responders’ capabilities to effectively rescue, decontaminate, and treat victims, whether or not they have been exposed to a chemical agent. Responders, therefore, must prioritize victims for receiving decontamination, treatment, and medical evacuation, in keeping with the precept of providing the greatest benefit for the greatest number of people. The first step in sorting victims is to segregate them as ambulatory and non-ambulatory. Casualties in both categories are further prioritized based on agent signs and symptoms or likelihood of exposure. In some circumstances, a severely injured, non-chemically exposed casualty cannot wait for ideal decontamination; therefore clothing removal may be the only decontamination performed before the victim is removed. Additionally, severely intoxicated nerve agent casualties may require antidote administration and treatment prior to decontamination. Charts depicting the prioritization of ambulatory and non-ambulatory triaged casualties with regards to agent exposure are outlined in the mass casualty decontamination report.

The MCDRT identified three shortfalls that were not addressed in the initial decontamination study. These shortfalls are:
• Cold weather decontamination procedures to reduce the risk of hypothermia
• A lack of information on how long to employ a low-pressure/high-volume flush to provide effective decontamination
• A lack of standardized methods to evaluate and optimize decontamination shower facilities for efficacy of skin decontamination

These shortfalls are being addressed in a follow-on study that will complement the Mass Casualty Decontamination report.

The final report for this test effort can be obtained online at the following Web site: http://www.nbc-prepare.org.
D. Chemical Detectors

1. Study Objectives. Knowledge of the identity and approximate quantity of chemical agent present at the scene of a chemical terrorist attack gives the responders information necessary to protect themselves and to properly manage and investigate the incident. This study looked at the needs and uses of CWA detectors by the emergency response community. Primary objectives were the following:

- Assess the detector requirements of the various components of emergency response.
- Determine if detectors available on the commercial markets can meet these requirements.
- Establish guidelines for detector purchasing decisions by emergency response agencies.
- Promote the development of chemical detectors designed specifically for emergency responders.

2. Study Overview. A report on the use of detectors by the emergency responder community has been prepared and is being reviewed for publication on the Domestic Preparedness Web site.

The following are actions that warrant the use of detectors by local emergency responders:

- Fire and Rescue units removing people from contaminated areas.
- Hazmat responders doing scene assessment.
- Law enforcement agencies conducting criminal investigations.
- Emergency medical personnel rendering on-scene first aid to casualties and transporting them to local hospitals.
- Hospital personnel doing follow-up medical care to the casualties at their hospitals.

Surveys of members of these various responder groups have shown that each of them has unique detector needs. Detectors for self-protection, scene assessment, and investigations have totally different requirements. Not only is the agent sensitivity and false alarm acceptability level different, but operational issues such as size, weight, power requirements, training needs, cost, and compatibility with the responder’s normal operating mode are also unique. What is suitable for a HazMat responder may be not suitable for a law enforcement officer or an emergency medical technician, and vice versa.

Market surveys of detector manufacturers revealed about 80 detectors, for both military and commercial users and claimed CWA detection capabilities, are being advertised and sold.
The surveys characterized the detectors by agent detection level, weight, power requirements, costs, skill level needed, training needs, start-up time and technology type. A technical description of each detector technology and manufacturers' contact information for each detector is included in the report.

Chemical agent testing was conducted on selected detectors. Minimum detection levels to nerve and mustard agents was determined as was response to interfering compounds, which are chemicals commonly found in commercial and household environments that potentially give false alarms. Reports of this testing have already been published on the Web site, and additional testing is currently on-going.

A limited test of several detectors' responses to a smoke-filled environment was also conducted.

3. Conclusions

- Many chemical detectors designed for detection of commercial chemicals are not sensitive enough to detect CWA at levels to determine what type of PPE is required.

- Military chemical detectors are subject to false alarms in domestic response situations and have not been designed for use outside of military operations.

- There are many detection requirements that no single, existing detector can adequately address. A matrix of detectors is needed, each one a solution to a specific responder need. There are also responder requirements that no detector currently on the market can fill.

- In addition to chemical detection capability, the selection of chemical detectors is dependent on operational needs, equipment budgets, maintenance requirements, and training considerations.

- First units on the scene of a chemical weapon incident can use colorimetric detector tubes used in the industrial hygiene community. They will detect CWA at concentrations that are immediately dangerous to life and health (IDLH). These are glass tubes that contain chemicals that change color when agent vapors are pulled through them. They are inexpensive, easy to use, and need no maintenance. However, they require manual operation and are not continuous chemical monitors.

- Specialized units such as HazMat response teams, evidence collectors, and hospitals have monitoring needs. Electrically-operated units capable of continuous operation are available. They sound an audible alarm or give some other indication when an agent is detected. These units range from small, hand-held, battery-operated detectors to laboratory instruments that must be operated from AC power lines. They are much more expensive than colorimetric tubes, require maintenance, and need highly trained operators.
Results of chemical agent testing of military and commercially available chemical detectors showed that some detectors that are used by emergency responders are capable of detecting military chemicals (e.g., nerve and blister agents at IDLH concentrations). Other detectors have been proven incapable of detection at IDLH levels. Also, many of the detectors will false alarm to interferents, non-toxic concentrations of other chemicals commonly found in civilian environments.

A limited test of several detectors in a smoke filled environment indicated that some detectors will false alarm to heavy smoke that would be found at a typical residence fire. This test was not conducted under controlled, replicable conditions. The results are indicative of the need for more testing; they are not a definitive answer to whether any particular detector is useful under these conditions.
E. Law Enforcement Personal Protective Equipment

1. Study Objectives. The objective of this study was to present the results of evaluations of PPE alternatives so that law enforcement officials will have sufficient information to make informed decisions about how to equip their departments in response to a chemical terrorist attack.

2. Study Overview. Law enforcement activities, during a CW incident, and associated PPE requirements were split into three general categories based on functions performed and proximity to the hazard at an attack scene: perimeter or Cold Zone; tactical team; and bomb squad. Each function was assessed differently. PPE guidance from NIOSH and the EPA was considered. The Law Enforcement Functional Group recognized that the PPE that was tested would afford protection to the wearer and recommended that departments equip and train their personnel as best as possible.

Similar testing that had been used by the IRP to determine the PPDFs of firefighter turnout gear in 1998 was used to do the same for the standard police officer’s duty uniform as well as six commercially available chemical protective ensembles. Test subjects were volunteers from the Maryland State Police Special Operations Division. In addition to the suits, volunteers wore overboots, rubber gloves, and military issue protective masks. These troopers performed activities in the chamber at SBCCOM that were representative of scenarios troopers would encounter in the field on actual operations.

Troopers also performed weapons firing on standard qualification ranges to assess the effect that wearing a chemical ensemble, mask, and chemical protective gloves would have on this vital law enforcement function. Based on the results, no degradation in weapons proficiency was discovered.

To address the issue of use of M17 protective masks departments may have received from the DoD, the Law Enforcement Functional Group assessed the condition of samples of these masks from the supply rooms of some departments. These masks were obtained for use in riot-control situations and may be well suited for that use. The assessment quickly showed that these masks, although obtained free of charge, were not suitable for use in an attack involving CWA due to improper filters, dry rot of the facepiece and unserviceable parts.
The complete report *Chemical Protective Clothing for Law Enforcement Patrol Officers and Emergency Medical Services When Responding to Terrorism with Chemical Weapons* can be found on the following Web site: http://www.nbc-prepare.org.

3. **Ongoing Efforts.** Further testing is underway, this time assessing SWAT team operations. Maryland State Police Special Operation Division personnel are being outfitted in other chemical protective suits and are performing typical special team operations in buildings converted to support the testing. The chemical suits worn for this testing are different from those tested before to accommodate the different stresses the SWAT teams put on their equipment. The results of this assessment are expected to provide law enforcement agencies with sufficient data to make informed decisions regarding how to equip their special teams.
F. Off-Site Triage, Treatment, and Transportation Center (OST\textsuperscript{3}C)

1. Study Objectives. The primary objective of an OST\textsuperscript{3}C is to operate as an ancillary medical facility that is set up to care for the mass number of “walking wounded” and “worried well” casualties that results from a chemical weapon terrorist attack. The OST\textsuperscript{3}C is a temporary site that supplements the existing healthcare infrastructure and can be duplicated to prevent facility over-crowding.

2. Study Overview. The CW IRP Health and Safety Functional Group identified many issues that will challenge a health department’s ability to respond to a chemical WMD attack. The overall purpose of identifying issues was to generate solutions, qualify those solutions, and create a template response plan for other cities to utilize. The sarin attack on the Tokyo subway resulted in more than 5,000 people seeking medical treatment, only 20 percent of which needed tertiary care. The Health and Safety Functional Group established the OST\textsuperscript{3}C as an alternative care facility designed to keep medical treatment facilities from being overwhelmed by the large numbers of non-critical and non-exposed patients expected to seek care.

Members from the local health department, area hospitals, animal control, SBCCOM, and private disaster consultants developed the initial format for the concept. The draft concept was formally written (winter 1999) and is scheduled to undergo a series of reviews and evaluations throughout the year 2000.

The basic concept of the OST\textsuperscript{3}C is to provide medical screening and care for non-critical patients from a chemical WMD incident. This care includes the following:

- Secondary decontamination for patients transported from the incident scene.
- Thorough decontamination for self-referring patients.
- Initial entry into the medical care system for patients not processed at the scene.
- Medical care for non-critical patients.
- Transportation to medical care facilities for patients exceeding the scope of care at the OST\textsuperscript{3}C.
- Mental health counseling and briefing for the victims and families.

Developing the OST\textsuperscript{3}C requires evaluating the concept from the perspective of those who would put the center into operation as well as staff the center. The Health and Safety Functional Group selected a 30-member panel to review the concept, based on the types of individuals needed to operate the center.

This review (March 2000) will present the concept of the OST\textsuperscript{3}C, specify how it fits into a city’s response to a chemical weapon terrorist attack, and evaluate patient flow through the center. A computer-generated scenario will simulate the patient flow through the center. At
each station, the staffing requirements, the station function, and the required supplies will be reviewed.

The goal of the Panel Review is to theoretically work out flaws in the overall concept before proceeding to staff training and a functional exercise.

A training day for OST³C staff (spring 2000) will brief personnel of their duties and responsibilities in the OST³C. These personnel will then staff the OST³C during the functional exercise (summer 2000).

The fourth step in the concept design is to put the OST³C into operation via a functional exercise. Standing up an OST³C will help agencies identify areas that need to be revised, identify staffing or station changes necessary to help maintain a constant flow of patients, help address concerns that may not have been previously introduced, and serve as a practice drill for the local health department staff.

Once the OST³C plan is revised, an external panel review is scheduled for summer 2000. The purpose of this panel is to present the concept to individuals who have not heard of the OST³C but understand chemical terrorism in general. The group’s feedback will serve as a reality check in evaluating a city’s overall ability to operate an OST³C.

Pending this last review and SBCCOM approval, the OST³C plan will be released for distribution on the Domestic Preparedness Web page as one facet of a city’s improved response plan to mitigate chemical terrorist attacks.
The CWIRP technical studies are documented in individual reports by SBCCOM. Downloadable copies of these reports are being placed on the domestic preparedness website as they are finalized. The website for Domestic Preparedness is http://www.nbc-prepare.org.

Technical studies

Guidelines for Incident Commander’s Use of Firefighter Protective Ensemble (FFPPE) with Self-Contained Breathing Apparatus (SCBA) for Rescue Operations During a Terrorist Chemical Agent Incident. Final Report dated August 1999.


Guidelines for Establishing an Off-Site Triage, Treatment and Transportation Center (OST³C) for Managing Casualties from a Terrorist Chemical Agent Incident. Draft Report, undated.
Part V

List of Acronyms

Domestic Preparedness
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<tr>
<th>Acronym</th>
<th>Abbreviation</th>
<th>Definition</th>
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<tr>
<td>BALTEX</td>
<td>Baltimore Exercise</td>
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<td>BRHA</td>
<td>Body Region Hazard Analysis</td>
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<td>BW IRP</td>
<td>Biological Weapons Improved Response Program</td>
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<td>C/B</td>
<td>Chemical and Biological</td>
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<td>CISM</td>
<td>Critical Incident Stress Management</td>
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<td>CWA</td>
<td>Chemical Warfare Agent</td>
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<td>CW IRP</td>
<td>Chemical Weapons Improved Response Program</td>
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<td>DoD</td>
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<td>DOMS</td>
<td>Department of Military Support</td>
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<td>DPP</td>
<td>Domestic Preparedness Program</td>
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<td>ED</td>
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<td>EDCS</td>
<td>Emergency Decontamination Corridor System</td>
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<td>EMS</td>
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<td>EPA</td>
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<td>FBI</td>
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<td>FEMA</td>
<td>Federal Emergency Management Agency</td>
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<td>HazMat</td>
<td>Hazardous Materials</td>
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<td>HSTTX</td>
<td>Health and Safety Tabletop Exercise</td>
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<td>IC</td>
<td>Incident Commander</td>
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<td>IDLH</td>
<td>Immediately Dangerous to Life and Health</td>
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<td>IMPT</td>
<td>Incident Management and Planning Tool</td>
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<td>IRP</td>
<td>Improved Response Program</td>
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<td>LDS</td>
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<td>ME</td>
<td>Medical Examiner</td>
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<td>MEMA</td>
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<td>MEMS</td>
<td>Modular Emergency Medical System</td>
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<td>MeS</td>
<td>Methyl Salicylate</td>
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<td>MIEMSS</td>
<td>Maryland Institute of Emergency Medical Services System</td>
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<td>MIST</td>
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<td>NIOSH</td>
<td>National Institute for Occupational Safety and Health</td>
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<td>NPV</td>
<td>Negative Pressure Ventilation</td>
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<td>OSHA</td>
<td>Occupational Safety and Health Administration</td>
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<td>OST³C</td>
<td>Off-Site Triage, Treatment, and Transportation Center</td>
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<tr>
<td>PBI</td>
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<td>PPDF</td>
<td>Physiological Protective Dosage Factor</td>
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<td>Positive Pressure Ventilation</td>
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<td>RMC</td>
<td>Royal Military College</td>
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<td>RNMT</td>
<td>Resource Needs Modeling Tool</td>
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<td>ROI</td>
<td>Rate of Improvement</td>
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<td>RVI</td>
<td>Rate of Ventilation Improvement</td>
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<td>SA</td>
<td>Special Agent</td>
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<td>SBCCOM</td>
<td>U.S. Army Soldier and Biological Chemical Command</td>
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<tr>
<td>SCBA</td>
<td>Self-Contained Breathing Apparatus</td>
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<td>STATE</td>
<td>Special Tactical Assault Team Element</td>
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<td>SWAT</td>
<td>Special Weapons and Tactics</td>
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<tr>
<td>WMD</td>
<td>Weapons of Mass Destruction</td>
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