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NATO AND TERRORISM
Catastrophic Terrorism and First Responders

Threats and Mitigation

Edited by
Friedrich Steinhäusler
Frances Edwards

Springer

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NATO AND TERRORISM

Catastrophic Terrorism and First Responders: Threats and Mitigation

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Catastrophic Terrorism and First Responders: Threats and Mitigation

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Preface

On May 10-12, 2004 NATO held an Advanced Research Workshop, entitled *Catastrophic Terrorism and First Responders: Threats and Mitigation,* at the facilities of the German Technisches Hilfswerk (THW) in Neuhausen-Stuttgart (Germany). The meeting was organized jointly between Dr. Heiko WERNER (THW, Germany) and Prof. Friedrich STEINHÄUSLER (University of Salzburg, Austria). Altogether 44 experts from 14 countries participated, presenting an overview of the current situation with regard to threat assessment and countermeasures taken in different countries.

The contributions represent the opinion of the authors but not necessarily that of the institution they represented at the NATO meeting.

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Introduction

Terrorist acts have been increasingly used as political tools over the last two centuries. The Irish freedom movement and the American capitalist/labor struggles of the nineteenth century proved the value of terror attacks in shaping public opinion and political outcomes. Terrorism became the weapon of choice for political insurgencies around the world, including the Palestinian independence movement, the Basque separatist movement, the Algerian independence movement and the Northern Ireland separatist movement in the twentieth century. Muslim extremists even tried to destroy the World Trade Center during the night in 1993. (JENKINS, 1996)

However, two events of unique impact shaped the development of city-based response to terrorist acts: the sarin attack on the Tokyo subway and the destruction of the federal building in Oklahoma City. The large numbers of dead and injured and the damages to infrastructure had an impact across the entire metropolitan area in each instance. While earlier attacks had disrupted specific services, such as transit or utilities, and may have caused incidental or small scale death and injury, these two attacks had the deaths and incapacitation of large numbers of victims as their goal. Furthermore, the sarin attack represented the first instance of a battlefield weapon of mass destruction (WMD) being used against a civilian target outside of a declared war and without a state sponsor. This meant that cities could n o longer rely on the armed military forces for protection against terrorist attacks. The First Responders to the scene of a WMD attack would be the fire and rescue, emergency medical and law enforcement forces of the attacked community.

These events triggered a renewed interest in city-based civil defense capabilities, and in enhanced training and equipping of local First Responders. In the United States, for example, on 23 September 1996, Congress passed The Defense Against Weapons of Mass Destruction Act, the so-called Nunn-Lugar-Domenici legislation, which led to the creation of the Metropolitan Medical Strike Teams in the 122 largest American cities. (WINSLOW, 1999)

In the aftermath of the terror attacks in the Unites States of America on September 11, 2001, most societies vulnerable to terrorism have reviewed their disaster management plans. It is generally agreed that planning for acts of terror will reduce mass panic and the number of casualties. In the future a *catastrophic terror attack*, i.e. a terror attack resulting in tens of thousands of casualties and injured, as well as large areas contaminated by radioactive, biological or chemical contaminants, must be anticipated by emergency planners. Such an attack can result from combining a "conventional" weapon (e.g., truck bomb) with hazardous materials (e.g.,

radioactive waste), or deploying a weapon-of-mass destruction (WMD). This would increase significantly the complexity of the tasks for First Responders as compared to the terror attacks experienced hitherto, ranging from a larger number of victims to more hazardous search and rescue operations. [1]

Irrespective of the political system or geographical region, every society relies on First Responders as its primary line of defence in combating terrorism. First Responders are active at the scene of a terror attack long before the specialised units arrive to provide further logistical support. However, despite a high level of training and sophistication in terms of hardware available to First Responders, there is still a need for upgrading the level of protection for First Responders during the aftermath of a terror attacks, such as: ensuring adequate communication among the First Responders themselves, between the Command and Control Center and the First Responders, as well as with the survivors; providing adequate physical protection for First Responders, since significant numbers of First Responders may be exposed to hazardous materials during search and rescue operations following a catastrophic terror attack, e.g., due to inhalation of toxic fumes or radioactive aerosols.

The level of training and sophistication of equipment of the First Responders determine to a significant extent the success or failure of all countermeasures taken in the primary post-attack phase. The training and the equipment should enable First Responders to meet the following challenges in the aftermath of a catastrophic terror attack:

- *Adequate level of self-protection:* First Responders will be the first individuals – besides the immediate victims of the attack – who may get exposed to a harmful agent, which they cannot detect with their senses (radioactive or biological hazardous material), or only with a potentially lethal time delay (chemical hazardous material). It is essential that First Responders - as the primary asset of any society in combating the consequences of terrorism - are equipped with simple to use, rugged, yet state-of-the art ergonomically designed equipment to detect the presence of radioactive, biological and chemical hazardous materials.
- *Complex search and rescue mission:* First Responders face the added challenge that they have to focus primarily on getting victims out of the attack area and into appropriate medical care, even once the presence of harmful radioactive, biological, and chemical material has been established. This means that First

[1] Law enforcement officers, fire service, emergency medical services, emergency management, mental health workers, medical practitioners, hospital staff, coroners, public works employees

Responders need suitable protective gear, which allows them to perform their search and rescue mission, whilst at the same time providing them with the highest level of protection.

- *Damage control in view of multiple threats:* In addition to the search and rescue operation, First Responders are expected to contain the damage caused by the terror attack, and eventually to bring the threat situation under control, irrespective of the simultaneous presence of contaminating and potentially life threatening materials. Therefore the First Responders need adequate hardware, which will enable them to contain several simultaneously present threats, such as fighting fires with radioactive plumes resulting from the detonation of a "dirty bomb;

- *Securing a crime scene:* Besides focusing on the search and rescue mission, First Responders should be able to secure the scene of the terror attack with regard to any potential criminal evidence, providing further clues about the person(s) involved in the crime and the weapon used;

- *Balanced risk assessment:* First Responders have the responsibility to provide the first assessment of the area to be designated as the impact zone of the terror attack ("Ground Zero") in order to prevent any further spread of the disaster before the arrival of specialized units from civil defence or the armed forces. Therefore First Responders need adequate hardware and software tools, allowing them to estimate the future development of the attack consequences in the near-term, including plume development, material deposition and disease spread.

This publication assesses the current situation for the First Responder community in terms of the threats it faces from catastrophic terrorism and the countermeasures taken in selected countries. Based on this assessment, short- and long-term actions are recommended in order to strengthen the protection of First Responders against such acts of terrorism. These conclusions are derived from the presentations and discussion of a meeting organized with the framework of the NATO Advanced Research Workshop entitled *Catastrophic Terrorism and First Responders: Threats and Mitigation*, held in Neuhausen-Stuttgart (Germany) from May 10-12, 2004**;** for the list of participants, see Appendix 1.

Chapter 1

CATASTROPHIC TERRORISM: RISK ASSESSMENT OF THE NEW THREATS TO FIRST RESPONDERS

1.1 The new situation for First Responders since 9/11/2001

Since the terror attacks on September 11, 2001 in New York City and Washington D.C., the community of First Responders faces new threats from *Catastrophic Terrorism (CT)*. The threats to First Responders due to this new face of terrorism include – in addition to the exposure to hazardous materials (HazMat) - the use of weapons of mass destruction (nuclear, biological, chemical WMD), improvised nuclear devices (IND), radiological dispersal devices (RDD), and weapons of mass killings (WMK, e.g., the deployment of large amounts of explosives in the order of several tons of TNT equivalent). Superimposed on these physical threats is the threat to the First Responders' support, infrastructure from cyber-attacks on the dedicated information- and communication system. The probability of life threatening situations for First Responders resulting from such terror attacks, whilst operating in the warm or hot zone of the attack area, ranges from *high* (e.g., deployment of WMD) to *low* (exposure to RDD). The actual level of threat to a First Responders after a terror attack depends on several modifying factors. These include the capability of the First Responders to understand what the risks are associated with WMD, IND, RDD and WMK; the ability to assess whether HazMat, WMD agents or WMD materials are present, and to understand the outcome or consequences of the resulting impacts and familiarity with the means of delivery of WMD agents.

Catastrophic Terrorism (CT) as a new dimension of terrorism poses a new level of risk to First Responders, since it differs significantly from *Conventional Terrorism* in the following manner:

(a) Levels of destruction resulting from a CT attack are unprecedented outside war fighting;
(b) CT attack may cause tens of thousands of casualties among the targeted population;
(c) CT aims at inflicting significant financial harm to the economy of the targeted country;
(d) CT has the potential to result in significant pollution of the environment, either intentionally or unintentionally

F. Steinhäusler and F. Edwards (eds.), NATO and Terrorism, 1–10.

Table 1: Impact on society due to an act of catastrophic terrorism as illustrated by the terror attack on the World Trade Center, New York, N.Y., September 11, 2001

PARAMETER	IMPACT
Damage at Ground Zero due to crashing two fully fuelled jetliners into the two towers	US$ 64 Billion
Number of casualties	Over 2,900
Indirect damage to the State of New York	US $ 600 Billion
Environmental Pollution	Over 400 fire fighters incapacitated due to serious health effects caused by atmospheric pollution at Ground Zero

These characteristics are illustrated in the case of the terror attacks on the World Trade Center Towers in New York on September 11, 2001 (Table 1).

In view of the magnitude of the impact resulting from such an attack, CT threats are intrinsically linked to *Critical Infrastructure Protection* (CIP) of a nation. Successful implementation of CT threats are likely to involve the release of large amounts of energy, possibly in the order of one or more kiloton of TNT explosive equivalent, causing widespread damage to buildings and vital infrastructure. Although technologically there are limitations in order to achieve such a large energy releases, it has been demonstrated by terrorists on 11 September 2001 in the US that is indeed possible to achieve this with conventional means, for example, with the combined kinetic and chemical energy of a large, fully fuelled civilian aircraft crashing into a building. Alternative terror scenarios with a similar impact could be the detonation of a super-tanker loaded with LPG in a harbour, or the deployment of a crude nuclear device in an urban environment. The logistical requirements for the first two scenarios (aircraft as missile and tanker filled with LPG as bomb) are within the realms of capability of several terror groups.

The probability of actually being able to build and use a crude nuclear device in a terror attack is considerably lower than for CT terror attacks using conventional weapons or explosives; for a detailed discussion on the logistical and technical requirements, see STEINHÄUSLER (2003). Also, since the sarin attack in the Tokyo subway system in the Spring of 1995 and the anthrax attacks in the US in the autumn of 2001, it can no longer be excluded that chemical or biological weapons of mass destruction

(WMD) may be deployed in a CT attack. The probability for such an attack mode is higher than that involving a crude nuclear device, since the logistical and technical requirements for a successful deployment of a biological or chemical WMD are considerably lower.

A CT attack is likely to be accompanied by a simultaneous *cyber attack* on communication systems dedicated for emergency response. In this manner communication between concerned citizens in need, as well as communication between members of the First Responders can be seriously impeded, thereby adding to the stress in the crisis management. Also coordinated threats to key personnel and government institutions, issued at the same time of the CT attack, will contribute to the overall difficulties of managing such a crisis.

An act of CT will most likely happen in a densely populated urban environment of an industrialized country, while it is least likely to occur in a rural area of a developing country. In any case, it will result in massive local disturbance and disruption of the national economy, akin to that of certain wartime acts. As time pressure increases and uncertainties will be abundant in the first phase after the attack, First Responders will be subject to an unprecedented level of stress. Therefore access to psychological care for First Responders is essential.

It is important to emphasize the fact that CT represents a significantly more complex issue for First Responders to come to terms with than a large-scale terrorist act because: (a) it is neither categorically foreign, nor necessarily domestic; (b) CT can include nationals and foreign citizens alike; and (c) these individuals will have been operating in and out of a country over protracted period of time. For these reasons CT cannot be defeated or deterred in any conventional sense.

CT is also a threat to national stability, if First Responders are faced with an unmanageable situation. The failure of public authorities to have prevented a CT attack, and their probable initial inability to cope with carnage on such a scale, could well undermine confidence in the constitutional order. The scale and intensity of a CT attack may lead to unimagined consequences. Routine disaster management approaches ignore the fact that the potency of scale and intensity inherent in CT may drive the original crisis in an unpredictable manner. In this case, the conventional approach of disaster mitigation (preparedness, response, recovery, rehabilitation) can no longer restore a pre-CT attack status and may escalate to a series of unexpected crises of a new form, defying

conventional responses. Such an escalating terror scenario has already been evaluated for London almost 40 years ago (KAHN, 1965).

A major challenge to First Responders is the increasing number of *suicide terror attacks* world wide, which can have an even more devastating impact, if combined with CT attack modes. There is an apparent lack of imagination by security experts who have so far failed to envisage this rising tide of individuals willing to sacrifice their lives for a terrorist cause and the resulting increased risk for First Responders. Coupled with the failure of public authorities to have prevented such attacks, this can add to a growing feeling of uncertainty in the public. So far, suicide attacks have happened in a variety of scenarios, such as:

(a) Suicide boats attacked a super-tanker (*Limburg)* and a modern battle ship *(USS Cole)* off the coast of Yemen (2000). These events represented a daunting task for rescue teams, facing respecively a super tanker on fire, and a warship loaded with weapons and fuel, and threatening to detonate;
(b) Three suicide planes attacked large buildings in New York and Washington, USA (2001), leading to their collapse. The resulting fumes and dust are suspected to have posed a health threat to the First Responders operating at Ground Zero, as well as the residents of the surrounding neighborhoods coated with thick dust from the destruction of the buildings.

Extrapolating from the recent past, First Responders may be new and uniquely horrific *CT threat scenarios* involving one or more suicide terrorists. These could include a suicide pilot of a plane or a suicide driver in a convoy of truck bombs attacking a nuclear power plant, chemical plant, or oil-/gas storage facility; suicide passenger(s) contaminating other passengers with smallpox on international flights; suicide pirates hijacking a LPG super-tanker and crashing it into a harbour with adjacent oil- and gas storage tanks and/or a refinery.

A further topic of concern is the *lack of protection inside buildings* designated as ad hoc temporary shelter for First Responders and civilians, or even as Command Center near the scene of a CT attack with radioactive fallout, biological or chemical agents. Due to the typical air exchange in normal residential or office buildings[2] of

[2] Assumptions: (a) the deposition time of the agent is very long; (b) a residential or office building selected as temporary Command Center is not equipped with filters.

approximately one complete air exchange every hour (or even more frequently in buildings with leaking windows and doors), the slow influx of radioactive fallout, biological or chemical agents released by the terrorists is matched by the slow efflux. Thereby, a First Responders (or a citizen for that matter) seeking shelter within such a building will eventually receive the same dose from radioactive fallout, biological or chemical agent as a person residing outside directly exposed to the passing cloud of contaminant, unless appropriate countermeasures are taken, such as sealing all openings, windows and doors (sheltering-in-place).

1.2 Lessons learned from past terror attacks

In the past ten years Japan and the US have experienced major terror attacks, which are indicative of the mode of attacks and the consequences for the First Responders in case of a CT attack. Although the sarin attacks produced significantly smaller numbers of deaths and injuries than the suicide plane attacks, both demonstrated the vulnerability of the First Responders, as well as the limits of the operational capabilities in such extreme working conditions.

1.2.1 Sarin attacks in Japan

In the past ten years Japan has experienced two sarin attacks, posing considerable challenges to its First Responders.

On June 27, 1994 the mountain town Matsumoto (300 000 inhabitants) housed three judges who were to deal with legal issues involving the Aum Shynrikyo cult. The dormitory of this remote town became subject to a CT attack by members of the cult who released sarin into the evening air. The release was carried out by using a computer-controlled valve, dripping liquid sarin onto a heater over a period of 20 min. This attack, resulting in seven dead and 500 injured, could be considered a “Practice Session” for the cult in view of the subsequent attack in Tokyo. First Responders in Matsumoto lacked any experience in how to deal with this threat.

On March 20, 1995 the Aum Shynrikyo cult attacked the subway system in the Japanese capital with sarin:

- *7:30 to 7:45:* Five cult members board an inbound subway on one of three different subway lines. Trains are bound in 5 different directions;
- *7: 48*: Each cult member pierces one or more bags of sarin and leaves the train;
- *8 am*: The five trains converge on the Kasumegsaeki station, which is considered the *power center* of Tokyo, and serves the Tokyo Metropolitan Police Department headquarters. MMost of the sarin is not released as respirable droplets, so it is unable to enter the respiratory tract of the passengers. However, even the limited efficiency of the release forced the subway stations to evacuate passengers *en masse*. Fire, police, and emergency medical doctors ran down the stairs in order to assist the victims. However, it is important to note that they were mostly unprotected and therefore some became victims themselves. Altogether thousands of passengers were affected either by choking, blinded by the chemicals, or collapsing in the streets.

Tokyo transport officials were completely unprepared, resulting in significant delay in recognising the release of sarin. It took about 10 minutes before transit workers noticed sick passengers. Subsequently widely differing announcements were made over the public loudspeakers, such as, "*An explosion has occurred!,"* or *"Next stop: Tsukiji!."* The *Marunouchi line* continued to run until 9:27, leaving a trail of sarin behind; on the *Chiyoda line* passengers pointed to two packages leaking fluid onto the floor, upon which station employees mopped up the liquid with newspaper and bare hands, resulting in 2 deaths

Also the *reaction of the security officials* showed severe shortcomings. Although police received emergency calls shortly after 8:00, it took another hour before a chemical agent was suspected. The Japanese Self Defense Force was requested to send two experts and at 9:44 the National Police Agency conceded, that "*There was indeed a problem".* Three hours after the attack police and military authorities identified sarin. However, it took until 12:00 p.m., i.e. 4 hours after the attack, before the information was shared with other emergency agencies. Search and rescue operations were hampered by the fact that there was neither a response plan in place, nor existed adequate training to prepare the response personnel for a WMD attack. No contingency plan existed outside the military. Many of the First Responders on the scene did not have the training to recognize and function in a contaminated environment. This leads to the erroneous

reaction by the FR (and volunteers) to rush to the scene trying to help and thereby causing secondary contamination.

The *Incident Management* made no effort to coordinate the provision of resources to each contaminated area, comprised altogether of 15 different subway stations. The pronounced lack of established interagency relationships contributed to the fact that there was no central coordination between police, fire department, and the public health department. Furthermore, it turned out that the Self Defence Force was unwilling to cooperate with the police.
Significant *communication problems* became apparent early on and continued for a considerable time:

- Due to information overload, the ambulance control centre could not dispatch emergency medical technicians. Drivers of ambulances could not acquire information about the availability of hospital beds;
- Some First Responders had to use public telephones to communicate with their organisations; The Japanese public did not receive any official communication for days; Communication between Japan and other countries about the attack was all but absent.

Most First Responders lacked adequate *personal protection*. Whilst primary contamination claimed the lives of 10 passengers and 2 transit workers, First Responders were sickened *indirectly* by exposure to victims who had been in direct contact with sarin: out of 1 345 emergency workers, 135 suffered acute symptoms.
Another significant secondary effect was the impact on hospital care in central Tokyo. Contaminated victims arrived in taxis, busses and on motorbikes, and in turn contaminated emergency rooms at hospitals, causing several to close to ambulance services. Secondary deaths resulted from routine heart attack and stroke victims being denied access to the closest emergency department because it was closed by sarin contamination or overwhelmed by sarin patients. The prolonged transport times to outlying hospitals resulted in several deaths, a model of the secondary and unintended consequences of CT attacks.

1.2.2 Terror attacks with civilian aircrafts as guided missiles in New York City and Washington, D.C.

On September 11, 2001 four fully fuelled civilian aircraft were hijacked on the East Coast of the United States; for details, see HOGE (2001) and BROECKERS (2002). Three of them were subsequently used like guided missiles to crash deliberately into the two towers of the World Trade Center (WTC) in New York City, and into the Pentagon in Washington, D.C. The fourth plane is suspected to have aimed either at the Three Miles Island nuclear power plant or the White House. This remains speculative though, since the plane crashed earlier, reportedly after a fight between passengers and crew members against terrorists. In New York City both towers of the WTC collapsed and damaged several adjacent buildings (*Ground Zero)*. The Pentagon suffered severe damage at the site of the reported plane impact.

The Fire Department of New York City (FDNY) followed normal high rise building fire tactics in responding to the initial plane crash and ensuing fire reports. The Incident Command Post was established in the lobby adjacent to the fire annunciator box that delineated areas where fire suppression systems had beden actrivated in the bvuiklding. This information was used to deploy fire resources for fire suppression and rescue operations. (SMITH, 2002)
The *Command Structure,* coordinating the First Responders at Ground Zero, was severely impeded after the collapse of the north tower of the WTC, since this also meant that the Incident Command Post was gone. The catastrophic collapse caused such total destruction of the two towers, and such devastation to the remaining buildings in the World Trade Center complex, that a complete reevaluation of the search and rescue deployment plan was required. The kinetic energy of the collapse pulverized all of the buiding's contents, from furnishings to concrete piers, leaving only some structural steel recognizable in the rubble after the dust settled. (SMITH 2002) In the immediate aftermath of this event the incident command had to be re-established and a new rescue plan devised. The New York Police Department's (NYPD) Command and Control Center was operational, and the Port Authority of New York and New Jersey's Emergency Operations Center was activated. (JENKINS & EDWARDS-WINSLOW, 2003) The unprecedented and unique collapse of the buildings had been an operationally-paralyzing event to First Responders. It should be noted that no modern high rise building in the United States had ever suffered a significant structure failure as a result of a fire before 9-11. U.S. building codes required that high rise buildings be constructed of intrinsically fire-resistant materials and be equipped with fire suppression systems.

In fact the Twin Towers had been designed to withstand the impact of a 707 jet crashing into them. What was unanticipated in the original engineering was a change in the fuel loading of the building. The required on-site generator was designed to be in the sub-basement. However, after the 1993 truck bombing attack in the garage the generators in both buildings were incapacitated, depriving the da,aged buildings of elevator service and other electriocal systems requiring back-up generator power. During the repairs the generators and the fuel tanks for both towers were moved to the upper levels for protection from a similar attack. As a result, when the towers were hit by the planes, the diesel fuel tanks ruptured, providing a river of fuel flowing throughout the building. While the jet fuel alone would not have engendered a catastrophic fire, the addition of the diesel fuel raised the heat, caused the structural steel to stretch, and ultimately caused the building to collapse. (NOVA 2002)

The catastrophic attacks placed demands on the First Responders that surpassed their plans and capabilities. This led to a variety of system failures. The *Search and Rescue Operations* by the First Responders and *communication* among First Responders, with their organisations, with victims, as well as general communication showed significant deficiencies (HOLUSHA, 2004) in the face of CT.

Health effects related to the search & rescue operations, as well as the clean-up operations were inadequately understood in the first hours to days following the collapse. Activities at Ground Zero may have been carried out without adequate protection of First Responders. First Responders from the Federal Emergency Management Agency-sponsored Urban Search and Rescue Teamms reported that Federal Environmental Protection Agency staff members evaluated the pile and the plume every morning at 6:00 a.m. Based on their evaluation the level of required personal protective equipment (PPE) was established. The police officers patrolling the perimeter of the site were from the New York State Department of Environmental Protection and wore their respirators routinely. FEMA USAR members were accustomed to performing rescue work in PPE, but FDNY members refused to use PPE believing that it was a safety concern because it impeded speech and hearing. As a result most rescue work at the pile was performed with absent or inadequate PPE.

Burning ruins of the WTC emitted toxic gases for at least six weeks after 9/11 (CAHILL, 2003) Tons of furniture, carpets, insulation, computers and paper burned until Dec. 19, 2001. Fumes originated from burning debris, organic matter and chlorine from papers and plastics. These fumes

escaped to the surface as metal-rich gases or chemically decomposed into very fine particles. Altogether four classes of pollutants could be identified: fine metal particles, sulphuric acid, fine undissolvable glass particles, and high temperature carcinogenic organic matter. It took until May 2002 for all the fine components to decline by more than 90%. The National Security Council controlled US EPA communications to the general public in the days after 9/11 and reportedly information was withheld concerning the potential health hazard of breathing asbestos, lead, concrete and pulverized glass from the WTC collapse (TINSLEY, 2001).[3] Air quality returned to pre-Sep 11 levels only by June 2002. Also, US EPA was convinced to omit guidance for cleaning indoor spaces, where surfaces were covered with layers of fine dust resulting from the collapse of the buildings. Up to 300 fire fighters, who were involved in such operations at Ground Zero, may be forced to retire because of health ailments, possibly linked to the site. An estimated 500 fire fighters went on medical leave because of injuries related to rescue and recovery, and up to 300 were suffering from lung ailments (CLINTON, 2001).

[3] The White House reportedly pressured the US EPA to make premature statements that the air was safe to breath, (e.g., on Sept 18, 2001), even though it did not have sufficient data and analyses to make the statement.

Chapter 2

CURRENT THREATS TO FIRST RESPONDERS

2.1 Threats to First Responders due to radioactive materials

The basic requirement for terrorist to deploy a *crude nuclear device* is the acquisition of weapon-usable fissile material. In view of the technical complexity to build an implosion-type Pu-based bomb[4], it is more likely that terrorists will attempt to acquire highly enriched uranium (HEU) with a degree of enrichment >80% U 235.[5] The amount of HEU required to build such a device depends largely on the technical skills of the terrorists and will typically be in the order of several tens of kilogram of HEU. Such material could be obtained, e.g., from research reactors using HEU. Currently 28 such facilities are located in developing countries with questionable physical protection (BUNN et al, 2002; STEINHÄUSLER et al, 2003 a; STEINHÄUSLER et al, 2003 b). Once the fissile material has been acquired it feasible to consider that the device could be fabricated in a basement, garage, or storage site, provided certain technical equipment and scientific know-how is available to the terrorists. Such a device could have an explosive yield in the order of about 10 kt TNT equivalent, resulting in an impact on the targeted society and its First Responders similar to the nuclear explosions at Hiroshima and Nagasaki in WW II.[6]

An alternative source for a nuclear weapon for terrorists could be the acquisition of a *military nuclear device* on the black market. Assuming that indeed such a weapon was provided to terrorists, it could be smuggled in a cargo container or light aircraft into the targeted country. Upon arrival the weapon could be transported by vehicle to the car park of a shopping

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[4] Every large reactor produces annually about 200 kg Pu, which is not and need not be weapon grade for building a device. Although more complex, the possibility of a Pu-based device built by terrorists, supported by a rogue state, is not negligible "Proliferating states using designs of intermediate sophistication could produce weapons with assured yields substantially higher than the kiloton range possible with a simple, first generation device". (US Department of Energy, January 1997)

[5] *If somebody tells you that making a plutonium implosion bomb is easy, he is wrong. And if somebody tells you that making an improvised nuclear device with HEU is difficult, he is even more wrong.*
Senator Joseph Biden, March 6, 2002, Hearing of the US Senate Foreign Relations Committee, quoting former Los Alamos National Lab Director Harold M. Agnew

[6] For comparison, a large truck bomb has an explosive yield of about 0.008 kt

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centre. If the detonation takes place on a workday in a densely populated urban area, casualties would amount to several hundred thousand dead. However, terrorists would have to be able to overcome the built-security features securing the weapon in a fail-safe mode, and they would not be sure whether the weapon is in a ready-to-use state, i.e. having received adequate maintenance.

At the present stage it is safe to assume that no civilian Emergency Response Force is capable of coping with the initial aftermath of terrorists deploying a crude nuclear device, and even less so in the case of a military device, since First Responders will have to manage a variety of simultaneous problems. These include:

- Several tens of thousands of dead and wounded in an environment experiencing radioactive contamination, in addition to the wide-spread physical destruction due to blast and heat effects. Typically, this would mean the management of 50% of the target population dead from prompt radiation dose, air blast, and burns, together with about 50% injured;
- The detonation of the nuclear device as a ground blast will result in a large amount of earth and vaporized structures, i.e. causing lethal fallout near Ground Zero;35% of the energy from blast will be bursts of thermal radiation, causing widespread fires and burn victims;
- Some First Responders will suffer from flash-blindness lasting for several minutes, having looked in the direction of the blast. If the flash is focused through the lens of the eye, this will result in permanent retinal burn; if flash-blinded while driving a car, the vehicle is likely to crash, causing injury to the crew and thereby incapacitating the First Responders.

Significant effects impeding on the work of First Responders, assuming only the deployment of a relatively small crude nuclear device, are summarized in Table 2.

Table 2: Impact (radius around Ground Zero) on First Responders working in the Ground Zero area after the detonation of a crude nuclear device (assumptions: ground detonation; explosive yield: 1 kt)

PARAMETER	IMPACT ZONE (IN METER)
External gamma radiation (4 Gy)	790
Fallout in first hour (4 Gy)	5 500
Serious injuries due to air blast*	275
Serious injuries due to thermal burns (50% mortality)	610

Another CT threat for First Responders results from possible terror threats to the nuclear fuel cycle. According to the results of a NATO Group of Experts, more than 25 terrorism threat scenarios are considered as credible for nuclear power plants (NPP) and the transport of nuclear material (STEINHÄUSLER, 2004). Some of these scenarios have a high probability to result in an uncontrolled release of a large amount of radionuclides. This implies major health risks for First Responders, in particular fire fighters and paramedics during the search and rescue operations, as well as fighting the fires resulting from the attack.

Another threat to First Responders due to radioactive materials results from the deployment of a *radiological dispersal device (RDD)*. One of the many ways of dispersing radioactive material is the combination of conventional explosives with a radioisotope, commonly referred to as a *dirty bomb*. Using software and formulas to characterize a dirty bomb, it can be illustrated why it is categorized as a weapon of mass disturbance rather than of mass destruction. While the blast itself may pose a physical threat, the device's psychosocial impact generally exceeds the radiological or physical consequences. The following section provides some fundamentals for the hand-on exploration of dirty bombs through use of the Hotspot computer program (HOMANN, 2003).

Probably as a residual of the cold war era visions of nuclear holocaust and dooms day weapons blanketing the globe in lethal radiation, the dirty bomb seems to rise to undeserved prominence among terrorist concerns. A nuclear weapon is certainly a weapon of mass destruction (WMD), as are the weapons of chemical and biological warfare attacks. Like a nuclear weapon, in the minds of the public, and to some extent exacerbated by the popular press, the dirty bomb occupies a position of high concern and even outright fear because of its radioactivity. In this instance, radioactivity is understood in the context of acute radiation sickness and cancer causing doses. Thus, most of the dirty bomb worry is for the wrong reason. Dispersal of radioactive material does not require a large amount of explosives, therefore the physical damage will be small. However, the disturbance to society, in terms of psychological impact and economic loss will be enormous, straining the resources of government and society to undo the consequences of an attack. People in the vicinity of the explosion, who survive the overpressure of the blast, will most likely survive the radiation impact. Assuming that terrorists have obtained a nominal amount of conventional explosives (about 250 kg) and detonated it together with stolen radioactive material from an industrial source (e.g., a Cs 137 source) in a heavily populated Downtown area, it can be

postulated that the conventional blast would result in the destruction of approximately 10 cars and possibly set four buildings on fire. In addition, there would be about 20 blast-related deaths and about 500-blast-related injuries. However, the situation would be aggravated by the radioactive contamination and the associated fear among the affected population (possibly also fear among the First Responders) with up to 30 000 persons perceived as *contaminated* [7], together with <100 cancer deaths related to the blast. Furthermore, the decontamination costs for the Downtown area will amount to several billions of EURO, if the current environmental clean-up criteria are applied.

The characteristics of the dirty bomb[8] include the following:

- The explosion, which kills or injures people in its immediate vicinity.
- The explosion disperses radioactive material in all directions, including upward into the wind stream where it is subsequently distributed over a wide-area.
- It can result in increased risk of cancer in the population exposed and in large areas requiring decontamination. However, acute radiation effects are unlikely for First Responders or the public.
- Survivors of the blast will probably survive the radiation.
- Internal dose via inhalation is probably a greater threat than external radiation.

Members of the RDD family of devices consist of devices whose method of dispersal includes spraying such as insect flogging devices, street washers, water truck sprays, or dispersal as granular or powdered material surreptitiously spread in public places, such as railroad stations or malls. Another potential dispersal method is by injection into a public water supply distribution system. The methods of dispersing radioactive material in the environment are almost infinite. When terrorist do not regard their personal safety to be of a great consequence, and suicide missions remain a possibility, then the only limit on methodology is the

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[7] Fear of radiation occurs frequently irrespective of the actual level of radioactive contamination.

[8] The RDD is different than the group referred to as REDs or radiation exposure devices. The latter consists of radioactive material that is intended to expose people in the vicinity of the device to emitted radiation. Significant RED exposure could occur from a high activity industrial radiography source covertly placed in a public place. After a few hours close proximity, this could lead to acute radiation symptoms in the exposed individual.

imagination. In terms of radiological damage inflicted to the population, the dirty bomb may be the least effective of these devices, with its power lying in the psychological and economic impacts.

First of all, the dirty bomb is a psychological weapon. The public worldwide has an inherent fear of radioactivity. In general, they don't understand radioactivity and don't want anything to do with it, regardless of the amount. Consequently, even small amounts of radioactivity dispersed in the environment will result in public panic and avoidance of the areas contaminated. Probably, even in situations where the radioactive contamination is so small as to have no effect on their health or life expectancy, the public will not accept these areas for habitation, business, or recreational use. This makes the dirty bomb an urban weapon or possibly a suburban weapon. The dirty bomb does not seem to have any effective role in a rural or agricultural setting, since - to be effective - the dirty bomb needs to have large numbers of people, buildings, public places, all found in an urban environment
Secondly, the dirty bomb is an economic weapon. By spreading radioactive material, office buildings, factories and schools may be deemed contaminated, at least in terms of present environmental radiation standards. If they cannot be decontaminated within a reasonable timeframe (taking economic constraints into consideration), and it is questionable if they could be, these facilities would be rendered useless and unable to function, and they would have to be replaced at great cost. Further, in the United States at the present time, and at least some other NATO member states, there is no insurance available for property contaminated by radioactivity. Thus the cost of property replacement and loss of business income would not be reimbursed.

The US Environmental Protection Agency developed a Manual of Protective Action Guidelines (EPA, 1992). This guidance was developed primarily for incidents near nuclear power facilities. Similar guidelines were put in place in most of the countries with nuclear power plants. In view of the Health Physics Society (2004), the framework of the protective action guidelines is generally applicable to radiological terrorist event. In the case of a radiological terrorist event in which dispersal of radioactive materials is by conventional explosive, i.e. the dirty bomb, than the so-called *early phase* will be the period immediately following the explosion. After First Responders have determined the existence and extent of the contamination, a decision has to be made if sheltering-in-place or evacuation of the radioactively contaminated area is required in order to control radiation exposure. In the case of the dirty bomb the most

significant contamination will probably be localized in the blast area, and whatever actions are deemed necessary can be completed quickly concluding the early phase. The protective action guidelines are based on doses that may be avoided by actions starting at 5 mSv and continuing by specifying conditions for avoiding dose at 10, 50 and 100 mSv.

Cesium-137, cobalt-60, strontium-90, iridium-192, americium-241 and tritium have sufficiently long half-lives to be of interest to terrorist considering making a dirty bomb. Most of these radionuclides have a long history of use in industrial gauges and radiography sources and hundreds of these are reported as lost, stolen or missing every year. The self-illuminating exit signs sometimes used in public places are a source of tritium and may contain up to several hundred Gigabecquerel (GBq). The strongest sources of Sr-90, which have been reported stolen in the past (ZAITSEVA, 2004), are the Russian thermoelectric generators (RITEGs) which may contain as much as 5000 Terabecquerel (TBq) of Sr- 90.

Other types of commonly-used radiological materials would be less attractive as CT materials. Medical radionuclides, like iodine-131, technetium-99m, and gallium 67, have little appeal to terrorist because they have such short half-lives, meaning that they would require deployment almost immediately after acquisition. The exception to this might be if terrorists could hijack a large shipment of medical radionuclides between the production source and the regional distribution center and proceed to blow it up in mass. There might still be an initial psychological impact but the economic impact would be blunted by radioactive decay restoring the contaminated area to a useful state relatively soon after the explosion. While a dirty bomb employing spent nuclear fuel as the radiological agent is a possibility, it would seem to be less likely than utilizing the common industrial radionuclides above. This is because of the greater physical security around spent fuel storage and the safeguards against its loss. Even less likely is the use of plutonium 238 or plutonium 239. While plutonium was used in the past for plutonium-beryllium neutron sources, most of these have been gathered up and are accounted for. Furthermore, it would seem that if terrorists were to acquire sufficient plutonium 239 or highly enriched weapons grade uranium to make a credible dirty bomb, they would be far more likely to take that amount of fissionable material and make a crude nuclear weapon.

The aim of the dirty bomb builder is to create an aerosol out of the radioactive source and introduce it into the prevailing wind pattern for

distribution. This in affect is dilution of the source material. The original source that existed at the point of explosive detonation might have been of sufficient strength to impart damaging or lethal amounts of radiation to people in its vicinity after only a short period of time. However, the explosion by dispersion reduced the specific activity of the source, and probably rendered the site of the explosion radio logically safe in terms of external radiation. Thus, the more effective the bomb builders were in obtaining their goals of dispersion, the safer the immediate vicinity of the explosion should be. While one cannot be certain of radiological safety at the bombsite, it is unlikely that First Responders will be in any immediate radiological danger[9]. The Health Physics Society (2004) in a paper discussing guidance and protective actions following a radiological terrorist event, states the following position:

> *"The Health Physics Society believes it is extremely unlikely that a radiological terrorist dispersal event (exclusive of detonation of a nuclear weapon) can disperse sufficient radioactive material for the resulting air and ground contamination to pose an immediate health hazard to people near the event or to First Responders. The Health Physics Society continues by recommending that lifesaving actions and actions to secure the area of a radiological terrorist incident should take precedence over radiological considerations, following a radiological terrorist event."*

Similarly with regard to radiological dispersal devices the National Council on Radiation Protection and Measurements concludes that the exposure to individuals would be expected to be small. Thus, the harm is primarily psychological and the doses received should produce no immediate adverse health effects and only a small probability of long-term health effects.

Bombs, which do not efficiently melt, vaporize or otherwise reduce the source to very fine particles or droplets (ideally of a size < 10 microns) may leave source residuals of sufficient quantity (activity) to be of concern. However, this is not considered to be likely. Mortality issues surrounding the dirty bomb incident is mostly for those at the site at the time of detonation due to the physical effects of blast overpressure and

[9] Provided they are aware of the radiological threat and are properly equipped for this type of work.

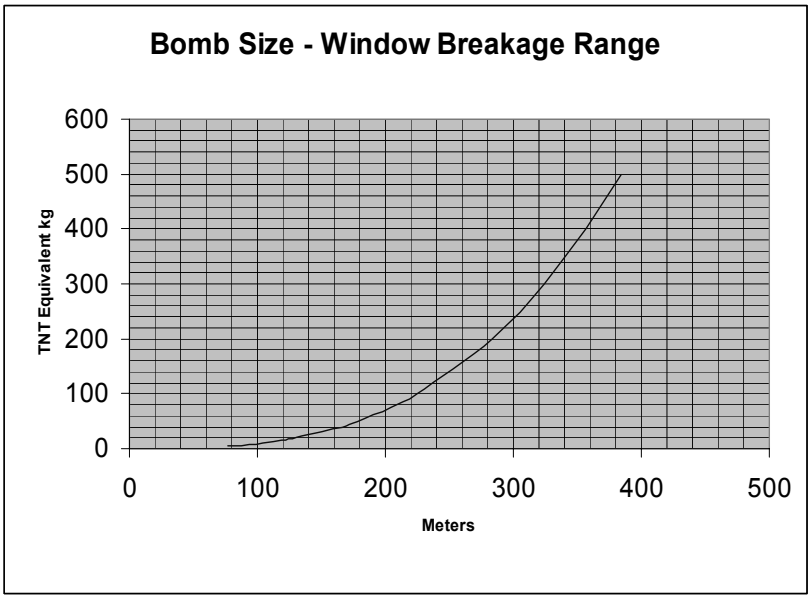
flying debris. Radiation long-term morbidity from internal exposure is more likely to be a factor for the population engulfed in the dust cloud following the explosion than for First Responders arriving on the scene somewhat later and presumably with appropriate protection. An explosion includes a large amount of dust and debris and a relatively small amount of very fine particles. Only the fine particles will be found much beyond the blast zone.

First Responders at a scene of an explosion that shows evidence of a deliberate bomb event should immediately try to determine if the explosion involved a radiological substance. Availability of survey instruments and knowledge of their capabilities to detect different types of radioactivity (alpha, beta and gamma) is a prerequisite to determining if a dirty bomb event has occurred. As a general rule of thumb, continued survey meter readings of 100 Microröntgen per hour (uR/hr) in the general vicinity of an explosion are a strong indication that abnormal quantities of radioactive material are present. Readings of 1 Milliröntgen per hour (mR/hr) should indicate the need for a radiological survey team to assess the site, and work by First Responders should proceed only if there are living victims to rescue. until the safety of the bombsite has been determined. If a dirty bomb is suspected, or has been confirmed, an estimate of the size and shape of the "zone of concern" for radioactivity will be desired information.[10] Establishing the extent of the zone of concern is important. Uncontaminated people must be kept out of this zone and the people from within the zone need to be screened for decontamination and to avoid spreading radioactivity needlessly beyond the area. Following triage, contaminated patients should be decontaminated at the scene to avoid contaminating transport vehicles. Walk-in patients at hospitals should be decontaminated outside of the building to avoid contamination of hospital emergency rooms and other clean areas. Blast crater diameter and the range of broken window glass are functions of the amount of explosives involved and may have some value in determining the characteristics of a dirty bomb. Figure 1 presents window glass breakage data generated by *ConWep* (HYDE, 2003); they can be used as a predictor of explosive amounts, however, they

[10] A computer program like *Hotspot*, allows calculation of the size and shape of the zone of concern for radioactivity.

fail to provide much insight into dirty bomb dynamics.[11] It is pointed out though that the amount of explosives is less of a determinant of dispersal and plume dimensions than, for example, a change in terrain factors, as seen in Figures 2 and 3. Figure 4 is a log-log plot of Table 3, showing the dose conversion data resulting from a dirty bomb explosion.

Figure 1: Glass breakage values looks as a useful predictor of explosive amounts



[11] ConWep is an explosives program, developed by the U.S. Army Corps of Engineers and its glass breakage data plots as a smooth line that appears like it might be a predictor of explosive amounts.

Figure 2: 18 TBq source plume from a dirty bomb in a rural environment

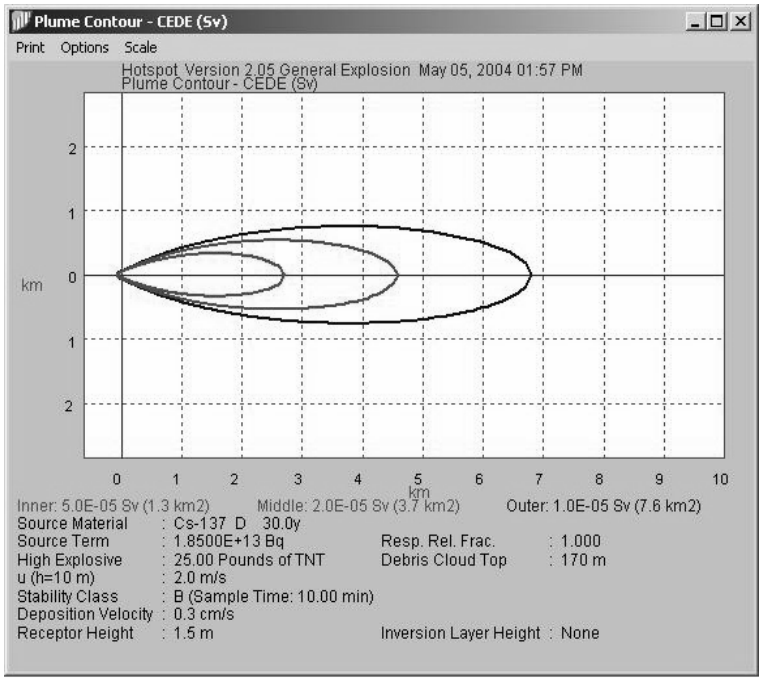


Figure 3: 18 TBq source plume from a dirty bomb with urban atmospheric conditions

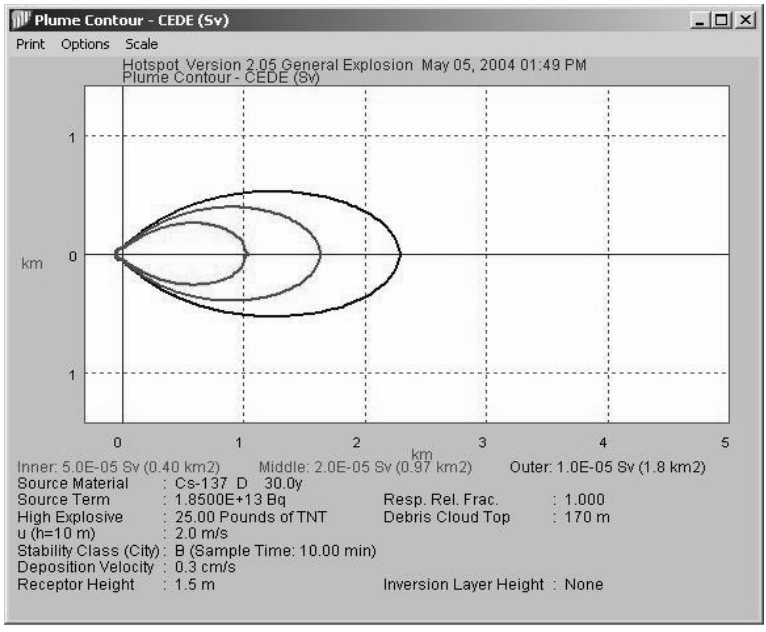
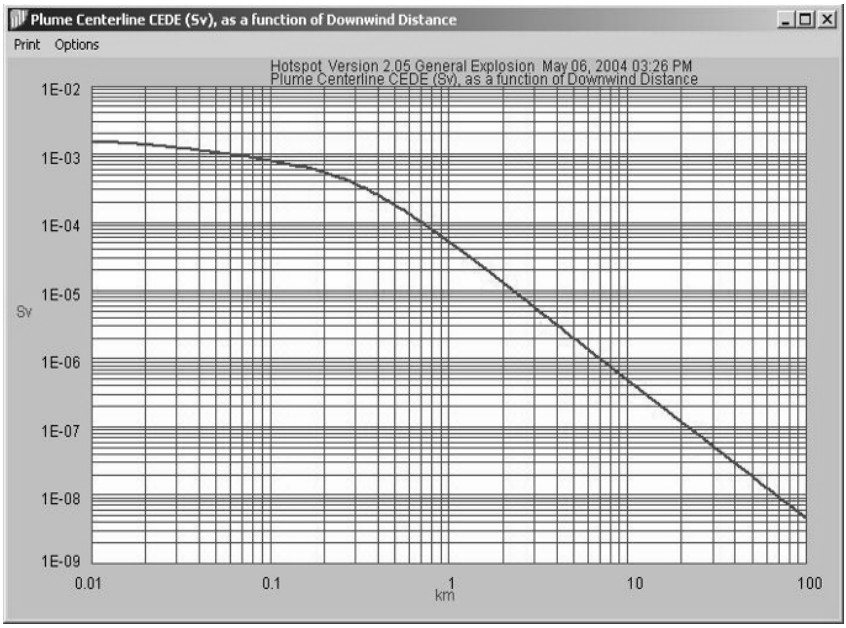


Table 3: Dose conversion data (forth and fifth columns deal with post plume dose and possible dose from resuspension of radioactive particles)

Distance (km)	CEDE (Sv)	Time-Integrated Air Conc. (Bq-sec/m^3)	Grd Surface Deposition (kBq/m^2)	Grd Shine Dose Rate (Sv/hr)	Arrival Time (hour:min)
0.030	1.2E-03	4.3E+08	1.3E+03	2.6E-06	<00: 01
0.100	8.0E-04	2.8E+08	8.3E+02	1.7E-06	<00:01
0.200	5.4E-04	1.9E+08	5.6E+02	1.1E-06	00:01
0.300	3.7E-04	1.3E+08	3.8E+02	7.5E-07	00:02
0.400	2.5E-04	8.7E+07	2.6E+02	5.2E-07	00:03
0.500	1.8E-04	6.2E+07	1.9E+02	3.7E-07	00:04
0.600	1.3E-04	4.6E+07	1.4E+02	2.7E-07	00:05
0.700	1.0E-04	3.5E+07	1.0E+02	2.1E-07	00:06
0.800	7.9E-05	2.7E+07	8.2E+01	1.6E-07	00:07
0.900	6.4E-05	2.2E+07	6.6E+01	1.3E-07	00:08
1.000	5.2E-05	1.8E+07	5.4E+01	1.1E-07	00:09
2.000	1.3E-05	4.5E+06	1.4E+01	2.7E-08	00:18
4.000	3.2E-06	1.1E+06	3.3E+00	6.5E-09	00:37
6.000	1.4E-06	4.7E+05	1.4E+00	2.8E-09	00:55
8.000	7.6E-07	2.6E+05	7.9E-01	1.6E-09	01:14
10.000	4.8E-07	1.7E+05	5.0E-01	1.0E-09	01:33
20.000	1.2E-07	4.1E+04	1.2E-01	2.4E-10	03:06
40.000	2.9E-08	1.0E+04	3.0E-02	6.0E-11	06:13
60.000	1.3E-08	4.4E+03	1.3E-02	2.7E-11	09:19
80.000	7.2E-09	2.5E+03	7.5E-03	1.5E-11	12:26

Figure 4: Log – log plot of distance vs. dose; distance and CEDE (Sv) are the left two columns from Table 3



2.2 Threats to First Responders due to biological materials

The international community of First Responders has only limited practical experience with terror attacks using biological material.

- Between 1990 and 1995 Aum Shinrykyo carried out attacks in three locations with *Clostridium botulinum*, isolated from soil, but with no identified victims;
- Letters containing anthrax-spores in US were sent by mail to media and political targets in two states and Washington, D.C. in the autumn of 2001. Although only one victim was an intended media target, four other deaths resulted from unanticipated deposition in the mail system. The reaction to these anthrax attacks by an indeterminate foe in the weeks that followed was considered unfocused and incoherent (HILLS, 2002). Those with known exposures were aggressively treated with high doses of antibiotics, and buildings were sealed and decontaminated. The deposition in the mail system was not understood until an epidemiological

> investigation of the four deaths pointed to the mail system as the only possible commonality. This resulted in a delayed and probably ineffective effort to provide prophylaxis to potentially exposed postal workers. (PRESTON 2002)

Parcels, containing biohazardous materials sent by ordinary mail, can pose a threat to First Responders for a variety of reasons including poor packaging.[12] There is no global experience in a CT attack deploying biological material. For example, if smallpox (infectious and contagious) were used by terrorists the impacts are unknown. Previous experience with documented cases of infectious persons travelling on public transit occurred in a period of history when most of the population was vaccinated against smallpox. While the infection rate was zero, todays medically naïve population might react differently. Not only has no general population vaccination occurred since the early 1970's when the World Health Organization declared smallpox eradicated, no one has contracted this disease to obtain natural immunity, either. Thus this is the first time in recorded history when most of the population has no level of immunity to smallpox. (PRESTON, 2002) This disease organism is not robust, leading Soviet biological warfare program scientists to bioengineer pneumonia and other pathogens into smallpox to enhance its virulence. (ALIBEK, 1999)

The terrorist use of smallpox could result in an infection of 50 000 primary cases, 150 000 secondary cases within 2 weeks, and 450 000 such cases within 4 weeks.[13] In other words, such an attack mode could theoretically threaten a nation, since the death rate is about 30%. Since vaccination was stopped in Western industrialized countries in the early 1970's, widespread immunity due to small pox has largely disappeared.[14]

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[12] Letter to *The Lancet* in 1975, with regard to a shipment of a serum sample containing the highly infectious hemorrhagic Lassa fever virus: *"The condition in which many of the specimens arrive causes us extreme concern. Our most recent examples have been badly smashed blood samples sent by post overseas for hepatitis and Lassa-fever studies. These samples were potentially highly infectious, but were so badly packed that serum was leaking freely through the outer paper. There is no need to stress the hazard to postal workers or to those who have to open the package".*

[13] Assumption: If each primary victim infects (by contagion) three secondary victims, then each secondary victim might be expected to infect another three, i.e after about 14 days the number of primary victims is multiplied by three, and then again by three after the next 14 days, and so on.

[14] Immunity to smallpox in a well-vaccinated person is expected to decay after 10 years.

Similar considerations apply in case a CT attack involves other biological agents, such as Lassa fever, malleus, plague, Q-Fever, Alphavirus, anthrax, botulism, brucellosis, Ebola, or Entero-Toxin B. Some of these threats can remain dangerous through an extended period, e.g., while plague aerosol remains alive only for about 1 hour, small pox aerosol remains stable for days.

There are specific *operational challenges* for First Responders related to a CT attack involving biological material.

- At present reliable portable bio-detectors for routine use are not available, so First Responders cannot easily verify the actual biohazard level at the site of an emergency;
- Covert transport of biological material intended as a weapon is easy and the probability for it to potentially occur in planes, cars, trucks, ships, and all modes of public transport is high. Therefore, First Responders may be exposed to such material at practically any scene requiring their presence (accidents, emergency situations, rescue operations);
- Biological weapons will typically require hours to weeks to create symptoms of disease. If deposition at a scene is through an explosive or destructive device, victims at the scene of a biological terror attack may not be recognized as contaminated, so First Responders rushing to the scene to rescue them may thereby become contaminated themselves;
- Biological material represents a high indirect risk to employees who may not even be the primary target of such an attack, e.g., postal workers (letter, parcel post) and bank employees (bank notes), creating a contaminated environment usually unrecognisable by First Responders;
- There can be a significant time-delay between the infection and recognizable first symptoms of a disease, making identification of the source problematic;
- Biological material can be viewed as a self-replicating weapon, requiring the 100% decontamination of a site which has been subjected to a bioterror attack;
- Biological material is a low cost weapon which does not require special locations for its manufacture, unlike hazardous chemical materials. First Responders may be called to a scene for emergency assistance which actually poses a contamination hazard unknown to them;

- In view of genetically modified bio-agents not responding to currently available antibiotics or vaccines, the importance of an awareness of the health risk in case of a contamination is significantly increased in the First Responder community, with a concomitant need to improve PPE;
- Widespread biological contamination may have a significant psychological impact on First Responders and the uncontaminated public, possibly causing panic reactions.

2.3 Threats to First Responders due to chemical materials

Toxic Industrial Chemicals (TICs) are a key component of the industrialized society. These chemicals travel through ports, railroads and highways in large, unprotected quantities. In open societies they offer terrorists an easier and often more catastrophic method of chemical attack than synthesizing or stealing chemical warfare agents (CWA). Particularly in the case of rapidly developing countries, as well as more fully industrialized nations, the trans-shipment and process utilization of chemical intermediates or end products may not be adequately controlled. Storage, handling, and use of certain substances have always presented certain risks to the public at large, most often minor but sometimes catastrophic. In the recent past First Responders have found themselves already in situations involving such hazards, for example:

- During the Atlanta 1996 Olympics, US federal authorities considered potential threats from improvised chemical devices, such as a terrorist using high explosives to puncture a train car loaded with chlorine gas (U.S. ARMY MEDICAL COMMAND, 1999);
- On October 15, 2003, ricin was detected at a mail facility in Greenville S.C., an offsite location where mail is processed for the White House (CBS, 2003);
- On April 26, 2004 it was revealed that Al Qaeda plotted to detonate a powerful bomb targeting Jordan's secret service and to use poison gas against the prime minister's office, the US Embassy and other diplomatic missions.[15]

[15]The terrorist Al-Jayousi received $ 170,000 from Al-Zarqawi to finance the plot, buying 20 t of chemicals (Associated Press, 2004).

Hazardous chemicals used in civilian commerce, including those that are highly toxic to mammals, are corrosive, and/or prone to deflagrate or decompose in a violent manner. Risks for First Responders exist especially in case of a CT attack with substances of such a highly toxic profile. Although the release of methyl isocyanate (MIC) – a chemical intermediate used in the synthesis of a carbamate pesticide (Sevin) – on December 3, 1984 killed immediately as many as 3,800 people in Bhopal (India) was the result of sabotage and not of a CT attack, the magnitude of this event demonstrated the risk to First Responders of an intentional release by terrorists illustrates the risk to First Responders. More common chemicals, such as ammonia, could be deliberately released into the environment by terrorists. In case of a CT attack terrorists could induce a major release within a chemical facility, or by sabotaging several containers en route.[16] In the future, First Responders are more likely to face non-military chemical agents (such as gasoline, ammonium nitrate, ricin) than military agents (sarin, mustard gas, VX, chlorine gas). Because there are innumerable chemicals used by industry and tens of thousands of new ones are synthesized each year, it is impossible to prepare for the detection of every individual chemical. Therefore, some effort has been made to distill these down to condensed lists of the greatest chemical threats based upon a combination of the most toxic and widely used compounds. There are a number of TICs lists available, some open source and some secure, illustrating that there are many TICs available, if someone chooses to use the chemical infrastructure against society. One such list is the US National Institute of Justice (NIJ) list which appears in their "Guide for the Selection of Chemical Agent and Toxic Industrial Material Detection Equipment for First Responders" (June 2000). This list is divided into three columns of high, medium and low threats (Table 4).

[16] Fire started on a cargo vessel, docked at Texas City on April 16, 1947, carrying a supply of ammonium nitrate fertilizer. This resulted in a 700 m high mushroom cloud; the explosion was heard for 250 km. Secondary fires erupted at the Monsanto Chemical Plant, while additional conflagrations spread to nearby petroleum refineries. At least 581 people died, and over 3,500 were injured; over 30% of the residential homes were seriously damaged and two thousand people were subsequently made homeless.

Table 4: Classification of chemical agents representing different levels of risk for First Responders, derived from a list published by the US National Institute of Justice, June 2000. The exposure limits used are derived from the NIOSH "Pocket Guide to Chemical Hazards", which focuses on some of the most common toxic chemicals used in U.S. industry (US DEPT. OF HEALTH AND HUMAN SERVICES). [17]

High Risk Chemical	Exposure Limit	Medium Risk Chemical	Exposure Limit	Low Risk Chemical	Exposure Limit
Ammonia	25 ppm	Acetone cyanohydrin	1.0 ppm	Allyl isothiocyanate	
Arsine	0.05 ppm	Acrolein	0.1 ppm	Arsenic trichloride	0.5 ppm
Boron trichloride	50 ppm (IDLH)	Acrylonitrile	1.0 ppm	Bromine	0.1 ppm
Boron triflouride	1.0 ppm	Allyl alcohol	2.0 ppm	Bromine chloride	
Carbon disulfide	20 ppm	Allyl amine		Bromine petafluoride	0.1 ppm
Chlorine	1 ppm	Allyl chlorocarbonate		Bromine trifluoride	
Diborane	0.1 ppm	Boron tribromide	1.0 ppm	Carbonyl fluoride	2.0 ppm
Ethylene oxide	1 ppm	Carbon monoxide	35 ppm	Chlorine petafluoride	
Fluorine	0.1 ppm	Carbonyl sulfide		Chlorine trifluoride	
Formaldehyde	0.75 ppm	Chloroacetone	1 ppm*	Chloroacetaldehyde	1 ppm
Hydrogen bromide	3 ppm	Chloroacetonitrile		Chloroacetyl chloride	0.05 ppm
Hydrogen chloride	5 ppm	Chlorosulfonic acid		Crotonaldehyde	2.0 ppm
Hydrogen cyanide	10 ppm	Diketene		Cyanogen chloride	0.3 ppm
Hydrogen sulfide	20 ppm	1,2-Dimethylhydrazine	0.06 ppm	Dimethyl sulfate	0.1 ppm
Nitric acid, fuming	2 ppm	Ethylene dibromide	0.045 ppm	Diphenylmethane-4,4-diisocyanate	
Phosgene	0.1 ppm	Hydrogen selenide	0.05 ppm	Ethyl chloroformate	
Phosphorous trichloride	0.5 ppm	Methane-sulfonyl chloride		Ethyl chlorothioformate	
Sulfur dioxide	5.0 ppm	Methyl bromide	20 ppm	Ethyl phosphonothioic dichloride	

[17] However, it does not have exposure limit data for all chemicals, even some considered to be highly toxic. Additional data on exposure limits can be obtained from a variety of sources including Material Safety Data Sheets (MSDSs). The threat these chemicals pose should be evaluated on both their toxicity and pervasiveness.

Table 4 (cont.)

Sulfuric acid	1 mg/m^3	Methyl chlorformate		Ethyl phosphonic dichloride	
Tungsten hexafluoride		Methyl chlorosilane		Ethyleneimine	C
		Methyl hydrazine	0.04 ppm	Hexachlorocyclopentadiene	
		Methyl isocyanate	0.02 ppm	Hydrogen iodine	
		Methyl mercapatan	0.5 ppm	Iron petacarbonyl	0.1 ppm
		Nitrogen dioxide	1.0 ppm	Isobutyl chloroformate	
		Phosphine	0.3 ppm	Isoproply chloroformate	
		Phosphorous oxychloride	0.1 ppm	Isopropyl isocyanate	
		Phosphorous pentafluoride		n-Butyl chlorformate	
		Selenium hexafluoride	0.05 ppm	n-Butyl isocyanate	
		Silicone tetraflouride		Nitric oxide	25 ppm
		Stibine	0.1 ppm	n-Propyl chloroformate	
		Phosphine	0.3 ppm	Isoproply chloroformate	
		Phosphorous oxychloride	0.1 ppm	Isopropyl isocyanate	
		Phosphorous pentafluoride		n-Butyl chlorformate	
		Selenium hexafluoride	0.05 ppm	n-Butyl isocyanate	
		Silicone tetraflouride		Nitric oxide	
		Stibine	0.1 ppm	n-Propyl chloroformate	
		Sulfur trixoxide		Parathion	0.05
		Sulfuryl chloride		Perchloromethyl mercaptan	
		Sulfuryl fluoride	5.0 ppm	Sec-Butyl chloroformate	
		Tellurium hexafluoride	0.02 ppm	Tert-Butyl isocyanate	
		n-Octyl mercaptan		Tetraethyl lead	0.075 ppm
		Titanium tetrachloride		Tetraethyl pyrophosphate	
		Trichloroacetyl chloride		Tetramethyl lead	0.075 ppm
		Trifluoroacetyl chloride		Toluene 2,4-diisocyanate	0.02 ppm
				Toluene 2,6-diisocyanate	

Hazardous chemicals, which could potentially be used for CT, are produced in large quantities; as an example, Table 5 shows the figures for U.S. production for some common chemicals. Some of these chemicals are readily available in many countries: chlorine gas is found in thousands of chemical plants and water treatment facilities; phosgene gas is used in chemical plants and is a critical part of urethane foam; hundreds of tons of anhydrous ammonia are used for agriculture, refrigeration and chemical plants.

Table 5: US production and exposure limits for some commonly used chemicals, derived from "The Rail Transportation of Chemicals" Volume No. 5, Association of American Railroad, February 2001

Chemical	Use	Thousands tons	Exposure limit
Sulfuric Acid	Refinery catalyst, numerous chemical processes	45,113	1 mg/m3
Ammonia	Fertilizer, refrigerant	18,959	25 ppm
Chlorine	All kinds of chemicals	13,284	1 ppm
Formaldehyde	Polymers	4,425	0.75 ppm
Ethylene Oxide	Polymers	4,275	1 ppm

These chemicals are not only synthesized near cities, but they enter ports in enormous tonnages, travelling publicly accessible railroads and highways until they reach their final destinations. According to figures compiled by the American Chemistry Council (ACC) in 1999 over 765 million tons of chemicals and related products were shipped by various transportation modes in the US, including: 415 million tons shipped by truck, 164 million tons shipped on waterways, and 34 million tons shipped by pipeline (Figures 5 and 6). Further, the U.S. Department of Transportation requires that all rail and trucking containers carrying hazardous substances be clearly marked with distinctive placards and

numerical codes. These placards are intended to protect First Responders at accident scenes by providing guidance on appropriate PPE and emergency response. (US DOT, 2004) These markings and codes equally serve as guides to potential terrorists looking for chemicals to use as weapons.

Figure 5*:* 2000 US Chemical Tanker Tonnage (U.S. DEPARTMENT OF TRANSPORTATION, Office of Statistical and Economic Analysis "Vessel Calls at US Ports 2000," January 2002 www.marad.dot.gov/marad_statistics)

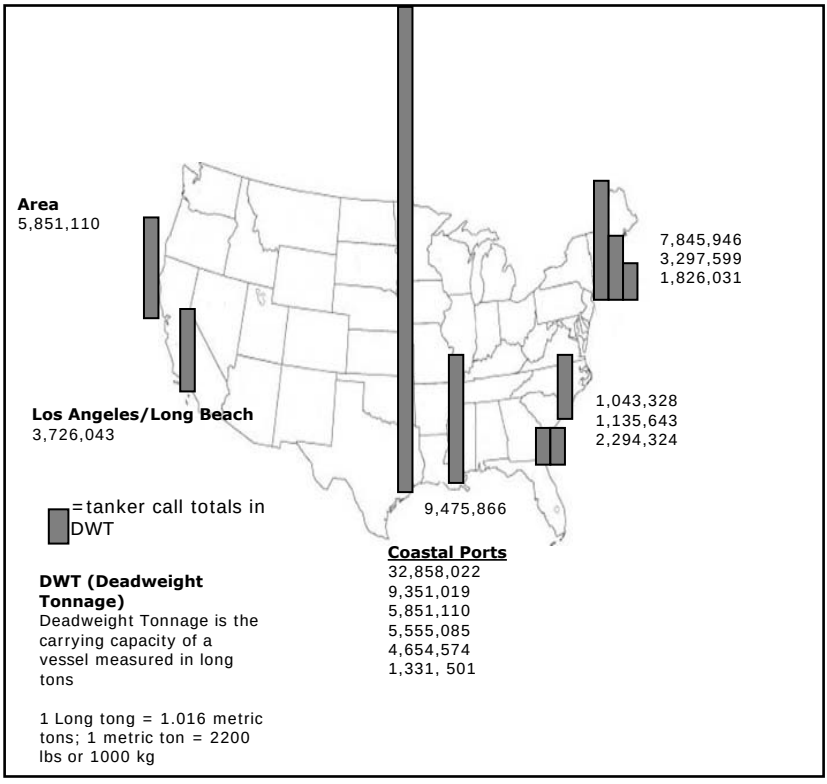
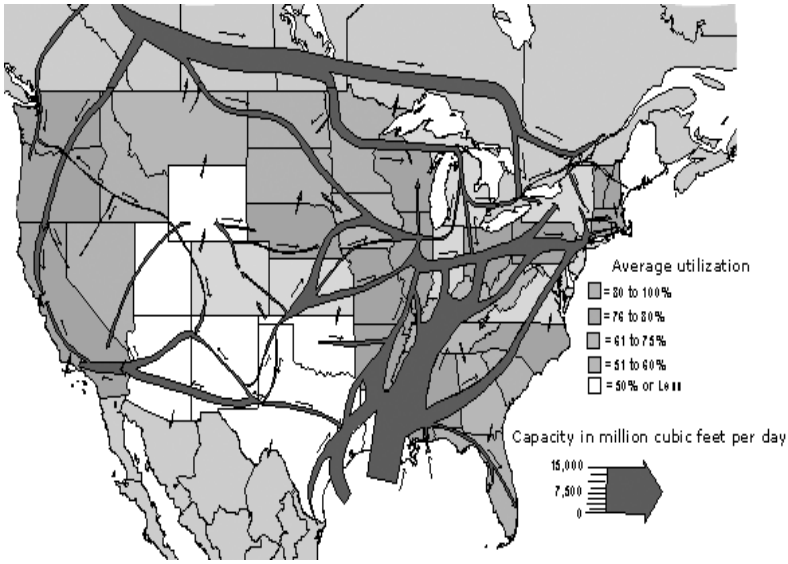


Figure 6: Pipelines bringing bulk chemicals and flammable/explosive gases to and through US cities (ENERGY INFORMATION ADMINISTRATION, US DEPARTMENT OF ENERGY)

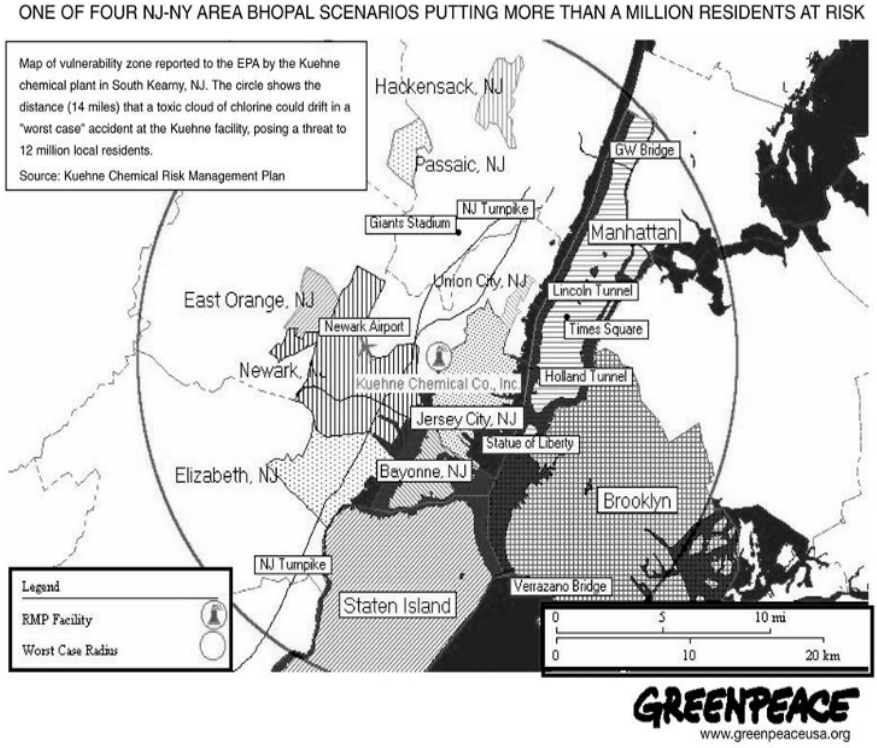


Each day, liquids and gases used in U.S. manufacturing course through 2.1 million miles of pipelines. Approximately 800,000 to 1.2 million loads of hazardous materials are transported around the country across more than 200,000 miles of track, highways and inland waterways.

Freight trains carrying deadly chlorine and other toxic chemicals continue to pass within four blocks of the U.S. Capitol every day. In case of a terrorist attack, the release of a toxic chlorine gas cloud from just one tank car over a crowded National Mall could kill or injure 100,000 people in 30 minutes (ENERGY INFORMATION ADMINISTRATION, US DEPARTMENT OF ENERGY). [18] Figure 7 shows a hypothetical scenario First Responders could be facing in the New York-New Jersey area in case of such a chemical attack.

[18] A derailment of anhydrous ammonia rail cars in Minot, ND, USA on January 19, 2002 resulted in just one death because it happened on the outskirts of town. Yet hundreds of people were permanently disabled by this accident.

Figure 7*:* Worst-case scenarios of chemical kill zones predict the possibility of Bhopal like consequences in the United States (http://www.greenpeaceusa.org/bin/view.fpl/8154/article/1097.html)



Chapter 3

CURRENT DETECTION CAPABILITIES AND THEIR LIMITATIONS

In a terrorist chemical attack, First Responders cannot rely on their senses for decision- making. Without adequate detection techniques First Responders are unable to properly respond to the level of threat and are apt to over- or under-respond. Over-responding can be just as dangerous to the community as under-responding because panic is as effective a killer as explosives, bombs or chemicals. Furthermore, the community echoes how First Responders react to a situation. If First Responders are perceived to overreact, then so will the community. Over- responding can also be dangerous to the First Responders. For example, protecting First Responders in encapsulating Level A-HazMat suits might provide the best and most complete protection if chemicals are present. However, if chemicals are not present or are present only in small quantities, wearing a Level A suit nevertheless can subject First Responders needlessly to significant heat stress. The number one injury to HazMat responders in the U.S. is not exposure to toxic chemicals but heat stress related injuries. Obviously, under-responding to a scene where the exposure to a chemical is at level exceeding approved exposure limits is likely to pose a lethal risk to First Responders.

For many HazMat trainers "Risk Based Response" is an important fundamental. In a risk based response, they respond at the lowest level necessary to prevent undue risk to themselves while protecting the public. However, First Responders can only properly execute upon risk based response if they understand the risks and this requires the use of detection tools to detect the presence, or absence, of environments representing a health hazard.

The following section provides an overview of radiation and chemical detectors and their limitations. Portable biological detector technology of comparable specificity and with field capabilities is currently unavailable for First Responders.

3.1 Radiation detection: the challenge due to alpha emitters

Management of counteraction to probable terrorist attacks with radioactive materials necessitates, among other things, the use of special

F. Steinhäusler and F. Edwards (eds.), NATO and Terrorism, 33–47.

radiation detection equipment. At present First Responders are equipped with gamma detectors at best (many First Responders do not routinely deploy radiation detectors at the scene of an emergency). However, in view of the high radiotoxicity of alpha radiation emitters, First Responders should also be outfitted with radiation detection devices which enable them to detect the presence of dispersed alpha-emitting particles. Although alpha emitters are not immediately life threatening, they represent hazardous materials in the long-term because of their carcinogenic potential. In case of alpha-emitting aerosols large segments of the civilian population can be exposed to such carcinogens in the aftermath of a terror attack. Such airborne radioactive materials can be deployed by terrorists either directly (e.g., by covertly generating and dispersing alpha emitting aerosols in a ventilation system), or in combination with conventional explosives. Due to the short range of alpha particles in air, until now the measurement of alpha contamination in the environment has required laboratory-level detection equipment and procedures.

Recently a novel portable device has been developed for assessment of the contamination of various surfaces and media due to alpha-emitters. It uses an atmospheric ion topometry method and works also in the presence of beta- and gamma-radiation under actual atmospheric conditions in a real time mode. This device provides reliable detection of alpha particles at a distance (as measured form the radiation source) significantly longer than the alpha-particle range in air. Alpha-particle detection is carried out through the registration of atmospheric ions generated along particle tracks. The atmospheric ions are transferred from the particle tracks into the detector operative chamber by air flux or electric field. Alpha particles are registered by gas discharges using a wire counter open in the pathway of the air flux.

This detector operates in an event count-mode, which has certain advantages over ion current measurement. It could be shown that only ions generated by alpha particles (excluding pulses from electron tracks) were measured by this device. Most currently existing alpha detection methods involve either laboratory analysis of field samples or the use of devices suitable for direct detection of alpha-particles which in turn implies direct contact with contaminated surfaces. These methods are unsuitable for the complete and rapid examination of a territory or an object, since they are too labor intensive. Besides, they have certain limitations associated with the type of surfaces that can be examined in such a manner. Atmospheric air contains both neutral atoms and

molecules. Ions are generated as the result of atmospheric ionization. In lower atmospheric layers this ionization is mainly due to natural radiation of radioactive substances and, to a lesser degree, to cosmic radiation. Equilibrium ion concentration is determined by the rate of ion generation in the air and the decrease in the number of ions due to recombination. Natural radioactivity from sources such as soil, rocks, and cosmic radiation is the determining factor for atmospheric ion concentration at a given location. Local deviations from typical worldwide averages are suggestive of an elevated ionization source, such as would occur at an emergency situation. Therefore the measurement of local deviations of the atmospheric ion concentration can serve as a radiation screening method.

A more accurate approach involves registration of ionization clusters along charged particle tracks. Distribution of ionization density is generally determined by ionization source and may be indicative of the origin of the ions. This principle underlies the alpha-radiation distant detection method deployed in this device. The lifetime T_i of light negative air-ions is determined by recombination with light positive ions as well as by atmospheric aerosol content. Under normal conditions T_i values are within 10-1000 s, which is sufficient for ion collection and detection. This new device uses gas-discharge detection of ions. Gas-discharge detection on a wire detector in non-uniform electric field processes offers important advantage:

- It enables the differentiation between particles with different ionization density in the ion clusters;
- It permits the separation of ionization effects from alpha–particles from background radiation of associated beta and gamma–radiation whereas detection efficiency depends on ionization density;
- As the ionization density on the alpha tracks substantially exceeds the density on the tracks of electrons, it possible to reject the background radiation by selecting the appropriate voltage for the counter.

Thereby, it is possible to detect with sufficient efficiency localized sources of alpha-radioactivity at a distance to some tens of centimeters. The device uses a specially designed airflow and ultrasonic for eliminating the influence of dust sedimentation. The inside of the counter is shown in Fig. 8. Output signals from the amplifier connected to the ion counter are presented at Fig. 9. Two groups of short discharge pulses can

be discriminated which are created by ion clusters. Also the possibility was investigated of transferring ions into the working volume of detector from the target object, using a special of airflow ("shaper"). This airflow is created with the aid of a fan and an aerodynamic lattice, controlling the characteristics of the flow. The air stream is directed onto the surface to be investigated. The part of the flow reflected, which contains ions from the tracks of alpha particles, enters back into the shaper, where the ions are extracted from the flow by the dispersed field of the detector and enter the working volume. The results of measurements, varying different parameters of air jet, are given at Fig. 10. It is evident that with a change in the distance from 5 to 65 cm the recording efficiency drops from 90% to 30%. Optimally the dimension of the area to be examined should be ~¼ m^2. The detection unit for investigating a surface polluted by a radioactive substance is presented in Fig. 11.

The device provides an air flow, scanning the surface of any profile, thereby ensuring a continuous transport of air ions into the detection chamber. In this manner the device can be used to serve as a real-time monitor for First Responders after a terrorist attack involving alpha-radioactive aerosol, e.g., Pu or U.

Figure 8: Cross section of the ion counter

Figure 9: Pulses of ion clusters due to two alpha particle tracks registered in the ion counter operative (Y-axis: 500 mV/div, X-axis: 10 ms/div).

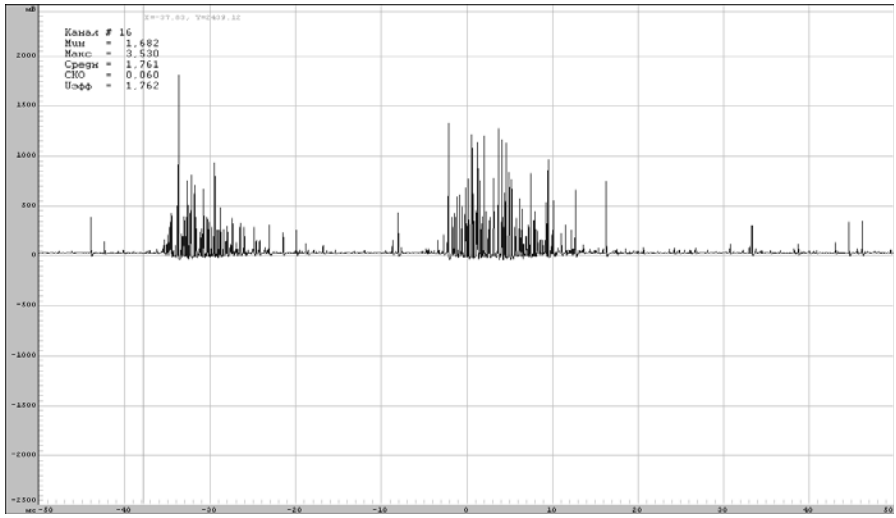


Figure 10: Dependence of the recording efficiency of negative ions clusters from the tracks of alpha particles at a given distance between input window of detector and investigated surface during the ion transport with the aid of air flow (power consumption of fan: 20 W; inspected surface area: 0,25 m^2 number of counts from the alpha source: 300 s^{-1}.; measurement time: 10 *s*).

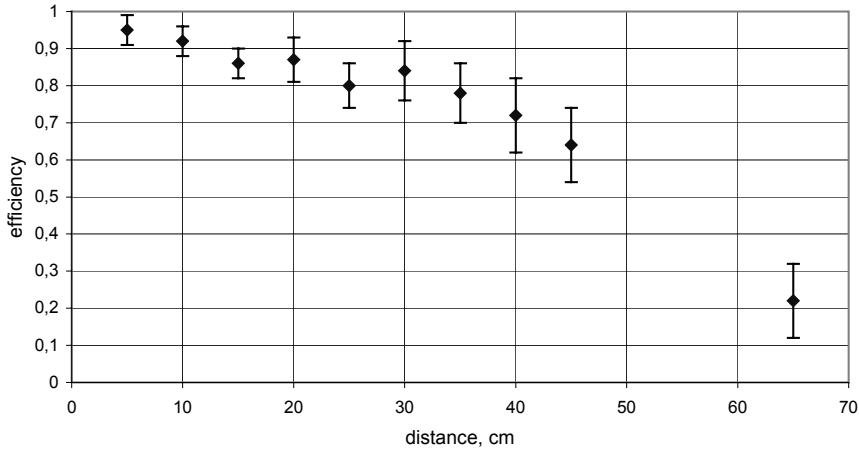
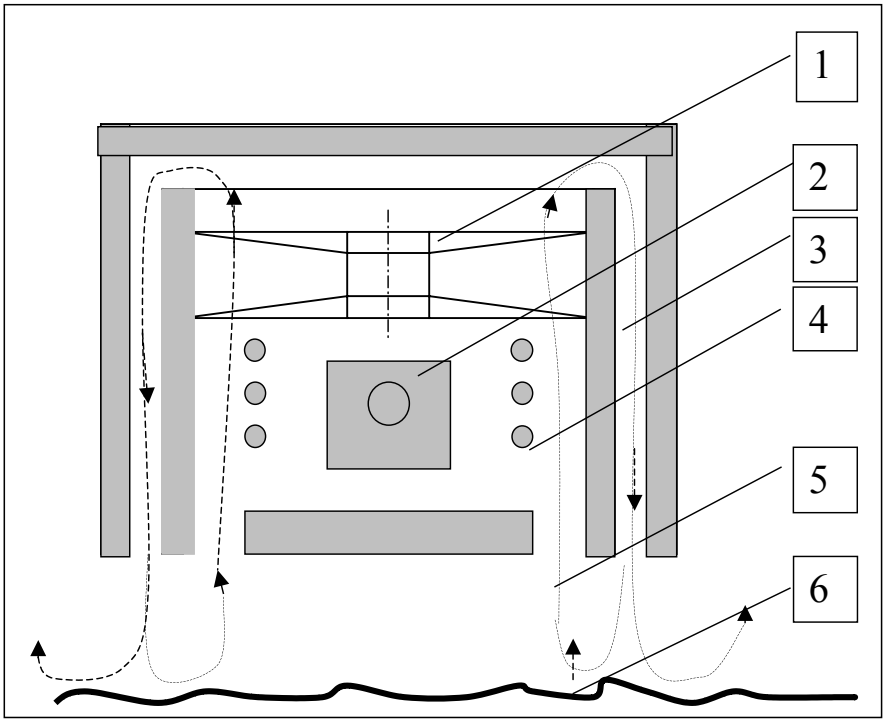


Figure 11: Schematic diagram of the detector unit: 1 - fan, 2 - ion counter, 3 – ring gap of the flow shaper, 4 - deflecting electrodes, 5 - air flow, 6 – surface under investigation.



For further information on the basic principles underline the detector and its application see refs. MIROSHNICHENKO, 1999a, MIROSHNICHENKO, 1999b and MIROSHNICHENKO, 1989.

3.2 Chemical detection: Assessment of the hardware capability

WMD programs initially only focused on military chemical weapons (CWA). While "nerve gas" is generally viewed as a lethal threat, frequently the threat represented by TICs tend to be underestimated by members of the public and political decision makers. In order to ensure adequate capabilities for First Responders, an integrated WMD response to chemical threats must encompass both CWA and a broad range of TIC detection capabilities. The U.S. Army in "A Curious Void – Army Doctrine and Toxic Industrial Materials in the Urban Battlespace (LEE, 2000)" recognizes TICs as a major new threat. As a result, the U.S. military has fielded TIC detection technologies in Afghanistan and Iraq because CWA detectors tend to be too specific and will miss the detection of most TICs.

Since the terror attacks on September 11, 2001, the rules have changed for First Responders and with it the need for emergency response units to make far-reaching decisions, for example: were TICs to be used against our communities by terrorists, at what point would the on-scene commander recognize that it's terrorism rather than a HazMat incident? The tools used to respond are the same whether it's a HazMat or a WMD event. Just two words separate a terrorist chemical attack from a HazMat incident. If the *intent* is to create *fear,* it is a terrorist incident, irrespective of the chemical utilized. In addition "A Curious Void" recognizes a major change in how war is conducted: Increasingly modern warfare is conducted in complex urban environments where the hazards of TICs and confined spaces, well known to local fire fighters and industry, are quickly becoming a military concern.

If terrorist chemical attacks are an extension of "normal" HazMat response, then "normal" gas monitoring techniques have a place in WMD response and are just as important as specialized CWA detection techniques. At present industry and HazMat responders use the following techniques to protect themselves and their communities from TICs:

- Oxygen Sensors
- Combustible gas sensors
- Electrochemical toxic gas sensors
- Colorimetric tubes

- Sampling with laboratory Gas Chromatographs or Mass Spectrometers (GC/MS)
- Continuous monitoring with broadband Photo ionization detectors

3.2.1 Oxygen sensors

Lack of oxygen is more acutely fatal than even the most toxic gases and vapours. Normal air contains about 20.9% oxygen, 78% nitrogen and 1.1% other gases. Breathing air containing less than 6% oxygen can lead to death within minutes (Table 6).

Table 6: The effect of varying oxygen concentrations on humans:

O_2 [%]	Effect:
20.9	Oxygen Content in fresh air
19.5-12	Impaired judgment, increased pulse and respiration. Fatigue and loss of coordination.
12-10	Disturbed respiration, poor circulation, worsening fatigue and loss of critical faculties. Symptoms within seconds to minutes
10-6	Nausea, vomiting, inability to move, loss of consciousness and death.
6-0	Convulsions, gasping respiration, cessation of breathing, cardiac arrest, symptoms immediate, death within minutes

There are any numbers of causes for oxygen deficiency, including displacement or combustion. If a carbon dioxide tank truck discharged its load into a subway vent, this would displace the oxygen in the subway, leading to the death of those in the immediate vicinity. If terrorists were to cause a major explosion and fire in a subway, the oxygen could be consumed quickly by the conflagration, resulting in additional deaths due to oxygen deficiency.

Oxygen sensors read in % oxygen and can provide a gross indication of the presence of other chemicals. 20.9% oxygen is 209,000 ppm (part per million) of oxygen. So a decrease in oxygen concentration from 20.9% to 20.8% would be indicative that some other gas or vapour has displaced the oxygen in the air. Oxygen sensors provide continuous readings and are a proven technology that is specific to oxygen. Oxygen sensors are required anytime a measurement of combustibility is made because the

accuracy of most combustible gas sensors is dependant upon adequate (more that 10%) oxygen. Oxygen sensors are packaged alone or with other sensors. The most popular style of multi-sensor product in the US is a 4-gas instrument containing sensors for oxygen, combustible gas (LEL sensor) and two toxic gases (typically carbon monoxide and hydrogen sulfide).

3.2.2 Combustible gas sensors

Terrorists have demonstrated that explosives are their weapon of choice, yet they need not rely on conventional explosives, like C4 or ANFO. Many chemicals are highly flammable and/or explosive and are readily available in bulk. An indication of the devastating effect due to such conventional explosions was the damage, which resulted from the train explosion in Ryongchon, North Korea, on April 21, 2004, originally suspected to be associated with a nuclear test.

A combustible gas or liquid will burn in the presence of a source of ignition when its concentration is between its Lower Explosive Limit (LEL) and its Upper Explosive Limit (UEL). Typically, a combustible gas sensor reads between 0-100% of LEL, where at a reading of 0% LEL there is no flammable threat present and at a reading of 100% an environment only needs an ignition source to be flammable. Usually alarm setpoints of 10% and 20% of LEL are used (Table 7). Confined spaces are not to be entered over 10% of LEL and 20% of LEL is used as a setpoint for other areas. Many chemicals are toxic well below their flammability thresholds, i.e. toxicity typically cannot be measured with an LEL sensor.

Table 7: The Lower (LEL) and Upper Explosive Limits (UEL) compared with Exposure Limits of some common flammable gases

Chemical	**NIJ Threat[1]**	**LEL**	**UEL**	**Exposure Limit[2]**
Methane	None	5 %	15 %	non-toxic
Propane	None	2.2 %	9.5 %	1000 ppm
Ammonia	High	16 %	25 %	25 ppm
Carbon monoxide	Medium	12.5 %	74 %	50 ppm
Ethylene oxide	High	3 %	100 %	1 ppm
Hydrogen sulfide	High	4.3 %	46 %	10 ppm

Combustible gas sensors provide continuous readings and are a proven technology to detect potentially flammable environments. However, they measure "Explosivity" not "Toxicity" and therefore are not sensitive enough for making toxicity decisions. These sensors are typically packaged in gas detection instruments either alone, or with oxygen and toxic gas sensors.

3.2.3 Electrochemical toxic gas sensors

The "workhorse" for chemical facilities utilizing a particular chemical, these small cells are designed to be specific to a particular gas or class of gases, using a specific chemical reaction and filters to attain some degree of specificity. Typically these sensors read in parts per million (ppm) and their range typically encompasses the normal level of toxicity with no more than 10x of over-range scale. CO, H_2S, SO_2, NO, NO_2, Cl_2, HCN, NH_3, PH_3 and other sensors are available.
These sensors are typically packaged in one to 5 sensor-instruments that can provide multiple toxic gas readings at the same time. These products provide continuous readings and are a proven, specific technology. Some of the less common sensors can be expensive to purchase and have typical operational lives of about 1 year. Exotic calibration gases can also be expensive and costs range from US $300 to US$ 500.

3.2.4 Colorimetric tubes

One of the earliest ways to detect toxic gases and vapors in air, colorimetric tubes still play a major role. A colorimetric tube is a glass tube filled with an inert substrate and coated with a reagent that will produce a color change when exposed to the chemical of interest. The tube is factory calibrated and this calibration scale is printed on the side of the tube. Tubes are relatively stable and have a shelf-life of 1-3 years. To make a measurement, a user draws a predetermined sample through the tube using a device supplied by the tube manufacturer. After the required sample passes through the tube, it is read much like one reads the scale of a glass thermometer. Tubes can only be used for one reading each.
Tubes are a proven technology whose roots reach back to the early 20^{th} century. At $25-70 per a box of 10 samples, they are relative inexpensive. Since they are factory calibrated, expensive, perishable calibration gas is not required. However, colorimetric tubes are relatively slow to respond and they only provide a "snapshot" of the environment. The "spot check" nature of tubes also makes them more prone to sample error. Continuous

monitors, sampling at 100-500 cm^3/min, are less likely to provide erroneous results due to a false high or low reading, caused by small sample volume, air currents or bad sampling technique in general.

3.2.5 Choosing between electrochemical sensors and tubes

While it may seem that the best way to measure toxic gases it to always use specific electrochemical sensors, tubes have their proper place and responders should carefully consider which technology to use. In many circumstances it is appropriate to carry both. Electrochemical sensors range in price from $125-$500. Calibration gases range in price from $50-$300+ for these sensors and have shelf-lives of 6-24 months, depending on the type of gas. Given these parameters, electrochemical toxic gas sensors should be considered for use if the chemical threat is always present and real. For example, if a water treatment plant has significant quantities of chlorine on-site in a given jurisdiction, then consideration should be given to the purchase of a chlorine sensor. But if there is only the occasional threat that chlorine tanks might travel through an urban environment, then all that may be needed is a box of chlorine colorimetric tubes. Even if one chooses to use electrochemical sensor, tubes provide an excellent alternative verification technique in cases where the readings of the electrochemical sensor are suspect.

3.2.6 Gas Chromatography/Mass Spectrometry (GC/MS)

GC/MS technology has long been considered the “gold standard” of gas detection because of its accuracy and specificity. In industrial chemical plants, Industrial Hygienists collect sample using absorbent tubes or evacuated canisters. These samples can be taken on a First Responder or from the area in which the First Responder work. Once collected, a sample is then taken to a lab where it is desorbed into the GC/MS. The gas chromatograph separates the sample into its constituents and the mass spectroscopy identifies the separated constituents. In this traditional role, GS/MS results take hours, days or even weeks to get back to the field. Portable GC/MS bring this capability to the field with backpack-sized units that produce results in 12-30 minutes. Like colorimetric tubes they only provide a “snapshot” of the environment and are largely used to analyze samples found using broadband sensors like a PID. GC/MS are heavy, bulky and expensive, costing in the range of $60K-$100K. In addition, they are not user-friendly and require intensive training.

3.2.7 Photo-ionization Detectors (PIDs)

A photo-ionization detector measures volatile organic chemicals (VOC) and other toxic gases in low concentrations from ppb (parts per billion) up to 10,000 ppm (parts per million) or 1% by volume). A PID uses an ultraviolet (UV) light source to break down chemicals to positive and negative ions that can easily be counted with a detector. The detector measures the amount of ions and converts the signal into current. The current is then amplified and displayed on the meter as "ppm." PIDs can be stand-alone handheld devices or can be integrated into handheld multi-sensor instruments.

The largest group of compounds, measured by a PID, are the organics, i.e. compounds containing carbon (C) atoms. These include:

- **Aromatics** - compounds containing a benzene ring including: benzene, toluene, ethyl benzene and xylene;
- **Ketones & Aldehydes** - compounds with a C=O bond including: acetone, methyl ethyl ketone (MEK) and acetaldehyde;
- **Amines & Amides** - Carbon compounds containing nitrogen, like diethylamine;
- **Chlorinated hydrocarbons -** trichloroethylene (TCE), perchloroethylene (PERC);
- **Sulfur compounds –** mercaptans, sulfides;
- **Unsaturated hydrocarbons** – like butadiene and isobutylene;
- **Alcohol's-** like isopropanol (IPA) and ethanol;
- **Saturated hydrocarbons -** like butane and octane.

In addition to organic compounds, PIDs can be used to measure some inorganics. These are compounds without carbon and include:

- Ammonia
- Semiconductor gases: Arsine, Phosphine
- Hydrogen sulfide
- Nitric Oxide
- Bromine and Iodine

A PID is a very sensitive monitor that can accurately measure gases and vapors in low ppm or even ppb levels. However, the PID is not a selective monitor, having little ability to differentiate between chemicals.

When approaching an unknown chemical release, the PID is set to its calibration gas of isobutylene. Once the chemical is identified by means of placard, manifest, waybill or other means, the PID sensitivity can be adjusted to that chemical so that it reads in an accurate scale. For example, if we calibrate on isobutylene and happen to measure a toluene leak of 1 ppm, the PID will display 2 ppm because it is twice as sensitive to toluene as it is to isobutylene. Once we have identified the leak as toluene, then the PID scale can be set to a toluene Correction Factor and the PID will accurately read 1 ppm, if exposed to 1 ppm of toluene.

PIDs provide protection from the chemicals not detected by other specific technologies like electrochemical toxic sensors, colorimetric tubes and CWA detectors. Alarm thresholds and concentrations trends help to define this safety net which can vary, based upon the perceived threat. Nobody can predict every chemical threat and the PID provides a "Safety Net" for unexpected asymmetrical chemical threats. The PID safety net can be supplemented by electrochemical sensors, selected for specific industrial threats. Water treatment plants or chemical plants using chlorine call for electrochemical sensors, while plating facilities call for hydrogen cyanide sensors. There is not a single detection technique that does it all. Responders must integrate the responses of multiple detection techniques to provide complete detection protection.

3.2.8 Strategies for integrating chemical detection techniques in WMD response

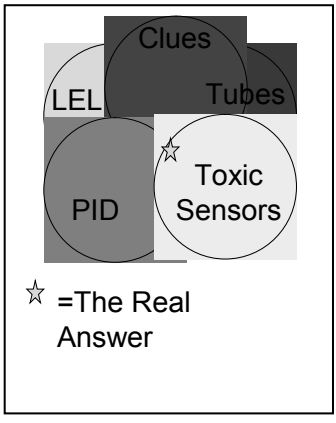


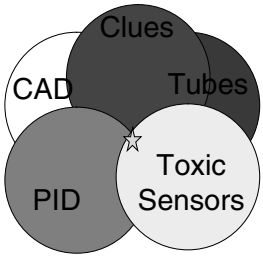
Figure 12: Gas detection circle diagram

Like police detectives, gas detectives in WMD response must assemble their "case" using a variety of methods until they have assembled a "preponderance" of evidence from which they can make

a conclusion. One way to visualize this is using gas detection circle diagrams (Fig. 12). Each circle represents the range of chemicals seen by a sensor. By overlaying multiple detection techniques one can zoom in on the solution, i.e. by using multiple techniques the optimum solution can be derived. Colored circles in the following examples indicate a positive response for that technology. In the following the detection circle method is used to diagram the measurement of some TICs with a high hazard from the NIJ list.

Ammonia

Figure 13: Gas detection circle diagram applied to a leak of anhydrous ammonia

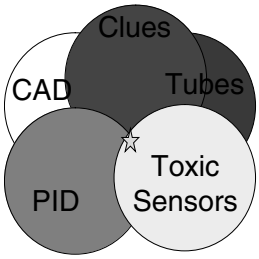


Refrigerant & Fertilizer, TWA= 25 ppm

In 1999 the US produced 18,959 thousand tons of anhydrous ammonia (NH_3) used for fertilizer, refrigeration and uncounted chemical processes. It has an exposure limit of 25 ppm. When released into the environment it forms a white gas cloud with a characteristic ammonia odor. Ammonia electrochemical toxic gas sensors respond readily to ammonia up to their saturation point of 200-300 ppm. Chemical agent detectors (CADs) of the popular Ion Mobility Spectroscopy (IMS) or Surface Acoustical Wave (SAW) types don't respond to ammonia. PIDs provide a strong reading particularly at high concentrations when electrochemical ammonia sensors burn out. Ammonia specific colorimetric tubes are available in a wide array of ranges from low levels to high. Using the detection circles one can see what detection technologies will help to assemble the clues necessary to make a decision in an anhydrous ammonia leak. The area where they all overlap is the answer to the detection question. In this case, they all overlap, thereby indicating the presence of ammonia.

Chlorine gas

Figure 14: Gas detection circle diagram applied to a leak of chlorine gas



Chemical Plants & Water Purification, Ceiling = 1 ppm

In 1999 the US produced 13,284 thousand tons of chlorine (Cl_2) used in numerous chemical processes. Chlorine has an exposure limit of 1 ppm. When released into the environment it produces a greenish/yellowish cloud with pungent odor. Chlorine electrochemical toxic gas sensors respond readily. CADs of the IMS and SAW type don't provide a response unless they are supplemented with an electrochemical sensor. PIDs using 11.7eV lamps provide a strong response to chlorine. Chlorine specific colorimetric tubes are available in a wide array of ranges from low levels to high. Using the same method as above one can see that the circles of detection overlap. The area where they all overlap is the answer to the detection question. In this case they all overlap indicating the presence of chlorine.

Chapter 4

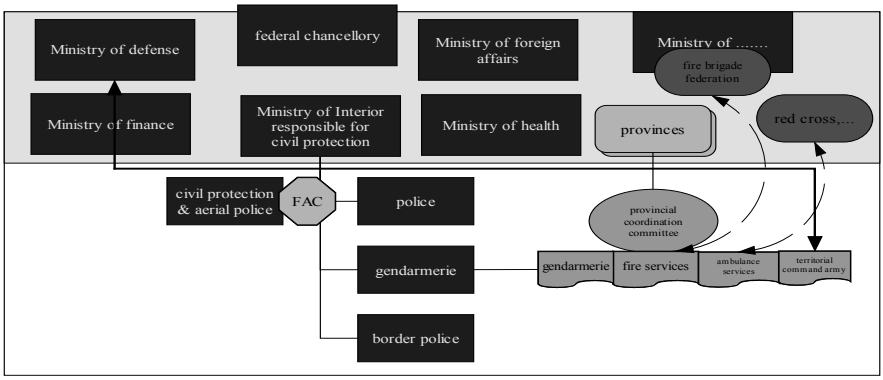
CURRENT CAPABILITIES OF FIRST RESPONDERS IN DIFFERENT COUNTRIES

4.1 Austria

4.1.1 Operational logistics

The organizational structure for the response to a catastrophic terror attack in Austria is shown in Fig. 15. The overall responsibility for civil protection and security rests with the Austrian Ministry of Interior (MoI). However, the MoI can exercise its authority only trough law enforcement operatives, i.e. for all other topic areas the MoI has to rely on the support of other organizations and institutions.

Figure 15: Organization of contingency planning in Austria



Security is mandated to the MoI, whilst disaster response is considered the responsibility of each of the nine Provinces. It is important to emphasize that in any case, the backbone of such a response (fire fighters, paramedics) as well as specialized services (e.g., mountain rescue services) are based on voluntary services. These relief organizations have a nation-wide infrastructure, using a variety of specialized bases. For example, fire fighters have a dedicated Hazmat base in each political district. At distinct locations, such as important road tunnels, specially tailored units are strategically positioned. This stationary infrastructure is reinforced by specialized mobile units.

F. Steinhäusler and F. Edwards (eds.), NATO and Terrorism, 48–81.

As an example, the following information illustrates the extensive volunteer-based infrastructure available as of January 2000:

- *Fire fighters:* there were a total of 4 874 fire brigades with altogether 312 897 fire fighters, of which 281 912 fire fighters and 18 600 cadets (age: 10 to 16 years) were unpaid volunteers;
- *Paramedics:* approximately 45 000 volunteers and 5 000 employees were stationed at 956 municipal bases, respectively 142 district bases. They were supported by additional mobile units, such as nuclear-biological-chemical rescue teams.

These resources are concentrated in large urban areas (event- and shopping malls, high profile society events[19] and targets of high strategic value (Alpine tunnels, rail/road bridges), which could be subject to a catastrophic terror attack.

4.1.2 National constraints

Major constraints result from the limited financial means available. This prevents the nation-wide distribution of specialized equipment, lack of adequate equipment for the detection of WMD-related contamination, insufficient means of transport and communication, as well as unavailability of permanent (L 4) isolation facilities.

At present, each organization of the Austrian First Responder community carries out its own, independent training programme. However, there is increased emphasis on cooperation with regard to the training of specialized units. An unresolved issue is the fact that the current recruitment system of full time professionals and volunteers makes it practically impossible to train all responders to the same required level of technical and practical expertise; for example, experience from the Red Cross illustrates that manning *one* expert First Responder position requires typically *ten* persons from a volunteer organization.
Special attention is paid to ensuring the operational capability of hospitals, since it is difficult to replace them. They are particularly vulnerable to secondary contamination by victims delivered from an act of terror involving radioactive, biological or chemical materials. Also there is a

[19] For example, the *Danube-Island Festival* (Vienna) is the biggest open-air event in Europe, attracting 2.5 Mio spectators over a period of 3 days.

lack of adequate treatment capacity: at present even in the capital Vienna there are only three hospitals, which are equipped to treat such contaminated patients.

In order to ensure logistical support for the Austrian First Responder community in case its own infrastructure has been significantly damaged, the Austrian authorities have established alternative lines of logistical support, such as:

- Since the transport infrastructure itself represents a potential target of terrorism, the Austrian authorities have ensured that the First Responder community has access to alternative transport choices, e.g., special equipment may be flown to the scene using aircraft from the Austrian Armed Forces or the MoI;
- Scientists and laboratory technicians, working in various national and industrial research establishments and capable of providing logistical support, were identified and a centralized database was established, e.g., for supporting the First Responder community with added laboratory and analytical capabilities in case of an anthrax attack;Communication among members of the First Responder community can be strengthened by using prioritised cellular phones, provided upon demand by the Austrian Telecom company, or the deployment of mobile bases.[20]

4.2 Israel

4.2.1 Security threats

Israel has been targeted by primitive attempts of Palestinian terrorists to use chemical and biological agents since 1965 (MERARI, 2000). There is one incident that is repeatedly associated with them and is frequently mentioned in the literature: the 1978 poisoning of Israeli oranges in Europe by injection with liquid mercury (KARMON and SPRINZAK). These were followed by the 1979 effort by a local group of the Popular Front for the Liberation of Palestine in Gaza to contaminate Israeli oranges in Tel Aviv and the 1988 effort by pro-Palestinian groups in Italy to instill fear of grapefruit poisoning. However, the real aim of the

[20] An earlier attempt to establish a common communication system for all FR members had failed.

operation was ‘not to indiscriminately kill …[the] population, but to sabotage the Israeli economy,’ which suffered in this case some 40 million dollars damage. (KARMON and SPRINZAK) The perpetrators of this campaign were clearly aware of the psychological and political impact of the new chemical *modus operandi* on civilian population and sought to elicit fears of unconventional weapons.

In the second half of the 1980s more plans and attempts by secular Palestinian terrorist activists to stage such kind of attacks were reported or were foiled by the Israeli security services. This included discussion about poisoning the food of then cabinet minister Ariel Sharon by a Palestinian member of the PFLP-GC (Ahmad Jibril’s organization) working in a Tel Aviv restaurant (September 1985); a plan by PFLP-Abu al-Abbas faction activists to pour several glasses of Polidol (a chemical fertilizer usually sprayed in vineyards) into containers of drinking water placed on the roofs of Israeli houses or try and inject it into bread loaves at Israeli supermarkets (June 1986). In October 1986 a member of Fatah’s Force 17 is reported to have expressed an interest in poisoning ponds of fish nurseries near Haifa; several intelligence reports refer to a possible use of cyanide against the drinking water of Jewish settlements in the West Bank and a plan by Fatah – Revolutionary Command (the Abu Nidal) organization, which allegedly had successfully developed a liquid poison that cannot be detected in routine tests (July - August 1987) (KARMON and SPRINZAK).

According to a Channel Two Television report, Israeli and PLO Authority (PA) security forces foiled a planned Hamas terror attack involving a chemical attack in May 1999, on the eve of the Israeli national elections. A senior Hamas terrorist leader reportedly received instructions in the preparation of the chemical weaponry from supervisors aboard (MCGRORY, 2002).

The Palestinian interest in non-conventional weaponry soared after the September 11, 2001 terror attacks in the United States and the wave of anthrax letters, probably because terrorist groups saw these bombings as having ‘broken a taboo’ against mass-casualty terror attacks (MEMRI SPECIAL DISPATCH, 2001). Moreover, they were encouraged by the new campaign of violence opened by the Palestinian Authority in October 2000, the so-called ‘al-Aqsa intifada.’ The radical Islamist Hamas organization took the lead in the use of chemical agents in attacks against Israeli targets.

Israel's Health Ministry revealed that nails and bolts packed into explosives detonated by a Hamas suicide bomber on December 1, 2001 in a Jerusalem pedestrian mall had been dipped into rat poison. The Health Ministry revealed that the blasts have destroyed the poisons' potency and therefore no bomb victims had been harmed by the chemicals. The military wing of the Islamic militant group Hamas claimed that it had dealt a blow to Israeli morale by planting poisonous chemicals on the bombs its activists have detonated of late. On its Web site, Izzedine al-Qassam claimed its militants had a new weapon that had created a situation of fear in the Zionist security services.' The Hamas military wing cited Israeli media reports of public consternation at the prospect of Palestinian chemical warfare. It did not say what chemicals it might have (WEIZMAN, 2001). Israeli police spokesman reported that since 1994, traces of various toxic chemicals have been found in at least five Palestinian bomb attacks, like traces of pesticides. But he said it was unclear if they had been deliberately introduced to enhance the bombs' deadliness, or if the explosives used were transported in containers that had previously contained other substances. Police and others who work at bomb scenes have been issued protective overalls, but that the chemical threat was really a minor one. (WEIZMAN, 2001) It seems that in all some 13 such attacks have been reported.

Members of Hamas' military wing have been gathering information during 2002 with the goal of carrying out attacks using biological and chemical weapons. In one case, the orders for this effort came from a close associate of Salah Shehadeh, the Hamas 'military' leader. During the last months of 2002 more and more arrested Palestinians, mainly from Hamas, have admitted that their organization was interested in the idea of using non-conventional weapons and had begun to prepare for this possibility. Several reports mentioned the possibility that the organizations intended to use cyanide (TURNBULL and ABHAYARATNE, 2002). By the end of 2002, Hamas posted on its website a 'Poisons Handbook' (dated February 7, 1996). The eight-chapter ''Mujahideen Poisons Handbook' gave detailed instructions and diagrams in English for mass-producing what are described as deadly chemical gases and liquids. One recipe was for a poison purportedly based on nicotine and derived from tobacco boiled down in industrial alcohol. The identity of the manual's author, signed as Abdel-Aziz, could not be verified but it was strangely similar to manuals of the kind published by radical right-wing websites. Hamas official Ismail Haniyah claimed the group bore no responsibility for what contributors said on its site. The handbook was later removed from the website (WILLIAMS, 2003).

Several plans to use biological agents have come to light, including a Hamas plan to poison the food with dangerous medicines in a Jerusalem restaurant; an Islamic Jihad plan to poison the water supply of a Jerusalem hospital; and a plan by Nabil Okhel, an al-Qaeda operative, to poison the entire country's water supply (HAREL, 2003). Lately an attempt to send a suicide bomber with an AIDS disease meant to contaminate the injured persons was foiled by the Israeli Security Service.

It should be noted that Palestinian organizations tried to bomb the main Israeli gas storage area near Tel-Aviv, tried twice to use truck-bombs against the highest (Azriyeli) building in Tel-Aviv, and in a March 2004 suicide attack by a combined Hamas and Fatah team in the harbour of Asdod could have targeted a truck carrying the highly poisonous chemical bromine. Fortunately, these potentially extremely lethal attacks were foiled or succeeded only partially.

4.2.2 Integrated countermeasures

The best source for understanding Israel's management of the chemical, biological and radiological terrorism is Ariel Merari's comprehensive article, *Israel's Preparedness for High Consequence Terrorism*. Merari presents the picture correct to October 2000, just before the unleashing of the big wave of Palestinian violence and terrorism known under the name of 'al-Aqsa intifada,' and it is heavily cited in the next paragraphs.

Merari stresses that to manage a terrorist WMD attack Israel relied on its existing wartime civil defense system. It has not developed a separate system for managing WMD events caused by terrorists, as opposed to other states, because it evaluated that the worst terrorist attack would presumably still be less severe than a barrage of Iraqi or Syrian missiles carrying chemical or biological warheads.

A 1974 government decision charged the police with responsibility for handling terrorist incidents within Israel's borders. It also made the Israeli Defense Forces (IDF) responsible for managing incidents up to five kilometers from the borders, in the Negev Desert, which encompasses the southern half of the country (with the exception of cities and towns there), and in the Territories. The minister of defense, however, may declare a 'limited state of emergency,' thereby transferring comprehensive responsibility for managing an incident to the military. The declaration of a state of emergency allows military authorities to take actions to ensure public security and the uninterrupted supply of vital services. It allows the

military to force people to stay in bomb shelters, to obtain means of defense as determined by the military, and to shut down schools and other public services and workplaces. By law, the declaration must be made public through radio, television, and newspapers as soon as possible.

In *conventional terrorist incidents*, according to Merari, the police are capable, in principle, of assuming comprehensive responsibility. This is not the case, however, in unconventional incidents such WMD events. Until October 2000 the police were unable and unequipped to manage an unconventional incident. For instance, they were neither trained, nor equipped to detect and identify chemical substances. Therefore, the army's Home Front Command (HFC), formed in 1992 as a consequence of the lessons learned during the first Gulf War, was the only organization that could manage an unconventional incident and would be in charge in a case of this kind. However, as a result of the 9/11 attacks, the anthrax campaign in the US and the violent intifada which saw the first serious attempts to use chemical agents in suicide explosive attacks, the Israeli government decided by the end of 2001 that:

- Police will be responsible for the managing of chemical terrorist attacks,
- A joint team of the Ministry of Defense will manage terrorist biological attacks, and
- IDF specialized units will be responsible to deal with radiological attacks and more specifically with the decontamination work after such an attack.

The evaluation of the Israeli authorities at this stage is that a *radiological attack* has a very low probability in Israel, although a potential threat of an attack against an existing radiological department in a big hospital I considered within the realm of possibility.

The Israeli Police is responsible and is coordinating all the activities related to a *chemical attack*, either one resulting from a combined explosive-chemical attack or a covert chemical one. The local or regional police units are the first ones to arrive at the scene of a terrorist event, but they are not equipped with the necessary devices for detection of chemical agents. This task is performed by the Special Police Unit, YAMAM, Israel's elite civilian hostage rescue and CT unit. The unit belongs to the Israeli Border Guard (MAGAV). This small but highly professional and experienced unit has received from the HFC the necessary protection kits and detection equipment and has a chemist in its ranks. In all cases of

explosive attacks, even if they involve chemical agents, the direct responsibility for dealing with the event is done by the Bomb Disposal units, be it in Israel or in the Territories. In case of a covert chemical event the detection of the agents and their identification is done by special teams belonging to the Ministry of Environment Protection.

In the area of emergency medicine, Magen David Adom (MADA), the organisation entrusted to carry out in Israel the functions assigned by the Geneva Convention national societies of the Red Cross, sends its ambulances with volunteer paramedics to every terrorist incident or attack and is responsible to give the first treatment on the spot and send the injured people to the hospitals. In the event of an attack, the hospital next on the rotation list receives notification. It is also notified if a chemical agent is suspected, even before detection and identification have been performed. The hospital then sets in motion its emergency procedures. The police ensures that evacuation routes to the hospitals have been cleared. Upon reaching the hospital's entrance, the casualties are assessed by the medical staff. Chemical attack victims requiring hospitalization are taken to the vicinity of the emergency room where showers have been set up for decontamination. Treatment by type of substance is given according to binding orders of HFC. Long-range treatment and follow-up is provided by the civilian community medical services (sick funds) (MERARI, 2000).

Biological attacks are distinct in several crucial respects and require different, generally simpler organization and procedures. A terrorist WMD attack would occur without warning, leaving people no time to protect themselves. The time frame for detecting a biological incident, identifying its parameters, and managing it is considerably longer. An unannounced terrorist biological attack, on the other hand, could cause many casualties before the source is identified and the exposed population gets proper treatment. During the months following the anthrax letter incidents in the US, the police and its bomb disposal units were responsible for the control and identification of suspect letters or packages. However, in case of a major threat of biological terrorist attacks the responsibility passes to a special team of the Ministry of Defense, which has the knowledge and the means to identify and manage such a national event. Like other components of the preparedness system, the medical complex relies on procedures designed to deal with the greater threat of unconventional attacks by regular armies and does not maintain special readiness for WMD terrorist attacks.

A terrorist WMD attack would occur without warning, leaving people no time to protect themselves. The number of casualties per unit quantity of chemical or biological substance (i.e., the effectiveness ratio), according to Merari's evaluation, would therefore be considerably higher than in the case of a state-sponsored WMD attack. This difference is even more pronounced with regard to unannounced biological terrorist attacks. In wartime an enemy missile carrying biological warfare material would likely be immediately identified as such, leaving enough time for preventive treatment. An unannounced terrorist biological attack, on the other hand, could cause many casualties before the source is identified and the exposed population gets proper treatment.

For Israel's medical system, preparedness for a biological attack means awareness of symptoms and readiness for treatment. The ministry of public health monitors the incidence of contagious diseases throughout the country, particularly those diseases that could be used in biological warfare. By law, hospitals must immediately report the occurrence of such diseases. In the event of a biological incident, HFC can call upon teams of soldiers to canvass the affected area. Going door to door, the teams give residents the appropriate medicines and printed follow-up instructions.

The doctrine and the management by First Responders of chemical and biological terrorist attacks in Israel is a complex task, influenced in great measure by the major threat of the potential war-time deployment of WMD against Israel. This doctrine has been adapted to fit the new realities of the post 9/11 situation and the real attempts of terrorist organizations, however inefficient at this stage, to wage chemical and biological attacks. However, the HFC remains one of the pillars of Israel's readiness in the fight against this threat and will certainly lead any response to a major or what is today called mega attack. The goals of the HFC are defined as follows: to define the civilian defense concept; to steer, direct and prepare the civilian population for a state of emergency; to direct and guide all civilian systems, auxiliary organizations, the Israeli police and the military systems (NURIEL, 2002). The HFC acts according to the Civil Defense Law and serves as the primary professional authority in the IDF for civil defense. At the same time it serves as a territorial command in its area. The responsibilities of the HFC include: to command and coordinate all forces involved in the incident, in order to optimize the national response; to develop a combined doctrine for all the forces involved in the incident; to carry out combined training at all levels of command; to inform and instruct the civilian population in personal and

collective protection issues; to plan and deploy warning systems; to be in continuous readiness to help police forces during terrorist incidents.

In order to accomplish these complex missions the HFC has at its disposal: rescue battalions, security battalions, chem-bio battalions, observation units, and medical units. It also has fire brigade units (combined military and civilian), warning and alarm systems, and departments for information, instruction and civilian care.

In order to cope with the multiple threats Israel faces today, it has devised a strategy for several basic situations involving chemical, biological and radiological terrorist threats:

- The police is responsible for the management of the event in peacetime
- The HFC is responsible for the management of the event in wartime
- The police deal initially with chemical attacks, and in case of a major attack, the HFC takes over command by request of the police.

4.3 Russia

4.3.1 Counter-terrorism logistics

The recent years showed an increase in global terrorist activities. The threat of using the most dangerous weapons – weapons of mass destruction (WMD) or a radiological dispersal device, the so-called "dirty bomb" – by terrorist organizations has grown. Thus, according to the data published in the book "New Terrorism: Anatomy, Trends and Counter-Strategies," 292 terrorist acts using or threatening to use nuclear, biological and chemical weapons were recorded in the period 1970 to 1998 worldwide. (TAN and RAMAKRISHNA, 2002) More than a half of these incidents were recorded in the USA. The use of such weapons in terrorist attacks is extremely dangerous due to both the great destruction capability and the enormous cost related to consequence management. It should be noted that the above-mentioned source lists the following WMD terrorist acts as successful: sarin gas attacks by Aum Sinrikyo in Matsumoto in 1994 (3 dead) and in the Tokyo Metro in 1995 (12 dead, about 5000 injured). The first terrorist organization to deploy chemical weapons was the Tamil Tigers, who used gaseous chloride in their attack on Sri Lanka military in 1990. With regard to serious radiological

incidents, researchers refer to the discovery of a container with cesium-137 in Moscow's Izmailovsky Park, which had been placed there by Chechen terrorists. Neither public health, nor the environment was affected. (TAN AND RAMAKRISHNA, 2002) The world community and, first of all, the G-7 countries addressed the problem of countering terrorism by signing the Declaration on Terrorism in Lyon in 1996, which proclaimed fight against terrorism the absolute priority. (SUMMIT, 1996)

Most researchers working on terrorism issues believe that a high level of preparedness of the general public to terrorist attacks may significantly decrease both the number of casualties and the economic loss due to their consequences. Of paramount importance also is the preparedness of the First Responders, who are the first ones to arrive at the scene of an attack. In Russia, First Responders include units of the Ministry of Emergency Situations – rescue personnel, fire fighters, and civil defence forces, – as well as paramedics and police. (REGULATION ON THE MINISTRY OF THE RUSSIAN FEDERATION ON CIVIL DEFENSE, 2002)

The level of preparedness of First Responders is determined by their ability to perform – before the arrival of specialized forces – a wide range of different tasks, ranging from identifying the type of and localizing the WMD used, to rescuing the survivors. To make this possible, the preparedness of First Responders should cover individual protective means against any hazardous substances, as well as the equipment and software that would allow them to perform their tasks in the most effective manner. Without doubt, First Responders should be well trained to use these means professionally in conditions of emergency situations. The current approach to First Responders in the United States is described in detail in the book "Emergency Responders' Needs, Goals, and Priorities". (POLLARD et al, 2003). The authors carefully researched all aspects of First Responders' activities regarding the countering and management of the consequences of chemical, biological, radiological and nuclear explosive (CBRNE) terrorism, starting from listing the tasks of First Responders to the logistical requirements necessary for the efficient implementation of these tasks. It should be acknowledged that solutions to the above problems are no longer just national issues, but have acquired an international dimension. This is due to the extreme importance of prevention and mitigation of catastrophic terrorist acts for the whole world community, as well as the high costs and technical complexity of these efforts. Therefore, there is no principal difference in approaches of different countries aiming to provide the highest degree of preparedness of

First Responders to perform their tasks – only financial and technological capabilities differ from country to country.

The major logistical requirements for First Responders in Russia are as follows:

- Individual protective means (of both, the whole body and respiratory organs) against the maximum possible number of hazardous substances;
- Hazmat identification and contamination assessment equipment;
- Means of communication with coordinating authorities and other First Responders;
- Means of delineating the affected area (police, military units of civil defence and emergency situations, and, if necessary, other military units) (REGULATION ON THE MINISTRY OF THE RUSSIAN FEDERATION ON CIVIL DEFENSE, 2002);
- Rapid response capabilities (most of all, transport);
- Means of effective real-time mitigation of the consequences of a terrorist attack (fire fighters, paramedics, specialists trained in the area of consequence management after a WMD attack and equipped with all the necessary devices and disposable materials).

In case of a nuclear or radiological catastrophe in Russia, it will be the specialists of the Department of Safety and Emergency Situations of the Federal Atomic Energy Agency (FAEA) of the Russian Federation. In addition, specialists of the FAEA Situational Crisis Center may be involved, whose tasks include the following:

- Environmental monitoring at FAEA sites and facilities;
- Monitoring of technical conditions at FAEA facilities;
- Control and accounting of nuclear material;
- Monitoring of the transport of nuclear and other radioactive material; etc. (RUSSIAN MINISTRY OF ATOMIC ENERGY, 2003).

Naturally, the level – both, qualitative and quantitative – of means necessary for the efficient work of the First Responders is determined by the economic and technological capabilities of each country, as well as professionalism of the employed personnel. In order to reach a sufficient

level of competence (not only in Russia), significant research and design efforts are needed with the financial support from both, industry and state. It should also be noted that it is most cost-efficient to concentrate on providing physical protection, control and accounting of materials suitable for WMD terrorist attacks.

4.3.2 Countering radiological and nuclear terrorism

The current approach to countering the problem of nuclear and radiological terrorism in Russia has been well described (ROSSIYSKAYA GAZETA, 2004). One of the main reasons for creating this document was "increased threats by radical terrorist organizations, including international, with regard to nuclear and radiological potentially hazardous sites and materials." This document states that in order to provide nuclear and radiological security, funding should concentrate on the following tasks:

- Improving State administration and coordination in the area of nuclear and radiological security, first of all, the State radiological security system of the Russian Federation, using examples from the international practice;
- Strengthening the protection of nuclear and radiological facilities against harmful influence by man-caused and natural factors, as well as terrorist acts;
- Upgrading physical protection systems and equipment at nuclear facilities and increasing their resistance to acts of sabotage and terrorism;
- Improving medical supplies and treatment facilities for nuclear and radiological site personnel and the general public;
- Increasing the efficiency of international cooperation in the area of nuclear and radiological security.

The document lists the following major tasks:

- To maintain the necessary level of preparedness of First Responders and their means for the mitigation of emergency situations, as well as terrorist attacks on especially dangerous nuclear and radiological facilities;
- To increase the efficiency of activities in the following areas:
  - Reduction of risk and mitigation of consequences resulting from natural and man-caused catastrophes at nuclear and radiological facilities, and prevention and elimination of radiological emergencies;

- Maintaining the necessary level of preparedness of medical units at FAEA nuclear facilities and implementing a complex of social, medical-prophylactic and sanitary-hygienic measures in case of emergency situations, including those involving terrorist attacks against nuclear and radiological facilities.

From the standpoint of consequences to the general public and economic losses, nuclear weapons and 'dirty bombs' are some of the most dangerous types of WMD. Building nuclear weapons by terrorist organizations would be problematic. From the first nuclear test in 1949 to the disintegration of the Soviet Union, multiple factors guaranteed reliable protection of the Soviet nuclear material against unauthorized access. (ORLOV, 1997) These factors included the existence of the "iron curtain" at country's borders, political stability, absolute control over the personnel of the strategic nuclear sites, timely and significant financing of the "homeland's nuclear shield," which made working in the nuclear arena prestigious. At the same time, little attention was paid to the protection of nuclear material, radioactive waste, chemical weapons, and nuclear warheads and technologies against the "local enemy," such as political terrorist groups, ethnical radical nationalists or organized crime groups. The reason was quite simple: up until 1990, criminal groups were not well-organized, whilst political opponents to the existing regime had used peaceful ways of resistance. A significantly larger number of efforts were directed to prevent potential sabotage by the imperialistic West. With regard to small-sized tactical nuclear weapons (rucksack type), Colonel-General Victor Yesin, former Chief of Staff of RVSN and now the first Vice-President of Russia's Public Academy of Safety, Defence and Law and Order, stated that such devices were part of the US Army and Navy since 1964. (YESIN, 2004) They were called Special Atomic Demolition Munitions (SADM) and were produced in two versions – M-129 and M-159 – with a W-54 nuclear charge, ranging from 0.01 to 1 kiloton. Their size was 87 x 65 x 67 cm and the total weight of the rucksack and container amounted to about 70 kg. A total of around 300 units were deployed. According to reports in foreign mass media, all devices were utilized in late 1992 – early 1993. The Soviet Union started production of similar munitions later, in 1967. They were known as "special mines" and were produced in lower numbers than in the USA. According to the former Russia's Minister of Foreign Affairs Igor Ivanov, these munitions were eliminated in accordance with a bilateral agreement between Moscow and Washington, DC, before the end of 2000. According to the data published by the Stockholm International Peace Research Institute,

besides Russia and the United States, China and Israel possess the technological capabilities to produce small-sized nuclear devices. (YESIN, 2004). A comprehensive inspection conducted by a group of experts of the Security Council of the Russian Federation in 1998 revealed no incidents of loss or theft of special mines in the former USSR and, consequently, the Russian Federation.

In early 1990s, the situation in the country rapidly changed. Russia and the United States concluded a number of bilateral agreements on cooperation in improving physical protection, control and accounting of nuclear material at Russia's nuclear installations with the US financial support. It should be noted that these efforts were initiated by the United States. In 1991, Senators Sam Nunn and Richard Lugar secured support in the US Congress regarding the allocation of US$ 400 million from the budget of US Department of Defence annually to assist the Soviet Union in providing secure transportation, storage and elimination of its WMD stockpiles. During the Clinton Administration, this program, initially called Nunn-Lugar Program, was transformed into the Cooperative Threat Reduction (CTR) Program financed by three sources – Department of Defence, Department of Energy, and State Department. This has been the largest US assistance program to Russia. It has involved over 60 Russian facilities, and more than US$ 3 billion has been spent during its implementation (NUCLEAR REPORT, 2002). One of the major parts of this effort has been the Material Protection, Control and Accounting (MPC&A) Program conducted at Russia's nuclear facilities, which currently ranks first among other preventive measures to secure nuclear material. Since 1996, this Program has been supported directly from the budget of the US Department of Energy. In Russia, physical security of nuclear material is provided by various divisions of the Ministry of Interior (MVD) and, of course, the management of nuclear facilities. Over the past 10 years, the level of preparedness and equipment of the MVD divisions responsible for the protection of nuclear installations and security of nuclear material have been significantly improved and continues to grow due to the financial and logistical assistance by the United States within the MPC&A Program.

It should be noted, that as far as the consequences are concerned, the threat of man-caused accidents at nuclear installations may be equal, or even significantly higher, than that of terrorist acts. In Russia the above has been demonstrated by the Kyshtym (29 September 1957) and Chernobyl (26 April 1986) accidents. These accidents have been described in detail in the literature. One literature source referring to both

catastrophes, “The Legacy of Chernobyl” by Zhores Medvedev, lists over 600 potentially dangerous facilities. (MEDVEDEV, 1990). The Chernobyl accident clearly demonstrated the importance of protective and analytical equipment for First Responders, including state-of-the-art communication means with the authorities coordinating the consequence management efforts. The lack thereof in 1986 led to the death of many First Responders. Of course, the lessons learned about the reasons behind the above catastrophes and experience gained during the consequence management efforts have contributed to the improvement of the protection and, subsequently, the safety of nuclear facilities in Russia.

In Russia the probability of the use of so-called “dirty bomb” in a terrorist attack is viewed to be significantly higher than that of nuclear weapons. Practically any information on radiological dispersal devices is accessible to anyone interested. Just by using the Yahoo search engine on the Internet one gains access to almost 2,500,000 references ranging from methods of building such a device to the assessment of consequences of such an attack in large cities (e.g., in London). The Internet also contains BBC reports referring to unidentified sources in the British Government that members of Al Qaeda, supported by Taleban, have already produced a dirty bomb on the territory of Afghanistan. The consequences of the explosion of such a bomb in a large city may be estimated in view of the devastating 1995 blast in Oklahoma-city as an example, when 168 people were killed, but which did not involve any radioactive material. Therefore, to prevent terrorist attacks using radiological dispersal devices an emphasis should be made on eliminating the possibility of unauthorized access to radioactive material at the facilities where such material are being used. Although the current MPC&A program implemented in Russia is contributing to the security of nuclear radioactive material, more emphasis should be placed on the protection of any radioactive material (including spent fuel and radioactive waste) not only in storage, but also during their handling as well (including transport). The importance of implementing this task is hard to overestimate. Thus, in April 2004, a Russian web-site published an article referring to the head of the International Atomic Energy Agency, Mohamed El Baradei, which stated that there have been several incidents in Iraq when “large caches of radioactive material, and sometimes the whole facilities where it was stored, went missing” (URL). According to an article published by the same website in January 2004, the “uranium oxide cargo discovered in the port of Rotterdam had likely originated in Iraq.” Solving the problem of preventing a “dirty bomb,” as well as material suitable for this purpose, from entering the territory of a country (not only Russia) will also require

a major effort. In order to do this, it is necessary to develop new devices that would allow rapid identification not only of metals, but radioactive and explosive materials as well. International cooperation and exchange of the existing technologies would allow making the development process faster and more effective and the world safer against terrorism.

4.4 Slovenia

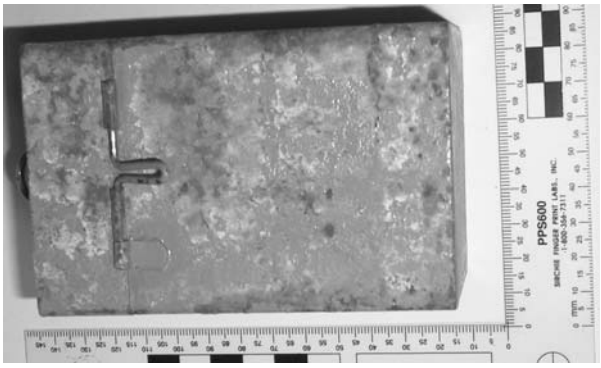
4.4.1 Past events

Events, such as the discovery of chemical weapons, a threat involving a TBC agent, and scares involving anthrax triggered Slovenia to consider actions in the case of a threat involving weapons of mass destruction. Subsequently some irregularities were discovered and mistakes in the system were revealed, which had not been addressed before. In the following some typical examples of events involving such materials and the reaction of the Slovenian First Responder community are described.

Chemical weapon: On 24 November 2000 the Bomb Squad in Ljubljana (Republic of Slovenia) was notified about the seizure of a yellow square box with black letters (in Cyrillic and Latin) »IPERIT« written on it. In the Slovenian language, IPERIT stands for a mustard gas blister agent. During the discussion it was discovered that the box had been seized during a house search and brought to the police station. One 16-year old boy had found the box at an old military dump yard and brought it home. The group on duty was immediately dispatched to the scene, ordering the police officers to move away from the seized object. At the police station they identified a yellow box made from aluminium, measuring (W70 X L70 X H70 cm) with black letters on it (Figs. 16, 17).

Figure 16: Mustard gas container

Figure 17: Dimensions of mustard gas container



The bomb technicians at the scene decided to conduct an X-ray examination of the interior of the box. The square box was put against the wall at a small inclination to see if there is any liquid inside it (Figs. 18).

It was confirmed, that there was a bottle inside the box, which contained an unknown liquid. No booby trap devices were found inside the box. The expert group from the Ministry of Defence was called to the scene, and they took care of the blister agent.

Figure 18: X-ray photo of mustard gas container (tilted)

Figure 19: Flask with TBC agent

Figure 20: Transport container of TBC agent

TBC agent: On 2 February 2003 at 16.14, the Mozirje Police Station received a call from a driver who had found a suspicious object on the front passenger seat of his lorry (Figures 19, 20). A police patrol unit was sent to the scene to perform an inspection of the suspicious subject. The police officers established that the object was oval-shaped, 40 mm in diameter, 123 mm long and closed by coil. The object carried the writing TBC Golnik. It was closed in a plastic bag, tightened with a rubber band. Golnik is a place in Slovenia with a well-known hospital for pulmonary diseases where tuberculosis patients are treated. The police officers took the object to Mozirje Health Care Centre and showed it to a medical doctor who insisted that the object did not come from their institution. He,

however, confirmed the possibility of the container being genuine. The police officers then took the container to Mozirje Police Station. The on-duty officer realized that the procedure taken so far had been wrong and notified the criminal investigations inspection group, the local health inspectorate and the bomb squad. The health inspector who arrived at the scene confirmed that the object was a typical container used to carry the infectious samples sent to Golnik Hospital for further examination. The bomb technicians performed an X-ray scan in order to exclude the possibility of a dangerous mechanism being placed in the object.

Further investigations revealed that this incident had been the result of a marital dispute.

Anthrax threats: After the publication of the reports of an anthrax attack in the USA, parcels with a suspicious white powder appeared in Ljubljana the following day. The numerous simultaneous reports (10 calls within a very short period) overloaded the system so much that it came to a standstill. Several urgent measures needed to be taken in order to organize the response service. The analyses conducted later on showed that some of the decisions that were taken had not been optimal.

4.4.2 National response

In view of the newly emerged geopolitical situation and given the experiences from previous interventions, the Slovenian National Security Council met, at the initiative of the Slovene Police and formed a working group charged with preparing the response of state bodies in case of a national security threat. The main task of the working group was to identify all the means available for use in case of a threat with weapons of mass destruction. It was established that some appropriate equipment and knowledge existed which was, however, dispersed over various organizations (state bodies, public institutions and private companies). Furthermore, it was not immediately available, since most of the services do not have an organized permanent team ready at all times. Such teams are neither capable of responding immediately in the field, nor do they have training for direct intervention in the field.

In the future this working group has the remaining task to ensure optimization and joint intervention in the event of a threat, with weapons of mass destruction topping the list of priorities. As such, many organizations have offered to cooperate, albeit some of the managers have mistakenly understood their willingness to cooperate as the final solution

to the response system. Problems have arisen because everybody wants to offer advice and make long-term plans. While this may be desirable, it does not help the First Responders who come in contact with a suspicious object in the field, suspected of containing weapons of mass destruction. In a concrete case, whereby weapons of mass destruction are found, the situation must be dealt with quickly, and the same time avoiding harmful emissions and enabling conventional forensic work. Furthermore, life in the surroundings of the place of WMD discovery must be returned to the normal conditions as soon as possible.

The First Responders must, as such, have precise advance knowledge of the operation procedures. This led the Slovenian authorities to adopt the approach applied in Spain and London (the Metropolitan Police), whereby the bomb technicians perform the first procedures (separation of the spray mechanism, enclosing the weapon of mass destruction in a hermetic container, the initial detection and identification, etc.).It was, of course, and there will continue to be a need to adapt the standard procedures applied by the bomb squad for destroying suspicious objects. Some of these may be quite spectacular but, for understandable reasons, entirely inappropriate in procedures which involve weapons of mass destruction (for example, the destruction of a suspicious object by explosives).

Additional training has been organized in the field of weapons of mass destruction (basic concepts of the weapons of mass destruction, detection, etc.). With the assistance of the EU, IAEA and the US Government, training and equipment has been provided to Slovenian Frist Responders, enabling them to conduct complex countermeasures with regard to weapons of mass destruction, ranging from detection of WMD to the prosecution of the offenders. The final stage of training was concluded with the exercise “New Horizons” which included all the actors in this field in the Republic of Slovenia.

4.5 United States of America

4.5.1 Past and present threats

In 1995 the world events turned the US government’s focus toward the threat of terrorism and unconventional weapons.

- *Aum Shinrikyo*, a religious cult in Japan, attacked the Tokyo subway system with the nerve agent sarin.

- A threat, thought to be credible, was made to disperse a chemical agent in Disneyland.
- UNSCOM and a son-in-law revealed disturbing information about Saddam's unconventional weapons programs.
- Domestic terrorists used a truck bomb to attack the federal building in Oklahoma City.
- Radioactive materials were leaking out of the former Soviet Union.

The US Congress and President and others shared the concern both that unconventional terrorism would increase and that First Responders were not properly trained or equipped to mitigate such incidents. Senator Richard Lugar noted: "The preparation [to manage the consequences of the use of unconventional weapons against civilian populations] must take the form of help to local 'First Responders' – the firemen, police, emergency management teams, and medical personnel who will be on the front lines if deterrence and prevention of such incidents fail" (LUGAR, 1997).

As a result, the federal government began several training and grant (US DEPT. OF HOMELAND SECURITY) programs to help First Responders in the nation's largest 122 cities to plan for and respond to unconventional terrorism. The Departments of Defense, Health and Human Services, and Justice each offered slightly different programs to the First Responder communities across the nation. The programs complemented each other: the Defense program offered classroom training, equipment and exercises, the Health and Human Services program built locally-based, inter-agency response teams, and the Justice program offered grants to purchase needed equipment and a methodology to assess the threat in each local community.

Though not without their problems (TUCKER and SANDS, 1999), all three programs succeeded at least partially in at least three ways: (1) they motivated the creation of local and regional working groups comprised of crisis and consequence management officials from local, state, and federal governments; (2) mandated that local jurisdictions create response plans, and more important, go through the process of working together to create these plans (SMITHSON and LEVY, 2000); and (3) increased the level of awareness of the potential possibilities and problems of unconventional weapons.

The successes, or perhaps the degree to which there was success, have been difficult to sustain. Anthrax hoaxes in several cities from 1998-2000 resulted in the creation of response protocols that got away from physical decontamination and moved toward mass prophylaxis. However, communities without actual exerpeince in anthrax responses often fell back to a hazardous materials-type response protocol when confronted with a hoax event. In many cases, the actions of the First Responders fulfilled the perpetrator's goal to create fear, panic, and confusion. The actual use of anthrax in October 2001 – and the length of time it took to recognize that this was, finally, a real event, as well as the actions of the First Responders – served only to heighten the fears of a jittery nation so recently subjected to the airplane-based terror attacks.

What is the current status in the United States? To appreciate how far the First Responder community in the United States has progressed since 1995, it would be useful to remember the issues with which it struggled then. Many of the issues the First Responder community worked through in the late 1990's may seem basic now, but their resolution represents a true paradigm shift. These issues included:

(1) An appreciation that terrorism affects Americans at home,
(2) An awareness of unconventional terrorism involving chemical, biological, radiological, or nuclear weapons,
(3) The concept that the planning for and response to terrorism threats and incidents required a multi-disciplinary, multi-jurisdictional approach involving crisis and consequence management agencies from the local, regional, state, and federal governments, and
(4) The requirement of a management system that could be efficiently employed by all these agencies during an incident.

Later issues included the integration of public health officials and hospital personnel – not normally viewed as First Responders, although recognized as partners in WMD events involving biological weapons, and critical to the response and mitigation of other types of attacks. Other operational issues included mass casualty decontamination, processing of mass fatalities, laboratory protocols for testing chemical and biological weapons, and the development of workable plans for the quarantine of large populations.

The salient issues in the United States are greater now than they were in 1995. Training and equipment that began in the largest cities has been expanded to include all states, counties, and cities. The quality of both the training and the equipment has improved. Public health has benefited in training, equipment, and experience from increased funding following the anthrax attacks in late 2001 and lessons learned from naturally occurring outbreaks, such as West Nile Virus and SARS. Still, in many areas the First Responder community has not yet meaningfully engaged the hospitals and public health community to plan for and respond to unconventional terrorism. Interoperable communications systems are a critical asset that must be developed with uniform standards and considerable financial assistance.

4.5.2 Lessons (to be) learned

The issues continue to evolve, but the fundamentals - communications, command and control, and coordination – are the foundation upon which all else is built. The foundation is built by training and exercises and learning from local, regional and national experiences through the identification of lessons learned, best practices, and institutionalized standards.

The need to identify lessons learned and establish best practices cannot be overstated. It has been observed that, "Experience cannot be transferred. We may give wise advice, but we cannot give wisdom to follow it" (THE COLUMBIA WORLD OF QUOTATIONS, 1996). This may be true: the lessons learned by others have often been ignored, partly due to a lack of adequate time and resources, and sometimes due to power struggles and inter-agency or inter-jurisdictional squabbles. Within the past two years, numerous excellent reports have been written about the terrorist attacks on September 11, 2001 and the lessons that can be learned from the events that day. In addition, much of this knowledge has been translated into policy and guidance. Highlights from three notable reports can be found in the Appendix of this section (NATIONAL LEAGUE OF CITIES; FEMA, 2002; NIMS, 2004).

Communication has many aspects and each of them is critical to a successful response. First, personnel at the scene must be able to communicate with each other effectively, both within their professions and across professions. When multiple agencies and jurisdictions are working together, as in almost all terrorism cases, they must be able to communicate across organizational systems. First Responders need equipment that is both interoperable and compatible. Interoperability and

compatibility are achieved through the use of such tools as common communications and data standards, digital data formats, equipment standards, and design standards. In most cities in the USA, the police department used one set of frequencies and the fire department used a different, incompatible frequency set. This situation has improved in some areas – thanks in great measure to federal dollars – but it remains a problem in most cities as well as between regions and states.

Second, information must flow. From its source to its recipient, it is useful only if it gets to the right person in time to make effective use of its value. Third, the information must also be tracked. Whether the information is useful to law enforcement for later criminal prosecution or useful to coordinate the movement of resources and personnel or simply required to brief the next shift of responders, information must be tracked. And fourth, public information - both its dissemination and the content of the message - is critical. The public and media will want accurate information from a source it can believe. In its absence, the public will speculate the worst and the media will report something, but without the benefit of the government's insight. To produce a clear and trustworthy message, all the various responding agencies will communicate through a single public information center. To not do so will make the government appear confused and disorganized, thus causing public apprehension and perhaps an erosion of confidence.

Command and Control is essential when a terrorism incident (or even a threat) occurs, since several agencies are involved in the response, mitigation, or investigation. These agencies have different functions, such as safety (fire, law enforcement, emergency medical services), mitigation (hazardous materials response teams, explosive ordinance disposal units), and investigation (both law enforcement and regulatory), and professional emergency management from the local, state, and federal governments. An effective command and control structure that is both flexible enough to adapt to the situation and able to integrate all the response agencies is vital. The US First Responder community uses the Incident Command System (ICS).[21] In incidents that involve multiple agencies or multiple

[21] ICS has been described: "ICS is the model tool for command, control, and coordination of a response and provides a means to coordinate the efforts of individual agencies as they work toward the common goal of stabilizing the incident and protecting life, property, and the environment. ICS uses principles that have been proven to improve efficiency and effectiveness in a business setting and applies the principles to emergency response"; there are many sources

jurisdictions, such as terrorism incidents, the concept of Unified Command is used.[22] ICS is an effective and efficient system to command and control an event, but only if the personnel in all the agencies responding to the event have been trained and exercised the concept. In this system, no one supervises more than 5-7 people and each person has a specific, defined role. In an exercise or event, a quick method to determine whether the ICS is effective is to ask various personnel two questions: to whom do you report and what is your job? Each person in the structure should be able to answer both questions. It is, perhaps, not surprising that this system is often not effective and/or efficient in agencies where its use is either optional or reserved only for major catastrophes. The requirement to train personnel, exercise it, and practice it with other agencies is vital. The ICS will succeed if these actions are taken, but will be less than fully successful if these actions are ignored.

Coordination begins long before an incident occurs. With multiple disciplines and multiple jurisdictions involved in both the planning for and the response to a threat or act of terrorism, it is useful to know the needs and capabilities of other agencies, as well as the people within those agencies. One of the lasting legacies of the training programs, begun by the federal government after 1995, was a willingness and desire to work with and get to know other responders and their agencies. Most large and medium urban areas formed terrorism working groups comprised of local, state, and federal crisis and consequence management agencies. The purpose of these groups is to provide an opportunity for liaison, to conduct and coordinate training and exercises, and to share information.

Exercise is the means by which we can evaluate and validate our training, plans, and procedures. Exercise planning includes formulating the goals and objectives, what will be tested, developing a methodology for evaluating the exercise, and determining what we do with the "lessons

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of information about ICS; for just one source that is useful and comprehensive, see http://www.911dispatch.com/ics/ics_main.html

[22] Unified Command: In incidents involving multiple jurisdictions, a single jurisdiction with multiagency involvement, or multiple jurisdictions with multiagency involvement, unified command allows agencies with different legal, geographic, and functional authorities and responsibilities to work together effectively without affecting individual agency authority, responsibility, or accountability.

learned." The reason is simple: the goal of the exercise is not to conduct an exercise, but to understand capabilities and gaps.

There are three types of exercises and a useful approach to consider their utility has been called "Crawl – Walk – Run." The three types are:

- Tabletop Exercise ("crawl"): This is an exercise for high-level responders. Its goals include: discuss plans and policy issues, discuss command and control issues, determine availability of resources, and evaluate mutual aid agreements.

- Command Post Exercise ("walk"): This is an exercise for mid-level responders. Its goals include: validate notification procedures, evaluate communications, and validate access to available resources.

- Full-Field Exercise ("run"): This is an exercise for all levels of responders. Its goals include: validate plans and policy issues, validate notification procedures, and validate the training of the First Responders.

Ideally, there is a progression of exercises: tabletop exercise, followed by a command post exercise, and then followed by a full field exercise, or crawl-walk-run. Typically, there will be at least a few and even several weeks between each exercise. This allows sufficient time to identify the lessons learned from one exercise and apply them to the next. In addition to the goals in each of the three types of exercises, the value in conducting exercises in often in the planning of the exercise, rather than its execution. The planning and preparedness stages leading up to an exercise bring together the responders from various agencies to work together through a process. Development of the Master Sequence of Events List (MSEL), evaluation tools, and exercise methodologies allow participants to envision the right response, and how to obtain it from the participants.

An overview of lessons learned from real events of 9-11-01 in the United States is presented in Appendix 2.

Future challenges remain, despite the fact that the progress has been great. However, in the absence of solid data, the threat is still often not grounded in reality, but rather, based on worse case scenarios. At present the physical and fiscal fatigue factor is high. First Responders, who eagerly embraced a new mission in the late 1990's, have been exhausted

by responding to unknown white powders and increased terrorist levels. Local and state budgets have been battered. Though the federal government has distributed billions of dollars to local and state governments, much of the extra expense has been for training and overtime, which are not usually covered by the federal grants. When forced to choose between being able to provide day-to-day services, such as schools, police, fire, and public works, and response measures to protect the homeland, some cities can afford only the former, not the latter. There is also a relatively high turnover rate among responders; many either leave (including retirements) or get promoted or transferred within their agencies to non-response positions. The ability to sustain the training, the level of interest, the commitment of management, and funding all pose challenges.

4.6 Italy

4.6.1 Background

The Italian National Fire Corps is based in the Ministry of the Interior, and has 30,000 professional fire fighters located across the country. There are 20 regions and 101 provinces. This national configuration enables a more consistent training standard across the country, permitting greater flexibility than a locally based organization.

Italy has experienced hazardous materials incidents and accidents over the years. It is also earthquake-prone, has areas of volcanic activity, and has areas that flood. It has long coastlines and many ports, opening the possibility of maritime disasters, water pollution from shipping accidents, and port-related emergencies. This need to be prepared for a variety of natural hazards and technological events has laid the foundation for developing a national approach to emergency response for all hazards, including CBRNE events. The Italian government uses major-risk chemical industries induced hazardous materials events as the paradigm for the design of the system, which works equally well for CBRNE.

Noting that hazardous materials accidents and CBRNE events have much in common, the Italian fire service has evaluated the best way to provide a rapid and efficient response, while also protecting the First Responders from unnecessary exposure to danger, regardless of the cause of the disaster.

4.6.2 Response capability based on uniform systems and equipment

Italy's national organizational structure results in uniform equipment across the country. Each area has been given an identical cache of equipment and vehicles to ensure the ability to muster a large response to serious events. At least nine response vehicles can be brought to any event within one hour because of the location of identical equipment in each province.

The national response approach also means that every jurisdiction does not need every possible piece of equipment. Specialized items like a turntable ladder or a mobile crane can be strategically placed to be a resource to many areas of the country. Basic response is available in every fire station response area. Intermediate level response is at the provincial level, such as technical experts. Specialist level is available at every one of the twenty regions through the Regional Operating Unit. Coordination of the internal assets and those from outside belongs to the Fire Chief of the province, so there is a clear line of authority and chain of command at any incident scene.

Communication equipment is very important. It saves lives, including the lives of the First Responders. A quick and constant flow of information is necessary to ensure control of the event for the benefit of the victims and the protection of the First Responders. The communication vehicles accommodate 5 people inside with a variety of radios. Each of the 101 provinces has a communication vehicle. These can be used jointly to support a large event

Italy has not yet adopted the unified European emergency number 112. This number belongs to one of the Italian police forces and other emergency responders organizations have their own number: e.g. Fire Service 115, EMS 118. An improvement has been experienced in some Provinces where, even if each Organization maintains its own emergency number, the operation center is shared in the same facilities. This enhances significantly the interagency communication capabilities and consequently the safety of the First Responders.

Italy has also adopted the Incident Command System (ICS) as the national standard for the command and control of emergencies. Specific training is provided in the latest courses developed for CBRN command level for the Officers of different ranks in the National Fire Corp. Unified Command based on the Incident Command System (ICS) is going to be used at large

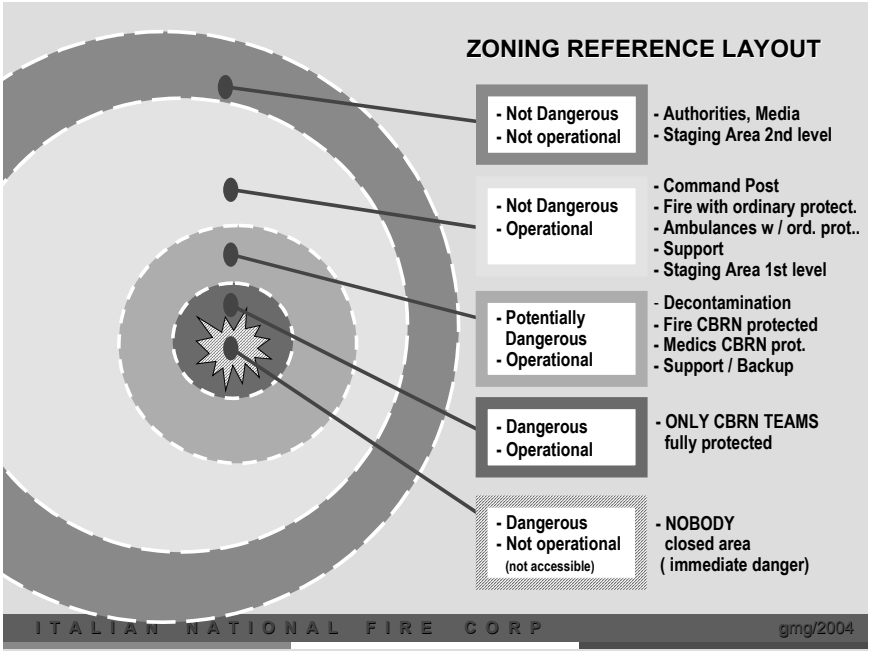
events also to coordinate the work of responders across jurisdictions, similar to the Incident Command System used in the United States. Similar ease of interoperability could be developed across jurisdictional and national lines through a wider adoption of a common command and control system, like ICS.

Because every part of Italy has the same equipment there are great economies of scale achieved. Uniform equipment may be procured at better prices. Spare parts are interchangeable for the equipment, which is a real benefit at a large event where various provinces are presented. All personnel use the same personal protective equipment (PPE), so replacements are readily available at a response scene.

Because the Incident Command System is used throughout Italy, personnel can operate effectively at any disaster scene, regardless of which province they may be in. Joint training also offers savings in allowing for the development of one set of training tools and equipment, including audio-visual materials and text books, which are used nationally.

4.6.3 Eight steps to CBRNE emergency response

The Italian approach to the CBRNE conventional event has eight steps. This system is very similar to the one developed in U.S. called "The Eight Step Process". Scene control is followed by a size-up and risk evaluation. Appropriate PPE is selected based on the size-up. Information management is achieved through the Incident Command System, and an Incident Action Plan establishes the goals for the action period. Resources are coordinated to rescue victims, decontaminate victims, provide immediate medical treatment on the scene, and rapidly transport victims to definitive medical care. The incident is over when the goals have been achieved, including restoration of the site to safety. This system has shown to be very effective when used also for non- conventional events.



First they take control of the site to protect the public. Next, they zone the area and determine if the area is dangerous or not dangerous.
The Italian system actually uses a four square box based on two words: operational and dangerous.

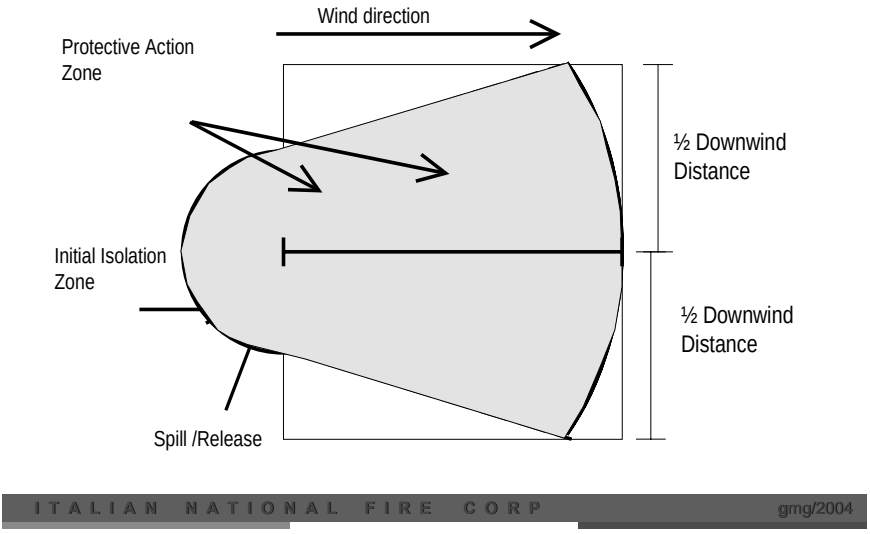
- The most affected area where nobody can enter because it is too dangerous (too high level of contamination or risk of collapse or secondary devices) is designated as dangerous and NON-operational. Usually these are smaller interdicted areas, inside a larger hot zone.

- The next ring is the internationally recognized hot zone, which is considered “dangerous but operable”, where First Responders with appropriate procedures and PPE can provide rescue, immediate treatment and transport to victims.
- The next zone is potentially dangerous and operable, where First Responders will still wear PPE. (Warm zone)
- The next ring out is not dangerous and operable, where First Responders can assist victims without wearing PPE, so more advanced medical care can be given. (Cold zone)
- There is an outer most “green zone” which is non-operational and non-dangerous, and can house the media, and serve as a staging area.

Regarding the level of protection for the First Responders there is a continuous ongoing re-evaluation of former procedures that have shown – during large-scale exercises - to be mostly “defensive”. The procedures have shown that today we have reached a high level of awareness regarding the level of protection for the First Responders, but there might be a significant margin of improvement in terms of more “aggressive” rescue. This, obviously, shall be improved without raising the risk of exposure for the rescuers. In simple words, the most important message is that we shall always improve our risk-analysis capabilities, in order to provide the most adequate protection and the better lifesavings results.

Italy has also adopted common documents for determining how to manage decontamination and response at hazardous material scenes. Among these documents there is the Emergency Response Guidebook (ERG) developed in North America. Having just one evaluation document simplified training for personnel, and provides for uniform markings on containers and vehicles. As this book is already an international consensus document, and available in languages of the E.U. (English, French, German, Spanish, Portuguese), it provides another opportunity for a common management system. With the guidance of the ERG the isolation zone and protective action zone can be identified, and protective actions can begin for both the disaster site and the greater community downwind.

Decontamination can be undertaken in the transition between the potentially dangerous and non-dangerous areas for both victims and First Responders. Resolution of the event comes when the victims are cared for and the site is secure and not a threat to the public. Additional decontamination of the environment may still be needed.



The outer working perimeter is shared with fire, police and emergency medical services personnel. A plume model is run to create the boundaries of the exclusion zone (dangerous and potentially dangerous). The hot zone is then defined with instruments and detectors. Multi-agency planning underlies the ability to share the response effectively.

The suite of response vehicles available to Italian Fire Corps personnel provides a comprehensive response capability, including command, rescue and first medical care (with Red Cross and local EMS services), and decontamination. The fact that this same vehicle suite is available at every province makes the management of large or small incidents scalable.

4.6.4 Possible model for E.U. development

Italy has found that the adoption of the Incident Command System as a national model has greatly enhanced the ability to bring assets together effectively for large events. The successful application of the Incident Command System nationally in Italy raises the possibility that ICS might be useful on a multinational basis, and there is the capability of exporting

that same system across the European Union. Italy has adopted the ICS from the American National Fire Academy.

ICS is used in U.S. across the fifty States, each of which has its own unique laws and regulations governing emergency response, tort law, and liability issues. Some E.U. nations may have concerns that existing systems and national sovereignty would be challenges for implementation of an EU-wide emergency response method. However, Italy has demonstrated the benefits of nationwide integration in bringing to bear large numbers of personnel and equipment rapidly for a more effective disaster response. This model could provide an incentive to consider moving toward some consensus methods for cross-border emergency and disaster assistance within the E.U. Day to day savings in procurement of equipment and delivery of training, as well as interoperability at large scale, multi-jurisdictional events, point to benefits in developing common command and control systems and common equipment standards.

Chapter 5

FUTURE REQUIREMENTS OF THE FIRST RESPONDER COMMUNITY

5.1 Potential legal aspects relative to First Responders

This introductory material is provided to clarify the environment in which the legal issues arise that are discussed in the body of Section 7.1, and to provide a framework for understanding its applicability to potential cross-national efforts within Europe. This information may be useful in developing cross-national agreements and cooperative plans, as the United States is actually fifty different governments with individual sovereignty in most areas of emergency response.[23]

In the United States regulations effecting First Responder mandates and performance vary widely from state to state, and reflect differing legal codes. The field-level First Responder community (law enforcement, fire fighters and emergency medical services personnel) is made up of a variety of types of personnel who are governed by these various sets of rules, regulations, laws and agreements. Furthermore, different levels of government have differing levels of immunity from prosecution for liability and negligence during disaster response under the various legal codes

First, among the fifty states there are two types of governance. The thirteen original colonies, and other eastern states, derive their laws from English Common Law. The states formerly part of the Louisiana Purchase, and those acquired from Spain, may base their laws on civil code or Napoleonic Code. Issues of responsibility and liability will be adjudicated quite differently depending on the legal basis of the state.

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[23] The United States Constitution enumerates the powers of the Federal Government in the Articles of the Constitution and the Bill of Rights, its first ten amendments. The 10th Amendment states, "The powers not delegated to the United States by the Constitution, nor prohibited by it to the States, are reserved to the States respectively, or to the people." This so-called "Reserve Clause" leaves most elements of public safety and emergency response to the discretion of the states.

F. Steinhäusler and F. Edwards (eds.), NATO and Terrorism, 82–117.

Second, sovereign immunity resides only with the Federal government, and even that has evolved from an absolute protection to a relative protection, depending on the issues to which it is applied. States, however, have a much lower level of immunity from prosecution. For example, in the State of California, the state and its entities (cities and counties) only have immunity from liability when there is no negligence by the responders involved in the action under consideration. Negligence normally results in liability for the local or state entity.

Third, First Responders come in four categories: fulltime employees, "paid volunteers," organized volunteers, and convergent volunteers. The responsibilities of the fulltime employees are spelled out in their employment contracts, and in local and state regulations. Thus, the responsibilities of fulltime public safety personnel will vary from jurisdiction to jurisdiction within a state, as well as from state to state. Fulltime First Responders have a duty to perform certain acts. However, the employer has a duty to provide adequate training and personal protective equipment before sending an individual into a situation that is inherently dangerous. For example, while it is the obligation of a fire fighter to rescue people from a burning building, it is the obligation of the local government to provide appropriate fire resistant clothing, self-contained breathing apparatus, adequate water supply and hose, and appropriate command and control over the scene before sending anyone into a burning building to perform a rescue. Furthermore, the National Fire Protection Association has set standards for occupational safety at the scene of a fire. For example, no one can enter a burning building until there are at least four people at the scene with the proper training and equipment to attack the fire. No one can enter a hazardous material environment with an unknown substance until there are at least four people with technician level training in Level A suits ready to enter. The local government is responsible to enforce these safety standards, and will be fined for breaches of the regulations. In addition, Federal and State Occupational Safety and Health Administration (OSHA) regulations determine what constitutes "adequate" training and equipment for a given hazard. This provides a brief overview of the types of restrictions that exist within the paid First Responder community. Many states also have a form of "be-a-manager-go-to-jail" law, which make the first line supervisors responsible for the safety of their staff. Knowingly allowing an improperly trained or equipped person to enter an unsafe environment can result in criminal liability for the individual supervisor.

A second category is the "paid volunteer." Many large police or fire departments augment fulltime staff with paid volunteers. They may be called "reserve officers," or "paid call fire fighters." These staff members go to the same academy and receive the same equipment and training as the fulltime staff, but only work limited shifts for no pay. Often they supplement fulltime staff during seasonal rises in demand, such as the summer fire season. In some departments they are paid if they go on an actual emergency call. Otherwise they work as volunteers. In other instances, they donate a certain number of volunteer hours in a month, then are paid for any hours they work over the volunteer allotment. While they are not fulltime employees, their actions are governed by the same laws and regulations as that of the paid staff of the organization.

A third type of First Responder is the volunteer who works for a purely volunteer organization. This status is typical of volunteer fire departments in many states, and of community ambulance companies, and includes deputy sheriffs in many western states. Volunteer amateur radio operators in organized groups, and most non-governmental organizations, also fall into this category. These people volunteer as a community service and are never paid for their services. In most cases they strive for the same level of professionalism as paid fulltime departments. They take extensive training, and often exercise with fulltime paid departments. Their safety is governed by the same laws and regulations. However, since they have not been contracted for, it is an open question whether they can be expected to risk their lives outside of the narrowest definition of their volunteer work. So, for example, while a volunteer fire fighter may be expected to respond to the scene of a burning building, it is questionable whether he or she has an obligation to respond to a terrorist attack. While American Red Cross volunteers routinely assist victims of natural disasters, it is questionable whether they have an obligation to respond to a community where a chemical agent has been released.

Finally, there are the volunteers who come forward only after an emergency has occurred. These people may have personal capabilities and skills, but they have not been integrated into the organized response plans. They are generally covered by Good Samaritan laws as long as they are not licensed medical personnel and have no particular obligation to assist. The most typical convergent volunteer is the person who stops to help after a car accident and provides first aid care until the trained First Responders arrive. These people may be a help in small-scale events, but they become a management problem during large-scale events, and are usually barred from disaster scenes. It is impossible, during a disaster, to

screen them for appropriate training, criminal records, and physical capability to perform the tasks for which they are volunteering. Government generally prefers to limit access to disaster scenes to known, trained and registered volunteers.[24]

In summary, the legal aspects of emergency response will vary among states and among types of personnel. Every community must take seriously the need to write realistic plans for disaster responses of all kinds, based on the likelihood of personnel being available, and laws and regulations supporting the expected behaviors. The legal environment changes from one type of personnel to another, as well as from one jurisdiction to another.

5.1.1 The presumption of response to terrorism

The role of the First Responder community in relationship to a mass casualty incident involving non-conventional weapons is fraught with intertwined legal, moral, and social issues. On one hand society has an expectation that if we provide training and equipment for police, fire fighters, and security forces, they will in turn respond to emergency situations. On the other hand during such an incident they could be asked to risk their own health, safety, and even lives for the social good.

The following will draw upon legal/policy doctrine in both the United States (U.S.) and European Union (E.U.), as well as experiences with the September 11, 2001 attacks, to discuss three interrelated areas of concern: the presumption of response by the First Responder community to an incident, the anticipation of *Samaritanism* during response to the incident, and the post-incident expectation of social services for First Responders who may be injured or killed while conducting their response activities.
In order to obtain the proper resolution of the complex issues relative to the civil liability for First Responders and others affected by a mass casualty non-conventional attack, discussions of legal liability should become an imbedded and on-going element in terrorism policy debates. These policy debates should include lawyers and other legal counselors in the process of governmental planning, funding, or discussions of response contingencies. Recognizing and addressing potential civil liability is difficult since the risk factors may be extensive and the rewards for the First Responder intangible. Given this difficulty, these issues demand the

[24] For a plan for using convergent volunteers see www.oes.ca.gov. (Accessed 1/12/05)

same level of attention as that currently placed on the prevention, detection, and mitigation of these catastrophic events.

Some representative concerns relate to the potential of civil liability for the First Responder community as a result of catastrophic events that cause private injuries and the consequent policy concerns that emerge because these catastrophic events extend beyond the private individual conduct and personal injuries that civil justice systems are designed to redress. The admission of new member nations to the E.U (http://www.europa.eu.int) has resulted in changes in its political structures (ROTELLA, 2004), including both alterations of the legal landscape that emerges when the federalization of power occurs, especially within the context of E.U. *subsidiarity* (SWAINE, 2000), the heightened global threat of terrorism (BALLARD, 2003) and the potential for mass casualties from political violence and terrorist attacks (CORDESMAN, 2001; LAQUEUR, 2000; GURR and COLE, 2000).

This section focuses on several of the issues that are representative of those issues that have the potential to be overlooked by policy makers, government officials, and even the First Responders community when planning, training, and preparing for terrorist attacks. Included in this examination is a consideration of whether the civil justice systems of E.U. countries involved are the appropriate forum to resolve these issues, as well as an examination of possible alternative approaches. Developing these alternatives in advance of the need to use them, to maximize their effectiveness in providing the needed social support for the First Responder community, is also identified as a desirable outcome.

The first section of this article recognizes some of the principle concerns of tort law (or its non-common law equivalent in E.U. jurisdictions using other forms of justice administration) that should be anticipated as the result of an attack, termed the *presumption of response*. Thereafter, some of the many legal and tort liability issues that are implicated during a response to such incidents are discussed in anticipation of the altruistic actions (DOVIDIO, 1984; PILAVIAN and HONGWN, 1990) of those who will be called upon to respond, categorizing them as *Samaritanism*. The discussion will then continue as to typical legal and liability issues that should be addressed in advance of a mass casualty incident so that they will be operative when First Responders seek to redress any injuries they may have suffered as a result of their actions while providing necessary social support during times of crisis. Lastly, this section concludes with a discussion of: 1) some alternative approaches to the use

of civil justice systems to address these issues; 2) the importance of proactively educating policy makers on the need to address these issues prior to any terrorist attack; and 3) suggestions for specific strategies that could be employed.

The governmental actions in the U.S. and E.U. post-September 11, 2001 realized the societal expectation that these nations would provide an immediate and massive social response when a mass casualty incident occurred. In particular, these events disclosed the critical nature of the role of First Responders in that social reaction. Here the term *mass casualty incident* includes large-scale terrorist events that may employ a variety of tactics (JENKINS, 2001; HOFFMAN, 1986; LAQEUR 1996 and 1999). Such attack potentials may include massive bombs (e.g., ANFO truck bombs), asymmetrical tactics (e.g., commercial airliners as weapons), and/or a variety of threats known as weapons of mass victimization (WMV). WMV include the use of chemical, biological, radiological, and nuclear tactics to inflict death; but maybe more importantly and realistically to inflict as much social disruption as possible (BALLARD and MULLENDORE, 2003; LITTLE and BALLARD, 2004).
Initially it might seem that the liability issues associated with pre-incident planning, training, and allocation of resources to support those who would be asked to respond to a WMV incident would not differ from the everyday roles of the First Responders. On further examination it can be seen that the same concerns arise in responding to routine emergencies as when dealing with catastrophic events.and when dealing with less widely catastrophic events.

However, the nature of catastrophic events such as terrorist attacks has the potential to remove them from inclusion within the legal framework resulting from policy decisions that were meant to both determine the extent of their responsibilities to react under the law as well as delineating and limiting any civil liability that might be incurred (BARKETT, 2003). This is especially problematic in that, as a result, individual actors may not be afforded the same statutory or administrative protections from tort liability or, if found liable, may be exempted from limitations on the extent of that liability. The lack of this exempted status would not only be financially catastrophic to individual First Responders, but might also operate so as to have a deterrent affect on the willingness of persons to act in this capacity.

The need for legislative limits on potential liability is illustrated by, and mirrors, the concerns that were acknowledged and addressed in the international executive and legislative response to airline hijackings. In a discussion concerning whether tort liability should be imposed on airlines when they fail to warn passengers of terrorist threats against flights, one legal scholar noted that part of the impetus behind the Warsaw Convention was to limit the potential liability of common carriers under general tort or other civil liability theories, while still providing adequate compensation to the injured passengers (HODE, 1998). That hijacked airplanes were used as the devices to bring about the attacks on the World Trade Center, the Pentagon, and the crash landing in Pennsylvania, make the way in which policy makers addressed this concern of particular relevancy and poignancy in this discussion.

Additionally, the U.S. Congressional decision not to impose a duty to warn on airlines, and the airlines' consequent choice not to warn passengers except under extremely delimited circumstances, parallels the initial questions that are being asked regarding the liability of First Responders to catastrophic events. For example, do First Responders have a mandate to respond? At first glance it would appear that the general assumption held by many would be, of course the First Responder community is required to handle the problems that would emerge during an attack on the society. The public expects that, within reasonable limits no matter what the circumstances, community protectors (i.e., police, security forces, and firefighters) will react to emergencies without regard to their own safety and security.

If this expectation is valid, however, then it is not consistent with the lack of legal responsibility noted above for airlines when they do not warn passengers of terrorist threats to flights. And, questions are also left open, in the U.S. and countries who have made similar policy choices, as to what degree this assumption of response is, should, or could be codified within law when the inverse choice was made by the U.S. Congress with respect to airline notification to passengers (HODE, 1998). Further, what are the liability issues that may arise if First Responders fail to fulfill their missions and, as corollary issues, what would be their liability when they do fulfill their mission when they decide to respond in a limited fashion to terrorist attacks? The following section addresses some of these concerns in an attempt to promote awareness and contemplation of these potential problems faced by First Responders.

5.1.2 Anticipation of *Samaritanism*

A "Good Samaritan" is someone who renders aid to others when they are in need of assistance. Samaritans provide care and service to other's needs, overcoming or disregarding any personal concerns including potential tort liability, in service to the larger good. There is a difference between the positions of common law and civil law countries with respect their laws regarding the legal treatment of the exercise of the choice to help, or not. In nations with common law traditions the duty to generally assist anyone in need was not legally reinforced as a duty to act, while in civil law countries it was more generally recognized as a societal good that was reinforced when given favorable legal treatment (PARDUN, 1998). Within common law this support was given in a variety of different contexts, such as statutory imposition of a duty upon trained emergency personnel to administer aid to victims of accidents because of the licensed nature of the professions involved, but only if there was no risk of injury to the person offering aid and it also, then, provides legal protection from civil liability to those who have responded (PARDUN, 1998).

Advanced industrial societies have many common expectations of the First Responder community during times of crisis that precipitated the development of consequent legal doctrines, one of which is *Samaritanism* (WHITE, 2002). For example, the U. S. Congress demonstrated its recognition of *Samaritanism* by enacting the Volunteer Protection Act (1997). This Act preempts lower levels of volunteer liability established under state law (more than gross negligence is required), unless a state specifically opts out of its coverage, a necessary deference to state lawmaking authority in the U.S. legal system.

This was done in part because the federal legislature was aware that fear of potential civil liability for their actions would be a deterrent to an incipient volunteer's offering assistance to others in need (NICHOLSON, 2003). This federal recognition of the importance of citizen volunteer efforts in assisting professional emergency workers was a significant signpost. It further demonstrated a gradual shift away from traditional common law principles (that failed to impose either criminal or civil liability on personal inaction when confronted with an emergency not created by their own fault) towards the imposition of civil and criminal liability for those who fail to protect others in need where doing so would not endanger them.

Similar concerns are included among the more immediate potential problems that the E. U. faces in forging a common set of legal principles across countries when all of them have their separate justice systems with continuing recognition within the Union, especially in the potential event of a mass casualty incident as outlined here that create the scenarios wherein such issues arise (KOCH, 2004).
As a result of the sacrifices that First Responders offer daily in the practice of their respective professions, they may have an expectation of social support from the greater social good they serve. Namely, an expectation that if and when they are harmed during a response to a mass casualty incident, they can and should receive from the larger society support sufficient to meet their needs and provides both comfort and security to them and their families in the event of death, injury, or property loss.
State sponsored and private compensation methods vary among the states in the U. S. and within the E. U. Possible exemplar mechanisms for financially supporting any injured First Responders or their surviving families include coverage within social security and other state welfare programs, unemployment compensation plans, workers compensation plans, and national compensation funds (BARKETT and LAUNSTEIN, 2002).

One example of a federal level fund was the one created after the recent attacks: The September 11th Compensation Fund of 2001. Included in this particular compensation fund are mechanisms to provide immediate assistance to the victims and families, but there are also limitations on other legal options (such as litigating claims in the civil justice system), which come with the acceptance and payout of benefits under the fund.

Private insurance businesses and the local jurisdiction of New York City were also afforded protection within this fund. It placed limits on compensatory and punitive damages equivalent to those provided by the insurance policies in effect at the time of the attack. This legislation also anticipated the desirability of addressing the possibility of future terrorist activities involving airlines by providing immunity for persons who act to stop such terrorists in the execution of their plans, if the belief that a terrorist attack will, or was about to, occur is deemed reasonable (49 U.S.C. SECTION 44903, 2002).

However laudatory this *ex post facto* social response to the tragedy of September 11, 2001 was, a better policy response to this type of scenario would be to have the legislation in place, ready to be activated upon need.

The lesson is that financial effects for the victims and First Responders immediately after a mass casualty incident can be devastating and should be anticipated by policy makers. Such things as having benefits turn on the production of a death certificate when the body cannot be found and, thus, the death certificate can not be obtained, should be planned for and alternatives developed before the First Responders and other victims are in a crisis mode (CONWAY, 2002).

This is not the first time that a national response mechanism has been created in the U. S. That this type of administrative response can be used to replace tort litigation to address similar issues both subsequent to mass tort litigation is shown in the *Dalkon Shield* and *Agent Orange* cases. These schemes were devised to address liability issues that occurred before and after the injury was caused and/or discovered.

Other exemplars include the *Price-Anderson Act's* provisions to handle tort liability arising from a potential nuclear accident, the *National Childhood Vaccine Injury Act* of 1986, and *Superfund* for environmental site cleanup to name some (FLOERING, 2002). While it might not be possible to anticipate every type of tort claim that may arise (TAUNUS CORPORATION v. CITY OF NEW YORK, 2003) and litigation may still occur under these preemptive Funds, since these mechanisms are not intended to completely replace the use of courts (SCHNEIDER v. FEINBERG, 2003; O'REILLY, 2003), some tort based claims can be, and should be, anticipated and appropriate alternatives developed. The potential implications for claims based on violation of real property rights should also be considered (REYNOLDS, 1996).

The primary lesson that can be taken post-September 11, 2001 is not social fear as many have suggested (PYSZCZYNSKI et al., 2003; CUTTER et al, 2003; THUSSU et al, 2003) but rather this mass casualty incident should serve as a warning that the E. U. should plan for such attacks and have in place policies to protect their First Responders from harm. Specifically and wherever possible these prophylactic policy processes should address potential legal liability.

Emergency response planners should also be concerned with the liability that may arise between departments called in to assist each other when response occurs across jurisdictional lines. The rules on liability as it relates to such reciprocal relationships may vary according to the laws found within each independent jurisdiction (for example the "Good Samaritan laws" already discussed) and these issues could have

significant consequences for the responders and agencies involved. Planning and policy development that recognizes such issues within regional areas, multiple jurisdictions, and/or along differing lines of authority, could assist in detecting liability issues and planning to avoid related concerns that may arise for First Responders (WAUGH, 1994).

There are numerous legal and liability issues arising from the pre-incident, incident, and post-incident timeframes relative to a terrorist attack. In addition to the matters already discussed, are implications for policy development regarding: 1) consistent legal theory as it relates to member states which rise to the level of communitarianism; 2) identification and alteration of (or creation of) appropriate forums where liability issues can be addressed; 3) related substantive law and jurisprudence concerns arising within these choices; and 4) defenses that may be used for actions taken by the First Responder community within any of the three timeframes.

Implicit in the above discussion are the varying nature of the sources for the legal theories and potential alteration. These may include, but are not limited to, international law, EU law, and the legal traditions of individual member states. A partial listing of potentially applicable sources for legal theories include the Geneva Convention, Torture Victim Protection Act, Alien Torts Claims Act, and various treaties that are the foundation of the EU. Embedded within each of these theoretical paradigms are a series of issues that could rise to the fore at different points during the lifecycle of the attack. The following chart lists some of these concerns and indicates connections to the three time frames noted above (see Table 8).

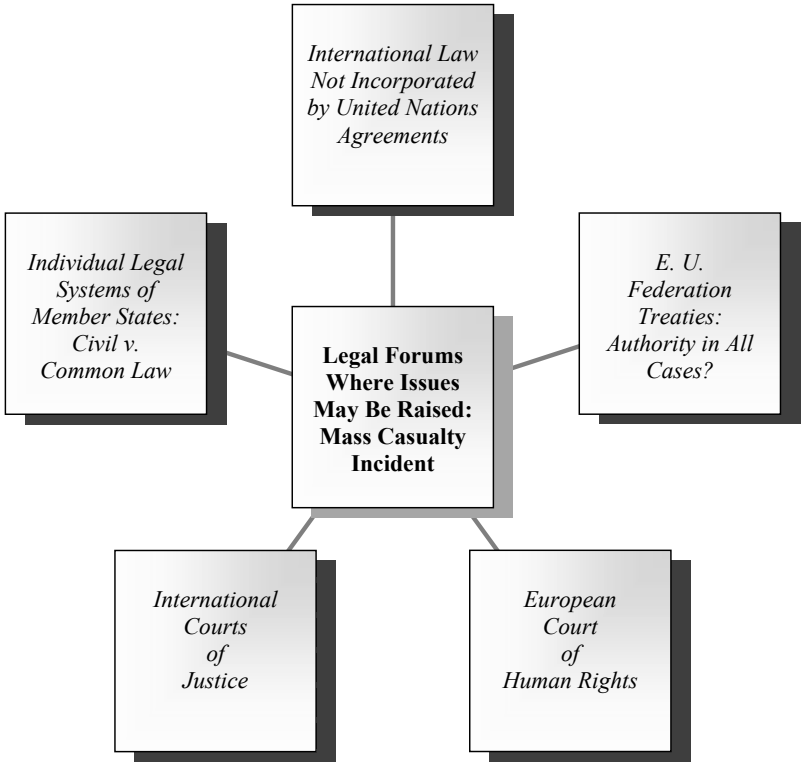
Table 8: Legal Theories and Liability

Liability area	Specific Notes	Pre Attack	During Attack	Post Attack
State Sponsored Action	Issues related to liability may fall within a variety of substantive law areas depending on pre-incident investigations, history with respect to such concerns as motive and past policy decisions, evidence disclosed in the investigation of the act, etc.	**X**	**X**	**X**
Invasion of Privacy	Issues related to this area of liability may also fall in a variety of other substantive law areas depending again on pre-incident investigations, history, what the investigation of the act discloses, etc.	**X**		**X**
Human Rights	This area of liability typically includes issues for both victims and suspects/perpetrators. In the case of victims, human rights issues may happen during the attack and in the aftermath when they seek treatment, for example. The suspects or perpetrators may seek relief as a result of actions during their apprehension and investigation of their activities. While some governmental policies regarding immigration, alien visitors, etc. may be implicated here, they do not rise to the same level of First Responders so are not included.		**X**	**X**
Personal Injury	Including claims regarding physical harm, death, pain, suffering, and economic losses as a result of these injuries.		**X**	**X**
Property Related	Issues related to this area of liability may include actual damage to property, as well as losses stemming from the inability to use, access, maintain, or earn a profit from rental of the property.		**X**	**X**
Tortious Interference	This area may also be known as economic liability. It includes claims regarding the interference with contractual obligations.		**X**	**X**

The second area, considerations of the appropriate forum to resolve any claims, refers to the confluence of agencies, overseers, commissions, and courts of justice that a person may petition to assume jurisdiction before,

during and after a mass casualty incident. The issues that may arise as a result of a mass casualty incident are complex and the jurisdictional lines of demarcation complex (see Figure 21).

Figure 21: Jurisdictional Confluence



This figure illustrates some of the potential and/or expected conflicts: Member state rules v. E.U. rules; the role of International Courts of Justice, potential human rights violations uncovered in investigations of the catastrophic events, etc. (STEPHENS, 1997 and 2002; BETZ, 2001; ROSETTI, 1997). Because of the exigent nature of the required response to counter any mass casualty event, it is feasible that each of these forums could play a part in determinations of subsequent liability to an event. The legal resolution of claims in these various forums has a potentially enormous impact on the First Responder community by the imposition of new regulations, limitations of their abilities to respond, and new working

doctrines, potentially adding to their already considerable occupational burden.

In addition to the cross-jurisdictional issues noted in Table 8, related legal concerns may include additional and specific jurisdictional issues. For example, the issue of subject matter v. personal jurisdiction may arise. As indicated above, the extra-jurisdictional concerns that carry with them specific outcomes as to choice of law and procedural characteristics, such as decisions as to the choice of appropriate forum and those that may be presented differently when a victim's physical presence is of a transient nature versus those with physical domicile or residence within a jurisdiction where the harm was committed, complicate legal decisions relative to mass casualty incidents that already have an intricate nature.

Given these complexities and concomitant ambiguities that may arise from legal claims that take place during such incidents, the defenses to these claims that may be legally recognized may likewise be multifaceted, and depending on their applicability may either be supportive, or not, of the First Responders who are tasked to take action during a mass casualty event. In this situation common law states may again have a very different legal perspective on this issue than civil law states. Questions arise like "Does the forum with appropriate jurisdiction have in place limits on the extent of liability that may be incurred by response activities?" "Do First Responders have either limited liability or complete sovereign immunity for their actions?" (VON HENNINGS, 2001) "Is there any conflict of laws between member states and the E. U. regarding tort claims rules, acts, and regulations?"
The necessity of posing solutions to these various ambiguities is something that many policy makers may not have considered and First Responders may have assumed are not issues applicable to their everyday professional lives. This is why it is incumbent upon the First Responder community to incorporate legal advisors in discussions of response planning, to the extent feasible during response activity, and why they also should be included in a debrief protocol *ex post facto* to a mass casualty incident to help First Responders make good choices that will also protect their individual rights.

The litigation activity following both the 1993 World Trade Center and September 11, 2001 attacks establishes that a wave of legal challenges from all sides will transpire after a mass casualty incident. In a similar fashion, the Madrid train bombings in March 2004 may prompt similar patterns of policy development, like the compensation acts noted above,

limits on liabilities as enacted by various governments, and legal challenges like those noted in the U. S.
Add to the mixture of post-mass casualty social reactions the ambiguities that can result from transnational responses, alternative legal forums and many other considerations and the need for legal assistance in the planning process seems reasonable. If the U.S. experiences with September 11, 2001 are any indication, in the aftermath of a mass casualty incident, claims for liability and alterations in legal, regulatory, and administrative structures will abound. While the U.S. may be unique in its extensive use of civil litigation, what can be learned by any nation from the U.S. experiences is the extent of individual injury that occurs and the need to proactively redress those harms. As a measure of self protection, First Responders should advocate for competent legal representation when considering the planning for such events, ask that lawyers be present during an incident, and seek legal services to deconstruct the inevitable problems that arise as a result of First Responders doing their duty.

5.2 First Responder needs in the U.S.

5.2.1 Regulatory approach

Surrounded as it is by oceans and seas, with two friendly neighbors, the United States has not had a homeland security perspective. Facing a global enemy in communism, the nation was organized to counter external threats with a military response, both offensive and defensive. Civil authorities expected that military units, ubiquitous during the Cold War, would come to the aid of communities under external attack.

In 1993 the terrorist attack on the World Trade Center in New York City, using a truck bomb in the underground garage, proved to be a test of the assumption of military assistance. In fact it was the Police and Fire departments of New York City that arrived with the Emergency Medical Services personnel to conduct search and rescue and provide medical care. The only Federal resource on the scene was the Federal Bureau of Investigation (FBI), whose evidence collection uncovered not only the explosive material used, but also cyanide as a secondary device. The First Responders from the local civilian community were poorly equipped to confront battlefield weapons, and escaped serious harm only serendipitously, based on poor engineering by the terrorists.

Within a month of each other two major terrorist attacks caused large-scale loss of life. The Aum Shinrikyo cult in Tokyo released Sarin, aimed

at debilitating the Tokyo Metropolitan Police Force, in March of 1995. The local police, fire and medical personnel responded to save lives with the equipment at their disposal. Contaminated patients further contaminated the medical personnel and medical facilities, causing the shut down of a significant number of central Tokyo medical facilities. Twelve people died and over 565 were eventually hospitalized for their injuries. ("Terrorist Attack in Tokyo," and COUNCIL ON FOREIGN RELATIONS)

In April of 1995 Timothy McVeigh killed 168 people with a truck bomb at the Federal Building in Oklahoma City, an act in retribution of government agency actions at Ruby Ridge and Waco, Texas. Children died at both of those events, so McVeigh chose a Federal building with on-site childcare, ensuring that children would be among the "collateral damage" of his attack. Nineteen children died, and children were among the 850 injured. (OKLAHOMA CITY NATIONAL MEMORIAL) The local First Responders saved lives in the first tragic hours using only the knowledge and tools at hand in a state capital in the Heartland.

Both events brought Congress to recognize that it is the First Responders of the attacked community who will respond in a time frame that saves lives. Outside searchers arrived too late for live rescues, although they were an important part of the overall recovery effort.

In 1997 the Nunn-Luger-Dominici Act appropriated funds to the Department of Defense to begin a partnership with the nation's largest cities to develop rescue and treatment capabilities among the police, fire and medical personnel. The Department of Defense provided training and some equipment. The Department of Health and Human Services provided project officers to assist the cities with the development of plans and equipment caches for the new Metropolitan Medical Strike Teams (Task Forces) established in each city. The Federal Bureau of Investigation assisted with the law enforcement elements of the planning, and, through the Department of Justice grants programs, equipment for law enforcement First Responders was acquired. The Federal Emergency Management Agency amended the Federal Response Plan to include terrorist acts to events covered by Federal financial assistance. The Environmental Protection Agency and the Department of Energy both provided expert guidance in developing clean-up plans for attacks with various nuclear, biological and chemical agents. (WINSLOW, 2001)

The local Metropolitan Medical Task Forces (MMTFs) included field level personnel from fire, law enforcement, emergency medical services, emergency services, public health, coroner, mental health, environmental health departments, and specialized responders like hazardous materials teams and bomb disposal units. Local hospital personnel and pharmacists were included in plan development. The initial focus was on chemical and nuclear/radiological events. In 2000 the focus broadened to include more emphasis on biological events, and a greater integration of medical community assets. The program developed Metropolitan Medical Response Systems (MMRS) that were not field deployable, but focused on delivering enhanced medical response through existing modalities. The MMRS developed relationships with communities to undertake planning for the distribution of mass prophylaxis and the administration of mass immunization. (WINSLOW AND WALMSLEY, 2001)

By September 11, 2001 when the World Trade Center was attacked, the original MMTF cities had completed their contracts, and a total of 120 cities were part of the MMTF or MMRS program. [25] A project was well underway at the National Academy of Sciences to evaluate the MMTF/MMRS programs and determine the benchmarks for operability. (MANNING et al, 2002) The attacks focused national attention on the fire fighters and police officers who died trying to save the victims of the attack. The term "First Responders" (FR) began to be applied to police and fire personnel and emergency medical personnel by terrorism response planners. By January 2002 the White House proposed a ten-fold increase in budgetary support for "First Responders." (WHITE HOUSE)

The President bolstered response capability through the mandate of a National Incident Management System (NIMS) to be used across the levels of government and a National Response Plan to cover all types of hazards, including terrorism. (HSPD-5) He also provided guidance on developing protection for critical infrastructure. (HSPD-7) Finally the

[25] The original MMTF rubric of WMD/NBC (weapons of mass destruction/ nuclear, biological, chemical) became CBRNE – chemical, biological, radiological, nuclear and explosive – after 9/11. (First Response) Although the original concern engendered by the use of Sarin was that battlefield materials would enter the civilian arena, 9/11 demonstrated instead that the explosive device was still the weapon of choice for terrorists, whether the truck bomb of 1993 and 1995, or the airplane bombs of 9/11/01. A re-focus on the explosive device, improvised explosive device and secondary device was added to MMTF training. The Federal government assembled a consortium of universities to offer specialized training for First Responders, and the New Mexico Institute of Technology created "Incident Response to Terrorist Bombings." (New Mexico Tech)

definition of “First Responder” was enlarged to include other field level assistance, such as public works, emergency management, public health, clinical care and other skilled personnel. (HSPD-8)

The suite of Homeland Security Presidential Directives provides new definitions of the phases of emergency management with a focus on terrorism. The all-hazards approach of the Federal Emergency Management Agency (FEMA) used to talk about the “four phases of emergency management:” Mitigation, planning/preparedness, response and recovery. (FOUR PHASES) Under the new approach to homeland security there are now three phases: prevention, response and recovery as outlined in HSPD-5.

The emphasis on prevention has replaced the “mitigation” effort, which some argue provided the best return on investment. As the FEMA website states, “Mitigation is the cornerstone of emergency management. It's the ongoing effort to lessen the impact disasters have on people's lives and property through damage prevention and flood insurance. Through measures such as, building safely within the floodplain or removing homes altogether; engineering buildings and infrastructures to withstand earthquakes: and creating and enforcing effective building codes to protect property from floods, hurricanes and other natural hazards, the impact on lives and communities is lessened.” (FEMA, Mitigation)

Implementation of the three phases takes five strategies under the Urban Area Security Initiative: planning, operations, equipment, training and exercising. Funding is provided for the communities to spend in these five focus areas. The result should be a higher level of preparedness for CBRNE events.

5.2.2 CBRNE preparedness

Prevention: Intelligence is the first focus of prevention. The local police department develops information about “potential terrorist entities,” and maintains surveillance of the local groups. The FBI also develops intelligence leads based on both their own leads and the coordination of leads from other law enforcement entities. The FBI has created the Joint Terrorism Task Forces in the major metropolitan areas of the United States. In addition some metropolitan areas have created Terrorism Early Warning Groups that bring in fire, emergency medical and emergency management colleagues to share leads and evaluate data. The multi-discipline approach allows for a more comprehensive collection and evaluation of data. Importantly, it adds both medical surveillance and hazardous materials use and security surveillance.

More work needs to be done to share intelligence at an early stage with other homeland security partners. The San Jose Urban Area has set a goal to develop protocols for law enforcement to share selected data with fire, medical, emergency services, public works and utility partners. These professions have staff in the field which could assist with surveillance. They have knowledge that could assist with evaluating and collating disparate data to create usable intelligence.

San Jose UASI Goal 2 emphasizes the importance of partnerships across professions. "Objective 2.2: Develop protocols to be used throughout UA law enforcement to ensure timely notification and briefings for law enforcement, fire service, public safety communications, emergency management, emergency medical services and public health personnel in leadership positions to ensure a heightened level of suspicion and awareness during periods of elevated concern for terrorist activities within the Bay Area." (SAN JOSE UASI, 2004). If prevention is to be the new benchmark of safety, data sharing to create intelligence will be crucial.

Planning: Pre-event planning can make response more efficient and effective. In California the emergency management community has been using the Standardized Emergency Management System (SEMS) since 1993. This system enables all Emergency Operations Centers (EOC) to be organized along the same lines, making cross-jurisdictional cooperation easier. HSPD-5 mandated the creation of a similar national system called National Incident Management System (NIMS) to enable jurisdictions to work together more smoothly.

HSPD-5 also mandates the creation of a new National Response Plan. This plan will combine the existing Federal Response Plan created by FEMA, the Oil Spill Contingency Plan of the Environmental Protection Agency, and other Federal level emergency response plans. "This plan shall integrate Federal Government domestic prevention, preparedness, response, and recovery plans into one all-discipline, all-hazards plan." (HSPD-5)

The Urban Area Security Initiative (UASI) program has facilitated the creation of sub-state regional planning in the 50 largest cities in the United States. (EMERGENCY MANAGEMENT FORUM) Each core city and core county have to work in partnership with each other, the state in which they are located, and some selection of adjacent counties. For example, San Jose includes Santa Clara County, the 14 other cities of Santa Clara

County, San Benito, Santa Cruz and Monterey Counties. San Francisco's UASI includes Marin County and San Mateo County.

Operations: During the urban wild land interface fires of the 1970's the fire service in Southern California developed a method for managing large events using personnel from many different fire departments. Based on the Napoleonic model of army staffing, they called it the Incident Command System (ICS). The system is hierarchical and flexible, offering the ability to use it for small events like a single house fire, or large events like the Southern California firestorms of 2003. The organization of effort is depicted with a five-box chart, the top box being "Command," and the four equal and subordinate boxes being Operations, Planning, Logistics and Finance. This system has been adopted as the standard for fire service operations by the National Fire Academy, (COLE, 2004) and is used by most urban fire departments in the United States today, with the exception of a few older East Coast cities. The ICS has spread from the fire service to all field level response agencies, enabling Police, Fire and Emergency Medical Services personnel to work together in a Unified Command structure at the field command post.

ICS is an important part of the success of mutual aid plans. Because most First Responders are familiar with ICS it forms the basis for successfully melding personnel and resources from different disciplines and different communities into one group to fight a common enemy. The most recent demonstration of its success was the Fall 2003 Firestorms in Southern California. Characterized by the Blue Ribbon Commission as "the most devastating wild land/urban interface fire in [Southern California's] history," the fire took 24 lives directly, and another 16 people perished in a flash flood/landslide in the first rainstorm after the fires. 739,597 acres were burned, along with 3631 homes. (Blue Ribbon Commission) As the report notes, mutual aid plans have been in place in California for more than 40 years. At the height of the Fall 2003 fires there were 15,631 fire personnel assigned to fight the fires, representing fire departments from throughout California. (Blue Ribbon Commission) For example, the County of Santa Clara assembled over 100 fire fighters from 8 departments to spend 10 days at the fires. (SANTA CLARA COUNTY EMERGENCY PREPAREDNESS COUNCIL, 2004) Deputy Chief Dana Reed of San Jose Fire Department served as the Safety Officer for one incident, while Battalion Chief Kevin Conant of San Jose Fire Department served as command staff at another incident.

California's mutual aid plan provides for on-duty personnel to be deployed to assist communities with emergency response at no cost to the receiving jurisdiction for the first 24 hours. The receiving jurisdiction is responsible to feed and house any responders who have to stay beyond their shift, and to replace or repair equipment that is damaged, consumed or destroyed in the response. After the first shift the receiving jurisdiction pays the cost of overtime for personnel, but there is no charge for the use of equipment. Mutual aid operates within 24 professions in California today. Although started by Police and Fire services as part of civil defense planning during the Cold War, mutual aid plans have now been made for emergency managers, public works personnel, and medical personnel. Among the most active non-sworn mutual aid programs are the coroners and building officials. These systems provide a depth of resources throughout the state that can be called upon in any emergency, including response to a terrorist event. The State of California is divided into six mutual aid regions. Jurisdictions needing mutual aid make the request first to the appropriate profession's mutual aid coordinator for the county in which they are located. For example, the Sheriff is usually the law enforcement mutual aid coordinator for that county. If there are insufficient resources available to meet the entire mutual aid need from within that county, the Sheriff then contacts the mutual aid coordinator for that region, generally another Sheriff. The regional coordinator polls the Sheriffs within that region and requests assistance on behalf of the jurisdiction experiencing the emergency. Police and sheriff's departments from throughout the region then determine what personnel and equipment they can spare, and offer it. The regional coordinator then selects the available resources that will be sent to meet the need.

If the region is unable to meet the need, as with the Southern California fires of 2003, a request is then sent from the regional coordinator to the Governor's Office of Emergency Services (OES). OES then sends a request to all six regions to obtain additional resources. If even the state's resources are exceeded, a request then goes from the Governor to the President for a Presidential Disaster Declaration and the use of federal assets, such as the National Forest Service fire assets or military fire assets and personnel.

A similar mutual aid system, called a multi-state compact, has been established among 47 of the states under the leadership of the National Emergency Management Association (NEMA). Their system, called the Emergency Mutual Aid Compact (EMAC) is similar to California's, but because it crosses state borders the financial arrangements are different

(Emergency Management Assistance Compact). California has not joined the EMAC because of the financial arrangements that would cost California communities money, the need for a disaster declaration before resources could be moved, and unresolved liability issues.

The pre-existing interstate agreement, of which California is a member, is the Interstate Civil Defense Disaster Compact that was formed in the 1950's. It has not been updated and its rates of pay are outdated. California has a subcompact with Idaho, Washington, Oregon, Arizona and Nevada that is kept current for rates of pay, and addresses liability issues. This compact does not require declaration of a disaster before equipment can be moved between states. (Blue Ribbon Commission)

As the most populous state in the nation, with a population of 35, 951,000 (CALIFORNIA DEPARTMENT OF FINANCE - Homepage), California has a formidable stand-by resource of state and local government-based emergency response capabilities. It has 900 fire departments and over 62,000 fire fighters. It seldom needs to call on other states for help, although Federal resources already within California have been part of mutual aid in the past. For example, resources of the Forest Service and Bureau of Land Management assisted with fighting the 2003 firestorm as it raged across their properties. Help also came from National Guard assets of Nevada, Arizona and Oregon. (CAMPBELL, 2004)

Interoperable communications systems have been proven to be an important link in emergency response. Even before 9/11/01 public safety personnel were seeking ways to ensure that the mutual aid partners under the UICS could communicate readily at an emergency. In Santa Clara County, California, the city managers formed a consortium to develop interoperable radio frequencies for law enforcement. The fire service in California has long had common radio channels for use at mutual aid events across the state. This system was developed because of the frequency with which fire service resources provide mutual aid across jurisdictions. Mutual aid was needed less often for law enforcement. However, after the Rodney King Riots in Los Angeles in the early 1990's it became clear that law enforcement mutual aid needed better communications support, as well.

The Santa Clara County effort became known as the Silicon Valley Radio Interoperability Project. It was started with $19,000 from each of the fifteen member cities and the county. When Homeland Security Grants became available in 2001, the emergency managers and First Responders recommended that the first year's funding go to support this project. Since that time additional homeland security funds have completed the Police

radio interoperability project. The Fire Service requested the development of a "CAD to CAD" system to allow for the exchange of data via the computer aided dispatch systems (CAD) in use by most fire and police departments and the county's emergency medical transportation provider. This project is multi-level, and is being considered as a national model by the Department of Homeland Security.

The San Jose Police Department also received a COPS Grant of over $5 million to pay for the development of a microwave communications system that would greatly enhance the bandwidth available for more sophisticated communications, such as teleconferences and streaming video. The San Jose Urban Area Security Initiative strategy proposes an additional investment of $1.8 million in the microwave system to tie in the public health laboratories of the three southern counties for which the Santa Clara County Public Health Laboratory serves as the medical reference laboratory for all suspicious disease investigations. This tie would be critical in a biological event, or a latent chemical event, such as mustard poisoning, where rapid medical evaluation would be essential for a good patient outcome, and perhaps to prevent contagion.

Experiences at the Southern California Firestorm of 2003 demonstrated that statewide development of a variety of communications systems that are interoperable is critical. (CAMPBELL, 2004) There are two committees already working on this problem: the Public Safety Radio Strategic Planning Committee and the California Statewide Interoperability Executive Committee. These groups must seek existing technologies for immediate application, and must seek new technologies to enhance interoperability long term. Satellite phones, microwave systems and cell phone technologies may work well in the short run, while new frequency allocations or new technologies are needed in the long run.

Medical operations at the field level are also operationally coordinated. The Federal government maintains the National Disaster Medical System (NDMS) to coordinate available hospital space, especially for specialty care. This system was developed during the Viet Nam War to expand hospital capacity that might have been needed for battlefield-injured soldiers. Fortunately it was never needed. In a disaster, patients from the damaged area could be air lifted by Air Force air ambulance resources to undamaged areas with patient capacity. This would be especially important for burn care, orthopedic care and other medical care that requires along term hospitalization of a patient who is stable enough to travel. (NDMS homepage)

The Department of Health and Human Services created the Disaster Medical Assistance Teams in partnership with the American Red Cross in the early 1980's. In 1986, Dr. Rodger Kelley started working with the National Disaster Medical System to form the first volunteer Disaster Medical Assistance Team. This team became known as the Orange County DMAT and was assigned the designation CA-1 from NDMS. The first team meeting was held at Los Alamitos Armed Forces Reserve Center in June of 1986. The first Memorandum of Understanding (MOU) was signed on June 6, 1989, between the Orange County Red Cross and the U.S. Public Health Service. The program has evolved to include 29 teams across the United States. (CA-1 DMAT Homepage) A DMAT is a group of professional and paraprofessional medical personnel (supported by a cadre of logistical and administrative staff) designed to provide emergency medical care during a disaster or other event. Each team has a sponsoring organization, such as a major medical center, public health or safety agency, non-profit, public or private organization that signs a Memorandum of Understanding (MOU) with the Public Health Service (PHS). The DMAT sponsor organizes the team and recruits members, arranges training, and coordinates the dispatch of the team. In addition to the standard DMATs, there are highly specialized DMATs that deal with specific medical conditions such as crush injury, burn, and mental health emergencies. Other specialty teams include Disaster Mortuary Operational Response Teams (DMORTs) that provide mortuary services, Veterinary Medical Assistance Teams (VMATs) that provide veterinary services, and National Medical Response Teams (NMRTs) that are equipped and trained to provide medical care for victims of weapons of mass destruction.

DMATs deploy to disaster sites with sufficient supplies and equipment to sustain themselves for a period of 72 hours while providing medical care at a fixed or temporary medical care site. In mass casualty incidents, their responsibilities include triaging patients, providing austere medical care, and preparing patients for evacuation. In other types of situations, DMATs may provide primary health care and/or may serve to augment overloaded local health care staffs. Under the rare circumstance that disaster victims are evacuated to a different locale to receive definitive medical care, DMATs may be activated to support patient reception and disposition of patients to hospitals. DMATs are designed to be a rapid-response element to supplement local medical care until other Federal or contract resources can be mobilized, or the situation is resolved.

DMAT members are required to maintain appropriate certifications and licensure within their discipline. When members are activated as Federal employees, licensure and certification is recognized by all States. Additionally, DMAT members are paid while serving as part-time federal employees and have the protection of the Federal Tort Claims Act in which the Federal Government becomes the defendant in the event of a malpractice claim. DMATs are principally a community resource available to support local, regional, and State requirements. However, as a National resource they can be federalized to provide interstate aid. (CA-1 DMAT Homepage)

The Metropolitan Medical Task Force/ Metropolitan Medical Response System mentioned earlier is a merger of local public safety and medical agencies, including partnership with private businesses – hospitals and ambulances. The MMTF/MMRS has been transferred to the Department of Homeland Security, and to the supervision of the Response Directorate. One element of the MMRS is the Strategic National Stockpile (SNS). The mission of the Center for Disease Control's (CDC) SNS Program is to ensure the availability and rapid deployment of life-saving pharmaceuticals, antidotes, other medical supplies, and equipment necessary to counter the effects of nerve agents, biological pathogens, and chemical agents. The SNS Program stands ready for immediate deployment to any U.S. location in the event of a terrorist attack using a biological toxin or chemical agent directed against a civilian population. (CDC - SNS Homepage) The SNS Program works with governmental and non-governmental partners to upgrade the nation’s public health capacity to respond to a national emergency. Critical to the success of this initiative is ensuring capacity is developed at federal, state, and local levels to receive, stage, and dispense SNS assets. The SNS is a national repository of antibiotics, chemical antidotes, antitoxins, life-support medications, IV administration, airway maintenance supplies, and medical/surgical items. The SNS is designed to supplement and re-supply state and local public health agencies in the event of a national emergency anywhere and at anytime within the U.S. or its territories. The SNS is organized for flexible response. The first line of support lies within the immediate response 12-hour Push Packages. These are caches of pharmaceuticals, antidotes, and medical supplies designed to provide rapid delivery of a broad spectrum of assets for an ill defined threat in the early hours of an event. These Push Packages are positioned in strategically located, secure warehouses ready for immediate deployment to a designated site within 12 hours of the federal decision to deploy SNS assets. If the incident requires additional pharmaceuticals and/or medical supplies, follow-on

vendor managed inventory (VMI) supplies will be shipped to arrive within 24 to 36 hours. If the agent is well defined, VMI can be tailored to provide pharmaceuticals, supplies and/or products specific to the suspected or confirmed agent(s). In this case, the VMI could act as the first option for immediate response from the SNS. To determine and review the composition of the SNS Program assets, Department of Homeland Security (DHS), Department of Health and Human Services (HHS) and Centers for Disease Control (CDC) jointly consider many factors, such as current biological and/or chemical threats, the availability of medical materiel, and the ease of dissemination of pharmaceuticals. One of the most significant factors in determining SNS composition, however, is the medical vulnerability of the U.S. civilian population. The SNS Program ensures that the medical materiel stock is rotated and kept within potency shelf-life limits. This involves quarterly quality assurance/quality control checks (QA/QC's) on all Push Packages, annual 100% inventory of all Package items, and inspections of environmental conditions, security, and overall package maintenance.

During a national emergency, state, local, and private stocks of medical materiel will be depleted quickly. State and local First Responders and health officials can use the SNS to bolster their response to a national emergency, with a 12-hour Push Package, VMI, or a combination of both, depending on the situation. The SNS is not a first response tool. The SNS Program is committed to have 12-hour Push Packages delivered anywhere in the U.S. or its territories within 12 hours of a federal decision to deploy. The 12-hour Push Packages have been configured to be immediately loaded onto either trucks or commercial cargo aircraft for the most rapid transportation. Concurrent to SNS transport, the SNS Program will deploy its Technical Advisory Response Unit (TARU). The TARU staff will coordinate with state and local officials so that the SNS assets can be efficiently received and distributed upon arrival at the site. DHS will transfer authority for the SNS materiel to the state and local authorities once it arrives at the designated receiving and storage site. State and local authorities will then begin the breakdown of the 12-hour Push Package for distribution. SNS TARU members will remain on site in order to assist and advise state and local officials in putting the SNS assets to prompt, and effective use.

Protection: Personal protective equipment (PPE) for First Responders is a key asset to ensure field level response. Legally First Responders may not be sent into contaminated areas without appropriate protection. Every field response profession must be provided with appropriate equipment, trained in its use, and offered refresher training and exercises. PPE for

chemical events is based on hazardous materials response experience. PPE includes respiratory protection and protective clothing. PPE comes in four levels, with Level D being typical clothing, Level C being clothing with some anti-splash features, Level B including respiratory protection through canister-based respirators or air purifying respirators, and Level A including fully encapsulated suits and self-contained breathing apparatus.

Hazardous materials technicians are typically members of the fire service. These personnel will make entry into contaminated areas (hot zone) to effect search and rescue, and provide immediate life-saving care. They must have Level A PPE. Other First Responders will not enter the hot zone. They will have a lower level appropriate to their work and potential exposure. For example, the police will have CBRNE-protective respirators to wear when directing traffic, handling crowd control or protecting evidence. Medical caregivers, exposed only to decontaminated patients, will need only universal precautions. Coroner personnel, exposed to potentially contaminated remains, may need a higher level of PPE than medical caregivers, but the requirements for dexterity and vision in performing autopsies will complicate the provision of appropriate PPE.

Protection against the effects of explosives requires a different set of materials. Bomb suits typically include blast protection shielding of vital organs, as well as overall flack protection against fragmentation of devices or exploded materials. The original bomb suits focused only on blast and shrapnel. With the recognition of the likelihood of CBRNE events, a new suit had to be devised that provided respiratory protection as well as the traditional blast and shrapnel protection. The challenge was developing both optics that allowed for adequate accuracy when viewing tiny bomb parts, and hand protection that still permitted adequate dexterity to disarm intricate devices.[26]

Protection against biological agents was at once both easier and more challenging. Universal precautions would protect First Responders against the standard infectious diseases. However, intentionally aerosolized material might be small enough to pass through a standard N-95 mask, and virulent agents might enter the bloodstream through small cuts in the skin, or collect on outer garments and infect the caregiver upon doffing the garments. [27] The infectious material collected on the outer garments,

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[26] Med Eng of Canada developed the first suit that provided Level B protection for bomb technicians.

[27] There were reports that some of the medical caregivers became infected in exactly this way when they removed their gloves and masks, and then their gowns.

became airborne as the gown was drawn off, and entered the unprotected airway. The CDC has developed a poster to remind all First Responders to remove potentially contaminated clothing first, and the mask last, being sure not to touch the contaminated shield area. (CDC, SARS)
Managing solid material, like anthrax and ricin, poses other problems. Inhalation and skin contact must both be avoided. The size of the material will determine what level of PPE is adequate. Some fire departments rely on standard fire turnout clothing and SCBAs, while others use Level A protection. Studies by the Department of Defense have suggested that standard turnouts are probably adequate, but the high degree of lethality and the long term health effects of anthrax make the management decision regarding PPE orders a challenge. (CDC, INTERIM RECOMMENDATIONS)

First Responder protection against radiological and nuclear materials is complicated by the variety of types of radiation to which they may be exposed. Alpha radiation poses principally a respiratory threat. A full face HEPA mask may be adequate: SCBA and standard turnout clothing offer higher protection against alpha-radiation emitting particles. Only respiratory protection has been recommended by Department of Homeland Security and certified by NIOSH. (Fire Chief). Beta and Gamma radiation demand the employment of dosimeters and the principles of time, distance and shielding to protect First Responders. The Chernobyl tragedy clearly demonstrated that First Responders' exposure to radioactive material has severe health consequences. At present there are no other recommended PPE for First Responders to use when conducting rescue operations at a radiological event. The Department of Energy does have a Nuclear Emergency Search Team (NEST) with specialized equipment that could aid First Responders with longer-term responses (NEST). The PPE available to the NEST is classified information. Because the NEST requires 12 to 24 hours to arrive at the scene of a radiological or nuclear release the local government's First Responders need better protection to provide rescue and initial care in the "golden hour," when medical care will be most effective in saving lives.

Decontamination: Fire department-based hazardous materials teams have long had Environmental Protection Agency standards for the management of chemical decontamination for both First Responders and victims of chemical weapons or accidents. First Responders are adequately protected from possible splash or off-gassing with Level B clothing and SCBAs. In an open outdoor environment a respirator will provide adequate respiratory protection for the First Responders helping

with decontamination, is less stressful on the respiratory system, and allows the person to work longer between rehabilitation breaks than with SCBA.

Copious amounts of soap and water and limited disrobing will successfully decontaminate victims of most agents. Fire departments have developed methods for gross decontamination for large numbers of people using large hose lines to drench victims departing a scene on their own. Furthermore, removal of the outer clothing will remove 85% of the contamination in most instances. (US ARMY SBCCOM)

Non-ambulatory patients may have to be scrubbed or rinsed by First Responders either in the field, or at the hospital of they self-transport from the scene and remain dirty. Systems using cannery rollers, backboards, hoses and brushes are available in most fire departments. Because decontamination is a dual use capability for both accidents and attacks, most communities can maintain adequate resources.

Since victims of explosions and radiological events may have been showered with particulate matter, decontamination may be required before medical treatment to stop the further migration of agent or exposure to radiation, and to lessen the likelihood of contaminating medical caregivers. The same strategy of removing the outer garments and using copious amount of water would be used. The same training and equipment will be effective for chemical, explosive or radiological exposures.

Biological agents pose a different problem. In most cases the exposure is internal, so external decontamination will not be beneficial. In addition, the potential for creating hypothermia in an injured patient is great if they are externally decontaminated outdoors. Therefore, decontamination is generally counter indicated for biological agent victims. The exception might be anthrax or ricin exposure. Decontamination of these patients would follow the chemical guidelines and use the chemical protocols.

In the field the military is usually short of water, so specialized foams and surfactants have been developed. However, in an urban environment with adequate fire hydrant systems, lots of plain water gives the best results and causes the least trauma to the patient and the environment. It also minimizes training requirements and requires no unique equipment.

During the decontamination process it is essential that adequate care be taken by First Responders to collect all wastes resulting from the

operation (e.g., run off) in order to avoid environmental contamination in adjacent ecosystems.

Detection: Chemical detectors are readily available and widely used in the fire service. Hazardous materials teams also have more sophisticated meters available. While these detectors generally provide only categories of agent – e.g. organophosphate versus Sarin – the information provided is adequate for scene control, plume modelling separating the contaminated from clean patients, monitoring the post-decontamination cleanliness of the patients, and immediate medical care. A patient suffering from organophosphate poisoning will be treated with atropine, whether the cause is a terrorist attack with Sarin or an agricultural accident with pesticide. Definitive samples for evidentiary purposes will be collected by the FBI's Evidence Response Team. Samples gathered for forensic purposes are evaluated at the FBI's lab at Quantico, Virginia (FBI, 1998).

Laboratory analysis can be performed at the local level in many communities. Crime analysis laboratories are established in local police departments in larger cities, and at the county or regional level in less populated areas. Field samples of air, water, soil and evidence materials may be collected and analyzed in the lab using mass spectrometry, wet chemistry, microscopy and fiber analysis. While the field tests, such as Drager tubes for air sampling and hand held detectors, usually produce a result within an hour or less, laboratory analysis may take hours to days. Thus First Responders generally rely on field tests for expedient decontamination and medical care decisions, while laboratory analysis is used for building a criminal case.

Explosive detectors are also available. Unfortunately the level of background chemicals in an urban environment makes the use of real-time detectors complex. For example, ammonium nitrate and fuel oil (ANFO) is still the most common explosive used by domestic terrorists in the United States, but fertilizer is commonly found on lawns and in parks in urban areas, so it is likely that many people would carry trace elements on their shoes, causing detectors to alarm. Dogs are generally used to seek explosives in airports and public buildings.

Biological detectors also suffer from the problem of determining "background" levels. Most communities have some ambient levels of anthrax and other weaponized or potentially weaponized biological materials. Time analysis is required to establish a baseline before any alarm level may be set. The EPA has a national sensor program for air

quality monitoring. This program is being tested as a potential bioterrorism early warning system called "Biowatch." (DHS, BIOWATCH FACT SHEET) So far in communities with the program there have been many false positives based on naturally occurring or non-aggressive releases of biological materials. For example, pesticide applications using spores, or even windy days, can create high levels of material on the filters. These false positives are recognized in the laboratory, and community alarms have been avoided. Biological substances of concern cannot be adequately tested in the field in real time. Background interference and contaminated working conditions make definitive field-testing difficult. At the present time the protocol is to collect the sample and have it tested in the local Level B lab that is part of the Laboratory Response Network of the CDC. (CDC, FACTS ABOUT LRN) The network was established in 1999 and comprises about 120 working laboratories, including local, state and federal public health facilities, veterinary and military labs. It was a Florida LRN that first diagnosed the anthrax attack using polymerase chain reaction (PCR) (YOUNG, 2004). LNR is also part of the Biowatch program, and works on emerging infectious diseases, like SARS.

Effective biological detectors require careful calibration and highly trained microbiologists and laboratory technicians to manage the new technology. It is unlikely that useful field level tests will be developed soon. The technology used by the military is based on a fixed level of background contamination that is unlikely to change during a battle, unless there is the release of a chem or bio weapon. Modern urban centers do not have stable levels of chemicals or pathogens, so testing requires human intervention for analysis based on discretion. Unfortunately, many manufacturers have tried to sell military equipment to urban First Responders, who find that their new technology was an expensive failure. In the early days of the Metropolitan Medical Strike Team development the Department of Health and Human Services required all MMST cities to use a portion of their meager Federal start-up funds ($350,000) to buy a set of "Smart Tickets" that claimed to detect biological agents in the environment. In fact they had a high rate of both false positives and false negatives, and were dropped from the program for 1999. [28]

[28] Successful detection of biological agents indoors is more likely. Cepheid Corporation had installed anthrax detectors in 15 selected United States Postal Service facilities in late November 2003 as a pilot program. But even in this restricted environment the PCR-based equipment, called Biohazard Detection System (BDS), has produced a high number of "inconclusive" tests. Cepheid described its system's test results as "teething problems," but

Detecting radiological or nuclear events is based on Geiger counters, dosimeters and a variety of dose rate survey meters. Some personal dosimeters have to be sent away to be read for accumulated dose. Others provide an alarm when exposures exceed safety guidelines.

Treatments: Because of the local experience with industrial chemicals, antidotes for most chemicals are readily available. The military has created simple to use administration methods for field forces. The Mark I kit combines atropine and 2PAM in auto injectors that can be carried on fire vehicles. The atropine mitigates the effects of a nerve agent by lessening the secretions, and the 2PAM is used to lessen the convulsions as a follow-up medication. Cold packs may be used to mitigate chemical burns. Coagulating agents applied externally will help slow bleeding. Respiratory support may be needed if the patient has experienced significant poisoning. Field bagging and in-patient ventilators may be needed for hours to days, depending on the severity of the poisoning and the amount of atropine administered.

Injuries from explosives will be treated with standard trauma care. Head injuries and ear damage are common, as are blast effect damage to internal organs. Cold packs, coagulating jell and special burn dressings will contribute to a better outcome for blast victims.

Biological medical care comes in two phases. If there is a threat or known release, prophylactic antibiotics and immunizations may be effective. Smallpox vaccine may be administered up to seven days after exposure and still be effective. Anthrax vaccine administered immediately after exposure can prevent or mitigate the toxicity of the organism. Cipro or doxycycline administered within 48 hours will kill the anthrax bacillus before it can create enough toxine to kill. Other antibiotics have proven effective in preventing the development of plague and other weaponized diseases.

Exposure to radiological or nuclear materials is amenable to limited treatment. The intake of KI will protect the thyroid from radioactive iodine created during nuclear reactions. Acute radiation sickness (ARS) is treated with supportive care until nausea passes and burns heal. However, severe cases of ARS typically die from bone marrow destruction.

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the postal service has paused in its original plan to install over 120 such detectors at key sorting locations (LINNANE, 2004).

Exposure to high doses of radiation may cause birth defects and certain cancers long term, which are not readily treated.

If there is an explosion involving the release of radioactive materials, special trauma care will be required. If the patient sustains secondary injuries from burn and blast, or shrapnel, even the specific care is likely to have only limited success rate. [29]

Training: Situational awareness is the key to First Responders' safety. Courses are available on CD and website, as well as in classroom formats. The focus on First Responders training is to identify the problem as early as possible to begin appropriate First Responders PPE and scene management. The best method is to train all the professions together who will have to coordinate at the scene: PD, FD, EMS, mental health, coroner, ambulance and hospital staff.

Police and Fire staff members have different perspectives on what constitutes a threat. Police personnel, who typically work alone, are taught to be observant and aware of the unusual people, items and situations in their usual work environment. Fire personnel, on the other hand, focus on building condition, searching for victims, and working as teams. These qualities need to be cross-trained to the other professions because secondary explosive devices are commonly found at terrorist attack sites. The goal is to commit one crime to draw First Responders to the scene, then have the larger explosions occur to kill the police, fire and ambulance crews. Eliminating First Responders would spread a sense of increased vulnerability among the community denied public safety services. This strategy was used in the abortion clinic bombings in Georgia in 1998, and in the 1993 World Trade Center bombing. The Office for Domestic Preparedness has provided several videotapes to reinforce secondary device training. (ODP)

Initially cross discipline joint training may be a challenge because of the different perspectives on approaching and managing a crime scene. A terrorist WMD event is a multiple casualty incident and a crime scene. The fire and EMS personnel would naturally focus on the medical treatment needs of the victims to the exclusion of evidentiary material. Conversely, traditionally the law enforcement personnel would focus on

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[29] In 1986, despite receiving special medical care at the national dedicated treatment center for radiation victims in Moscow, several fire fighters with radioactive contamination of their skin lesions and concurrent high exposure to beta- and gamma radiation received at the Chernobyl nuclear reactor accident died.

the need to collect and protect evidence and see the victims as witnesses. But cross training in advance can help to show fire personnel how to treat victims while minimizing interference with the crime scene, and provide hints on how the injuries, and evidentiary material in the patient injuries, may become important additions to law enforcement evidence. Training together can lead to pre-plans that lay out the Incident Command structure that may include unified command between law and fire.

Training may be offered through a variety of methods. Some of the basic courses may be offered as CDs for self-study, satellite broadcasts, web-based courses or distance learning strategies, such as teleconferencing. This approach may be used to bring experts to audiences across the nation or the world. Police and fire personnel have special courses developed through the Department of Defense and the Office for Domestic Preparedness. Awareness courses are often included in basic police and fire academies. Many departments also offer "continuing professional training" or "seldom used skills" annually or periodically. Emergency medical services, medical, public health, mental health and coroner personnel have classes developed by the Centers for Disease Control and Office for Domestic Preparedness that may be part of "grand rounds," continuing professional education and special programs, like Santa Clara County's Disaster University. (SANTA CLARA COUNTY)

Other public employees have been added to "First Responders" by Homeland Security Presidential Directive-8, (2) (d). Office of Emergency Services, public works, government administration, information technology and utilities staff members now need to receive both Awareness training, and specialized training related to their own work. Most recently the community is being brought into the "First Responder" definition through the Community Emergency Response Team (CERT) program. (CERT) The final class of the 20-hour CERT program focuses on terrorism awareness in the neighborhood, and actions that community members can take to help First Responders fight terrorism and ensure homeland security.

Training resources come from various Federal agencies, including CDC, Department of Homeland Security's National Fire Academy and National Emergency Training Center, and the Office for Domestic Preparedness. Catalogs of courses are available at their websites. (ODP CATALOG) State-based training comes through the National Guard, and state training organizations. In California the California Specialized Training Institute and Peace Officers Standards and Training are the sponsoring agencies.

Exercises: Exercises are held at the national and local levels. Nationally, the TOPOFF series had provided for inter-agency and cross-disciplinary training. The original Top Officials Exercise (TOPOFF) in 2000 was focused on the ability of the federal partners to manage a WMD event. Simulations were held in New Hampshire, a state with no special preparedness training, and Denver, where the MMSAT program had been accelerated to prepare for the G-7 summit in 1998. TOPOFF 2 was held in May 2003 in Seattle, Chicago and Washington, DC. Each postulated a different attack scenario. The After Action Report provides a blueprint for WMD response improvement. (DHS, TOPOFF 2)

Locally created exercises are held at cities and counties. They make take any of several forms. A *tabletop exercise* permits partner agencies to discuss the plan suing a scenario. This allows the plan to be evaluated and modified through group process. The *functional exercise* places Emergency Operations Center staff in their positions, and simulates the real world through phone, fax, e-mail and cell phone messages. This tests the knowledge of the individual, and their knowledge of the resources at hand. The *facilitated exercise* places First Responders in field positions but requires that they discuss their plan of action before acting out the response mode. For example, staff in the field operation module would receive a briefing from the Incident Commander, then the units discuss the action plan before executing it. This ensures that all First Responders only act correctly during the exercise to prevent future confusion about what was “right.” The *full-scale exercise* uses a skeleton script to drive actual action by field personnel. “Victims” are often moulaged to simulate appropriate injuries. Personnel use all the equipment and techniques appropriate to the simulated event.

Capability confirmation can be achieved either through the exercise program, or through analogous actual events. Examples would include the actual attacks on 9/11/01 that tested existing MMSTs and WMD/NBC planning in New York and Washington, DC; the anthrax attacks in the fall of 2001, and the ricin attack in Washington in the fall of 2004.[30]

[30] The city of San Jose had its own confirmation event on December 10, 2000. (MILLER, 2001) Three youths released pepper spray serially in several stores crowded with Christmas shoppers over a four hour period. Although the juveniles viewed it as a prank, the event caused the same crowd behaviors as an actual chemical attack would have done. Large stores were evacuated, many victims got in their private cars and left before medical assistance and traffic control could be established. Some contaminated people ended up at a local hospital and made the staff sick. Nine women in the late stages of pregnancy were admitted to the hospital overnight, one young man's asthma was stimulated and he was hospitalized for six weeks. A 70 year old woman with pre-existing heart disease died. The Incident Commander established the WMD response and provided evaluation to over 170 people, 70 of whom felt sick enough to be transported to the hospital in ambulances. Field triage and treatment, and evaluation of PPE levels were all tested. Since that time there were two suspicious substances on airplanes that triggered an response to a suspicious powder at Mineta San Jose International Airport, and in April 2003 a pilot quarantined his plane until several ill passengers were evaluated for SARS by a County health officer

Chapter 6

EU/US PUBLIC-PRIVATE PARTNERSHIPS IN DEVELOPING PROTECTIVE COUNTERMEASURES

6.1 The role of the business sector in homeland security

Security and stability have always been crucial factors in determining the competitive advantages of a country. At the beginning of the 21st century this seems to be even truer than in the past. Given the spread and the depth of economic globalization, there can be no doubt that the corporate sector must participate in guaranteeing and furthering national and international security. In the past, the corporate sector faced increasing demands for companies to come to terms with their societal, political, and ecological responsibilities. Because of the multi-facetted, transnational, and asymmetric nature of the new risks, however, the new demand to support national and international security entails consequences of a magnitude not witnessed before.

The role of emergency responders and the possible avenues for the business sector to support them should be analyzed against the background of homeland security. Given their past, European countries are more familiar with protecting their homeland against different natural and man-made catastrophes than the United States. However, the rise of non-state actors ready to use force to achieve their goals, religiously motivated fanaticism that nurtures catastrophic terrorism, and the proliferation of weapons of mass destruction have also increased the need to assess and renew European approaches to homeland security. These new challenges and the interdependencies among European countries demand a new level of inter- and intra-agency coordination and cooperation. Network centric approaches to devising strategic concepts, adapting existing processes and structures, and providing adequate instruments, capabilities, and resources must replace the existing solutions that were set up along traditional organizational stovepipes.

F. Steinhäusler and F. Edwards (eds.), NATO and Terrorism, 118–132.

The central role played by First Responders in national and European homeland security concepts as the key instrument of the first hour has been addressed only marginally up to now. The corporate sector can support the First Responders community in four different ways.

1. Multinational companies can help mitigate new security risks by adapting corporate policies. By doing so, they help improve conflict prevention and can thus directly address some of the causes of catastrophic terrorism;
2. The corporate sector must gear up its activities to provide its own security. In the 21st century, risk management and enterprise resilience should not be interpreted as mere cost factors that negatively impact the corporate bottom line. Rather, they must be seen as key assets guaranteeing corporate survival:
3. Companies must improve their products and services to meet the needs of the emergency responders. This is a challenge not only for research and development, but also for the way that business and emergency responders interact;
4. The public sector and the corporate sector must establish new guidelines, processes, and structures to forge public-private partnerships to the benefit of homeland security. Mutual integration must be pushed to a level not seen in the past. Given the different rationalities underlying the corporate and the public sectors, this is no small challenge. Above all, however, the public sector itself must be committed to carrying out the most serious reform work in order to overcome existing organizational shortfalls and deficiencies.

In the aftermath of the 2001 terrorist attacks on New York and Washington, D.C., the US government has embarked on an ambitious agenda to improve the security of the United States. The National Strategy for Homeland Security aims at establishing "a concerted national effort to prevent terrorist attacks within the United States, reduce America's vulnerability to terrorism, and minimize the damage from attacks that do occur. (NATIONAL STRATEGY FOR HOMELAND SECURITY, 2002) Although the US concept of homeland security is a specific approach to the challenges, the general reconfiguration of existing security structures to cope with new risks is relevant for Europe as well.

There are at least three reasons why Europeans need to come to terms with protecting their homeland:

- Interdependencies among EU members can increase vulnerability. (KUNREUTHER et al, 2002) While it can be argued that the main responsibility for homeland security rests with nation states, homeland security in Europe has a distinct, transnational character. Although precise concepts need to be developed, it is obvious that cross-border support in case of emergencies and thus the division of labor between European and national levels of intervention will be key;
- Europe's increased preparedness to share global responsibility will increase its risk exposure. In order to make serious international commitments, strengthened homeland security is indispensable;
- The draft of the EU constitutional treaty stipulates a solidarity clause that foresees the use of all available instruments to support EU member states in case of a terrorist act. This suggests that European solidarity and homeland security are closely interconnected. (DE WIJK, 2004).

From a conceptual point of view, it can be argued that homeland security should rest on a network-centric understanding of security governance in order to guarantee a seamless interlocking of all relevant security actors, levels of decision-making and action, security instruments, and tasks to be accomplished. Furthermore, it should emphasize co-operability among all relevant actors in the security sector (i.e., between military forces and other security forces) and relevant third parties (e.g., corporate sector) at the national and at the international level. It also requires capability-related concepts and approaches that emphasize mission critical functions, rather than the means (e.g., platforms, forces, and others) to fulfill them. (BORCHERT, 2004) Looking at the functions to be accomplished, the following preliminary working definition of homeland security in the European context can be formulated:

> *Homeland security is a concerted effort among all available civilian and military means to protect people, democratic institutions, and critical infrastructure against symmetrical and asymmetrical risks.*

To this end, homeland security puts a premier focus on

- Protection of the security forces (armed forces, emergency responders, and others) needed to prevent security risks from arising, fight them in times of escalation, and provide stabilization in the aftermath of a crisis;

- Emergency preparedness, consequence management, and recovery to deal with natural (floods, avalanches, fires) and man-made (industrial accidents, epidemics) catastrophes at national and international levels;
- Border control and border surveillance with a special, but not exclusive focus on EU borders in the south and in the east, and
- Defense as an instrument of last resort in case of violent conflicts, when all else fails.

The role of each actor in the First Responder community depends on various criteria, such as the risks to be tackled, the duration of the crisis to be fought, the scope of the consequences to be dealt with, the availability of the different forces, and the degree of violence witnessed on scene. However, as in defense planning, a capabilities-based approach to homeland security will redirect the focus from actors to their means and capacities to deal with challenges. This paradigm shift comes with the advantage of blurring organizational boundaries in favor of output and outcome of specific operations, rather than input. The challenges lie in orchestrating a complex web of inter-organizational relationships and establishing new processes and structures that cut across existing organizational stovepipes in order to jointly plan, conduct, and evaluate emergency operations.

The public and the private sectors have a mutual interest in increasing corporate activities to the benefit of homeland security in general and First Responders specifically. In the United States and in Europe, large portions of the critical infrastructure (NATIONAL STRATEGY FOR HOMELAND SECURITY, 2002) lie in the hands of private actors. While this has prompted increased awareness of the need to coordinate and harmonize activities in some areas (critical infrastructure protection, cyber security), other areas have not received the necessary attention. This was drastically illustrated after the attacks of September 11, 2001 on New York, when e.g., the Lower Manhattan economy lost about 100,000 jobs because of 9/11. (KAYYEM and CHANG, 2003) Catastrophic events of this magnitude clearly exceed the corporate sector's ability to cope with strikes of this kind on its own. At the same time, local industry can play an important role in dealing with the consequences of such events. For example, more than 10,000 skilled support personnel per day were needed to search and clean up the World Trade Center scene during the initial recovery stage. However, many of them were ill protected and prepared, lacking the necessary personal protective equipment and training in dealing with hazardous material. (COUNCIL ON FOREIGN RELATIONS, 2003)

Against this background, the corporate sector's role in homeland security should not be confined to single-issue solutions. Instead, a comprehensive conceptual approach is required in order to identify areas of common interests, define joint and individual tasks, and on that basis, delineate joint and individual responsibilities, competencies, and capabilities. This also holds true for corporate activities in support of First Responders. Four dimensions of support can be distinguished (Fig. 22): First, the corporate sector plays a key role in mitigating the new security risks that can lead to catastrophic terrorist activities. By interpreting corporate social responsibility in the light of foreign and security policy, the corporate sector plays an important role in long-term conflict prevention. Second, the corporate sector must do much more to increase preparedness and protection, thereby complementing the current focus on cyber risks and other technical dangers with new tasks. Third, First Responders and the respective industries should work together more closely to deliver those capabilities that First Responders need to cope with terrorist attacks. Finally, both sides should join forces in setting up new mechanisms of cooperation and coordination at all levels of interaction (local, national, international).

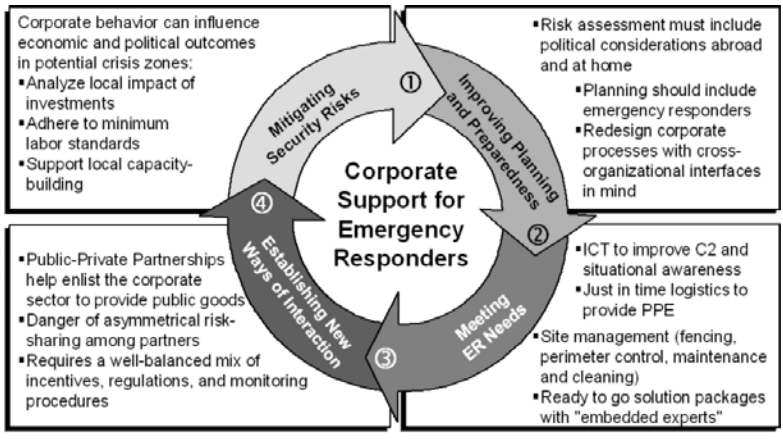
Besides their ideological underpinning, many of today's terrorist groups are motivated by a dangerous cocktail of sources of conflict such as economic underdevelopment, unbalanced distribution of wealth, corruption, political instability, religious extremism, and failed public institutions. Terrorists either envisage overcoming their authoritarian or nepotistic regimes to change domestic conditions, or they target Western countries whose influence they want to contain. In dealing with these causes, international politics has turned increasingly to the private sector to provide remedies. The basic rational is straightforward: by behaving in a certain way or refraining from critical practices, the corporate sector can influence economic and political outcomes in potential zones of crisis. (BANFIELD et al, 2003)

In 2000, a group of nongovernmental organizations published "The Business of Peace," an influential study that identified different types of action corporations can undertake at different stages of a conflict. For conflict prevention, companies doing business in potential zones of crisis could assess the impact of their investments on social, political, and economic structures and implement human rights, anti-corruption, and environmental codes of conduct. Furthermore, by engaging in policy programs aimed at addressing the most important causes of conflict,

multinationals could directly influence the political agenda. The escalation of a crisis will restrict the corporate sector's room for maneuver. Nevertheless, companies could team with nongovernmental aid organizations to provide food and shelter to the victims. Furthermore, they should ensure the integrity of the company's own security arrangements and could put pressure on politicians to negotiate conflict resolution. During the post-conflict stage, companies can restart the economy via new investments, help build up local economic capacities, and provide support in rebuilding damaged infrastructure. By closely engaging with the new political leaders, the business sector can contribute to reshaping a country's economic regulatory framework to the benefit of sustainable growth and prosperity. (NELSON, 2000)

The most effective protection of the European homeland lies in addressing the causes of conflict where they originate. To achieve this, there is much to be gained from tapping into the corporate sector's potential as part of homeland security, although the involvement of the corporate sector in homeland security and in conflict prevention and reconciliation is still in its early stages. It will be necessary to conduct comprehensive debate on the risks and opportunities of corporate engagement in the framework of foreign policy, economic and trade policy, and security policy. The discussion should focus not only on the conditions that need to be established in pockets of crises. In addition, it should also analyze the potential for coordinating and harmonizing regulatory frameworks at home in order to increase the incentives for the corporate sector to engage more actively in these fields. Besides this macro-level dialogue, which affects First Responders only indirectly and in the long-term, corporations have an

Figure 22: Corporate support for First Responders (FR)



Abbreviations: C2 Command and Control, ICT Information and Communication Technology, PPE Personal Protective Equipment

interest to support the development of adequate capabilities of First Responders abroad in order to facilitate eventual future cooperation. Therefore, First Responders should engage in an active dialogue with relevant companies about their role in strengthening their capabilities in crisis zones.

Against the background of broader corporate responsibilities in addressing the new security risks, strategic planning must be adapted as well. Where business continuity and enterprise resilience have not yet been established, company leaders should act quickly. At the same time, existing plans need to be critically assessed and modified in the light of catastrophic events. Preparedness, contingency management, and recovery goals need to be properly integrated into the overall framework of corporate goals in order to make sure that other critical functions and processes follow the same guidelines. This is the only way to make sure that employees get the necessary training, the right material is procured, production and other processes are redesigned, and facilities are assessed in order to make sure that companies can cope with the new risks. Most important is the direct link between contingency management and corporate communications. In times of crises, a company needs to communicate actively and coherently with internal and external target groups. To this end, points of contact and lines of communication must be pre-identified in order to facilitate crisis communication with the relevant public authorities. As argued above, all these measures should be undertaken in close cooperation with First Responders.

Assessing the performance of management systems – all processes, structures, and instruments of a company – is the first step in redesigning organizational structures. This is indispensable in order to make sure that tasks and responsibilities will be aligned according to company-wide standards and in tandem with preparatory activities in the public sector. To this end, corporate management systems have to foresee the integration of third-party processes or process elements. This is essential in cooperation with the public sector and First Responders. Where necessary, corporate representatives should join the planning and contingency management committees of the public sector in order to facilitate preparation in advance and cooperation in times of crises. In turn, First Responders should not only be fully involved in preparing corporate emergency plans, but assigning them special duties and integrating them in company-wide processes and committees might facilitate action under the strain of a crisis. Where companies possess specific capabilities (such as corporate First Responders in the chemical industry), they should make them

available to other companies and to the public sector as well.[31] This innovative approach of pooling resources could be of great advantage in guaranteeing the availability of critical capabilities that cash-strapped communities can hardly afford.

Constantly monitoring the appropriateness of corporate plans, processes, and strategies is a prerequisite for continuous development. As a first response to new challenges, companies will need to think about expanding the scope of existing controlling instruments and management systems already in place. Most controlling and reporting mechanisms were developed with a prime focus on internal processes and procedures only. Similarly, well known standards for management systems such as the ISO models [32] and the excellence model of the European Foundation for Quality Management (EFQM) (EUROPEAN FOUNDATION FOR QUALITY MANAGEMENT, 2003a+b) do not yet foresee the corporate homeland security dimension. While the trend towards extended enterprises is somewhat mirrored in the EFQM analytical dimension of "partnership development" and "corporate social responsibility," this will not suffice to mirror the close public-private interaction discussed in this paper.

The problem with these demands rests with the incurring costs. So far, security has been interpreted as a cost factor only, which neglects the fact that the absence of adequate preparedness in case of catastrophic events can lead to costs that outstrip security investments by far. (KAYYEM and CHANG, 2003) Therefore, experts are right to advocate the establishment of incentives that alter market mechanisms in favour of increased corporate security activities. In order to improve the safety of commercial buildings, for example, Peter Orszag proposes that governments impose direct regulation, require insurance to cover specific risks, provide subsidies or tax relief to finance respective measures, and couple insurance protection with third-party inspections of corporate compliance with regulations. (ORSZAG, 2003) In addition to new public incentives, also the enlistment of financial analysts and rating companies is needed, since they set the benchmarks for company valuation. If they come to rate investments in security provisions to benefit homeland security not only as costs but also as requirements indispensable to guaranteeing the smooth running of the economy, business calculations might begin to change.

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[31] Assessment methods will be needed in order to set up reimbursement schemes.

[32] http://www.iso.ch/iso/en/iso9000-14000/basics/general/basics_1.html> (accessed 23 April 2004)

6.2 Cooperation among the business sector, government and First Responders

First Responders need to accomplish challenging tasks in a tough environment entailing, among other things, managing chemical, biological, radiological, nuclear and/or explosive/incendiary (CBRNE) risks. Analyses of First Responders' capabilities conducted in the United States post September 11 painted an unsatisfactory picture. A report of an independent Task Force sponsored by the Council on Foreign Relations finds, for example, that:

- Fire departments lacked sufficient quantities of radios and breathing apparatuses to equip all firefighters during all shifts;
- Because they lacked protective gear, police departments were found not ready to secure a site following an attack with weapons of mass destruction;
- Public health laboratories lacked basic equipment and expertise to respond to BC attacks;
- Most cities were not equipped to determine what kind of hazardous material their emergency responders are about to face. (REPORT OF AN INDEPENDENT TASK FORCE, 2003)

Two comprehensive studies conducted by the RAND Corporation provide additional details of current shortcomings and the underlying causes. The first study argues that personal protective equipment (PPE) "did not provide sufficient protection against biological and infectious disease hazards, the heat of fires at the sites, and the demanding physical environment of unstable rubble piles, nor were they light and flexible enough to allow workers to move debris and enter confined spaces. (JACKSON, 2002) In addition, there is not enough training in selecting the right PPE, and the information provided to support procurement choices is regarded as inadequate. Most importantly, however, there are fundamental barriers to equipment standardization and interoperability among various First Responder organizations.

The second RAND study builds on this assessment and looks more closely at the needs of different First Responders. The study reveals that overall, many First Responders do not know what they need to protect against and are unsure about the performance and effectiveness of available products.

Fire fighters in general seem satisfied with their equipment. However, they see room for improvement in reducing thermal and physical stress (such as by reducing the weight of their PPE) and improving communication and

fire ground accountability. Emergency medical service responders argue that very little protective equipment is produced to meet their specific requests. In dealing with biological and chemical warfare agents, First Responders require better training and improved PPE. Law enforcement officers seem to present the most challenging personal protection task, because their almost constant mobility requirements limit the amount of gear they can carry and the time that is available for their training. A fundamental problem that is also underlined in the report is the incompatibility of radio communication systems currently in use with emergency responders. (LaTOURETTE, 2003)

In Europe, where few comprehensive assessments of First Responders needs are available, the situation does not appear to be any better. (WOHLLEBEN, 2003) This holds especially true for interoperability and co-operability among emergency responders. A report that analyzed interaction among different First Responders in dealing with the 2002 floods in Germany identified serious conceptual shortcomings in inter-agency coordination and cooperation, as well as a lack of interoperability of the communication systems. (FLUTWASSERKATASTROPHE, 2002) The communication system used by police forces, fire fighters, and the Federal Agency for Emergency (THW) is more than 30 years old. There are plans to replace it, but the German *Länder* cannot agree on a new system. In addition, there is disagreement over whether these services need a tailored system or whether they could use a system maintained by a commercial operator that guarantees safe bandwidth for First Responders communication. (DROESSER, 2004) Poland is about to introduce a new radio system from the United States (received as part of the offset program from purchasing new F-16 fighters) without taking into account interoperability with other European partners. (ENDERS, 2003) In Switzerland, interoperability among the communication systems of cantonal police corps is not guaranteed. (USIS, 2001)

It is rather obvious that the industry can support First Responders in addressing these problems and overcoming existing shortfalls. In view of the RAND analyses, this requires change on both sides. While industry must address First Responders needs more seriously instead of merely marketing its products, First Responders must overcome serious problems inherited with their organizational culture (such as sticking to a supplier due to strong loyalties and traditions). (LaTOURETTE, 2003; JACKSON, 2002) In many ways, the challenges faced by First Responder community resemble the situation in the defense sector. In response, defense ministries and defense companies have established new and closer forms of

cooperation via public-private partnerships (PPP). They have initiated integrated project teams comprising all relevant stakeholders from the public and the corporate sector to provide military capabilities. (NAO, 2002) This close interaction makes sure that customers needs and producers' capacities are tightly coordinated. As a precondition for closer interaction with the industry, First Responders need to identify and prioritize their capabilities. In the United States First Responders and research institutes have joined forces to engage in this exercise. Together they have identified twelve capability goals for dealing with CBRNE terrorism. These are (POLLARD et al, 2003):

1. Personal Protection
2. Detection, Identification, and Assessment
3. Unified Incident Command Decision Support and Interoperable Communications
4. Response and Recovery
5. Emergency Management Preparation and Planning
6. Crisis Evaluation and Management
7. All-Source Situational Understanding
8. Medical Response
9. Public Health Readiness for Biological Agent Event
10. Logistics Support
11. Criminal Investigation and Attribution
12. Agricultural Mitigation and Restoration

The first four capabilities listed above are earmarked as the most important. The study group that set up this list will also conduct a comparison of needs and current capabilities, identify gaps, and develop a comprehensive research, development, testing, and experimentation (RDT&E) plan to close the gaps. A similar list could help advance the capabilities of European First Responders and tailor industry support to focus on those capabilities that are in need of urgent support. Against this background, the following areas might be particularly suited for industry support of European FR.

First, the information and communication technology (ICT) systems of most First Responders must be modernized and should become interoperable with systems used by other national First Responders and international partners. In doing so, First Responders should pay special attention to the military concept of network centric or network enabled operations, which harnesses the ICT potential in order to improve situational awareness and decision-making transparency, shorten decision-

making cycles, and improve the ability to conduct operations rapidly. (CARAFANO, 2003) European companies that are already involved in similar tasks for armed forces are well equipped to offer these products and services to First Responders as well. (ANDERSSON, 2004)

Second, closely related with ICT is the issue of situational awareness, provision of adequate PPE, and logistics. Given the fact that First Responders are unlikely to use PPE if it is not readily available when needed, PPE availability becomes a crucial factor for success. (LaTOURETTE, 2003) Establishing a common operational picture (COP) with regard to all of the First Responders engaged on the spot is a major challenge and a corner stone for effective command and control. Once a COP is established, manufacturers of PPE could plug-in, thereby contributing to the real-time management of PPE used on site and of inventories in warehouses and production lines. This would improve and streamline logistical support. (JACKSON, 2002 and 2004) However, catastrophic terrorist attacks like 9/11 have had a serious negative impact on air transportation and overnight delivery services. For this reason, a pure just-in-time philosophy might not be appropriate with regard to supplying PPE to First Responders.

Third, private companies could provide added value in site management. (JACKSON, 2002) While central command and control authority needs to rest with the First Responders, operational support activities could be pooled and possibly outsourced. For example, private security companies or other security forces not directly involved in emergency operations could control the scene by establishing and enforcing perimeter control. This could include fencing off and sealing the scene. Effective perimeter control not only helps reduce the points of entry at the scene, but also facilitates control of who is allowed to enter what zone. Perimeter control could be coupled with PPE regulations. Compliance with these principles could be monitored and enforced by a third party as well. In addition, the "scene support manager" could also provide on-site maintenance and cleaning of PPE and technical equipment. A First Responder working at the Pentagon site in 2001 reported that his organization "contracted a *commercial service* to have the work clothes of technical rescue and [urban search and rescue] personnel cleaned and dried while they were off their 12-hour shifts. The arrangement made a 'big difference' because it reduced supply burdens, and workers returned to work in fresh gear. (JACKSON, 2002) Maintenance support is also very well suited as a generic service to be offered by the industry. (LaTOURETTE, 2003)

Finally, when the nature of the tasks becomes extremely difficult because it demands handling sophisticated technology and requires a lot of expertise, such as the detection and identification of hazardous material, industry could offer "ready to go" solution packages consisting of technical equipment and its own "embedded experts" that know how to operate it. (LaTOURETTE, 2003) In the defense sector this approach has become widely accepted, although it comes with a series of questions relating to the security of civilian contractors. However, mobile units run by the industry – say, in the fields of CBRNE detection and identification, as well as mobile headquarters equipped with the necessary ICT – could be attractive offers to First Responders.

The new security risks demand a seamless interplay between the private and the public sector in order to tackle the new challenges successfully. In addition to this functional argument, there is another aspect involved: in times of decreasing public funds and increasing demands, the public sector is interested in leveraging the benefits of new forms of cooperation with the private sector in order to tap new financial resources and private expertise. By engaging the private sector in public affairs, there is also an opportunity to share the burden among different partners and improve public sector management capabilities. (HOFMEISTER and BORCHERT, 2004) Therefore, it is no surprise that PPP has received increased attention, not only but especially in security and defense.

Although very much en vogue, the precise definition of PPP has remained rather vague, because it can mean different things under different conditions. In general, PPP describes the fact that public and private actors cooperate on a common project. How this cooperation is designed remains a case-by-case decision. Most often, PPP means that services that had previously been offered by the public sector are made available through private contractors. Among other things, private contractors tender to provide public transport, organize waste disposal, build highways, provide public housing, and other things. (PINT and HART, 2001; HARTLEY, 2003)

When discussing the use of PPP in homeland security and to support First Responders, two levels of analysis should be differentiated:

- At the general level of public-private interaction, there is common agreement that new security risks transcend organizational boundaries. In order to provide effective countermeasures, the public and the private sectors must thus agree on new ways of interacting and on new principles and guidelines to coordinate their response. In this regard, war games aimed at analyzing the

state of the art of public-private cooperation in the field of US bioterrorism preparedness and response have identified major shortcomings. PPP can help rectify them by "identifying and involving relevant participants, establishing agreed-upon roles and responsibilities, sharing information on stockpiles and surge capacities, pre-defining economic, legal, and liability parameters and limits, and by coordinating public awareness and education efforts. (AHLQUIST and BURNS, 2003)

- At the project level things are more difficult because general principles of cooperation need to be specified in order to provide guidelines for both partners and to protect their vital interests. Here the major challenge lies with the public sector. As the client, the public sector must define its expectations, identify performance measurement criteria, and set up performance measurement mechanisms or oversight boards to monitor and overview corporate service provision.

At both levels, successful PPPs require each side to come to terms with significant challenges. It will not be enough to rely on market mechanisms alone to provide homeland security. As a public good, and unless an adequate regulatory framework is established, homeland security will remain in short supply. (ORSZAG, 2003) Among the various issues that need to be settled, the connection between risk transfer to the private sector and the accountability of private actors is key. The notion of risk transfer is one of the main arguments in favor of PPP because, at least in theory, it will help free public hands. In practice, however, empirical proofs are hard to find. Whether private actors really bear a risk depends largely on the public sector's attitude vis-à-vis its private partners: if the provision of services is at risk, the public sector is all too quickly ready to bail out private contractors. It has been noted that in the UK ministers have been reluctant to apply their contractual rights to financial penalties and even termination due to a fear of discouraging the private sector from future PPPs. And yet this reluctance undermines the fundamental logic and benefits of entering into PPPs in the first place. (FLINDERS, 2004)

In the homeland security context this means three things. First, politicians need to reframe corporate incentives. A well-balanced mix of regulations stimulating market incentives combined with a monitoring regime that verifies progress can help achieve progress. Second, public privatization strategies must be reevaluated in the light of homeland security. Privatization helps reduce costs, but at the same time, redundancies and reserve capacity have also been reduced. The government no longer has the reserve capabilities, resources, or manpower to manage major crises it

once had and the private companies are unable and unwilling to assume full responsibility. (ANDERSSON and MALM, 2004) If the private sector is in doubt of providing adequate safety and security, especially in the field of critical infrastructure, existing contracts should either be renegotiated or privatization should be stopped.

The main components of a way forward are summarized in Table 9, indicating directions for future cooperation and research.

Table 9: New Rules for Successful Public-Private Governance (Source: Hofmeister and Borchert (2004)).

- **Strengthen cooperation and network-centric approaches:** Inward-looking reforms of the public sector must be replaced by reform activities that build around the capability to forge networks and to cooperate with the public sector's most important stakeholders. The state's function is to integrate and align various interests. This was hampered by new public management reforms and needs to be reinvigorated.
- **Optimize the use of scarce resources:** Transparency about the objectives and expectations of the partners involved is an important prerequisite. Cost reductions are legitimate but should not dominate. The overall aim is to use scarce resources effectively, no matter how specific ownership relations are designed. Periodical cost-benefits analysis can deliver valuable management information.
- **Identify cooperation and network rules:** A comprehensive risk analysis and an overall concept for the distribution of tasks and responsibilities between the public and private sectors and the civil society are preconditions for successful PPPs. Therefore, new principles are needed for public cooperation and network policy. At the same time, the management capabilities of political leaders must be strengthened.
- **Safeguard the manageability of PPPs by advancing sustainable partnerships:** New forms of cooperation between various partners in the public and private sectors play an important role in the transition to the new "enabling state" (*Gewährleistungsstaat*). Win-win situations should be aspired in order to avoid the dominance of one partner and to guarantee that political decision-makers are in the driver's seat of the development.
- **Advance soft law in favor of formal regulations:** Decisions about new organizational forms should focus on their contribution to advancing new cooperative opportunities. To this end, the use of "soft law" should be increased. At the same time, the public sector needs advanced capabilities to fulfill its functions within the new network centric environment. It requires new processes, structures and instruments.
- **Adopt a public private governance codex:** Without "new ethics" the required cultural shift towards cooperation will not be accomplished. We need a new public private governance codex that influences the behavior of all partners involved and provides for new instruments to guide action within a network-centric framework.

Chapter 7

THE WAY FORWARD

7.1 Outlook: Where do we go from here?

The preceding sections have underlined the important role of First Responders in the light of new homeland security challenges and the valuable support that the corporate sector can provide them. The following will focus on four critical areas: capabilities, research, procurement, and training. Although it will discuss these issues mainly from a European perspective, several topic areas are also applicable to non-European NATO members and other countries.

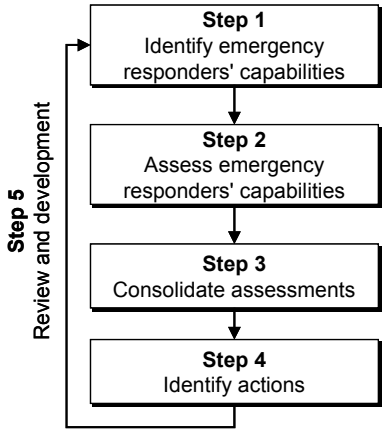
7.1.1 Capabilities

Capabilities are the currency of today's security forces. As shown above, US First Responders have already begun defining their capabilities, assessing strengths and weaknesses, and identifying programs to rectify shortfalls.[33] First Responders in other countries should follow this example, drawing for example on the European Capabilities Action Plan (ECAP), which was established to overcome capability deficits of European armed forces. As illustrated in Figure 23, an *Emergency Responders Capabilities Action Plan* could comprise five phases:

[33] On March 31, 2005 the U.S. Department of Homeland Security will issue a series of 25 scenarios to encourage scenario-based capability assessment. These assessments will then become the basis for the allocation of homeland security funding to develop appropriate capabilities to fill gaps.

F. Steinhäusler and F. Edwards (eds.), NATO and Terrorism, 133–161.

Figure 23: Emergency Responders Capabilities Action Plan



- *Step 1: Capability Definition*

  An international expert group of First Responders should define the key capabilities needed for acting in different environments. The goal is to establish a joint framework that can support analysis of existing national capabilities and identify shortfalls. In the European Union there is as yet no institutional framework to properly address these issues. (LINDLEY-FRENCH, 2004) First Responders' umbrella organizations should take the lead to convene these expert workshops in close cooperation with the European Commission, relevant NATO agencies (including capability planners, Civil Emergency Planning organizations), and representatives of other international organizations and the industry. (CEC 2004, WOHLLEBEN, 2003) At the top of the agenda, international experts should identify what First Responder capabilities are needed to address CBRNE terrorism and to cope with natural and man-made catastrophes. Both issues are crucial to strengthen capabilities for civil protection and, with regard to the EU, to implement the solidarity clause and the civil protection article of the draft EU constitution. (DRAFT TREATY, 2003)

  While it makes sense to address emergency responders' needs separately, respective actions should not be undertaken in isolation. For example, in the EU ongoing work in some of the ECAP project groups could benefit First Responders as well. Among them are projects for mobile headquarters and NBC protection, two issues

that stand at the core of emergency response. Other topics that are relevant for First Responders include:

- Unmanned aerial vehicles, which can improve situational awareness through constant monitoring of crises scenes;
- Space based assets, especially in connection with GPS (Global Positioning System) and GMES (Global Monitoring for the Environment and Security), which can improve communications and facilitate tracking and tracing of emergency responders;
- Communications interoperability issues addressed to ensure that all the First Responders at a disaster scene can share a common frequency or appropriate means of communications across jurisdictions and professions.
- Interoperability issues and working procedures for evacuation and humanitarian operations, which address inter-agency cooperation issues.

To benefit from these and other ECAP activities, First Responders should be included in the respective working groups or at least forge close ties with them.

- *Step 2: Capability Assessment*

Against this background, a comprehensive assessment of national capabilities for First Responders can be launched. This audit will help identify what is available, what is needed, and where priorities should be set. In doing so, public sector capabilities should include First Responders and armed forces. Due to their availability,[34] readiness, and specific capabilities (e.g., mobile communications, CBRN protection, and logistics), the armed forces could play an

[34] One caveat is that the military is, in fact, often not available for civil support functions. For example, in the U.S. there are two significant barriers to military involvement in civil emergencies. The first is the constitutional limitation on military involvement in domestic affairs. The second is the deployment of military assets outside of the U.S., leaving little capability to back-up First Responders in civil emergencies. For years the National Guard, a state military asset under the jurisdiction of each governor, was looked to as the back-up to civilian response. However, two major changes have made this moot. First, the Army Reserve became the logistics force, leaving the National Guard as a combat arms force, thus having little to offer in a civil emergency. Second, and most damaging, the National Guard has become the back-up to the regular military, with most members deployed overseas, leaving few resources at home for civil response.

important role in homeland security and in supporting First Responders. [35] At the same time, corporate capabilities should be analyzed as well, since specific industries may have key niche capabilities that should be integrated into a civil response.

Given the strong intra-European interdependencies, two issues should receive special attention in the EU. First, it will be necessary to identify what capabilities are available at what level. While it will be important that local levels have the necessary capabilities, it could make sense to organize other capabilities at the national, or even at the European level.[36] Second, readily deployable capabilities should be earmarked for mutual assistance among EU members (solidarity clause). In 2001, a Community Mechanism to facilitate reinforced cooperation in civil protection assistance intervention was launched. Even prior to its establishment, the European Commission was able to gather 1,000 rescuers from 15 member states, Norway, and Iceland with appropriate equipment to be dispatched after 9-11 in support of the United States within a few hours. (CEC, 2001)

- *Step 3: Consolidation*

Assessment results obtained in a bottom-up approach should be consolidated at the national and at the international level. This helps establish two action plans that are closely interrelated and makes sure that specific national conditions are taken into account. Exchange of information on national strengths and weaknesses increases transparency among neighbors and facilitates identification of opportunities for further joint action.[37]

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[35] Each E.U. nation would have to review constitutional limitations on the military to determine if civil support is currently permitted, or could become permitted through legislation.

[36] An interesting example for emergency responders is the new CBRN alert system to be established by Europol, which will provide its members with updates on wind projections every fifteen minutes.

[37] Because the U.S. is comprised of fifty sovereign states, some of the same issues of developing cross-jurisdictional plans and capabilities arise. The new National Response Plan (http://www.dhs.gov/dhspublic/display?content=4268 and http://www.dhs.gov/dhspublic/display?content=4270 Accessed 1/26/05) and NIMS guidelines documents (http://www.dhs.gov/dhspublic/display?theme=51&content=3423 Accessed 1/26/05) might provide useful models for future NATO and E.U. cross-

- *Step 4: Identify Actions*

  In order to overcome capability deficits, a number of different actions can be undertaken. In a first step, various First Responders at the national and international level could join forces to procure general equipment that requires no or only marginal customization (such as gloves, boots, coats, helmets, breathing apparatus).[38] By commonly procuring these products First Responders leverage their buying power vis-à-vis the industry. At a more advanced level, national emergency responders might decide to launch national programs aimed at rectifying shortcomings that could be opened for participation by foreign First Responders. This approach is recommended for neighbouring communities and countries facing similar risks either because of population density or because of industries with cross-border impacts (e.g., Mexico-USA-Canada; EU member states along the River Rhine). Finally, there is the option of joint multinational procurement projects for First Responders. The more First Responders embrace the logic of network centric or network enabled emergency operations, the more frequently this option should be considered for purchasing ICT.

- *Step 5: Review and Development*

  As with all assessments, it will not suffice to view the preceding steps as a one-time exercise. Rather, First Responder capabilities should be reviewed regularly at the national and at the international level. In order to assure continuous strengthening of capabilities, it will be necessary to adapt capability goals to reflect changes in the international and national risk assessment. In doing so, national and international *carrots and sticks* will be needed, as non-compliance is quite likely. Revising staffing plans to limit or eliminate volunteer participation, which is characteristic for many First Responder organisations, could be another option. Finally,

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jurisdictional planning and capability assessment. The existing EMAC agreement might also be a useful resource.

[38] The Italian experience in developing a national standard for uniform CBRNE equipment caches across the country, and the national adoption of the Incident Command System, might be a useful model. See 6.6 above.)

the provision of additional national or multi-national funds for CBRNE preparedness should be made contingent upon achieving certain standards to improve First Responder capabilities.

7.1.2 Research

From the perspective of First Responders, research can provide valuable returns in three different fields. First of all, it can improve products and technologies used to manufacture PPE and the technical devices used by emergency responders. If US assessments are in any way representative of the First Responder community as a whole, there is a need for PPE that is lighter and more comfortable to reduce physical stress under extreme conditions, such as working at a crisis scene after an act of catastrophic terrorism for weeks rather than only hours or days. At the system level, interoperability among various First Responders and other security forces that can be called to cope with a crisis is a key issue. Research can help identify standards for commonly used products and devise products that serve the purposes of many different emergency responders.

Second, catastrophic events such as 9/11 also expose First Responders to situations that they are not yet adequately trained to cope with – either because of the long duration of their assignments or because of the specific conditions that they face (such as picking up body parts among debris, dealing with terrorists on the scene, combating biological agents). Insights into the relationship between psychological and physical stress under severe conditions can help identify the limits of human endurance and resistance. This knowledge is indispensable for adapting and improving operational concepts. (LaTOURETTE, 2003) Finally, the advent of new risks might also require new doctrinal concepts in approaching scenes of catastrophic events. Here research can help spread lessons learned among First Responders from different countries, transfer insights from network centric/enabled operations to First Responders doctrines, and establish codes of best practice to increase the efficiency and effectiveness of First Responders.[39]

[39] In the U.S., the Department of Homeland Security has contracted with the Memorial Institute for the Prevention of Terrorism (http://www.mipt.org/ Accessed 1/26/05) to create a Lessons Learned website (https://www.llis.dhs.gov/ Accessed 1/26/05) with password protected access for First Responders. E.U. or NATO could create a similar website to promote knowledge and the spread of information among European First Responders.

New concepts that were established recently to improve national security and defense capabilities play an important role in addressing First Responders' research needs. As an example, the following describes European actions. In 2002, the European Council and the Commission launched a joint program to improve cooperation between member states in the field of CBRN risks that also includes research. Among other things, the program aims to strengthen risk analysis and assessment of CBRN threats, ensure quick detection and identification of CBRN attacks and provide those concerned with appropriate information, develop adequate instruments for consequence management, and strengthen the scientific basis of the program. (DE WIJK, 2004) The European Commission has launched preparatory actions towards establishing the European Security Research Programme (ESRP), which identifies five fields of activities.

Many of these activities are directly relevant for First Responders (Table 10). Capability-based assessment of existing strengths and weaknesses as suggested above should also help identify research priorities for First Responders. These should be taken into account when selecting projects under the ESRP preparatory action plan. For in 2007, when the first ESRP will be launched, First Responders needs must be systematically integrated in the call for proposals. A relevant share of the program volume, whose minimum threshold was set by the Group of Personalities at 1 bn Euro, (GROUP OF PERSONALITIES, 2004) should be earmarked for FR-related projects. As these funds should be available on top of existing research financing, (GROUP OF PERSONALITIES, 2004) the ESRP is particularly well suited to address key capability shortfalls. In this regard, it should be considered, whether the discussion on convergence criteria or other yardsticks that tie the financing of research to accomplishing certain minimal capability standards, could be applied in this area as well.

Table 10: Fields of activity in the European Commission Preparatory Action Plan for Security Research. Source: European Commission (2004), 8-9.

Fields of Activity	Relevant Issues for Projects
Improving situation awareness	• Demonstration of concepts, technologies and capabilities for situation awareness systems, to enhance surveillance of land and sea borders, especially supporting measures for new land borders in EU-25 and assets of global interest. • Demonstration of the appropriateness and acceptability of tagging, tracking and tracing devices by static and mobile

	multiple sensors that improve the capability to locate, identify and follow the movement of mobile assets, goods and persons, including smart documentation (e.g. biometrics, automatic chips with positioning) and data analysis techniques (remote control and access).
Optimizing security and protection of networked systems	• Development of standardized methodologies and decision tools for assessing the nature of the potential threat to critical networked infrastructures and to assess the respective vulnerabilities. • Demonstration of measures for enhanced protection and assurance of elements critical to public, private and government infrastructures to maintain security in an enlarged Europe. • Development of detection, prevention, response and alert capabilities to strengthen information and control systems, integrating, where appropriate, the use of space-based assets as well as fixed terrestrial and wireless terrestrial systems.
Protecting against terrorism (including bio-terrorism and incidents with biological, chemical and other substances)	• Demonstration of effective integration of active and passive sensor techniques, suitable for a wide range of platforms and data correlation techniques for detection and identification systems. • Development of models of large-scale dispersion over large areas and using multiple routes of high-risk pathogens of concern (smallpox, anthrax, C. botulinum, Yersinia pestis, haemorrhagic fever viruses, Francisella tularensis and genetically modified organisms) to produce a validated model for use by public authorities. • Demonstration of the viability of technologies and protocols for personnel, facilities and equipment decontamination against biological or chemical or other substances. • Assessment and identification of the overall needs of an enlarged EU for biosafety level 4 laboratories in order to guarantee optimal complementarity and development of an effective methodology for networking.
Enhancing crisis management (including evacuation, search and rescue operations, active agents control and remediation)	• Development of shared information management tools and models to facilitate the efficient integration of diverse emergency and management services with attention to inter alia: organizational structures, inter-organizational co-ordination and communication; distributed architectures and human factors.

Achieving interoperability and integrated systems for information and communication	• Develop and demonstrate with existing and potential categories of users, concepts and architectures for internationally interoperable systems and standards, for example in control and command as well as communication and information exchange systems. Attention should also be given to dependability, organizational aspects, protection of confidentiality and integrity of information.

7.1.3 Procurement

In procurement, the situation of First Responders is comparable to the defense sector. Incompatible funding and equipment replacement cycles, diverging purchasing powers, and strong bonds with traditional and well-established vendors make it difficult to think about joint procurements. (LaTOURETTE, 2003) Although substantial, these barriers could be overcome, for example in the European Union, within the framework of the new European agency in the field of defense capabilities development, research, acquisition, and armaments.[40] Although it is not yet clear to what extent the new agency will influence national procurement establishments and whether it will address First Responders issues, there are good reasons for doing so. First, the EU-Group of Personalities advising on the ESRP has underlined the need to address the dual use purpose of research and technology for security and defense purposes. The new agency would be ideally suited to achieve this goal, thereby bridging the gap between civil and military security forces. Second, the analysis of First Responder capabilities has identified some opportunities where they could plug in to ongoing activities aimed at rectifying key military capability short-comings. Finally, joint procurement would help address interoperability problems. In case of joint procurement, the purchase of similar equipment will mean that First Responders can become fully interoperable. If First Responders decide to buy different equipment, the agency could be

[40] The overall goals of this new body are to develop defense capabilities in the field of crisis management, promote and enhance European armaments cooperation, contribute to identifying and, if necessary, implementing policies and measures aimed at strengthening the European defense industrial and technological base, and promoting, together with the Community's research activities, research aimed at fulfilling future defense and security capability requirements.

instrumental in setting-up joint standards and certification processes to help improve interoperability. (LaTOURETTE, 2003)

The challenge entailed with the proposal to expand the scope of the European defense agency is at least threefold. First, it is not clear whether national defense ministers and representatives of the defense procurement establishment are willing to accept the participation of other security forces. In the current risk environment they should have an utmost interest in welcoming additional security forces to address new security challenges in tandem. Second, up to now First Responders have not yet found an "institutional home" in the EU architecture. This is particularly a problem because it renders coordination more difficult. However, it was argued above that joining forces with ongoing ECAP activities or launching a capabilities development mechanism would represent a major step forward. Finally, in order for European cooperation to bear fruit, national procurement processes for First Responders must either be overhauled or established anew. Here much depends on the different national starting points. If it is indeed true that the national procurement architecture for First Responders is weak at best, then it would be most suitable to redesign European and national processes in a coherent top-down approach.

7.1.4 Training

Training is indispensable to guarantee the availability of effective First Responders. In dealing with new threats, skills maintenance is critical. (LaTOURETTE, 2003) To this end, the European Commission organizes regular training courses and exercises in the framework of the Community Mechanism for civil protection.[41] A second priority is interoperability. Among other things, this includes knowledge of the equipment and techniques used by First Responders in different countries. This is important, because in many cases where First Responders assist their colleagues abroad they use local equipment. (CEC, 2004) In addition, the need for interaction among military forces and First Responders in dealing with the risks of terrorist CBRNE attacks increases training demands to further smooth cooperation.

In addition, consideration should be given to training First Responders countries considered as accession candidates, and – if it makes sense – in regions where the EU has fielded stabilization operations. As some of

[41] More recently, the European Commission has organized three exercises and two workshops on the CBRN issue, and five exercises on natural disasters and technical accidents are scheduled for 2004 and 2005.

these countries might one day become future members of the Union, similar training standards and procedures will facilitate cooperation in times of crisis. Some of the Union's emergency crisis information systems have already been expanded to non-member states. (CEC, 2004) Therefore, it is only logical to offer them training for First Responders as well, thereby strengthening their ability to act in solidarity with existing EU members.

Finally, the need for new doctrinal approaches to meet new security demands and the potential use of network centric/enabled emergency operations could direct attention to NATO's Concept Development and Experimentation (CD&E) branch at the new Atlantic Command Transformation.[42] The purpose of this branch is to devise, test, and assist in the implementation of new doctrinal concepts that support force transformation to the benefit of increased co-operability. Some of the training scenarios developed there could be of interest to First Responders. Crisis Management Exercise 2004, for example, simulates a Dutch request for NATO support in case of an explosion in a petrochemical plant. In the simulation, the situation worsens as the deadly cloud drifts and neighbouring countries experience casualties. (MONACO, 2004) These and other exercises could be well suited to address co-operability issues between armed forces and First Responders, and among First Responders themselves. Assuming that both will play a key role in national and international homeland security, joining forces in this field should be welcomed on both sides. In doing so, armed forces and First Responders would be undertaking a valuable first step towards harmonizing the development of their capabilities to the benefit of crisis prevention, crisis management, and stabilization in the aftermath of a crisis.

7. 2 Fifty actions recommended

The war against terrorism is being fought at home as well as abroad. It will only be won by balancing the effort to prevent terrorist acts and the ability to respond to the threat or actual event successfully. Apparent failure to protect the domestic civilian population and the national infrastructure from terrorism will drive a wedge between the citizen taxpayers and their government, and then the terrorists have won. Based on the information derived from a review of the lessons learned in different countries and the current level of training and equipment

[42] <http://www.act.nato.int/transformation/cdeindex.htm> (accessed 24 April 2004).

available for First Responders in case of an act of catastrophic terrorism, the following fifty short- and long-term actions are recommended:

1. The US Homeland Security Presidential Directives define the phases of emergency management as prevention, response and recovery. (HSPD-5) Prevention is based on excellent intelligence. The 9/11 hearings have focused on the failure of intelligence gathering and integration as the main causes of the vulnerability that led to the attacks (CBS EVENING NEWS). First Responders need expanded and integrated **"smart systems" for intelligence gathering** that can integrate information across agencies and disciplines to provide comprehensive data bases.[43]

2. Continual **threat assessment for the chemical infrastructure** of NATO member states is needed. Tons of highly hazardous chemicals move through Western industrialized countries every year which can be used as weapons, even openly declared through a truck or a rail car placard attached to the vehicle.[44] With the US "Chemical Security act of 2003" it can expected that chemical plant security will improve, but the shear number of chemical plants and the pervasiveness of chemicals throughout the transportation infrastructure means that these chemicals will always represent a threat and this calls for vigilance.

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[43] In the spring of 2004 the President planned a visit to the City of Santa Clara in California. Just hours before his planned arrival a variety of law enforcement equipment was stolen. First an FBI agent's car was stolen. It contained credentials, clothing and communications equipment. Later that same night a law enforcement clothing store in nearby Santa Cruz County was burglarized, and uniforms and patches of local law enforcement agencies were stolen. Both crimes were carried out very professionally, with the burglar knowledgeable about overcoming security systems. Someone using the stolen law enforcement and FBI material would have been recognized as part of the Federal law enforcement group protecting the President, making it easy to infiltrate off limits areas. Because a new intelligence system was in place in Santa Clara County, based in the San Jose Police Department, this information was quickly shared with all the First Responders, and warnings were issued to be sure to match the face on the FBI ID card with its carrier very carefully. Generally a badge suffices for law enforcement personnel, so this extra layer of identification checking would have prevented the successful use of the stolen equipment as a disguise.

[44] In the fall of 2003 crew members of the the U.S. news investigation show "60 Minutes" walked unchallenged onto a chemical plant processing highly toxic anhydrous ammonia and boron trifluoride[8] that could have had deadly affects on the city of Pittsburgh, PA, USA if these chemicals had been subject to an uncontrolled release.

3. **Federally sponsored R&D for equipment and supplies** should be accompanied by reliable independent evaluation of the capabilities of the equipment at the field level.

4. Federally **funded training and equipment** should meet local needs rather than complying with an arbitrary national template. Research, procurement, and training should be geared to the new demands of emergency responders in the framework of homeland security.

5. Federal **funding of specialty teams** should be reliable.

6. The **partnership between public and corporate sectors** must be strengthened, based on new guidelines, processes, and structures to guarantee close interaction.

7. Emergency responders should follow a **capabilities-based planning approach**, jointly agree on key capabilities to fight the new security risks, and establish a capability development mechanism at the national and at the European level.

8. Frequently the **domestic intelligence system** is limited to law enforcement personnel. Joint Terrorism Task Forces in major metropolitan areas bring together the police agencies, but excludes other First Responders. New mechanisms for intelligence development and sharing need to be promoted, such as those based in US FBI field offices.[45] The Joint Regional Information Exchange System (JRIES) is being placed in multiple First Responder agencies to enhance information sharing among agencies and jurisdictions in the U.S.[46] Originally developed for

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[45] In the San Francisco Bay Area the FBI partnered with the State Office of Emergency Services regional office to create the Bay Area Terrorism Working Group (BATWING). BATWING, which meets quarterly, includes not only law enforcement, but also fire, EMS, OES and large businesses' emergency managers. At these meetings information on homeland security concerns is shared so that all the professions can work in a partnership for surveillance and rapid reporting of unusual events. In Los Angeles they went the next step and created the Terrorism Early Warning Group, which brought together a multi-discipline task force for on-going analysis of data related to potential terrorist groups and acts. (LAW ENFORCEMENT AGENCY RESOURCE NETWORK)

[46] http://www.dhs.gov/dhspublic/display?content=3649 (Accessed 1/26/05)

the G-8 Summit, this system may prove to be a useful model for a web-based European intelligence sharing capability.

9. Protocols must be developed for integrating fire personnel, hazardous materials teams, EMS, OES, Public Health, and health care into **surveillance and intelligence systems** to create the largest network possible. These allied professions may see people with explosion-related injuries or receive reports of missing or stolen hazardous materials that may never come to law enforcement attention. Conversely, law enforcement may learn of events that could impact the other services' safety.[47] By alerting fire and medical personnel the net of surveillance can be widened, and prevention is enhanced.

10. Multi-disciplinary, information technology-based **data analysis system** need to become more user friendly, and have terminals in every dispatch center to facilitate information collection. For best success they should also be tied into a national database that can sort the routine from the unusual and notify the human analyst to review the significant data.

11. Improvements in **detectors** are needed. Detectors must be developed for use at the field level that are both rapid and accurate. Law enforcement and fire personnel have to be able to use them with little training and experience. Good detectors would be an asset for hazardous materials teams day-to-day. Better biohazards detectors are an even greater challenge, but need to allay public and staff fears when unknown substance/ "white powder" calls come in. New field tests are needed that rapidly and accurately assess solubility, reactivity, explosivity, and volatility to ensure that it is safe to move the material to a reference lab.

12. At the lab level there need to be **improved diagnostic tests** that do not require long preparation time. PCR still requires that some materials be "grown" first in a petri dish or other controlled medium to prepare the sample for DNA analysis. Wet chemistry requires preparatory and analysis time in the lab. New tests are

[47] Recent examples of such events happened in the US where tanker truck hauling a large quantity of fuel oil, one component of ANFO was stolen; stolen ambulances and stolen fire uniforms that, like the stolen FBI and police items before Bush visit in March 2004, could have bee used by terrorists to infiltrate "secure" scenes.

needed that provide rule in/ rule out information with a high degree of confidence in a much shorter time period.

13. To prevent the introduction of more inappropriate equipment into the First Responder community, **scientific hardware- and software evaluation** should be performed on all equipment created under Federally-funded R&D efforts.[48] Once the scientists have determined that the tests are accurate with a high degree of confidence, field-testing should follow, to rate the capabilities, uses, and benefits of various technologies.[49] Universities could form partnerships with local law enforcement and fire agencies to field-test and evaluate new technologies.

14. There is a need to accelerate **partnership programs,** which bring together academic institutions and high tech businesses. The US Federal government is putting together such a "new academic model", e.g., the Great Lakes Regional Center of Excellence that is developing around Argonne National Laboratory. (VAN, 2004) There are expectations for the development of specific products, including therapeutics and better tests.

15. **Near real-time air monitoring** needs to be improved. In addition to the on-going US EPA Biowatch effort, Oak Ridge National Laboratory is developing SensorNet, which is being field tested in Tennessee cities. The goal of SensorNet is to develop near real-time detection, identification and assessment of chemical, biological and radiological threats, will allow for First Responders to be dispatched within minutes of an event." (BIOTERRORISM WEEK) More important, when these First Responders are dispatched they will have knowledge about the PPE to wear and the decontamination and treatment needs of the victims.

16. Programs aiming on the development of more sophisticated **protection technologies** should be accelerated, e.g., like the

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[48] In the US the obvious candidates for evaluating these technologies are the FBI's laboratory, the Department of Justice's existing testing program, and the National Labs.

[49] For example: Flow cytometry is a credible and well understood laboratory-based technology. But it is questionable whether a truck-mounted unit can remain calibrated after being jostled over the average streets.

Information Analysis and Infrastructure Protection branch of the Department of Homeland Security.

17. Improved **treatments for victims of CBRNE** are also needed. Biological research is needed to develop antidotes for chemical warfare agents that create less trauma to the patient's system. For examples, new pharmaceuticals are needed that stop the spasms quicker and can be evacuated from the system quicker to lessen the dependence on respiratory support. As long as respiratory support will be a required as part of the treatment protocol, bioengineers need to develop ventilators that can be more easily stored for long periods of time, and that are smaller and easier to move, with reliable battery power for field use. At present there are few ventilators available, even in large metropolitan areas, because they deteriorate quickly in storage.[50]
18. The development of **new field level EMS protocols** is also warranted. For example, in the US the Mark 1 kits were meant for military personnel to use for self-protection and buddy aid. Civilian EMS protocols limit their use in a field situation to emergency responders. Protocols and packaging for pediatric use, use in the small of stature and the elderly are needed to save lives in a real event. Antidotes typically have to be administered within the first few minutes to be effective against nerve agents. Only the field level First Responders will arrive in time to make a difference for the most contaminated patients.

19. **New antibiotics** need to be developed for dual use with fewer side effects to make prophylaxis less costly to the economy and more acceptable to the victims. Existing prophylactic drugs can be debilitating. For example, the people who took the full 60-day course of Cipro following potential exposure to anthrax in the fall of 2001 had unpleasant gastro-intestinal side effects from the treatment, and many were out of work for the full course of the treatment. (FDA) Cipro was developed as a 7-14 day antibiotic for infectious diseases.

20. Similarly, **new anti-virals** that are more effective, and better vaccines with less side effects and contraindications are needed.

[50] Most areas have only a few percent above the normal annual maximum stock needed for flu and pneumonia season.

Existing anti-virals are not effective against most of the weaponized diseases. (Santa Clara County Public Health Zebra binder) The currently available vaccine against smallpox has many contraindications for adults, lessening the likelihood that adequate "herd immunity" could be developed to prevent a significant number of deaths and injuries, both from the disease and from the vaccination-related injuries. (CDC, SMALLPOX) Anthrax vaccine requires many visits over an 18 month time period to develop true protection. It is unlikely that people will stick with the regimen once the initial danger has past. There are also significant side effects from the vaccine. Newer protective regimens must be developed that overcome the contraindications and unwanted side effects.

21. Improved trauma care and more effective treatment protocols for **burn & blast injuries** are needed both for day-to-day events and for terrorist events. This dual use area of practice represents an investment that could save lives lost to accidents, as well as provide more effective and rapid care to victims of mass casualty events, including terrorism.
22. Improved **medical decontamination equipment** is required for contaminated or infectious patients. Current CBRNE decontamination equipment was designed for either the military of fire/EMS field environments. Recognizing from the Tokyo Sarin event that patients run away from mass casualty events and take themselves, still contaminated, to the hospital, outdoor decontamination capabilities have to be present at hospitals. Hospital staff members have to be trained to provide not only decontamination, but also triage and life saving treatment, in a contaminated environment or to contaminated patients. CBRNE PPE for medical applications has been adopted from the fire/EMS and military arenas. These designs were based on a stable population of trained individuals who would use the PPE on a regular basis, either in their usual work, as with fire SCBAs, or in routine training, as with the military. These basic assumptions about function are inappropriate for the medical community.

23. Nurses usually perform the triage function in most hospitals. Today most American hospitals rely on a small permanent staff augmented with nurses from the registry. Since nurses also move frequently, investments in staff training may be lost, while

registry staff may be untrained in CBRNE response. Therefore a revised **CBRNE training scheme for nurses** is needed.

24. **Improved PPE** is needed which has to be easy to use and require little or no training to be effective. Most PPE requires fit testing according to specific OHSA protocols. Facemasks usually cannot be properly fitted for individuals with beards. Those needing glasses have to have special lenses made for their masks. While these issues are not problems in the military and fire communities, where grooming codes can be dictated, medical personnel may find these limitations unacceptable. Also, the cost of assigning a mask and obtaining the spectacle holder and lenses for a regular user of equipment may seem small, but if the mask is to be assigned to someone who may never use it the extra $300-$400 will be economically prohibitive.

25. A decision needs to be made regarding what is actually adequate PPE for the management and supervision of **outdoor decontamination of self-dispatched patients**. Presumably these patients are only lightly contaminated to begin with, or they would have been too sick to leave the scene without First Responder care. In addition, they should be ambulatory and be self-cleaning, requiring minimal contact with medical caregivers before they are clean. NIOSH and other regulatory bodies should evaluate the actual probable levels of contamination and create a protocol for equipment use that responds to the real threat.

26. In a mass casualty event some patients who are quite ill and somewhat contaminated may be brought in by friends or family members, or by taxi. Again their ability to arrive at the hospital without debilitating the driver suggests that their level of off gassing is limited. However, since contaminated patients may arrive who could pose a threat to treating personnel forced to be in close proximity to the patient, a decision must be made regarding **PPE for medical staff treating contaminated patients** whose condition is now too grave to wait for decontamination before initial treatment. [48]

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[48] For example, the nerve agent may have built up in the enclosed vehicle and be causing more severe symptoms. This would be especially true in a child or small person whose driver was a larger adult, and perhaps driving with the window open clearing his air space, while a person lying on a back seat might not benefit from much air circulation, and would suffer from a higher concentration of the material. Or what about a lightly contaminated victim with a stress-induced asthma attack or heart attack? What about a lightly-contaminated woman in stress-induced labor? What PPE is adequate to protect medical

27. Depending on the level of PPE recommended, it will be necessary to **redesign some standard medical equipment** to work within the hearing and sight limitations of the PPE. For example, could designs be created for pulse-ox and stethoscopes that required no hearing, but relied only on visual readouts or light pulsations? What other essential information about patient history and vital signs needs to be collected that normally come through conversation with the patient, but which now will be interfered with by the hearing limitations imposed by PPE. Is it easier to overcome the limitations of the PPE by providing a microphone and earphone as part of the mask, for example?
28. There is a need to develop surge capacity in treatment and in-patient care, especially for patients needing on-going medical supervision, constant use of medical gasses, or who are infectious/contagious. Could surge capacity (for treatment only) be provided in non-hospital settings like schools, community centers or hotels without permanently damaging the economic usefulness of the facility in future? Experience suggests that such expedient uses may render the facility useless in the future.[49] Use of public facilities for activities perceived as "harmless," such as vaccination facilities or public education sites, might survive to be re-used for their original purpose, as witnessed by mass vaccinations in schools with student meningitis outbreaks. Social science research is needed here to determine what factors make re-use unacceptable, and how to rapidly evaluate those factors during a CBRNE attack.
29. In California a law requiring the **seismic safety of hospitals** by the year 2030 is resulting in the closure without replacement of older in-patient hospital facilities. This is reducing ICU, CCU and medical/surgical beds to the number that can be filled to 95% on

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staff while they provide expedient medical treatment outdoors – administer atropine, attach a monitor or IV line, provide an oxygen mask? What concentrations would there be and how long would the exposure be? What PPE would provide adequate protection to the medical responder pre-decontamination? Once this is known, appropriate protocol for current equipment, or appropriate new equipment, could be developed.

[49] For example, the boy's school gym used as a morgue in the 1978 San Diego (California) air disaster had to be razed because no one would use it. The Bellevue Stratford Hotel in Philadelphia (Pennsylvania) was bankrupted by the 1976 Legionnaire's Disease outbreak.

an average day. Given that little elective surgery is performed on an in-patient basis, most patients filling the beds are not candidates for early release. In a disaster it will be very difficult to create bed capacity for victims. Plans such as moving medical patients to skilled nursing facilities may work, but a study needs to be made of the actual surge capacity in these facilities. Medical evaluation of outpatient treatment and home care need to be considered. Research on the sociology and economics of these issues is needed**.**

30. A study needs to be done on what the **value of *phantom hospital beds*** (i.e., empty but available beds) is to the nation's security. [50] However, the space for those phantom beds is currently used for offices, storage or other purposes. Conversion could not be accomplished overnight. Would the federal government pay a space fee to have rooms closed off but set up for surge capacity? What would be a reasonable cost? Should federal hospitals be strategically developed and located against the day that a CBRNE event, or natural outbreak, occurs? Is the cost-benefit justified?

31. Current HRSA funding in the US is supporting the development of a plan to bring clinics into the medical treatment resource pool. However, most states do not require these facilities to have disaster plans or preparedness. Clinics are located in Fire Code B-2 occupancies, and they lack any special seismic or wind resistance factors in the building. They are not required to have generators or on-site water storage. They have no capability to create special post-CBRNE security for the facility or staff. A study should be done of what the cost would be to eliminate some of these **deficiencies in clinic facilities** and what added licensure requirements would be reasonable to ensure disaster preparedness for all hazards, not just CBRNE.

32. The economic cost and benefit of disaster preparedness and emergency management is going to have to be included in the business equation. A study of the **medical economics of**

[50] For economic reasons US Health Maintenance Organizations have consolidated care into a few facilities, and are limiting in-patient care. This trend means that as the population grows, the ratio of beds available per population is likely to continue to decline. Today hospitals in California may have 10-25% more licensed beds than they have staffed beds. The extra licenses are kept because the cost is low, and population growth might dictate adding facilities.

emergency preparedness steps could follow the standard business continuity model used by banks under FDIC laws, and NFPA 1600 requirements, as well as the hospital accreditation model. Makes one baby pool and a garden hose in a closet really constitute being prepared to decontaminate a patient? Does the new environment of care standard meet the need to have all hazards disaster preparedness in place without bankrupting the hospital? What is the comparison of disaster preparedness effort between an HMO based or for-profit hospital versus a not-for-profit community or religious-based hospital?

33. **Surge equipment** has to come from somewhere. We need to create logistics systems that are readily stored and rapidly activated. Items such as beds, medical gasses, and surgical support equipment would need to become available rapidly.[51]

34. A study needs to be done on **staffing the surge capacity.** In the US National Guard units have very limited medical capabilities. Army Reserve Medical units may be deployed to a foreign war, as many are now. The DMATs could be deployed, but it takes 24-72 hours for them to gather, emplane and arrive at the point of need. The President proposed, as part of the Citizen Corps Council effort to recruit volunteers, that a Medical Reserve Corps be developed nationally, but many barriers exist. (CITIZEN CORPS; MEDICAL RESERVE CORPS) Most active medical personnel with specialties related to disasters – trauma specialists, surgical staff, and infectious disease specialists – have reporting responsibilities to the hospitals where they practice if their community is impacted. If they have to cross state lines, they would have to be federalized to be licensed. Who would provide the malpractice insurance for these doctors? [52] In case of recruiting retired medical professionals, is their training

[51] While some military and Veterans Administration facilities might be a part of the solution in some parts of the nation, base closures have limited the number of bases available to communities. Logistics support units were taken over by the Army reserve System, while the National Guard units kept the combat arms resources. The result is that most states would have to turn to the federal government for help with medical care and logistics, not their more quickly mobilized and local National Guard units.

[52] Local projects, like the one in Santa Clara County based at the Volunteer Center of Silicon Valley (VCSC), are underway to try to answer some of these questions. The focus is on recruiting medical professionals who are retired or in specialties not required to respond to hospitals.

appropriate to the needs of a CBRNE attack? What services could a podiatrist or a dermatologist provide? What malpractice insurance issues would arise in practicing out of the board certified specialty?

35. Overall **contagious disease planning** is underdeveloped and requires more funding. In most communities there is no hospital designated as a contagious disease hospital. Therefore there are very limited resources for managing contagious patients, such as negative pressure rooms, HEPA filtration systems for patient care facilities, and staff PPE for a "hot" strain.[53] There is no existing protocol for determining which patients would be hospitalized and which would be sent home for family-based care. If a patient needs to be isolated, who is going to enforce it, and where is that patient going to go? And what if there are a dozen or a hundred such patients?

36. In case of **quarantine** the difficult question of who is going to enforce quarantine must be faced. Most law enforcement agencies are currently unwilling to use lethal force against a person with no symptoms who simply wants to flee with his family to an uninfected area. What would be the impact on a community if its police were seen as its jailers in an outbreak? Whose job is it to stop people from leaving an area with an outbreak? What about violence against people leaving by those in unaffected communities who do not want those fleeing to stop in that town and bring the potential for contagion? Can anyone state that vaccinations or prophylaxis provide adequate assurance that the fleeing person is not a danger to others? Who would say that and be believed? Plans need to be made based on good social science research, and studies need to be conducted on both the science and the social science of communicable disease management. SARS has offered a recent example that could be studied.

37. The **management of large local stockpiles of pharmaceuticals and medical equipment** needs to be addressed.[54] Planning for

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[53] With the rapid increase in the number and type of antibiotic resistant strains of disease – tuberculosis, pneumonia and staph to name only a few – this type of planning is not just for CBRNE attacks, but should be part of good public health practice all the time.

[54] In the US a Strategic National Stockpile (SNS) has been created, using both pre-positioned goods at 16 locations around the United States, and "vendor managed inventories" in warehouses that can be rapidly deployed when needed. (CDC. SNS) The original concept grew out of the recognition that the Metropolitan Medical Strike

reception, distribution, allocation, security, organization, administration was first given to the Metropolitan Medical Strike Teams/Task Forces (MMTFs), who quickly recognized that the attacked community would not have the capacity to also manage an influx of tons of pharmaceuticals and medical goods. Who really has or can develop the resources to manage and distribute these materials? Where can the planeload of goods be received and safeguarded pending breakdown and distribution? How will the MMTFs, local law enforcement, State Police, pharmacists, truck drivers and delivery services, community volunteers and other partners be brought into the planning and response? Where will the partner agencies get the resources for planning, training and exercising the plan once it is made?

38. Facing and resolving the **personnel issues** are the key to success in responding to CBRNE events. How to deliver adequate training for all First Responders that is appropriate to their role and level of responsibility. How do we maintain the appropriate level of response capability? What special certifications are needed for the equipment operation and PPE use? How many staff members on each shift need this level of training and certification? Which staff members in police, in fire, in EMS, and in all the other "First Responder" professions need specific training, and/or certifications? How many in each category? How do we draw the line between regular training and specialized resources for CBRNE. If we adopt the cost-effective dual use strategy, do we staff for the day-to-day demand for hazardous materials response, for example, or do we train adequate staff members on three shifts to manage a CBRNE event? Who will pay the cost of maintaining that level of qualified staff and that size equipment stockpile? What about specialty training in the medical community?

39. **Maintaining adequate training** comes at the cost of personnel time. Most of the training cannot be obtained while on-duty due to

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Teams/Task Forces (MMTFs) would need a source of re-supply during a CBRNE event. US State Health Departments were then tasked with developing a plan. US State Health Officers asked for logistical support from the Federal government. In 2004 the National Association of County and City Health Officials started developing planning guidance for local health departments on the management of the SNS. (NACCHO).

its length, intensity, and practical participation requirements. [55] The challenge for the local community still remains the allocation of scarce resources to CBRNE or day-to-day responsibilities. How often should the continuing professional training or seldom-used skills on CBRNE be offered relative to confined space rescue, barricaded hostage and swift water rescue skills? How can dual use of skills for CBRNE be embedded into departmental SOPs? How often can the "dual use" skills be applied beneficially in the community? Answering these questions becomes the management challenge.

40. The same challenges exist at the regional, state and federal levels with regard to **financial resources for First Responders.** In a time of shrinking tax revenues and rising personnel costs, what is the proper allocation of funds among dealing with the unthinkable and managing the day-to-day? Where the specialized teams and caches should be maintained? How do you maximize the cost/benefit day to day? Currently regional teams in the US include the Disaster Medical Assistance Teams under the Department of Health and Human Services, and the Urban Search and Rescue Teams formerly under Federal Emergency Management Agency (now Homeland Security). They rely, like the MMTFs, on federal funding for sustainment. These, however, are volunteer teams who donate their time but get their supplies and equipment from federal sources. When they are activated and deployed they become federalized and are paid. How many such teams do we need? How long will people continue to volunteer for the weekend drills? It is already getting harder to get medical personnel for the DMATs. How do we manage the specialized caches of equipment and supplies provided for CBRNE response? Locally we rely on the Fire Department's Hazardous Incident Team and the Police Department's Explosive Ordinance Disposal Unit as the First Responders to any CBRNE event. When the local government's budget dictates that these specialized units be downsized or eliminated, how is that weighed against library services or after-school programs that will have to be cut instead?

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[55] Some of the new US federal programs will pay for overtime or backfill wages for training for FR. At present the payments are limited to courses taught by specific vendors through the US Office for Domestic Preparedness (OFFICE FOR DOMESTIC PREPAREDNESS). However, cities can propose locally taught courses for certification, and can then use the Federal funds to cover the training.

The Metropolitan Medical Task Force episodically gets sustainment funds from Congress. In between largess how does the local government maintain and replace the pharmaceuticals, Level A suits and other dated, perishable equipment that will be the key to a rapid response to a CBRNE event, but is seldom used in large quantity day-to-day? Fire department urban search and rescue capabilities will be important to successful victim rescue in explosions and building collapses. How are these capabilities, certifications and equipment caches maintained when balanced against day-to-day demands?

41. **CBRNE operational planning** represents a major challenge for all organizations, including the Public Health departments who have to find solutions with regard to medical planning, staffing and training for such a rare event. Surveillance and epidemiology systems in place for infectious disease outbreaks may be part of a dual use plan for bioterrorism response. How much training can focus on CBRNE versus more common diseases? How much infrastructure is needed to monitor tuberculosis outbreaks, and can it be used for bio terrorism, or would it require augmentation?

42. In the US the National Guard has created **Civil Support Teams** at the state level. These specialized active duty units come with a mobile lab, communications equipment and self-support supplies. Their goal is to confirm the cause, size, and scope of the event and assist the US Department of Defense in mobilizing its resources. It is not a direct aid to communities at risk. How many such teams are needed, and where should they be placed? What travel times will impact delivery of goods and services?

43. **Public-private cooperation** must be complemented by improved public-public partnerships with increased and improved inter-agency coordination and cooperation.

44. There is a need to define **adequacy with regard to CBRNE preparedness and response** for a nationwide organization like US CDC. **Maintenance of specialized First Responder infrastructure with CBRNE** is essential. In the US there are teams that have been developed for assisting with preventing, preparing for or responding to CBRNE events, for example: DOE's NEST was developed to find and rescue nuclear material that had been lost or stolen, and to protect communities potentially exposed to the

material. That need continues to exist, and is likely to escalate as the Yucca Mountain spent fuel storage facility is developed, and spent fuel is moved around the nation. The Marine Corps' Chemical Biological Incident Response Force (CBRIF) was created for support for First Responders in a domestic CBRNE event. (CBIRF) Part of the CDC is the Agency for Toxic Substances and Disease Registry (AGENCY FOR TOXIC SUBSTANCES) whose emergency response teams assist communities. (ATSDR, FACT SHEET) These specialists can assist with acute chemical events. In the 9/11 attacks ATSDR staff provided air-monitoring services at Ground Zero, helped to make the GIS maps of the dust cloud, and assisted with the development of community protective information. They were also active in developing air samples for the anthrax events in the fall of 2001. (ATSDR - ROLE) Other CDC elements are active in laboratory support and the development of public information and education for diseases of concern, including CBRNE. Resources to support these programs battle with other priorities in Congress for funding.

45. Industry has to be shown the **cost/benefit in strengthening on-site security**, justifying the additional cost. Many of the chemicals and agents that could be used in attacks are already in place within our communities.[56]

46. Community planning on **managing large numbers of people in disasters** needs to be accelerated. Most emergency plans use an earthquake or hurricane as the paradigm, but a CBRNE event overlays the emergency with different psychology and different fears. Population relocation may not be as easy. Reception sites may be harder to find if contamination or contagion are issues. The numbers of people who could potentially be homeless, if a community had to be evacuated to avoid radiological material from a Chernobyl-style event, would be very large.

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[56] For example, the City of San Jose (California) alone has 1700 different sites where hazardous materials are used or stored. Although these sites are registered with the fire department, and are required to comply with state and federal storage regulations, it is clear that not all companies abide by all the requirements all the time. In addition, security for these materials is lax in some areas, such as in labs where small quantities are used in R&D work and not accounted for during the workday. Toxic gasses used in high tech can do significant damage in small quantities.

47. **Public education on evacuation versus shelter in place** decisions has to be improved.[57] More work is being done at the local level through emergency preparedness programs to help people understand how and why they may need to shelter in place. Progress is slow. Evacuation planning is well understood in areas where hurricanes are a seasonal threat. However, many communities are unprepared for large-scale evacuations. Communities with nuclear power plants have had community evacuation drills. However, even with an announced drill the same problems of running out of gas, flat tires and erratic driving lead to blocked roads and traffic snarls.[58]

48. **Isolation and quarantine issues** involve a whole series of legal and moral judgments. More work needs to be done to understand the rights of residents, the limits of the health officer's authority, and the pre-event steps that could be taken to get public cooperation in the quarantine were needed. Local health departments are working on mass vaccination and mass prophylaxis plans under CDC grants. Health departments have to bring into partnerships the local governments in whose jurisdictions the vaccination or distribution centers will have to be established. Traffic control and crowd control will be the obligation of the local law enforcement agencies. Local EMS agencies will have to provide standby support for individuals with bad reactions to the vaccination, or stress reactions to the event. Planning departments or general services departments will have to find facilities that are suitable for the medication distribution, taking into account parking, crowd control and security issues. Ethnic sensitivities and gang control issues may also come into play in the site selection process. Little of this coordination has been recognized in the planning to date.

49. After the terrorist bombing in Madrid in 2004 the importance of **emergency planning for transportation resources** became very

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[57] The well-meaning public education materials about duct tape issued by the US Department of Homeland Security in the fall of 2001 led to ridicule and little education.

[58] Washington, DC has clearly marked snow evacuation routes, yet in the uncoordinated decision to evacuate government workers from the District on 9/11 a traffic jam was created because one of the major exit routes was blocked to traffic on the Virginia side due to the Pentagon emergency response.

apparent. Public transit has been a target in Europe and Israel for some time. (JENKINS) New concerns include how to protect spent nuclear fuel rods while they are in transit, how to protect hazardous materials being transported by road or rail, and how to monitor cargo containers in international trade. All of this goods movement offers the opportunity for the theft of CBRNE materials, or for the placement of CBRNE materials in vulnerable areas. Owners and managers of bridges, tunnels, and freeways are also concerned about vulnerabilities to terrorist attacks using CBRNE. Explosives could be used to destroy transportation infrastructure as the primary incident, or to prevent help from arriving to another event.

50. As the E.U. moves forward with CBRNE response development it should consider:

    a. Developing **common systems**, **procedures** and **equipment** that allow rapid identification of any signal/clue that will lead to larger CBRN Emergency
    b. Strengthening the **flow of communication between European First Responder** organizations. This will help to spread immediately any useful information. The flow of information is the "must" of every effective Incident Management System.
    c. Training programmes based on common procedures and standards. This will enhance interoperability in multi-jurisdiction events and ensure that First Responders will work together effectively.

7.3 Conclusions

After the March 2004 attacks in Madrid, there can be no doubt that European cities are as likely to be targeted by terrorist activities as their US counterparts. The drafters of the EU constitutional treaty have thus rightly foreseen a solidarity clause providing mutual assistance for EU member states in case of terrorist activities. So far, however, ongoing discussions about improving Europe's security capabilities have focused primarily on expeditionary tasks while neglecting the provision of homeland security. To overcome this problem, the capabilities of First Responders must receive substantial reinforcement. Here the corporate sector can play a useful role. However, the most substantial reform effort

will have to be undertaken by the community of First Responders themselves. By adopting a capabilities-based planning approach, First Responders should jointly identify their capabilities at the international and national levels and set up a capability development mechanism. These actions will help coordinate research, procurement, and training. In doing so, First Responders will be able to assume the much needed role of a credible and capable player to complement NATO's security and defense policy.

Appendices

Appendix 1: List of participants

Appendix 2: Lessons learned in the US

Appendix 2.1 The National League of Cities, Lessons Learned from the September 11 Terrorist Attack

Appendix 2.2 Federal Emergency Management Agency (FEMA), *Summary of Post 9/11 Reports Lessons Learned: Cross-Cutting Analysis of Post 9/11 Report 'Key Recommendations' for Improving the Nation's Preparedness*, October 2002

Appendix 2.3 National Incident Management System (NIMS), U. S. Department of Homeland Security, March 1, 2004

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APPENDIX 2: LESSONS LEARNED IN THE US

Appendix 2.1 The National League of Cities
Lessons learned from the September 11 terrorist attack (http 1)

The following twelve lessons were developed by the National League of Cities Working Group on Homeland Security from a series of briefings held with key responders to the September 11 attacks on the World Trade Center. These twelve points offer practical guidance to local officials in cities and towns of all sizes as they develop and refine local and regional homeland security plans.

- Focus on effective communications to ensure effective emergency preparedness, response, and recovery. This includes both reliable and interoperable equipment and personal communication capacity/plans among levels of government, among agencies/departments in the city, with constituents and neighborhood groups, and with the public through the media.
- Build strong working relationships well before an emergency. The day of an emergency is not the time to exchange business cards. Solid relationships (where people know each other by name) and effective communication create confidence in each other that strengthens response capacity.
- Define and communicate clearly who's in charge in general and who is responsible for specific response components. A leadership matrix for various components of a response plan which defines who's in charge before, during, and after an emergency was recommended.
- Be prepared to operate alone in an emergency for 24 to 48 hours before other local/state/federal support arrives. Emergency plans should assume independent local response for up to 48 hours. A well-designed regional plan should outline how adjoining communities can support each other before the state and federal government arrive.
- Plan for continuity of government during and after an emergency. Those plans should consider both physical government facilities (*e.g.*, what to do if city hall, the emergency response center, or other critical public buildings are knocked out by the emergency) and leadership lines of succession, back up, redundancy.

- Practice, practice, practice. Regular drills, simulations, and table-top exercises will ensure that all personnel know the plan and know what to do. Drills will also point out areas of the plan that need additional work, refinement, and more practice. Planning + Practice = Performance
- Prepare boilerplate emergency proclamations, citizen alerts, etc. which can be put into effect immediately, and have all mutual aid agreements signed and in place. When an emergency hits, there's no time to draft proclamations, citizen guidelines etc. The more that is already in place or ready to go in case of an emergency, the more efficient the response can be.
- Maximize the use of technology to support emergency preparedness, response, and recovery. Technology resources that were mentioned include GIS mapping and databases of resources (including private industry, businesses, and volunteers).
- Emphasize training and cross training for all personnel. Broad cross training will increase the likelihood that someone on site knows what to do even if the "right people" are not there at every moment. Training should also focus on using discretion, common sense, and good judgment during an emergency so that employees have the confidence and skill to act quickly and responsibly in stressful situations.
- Respond only with the necessary people on site so that other operations can be sustained. Someone needs to stay behind - for both continuity of governance and continued operation of some basic services. This may be particularly challenging and particularly important in very small communities during those first hours of local only response.
- Consider the human element of employee response. Emergency planning should incorporate taking care of the emotional needs of employees after an emergency and the stress of dealing with a sustained emergency.
- Engage citizens in new ways as part of the planning process. Civic engagement in meaningful ways can enhance resources so that residents are part of the solution during an emergency. Community and neighborhood groups can enhance response capacity if they know what they are expected to do to support city personnel.

Appendix 2.2 Federal Emergency Management Agency (FEMA), *Summary of Post 9/11 Reports Lessons Learned: Cross-Cutting Analysis of Post 9/11 Report 'Key Recommendations' for Improving the Nation's Preparedness*, October 2002

This report examined and grouped key recommendations from several reports that identified lessons learned after the terrorist attacks on September 11, 2001. Below are excerpts for three areas: Command & Control, Communication, and Coordination.

COMMAND & CONTROL

The Arlington County after Action Report (http 2)

- . To every extent possible, the command structure at the incident site should be preplanned and agreed upon by area responders and public safety organizations. All agencies should adhere to a single command system.
- . Shift changes and dismissal instructions should be described in the department's standard operating procedures to which changes can be made to accommodate the circumstances of a particular event.
- . Standardized NIIMS ICS forms should be available and used for all long-term incidents.
- If a Joint Operations Center (JOC) is established, a Joint Information Center (JIC) should also be activated.
- . To every extent possible, the command structure at the incident site should be preplanned and agreed upon by area responders and public safety organizations. All agencies should adhere to a single command system.

McKinsey Report--Increasing FDNY's Preparedness (http 3)

- . Expand the use of the Incident Command System (ICS) to provide a foundation for responding to and managing any type of emergency.
- Review all FDNY procedures to ensure consistency with ICS principles.
- . Train FDNY personnel on the ICS.
- . Establish ongoing ICS training programs for Senior Personnel.

McKinsey Report--Improving NYPD Emergency Preparedness and Response (http 4)

- . Allow for clearer delineation of roles and responsibilities of key NYPD leaders.
- . Better clarity in the chain of command is needed.

Protecting Emergency Responders: Lessons Learned from Terrorist Attacks (http 5)

- . Plans made for establishing command over a disaster site must be sufficiently resilient and robust to handle situations that can disrupt them.
- . Mechanisms must be developed to allow rapid and efficient scene control at disaster sites as early as possible during a response.
- . The site should be isolated and entry and exit control quickly established.
- City managers should be compelled to immediately hire fencing contractors when a large incident occurs.
- . There must be a quick and effective establishment of an effective command authority over an incident site
- A mandatory staging system could be developed where mutual-aid responders gather in a staging area and then are selectively brought to the scene as a way to control the confusion associated with an influx of well-intentioned volunteers.
- . Strict access control combined with effective personnel- location technologies is the most effective way to account for individuals working in very chaotic and dangerous environments.
- Bar-coded identification cards linked to personnel records could be used to enable agencies to track on-site personnel.
- . Enforcement of the proper and constant use of personal protective equipment is an absolute necessity at disaster sites. Once perimeters are fixed with defined entry and exit points, appropriate protective equipment can become part of the “admission ticket” that allows workers to enter a site.
- . Provide guidelines and define organizational responsibilities for enforcing protective equipment use at major disaster sites, the health and safety of responders should be a principal concern.
- Explore mechanisms to effectively outfit all responders at large incident sites with appropriate personal protective equipment as rapidly as possible.

- . Guidelines must be practical in the sense that they consider the capabilities of emergency-response organizations, are easy to use in the field, and do not unduly impair the ability of emergency responders to perform critical life-saving missions.
- Define mechanisms to rapidly and effectively provide responders at incident sites with useful information about the hazards they face and the equipment they need for protection.
- . The safety officer at a disaster site should be an independent official whose sole responsibility is safety enforcement. In cases where incident sites are managed through a unified command structure, those responsible for responder safety could be part of that command.
- Site commanders could benefit from guidelines on how to handle VIPs, off-duty workers, and volunteers developed in advance of an incident.

States' Homeland Security Priorities (http 6)

- . Federal agencies should integrate their command systems into existing State and local incident command systems (ICS) rather than requiring State and local agencies to adapt to Federal command systems.

A National Action Plan for Safety and Security in America's Cities (http 7)

- The number of local Urban Search and Rescue teams should be increased and all teams should be fully equipped.
- When an incident occurs, there should be a single Federal point of contact.
- It must be clear how many deployed National Guard troops relate to local authorities.

COMMUNICATION

The Arlington County after Action Report

- A regional medical disaster plan should include the designation of a Clearinghouse Hospital to coordinate communication between the incident site and supporting medical treatment centers.

- . A communications mechanism needs to be developed to activate mutual-aid resources.
- . Procedures should be established to ensure timely public medical recall announcements during large-scale exercises.
- . There should be a regional review of response plans to identify, institute, and agree on communication channels to be used by all area responders and hospitals to ensure complete communications.

McKinsey Report--Increasing FDNY's Preparedness

- Revamp the management process it uses to evaluate, acquire and deploy communications systems and protocols and technology.
- . Immediately address urgent needs in its technology infrastructure, processes and protocols.
- . Lead the development of a long-term Technology Plan.
- Improve radio communications.
- . Improve the Department's ability to receive and disseminate critical incident information.
- . Give chief officers at incident scenes better ways to manage information and track personnel.

McKinsey Report - Improving NYPD Emergency Preparedness and Response

- Create radio communications protocols and procedures that optimize information flow.

Protecting Emergency Responders: Lessons Learned from Terrorist Attacks

- All Federal agencies acquiring and stocking personal protective equipment should use identical brands or, at the least, interoperable equipment.
- Regulations should be promulgated requiring that the Personal Protective Equipment (PPE) procured meet minimal performance standards.
- Federal regulations mandating that equipment purchased by responder organizations meet some standard of interoperability would aid effort
- The National Institute of Occupational Safety and Health (NIOSH) or another agency with jurisdiction should issue binding

regulations establishing standard couplings on respirators so that cartridges and masks could be used interchangeably.

- PPE acquisitions and logistics should be coordinated with other local and State jurisdictions to ensure interoperability.
- . Divisions and safety units of responding organizations should be monitored to ensure that data is coordinated, vetted, and disseminated in a way that is useful and credible to front-line responders.
- . There should be on-site environmental monitoring in a geographic information system to make information available to lead authorities.
- . Examine any barriers to equipment standardization or interoperability among emergency-responder organizations.

States' Homeland Security Priorities

- States must work with local governments to develop interoperable communications between First Responders and adequate wireless spectrum must be set aside to do the job.
- . Interoperable equipment standards for emergency responders, including definitions and terms, is critical so in any use of mutual aid the responding party has equipment compatible with all other responders.
- . Action must be taken at the Federal level to ensure that there are adequate radio frequencies dedicated to public safety needs. There is inadequate spectrum available under existing allocations by the FCC.
- Full funding is needed to provide a full and comprehensive land mobile radio system
- (LMRS) in each State. US DoD, Federal non-DoD, and State and local governments must all be included in this project.
- . Effective system must be developed that secures points of entry at borders, airports, and seaports without placing an undue burden on commerce.

A National Action Plan for Safety and Security in America's Cities

- . There must be communication system inter-operability to ensure clear communication among city departments and Federal, regional, State and other local entities responding to disasters.

COORDINATION

States' Homeland Security Priorities

- . Coordination must involve all levels of government.
- All Federal resources, programs, and activities involving State and local government must be coordinated through the nation's governors and their appropriate State agencies.
- Federal government must disseminate timely intelligence information to the States.
- The Office of Homeland Security should be a central repository and clearinghouse to provide State and local agencies with counter terrorism-related information to assist
- States in their efforts to distribute information tailored to communities.
- State and local governments need help and technical assistance to identify and protect critical infrastructure.
- Federal government should provide adequate Federal funding and support to ensure that homeland security needs are met.
- . National Guard should remain flexible and remain primarily under the control of the governor during times of crisis.

A National Action Plan for Safety and Security in America's Cities

- . The Mayor's organization has formed bipartisan task forces on airport security, coordination of Federal and local law enforcement, and water system security.
- Mayors, police chiefs, fire chiefs, emergency managers and public health officials from cities across the nations should join together for briefings by top Federal officials and for the sharing of information on "best practices" in safety and security.
- The Office of Homeland Security must be structured to work directly with mayors in support of their leadership roles and responsibilities in both their cities and their regions.
- The Director of Homeland Security should immediately establish a permanent commission consisting of mayors, police chiefs, local emergency managers, and local public health officials.
- Mayors and other local officials should have clear guidelines for the use of resources provided by both Federal and State governments when disasters occur.
- Mayors and police chiefs should be allowed to hold the security clearances needed to receive intelligence from the Federal level.

Federation of American Scientists Report-Training Technology against Terror (http 8)

- . Each Federal agency should be assigned missions consistent with its core competencies.
- . A coordinated interagency plan should be created and well implemented to provide timely updates, quality control, and peer review of the content.

Appendix 2.3 National Incident Management System (NIMS), U. S. Department of Homeland Security, March 1, 2004 (http 9)

CONCEPTS AND PRINCIPLES.

To provide this framework for interoperability and compatibility, the NIMS is based on an appropriate balance of flexibility and standardization.

Flexibility

The NIMS provides a consistent, flexible, and adjustable national framework within which government and private entities at all levels can work together to manage domestic incidents, regardless of their cause, size, location, or complexity. This flexibility applies across all phases of incident management: prevention, preparedness, response, recovery, and mitigation.

Standardization.

The NIMS provides a set of standardized organizational structures—such as the Incident Command System (ICS), multiagency coordination systems, and public information systems—as well as requirements for processes, procedures, and systems designed to improve interoperability among jurisdictions and disciplines in various areas, including: training; resource management; personnel qualification and certification; equipment certification; communications and information management; technology support; and continuous system improvement.

OVERVIEW

The NIMS integrates existing best practices into a consistent, nationwide approach to domestic incident management that is applicable at all jurisdictional levels and across functional disciplines in an all-hazards context. Six major components make up this systems approach. Of these components, the concepts and practices for Command and Management and Preparedness are the most fully developed, reflecting their regular use by many jurisdictional levels and agencies responsible for incident management across the country. Resource Management, Communications and Information Management, Supporting Technologies, and Ongoing Management and Maintenance introduce many concepts and requirements

that are also integral to the NIMS, but that will require further collaborative development and refinement over time.

1. NIMS Components
The following discussion provides a synopsis of each major component of the NIMS, as well as how these components work together as a system to provide the national framework for preparing for, preventing, responding to, and recovering from domestic incidents, regardless of cause, size, or complexity. A more detailed discussion of each component is included in subsequent chapters of this document.

a. Command and Management
NIMS standard incident command structures are based on three key organizational systems:

(1) The Incident Command System (ICS).
The ICS defines the operating characteristics, interactive management components, and structure of incident management and emergency response organizations engaged throughout the life cycle of an incident;

The Incident Command System (ICS) is the combination of facilities, equipment, personnel, procedures, and communications operating within a common organizational structure, designed to aid in domestic incident management activities. It is used for a broad spectrum of emergencies, from small to complex incidents, both natural and manmade, including acts of catastrophic terrorism. ICS is used by all levels of government—Federal, State, local, and tribal, as well as by many private-sector and nongovernmental organizations. ICS is usually organized around five major functional areas: command, operations, planning, logistics, and finance and administration. A sixth functional area, Intelligence, may be established if deemed necessary by the Incident Commander, depending on the requirements of the situation at hand. Some of the more important "transitional steps" that are necessary to apply ICS in a field incident environment include the following:

- recognizing and anticipating the requirement that organizational elements will be activated and taking the necessary steps to delegate authority as appropriate;
- establishing incident facilities as needed, strategically located, to support field operations;
- establishing the use of common terminology for organizational functional elements, position titles, facilities, and resources; and

- rapidly evolving from providing oral direction to the development of a written Incident Action Plan.

(2) Multiagency Coordination Systems.
These define the operating characteristics, interactive management components, and organizational structure of supporting incident management entities engaged at the Federal, State, local, tribal, and regional levels through mutual-aid agreements and other assistance arrangements; and

(3) Public Information Systems.
These refer to processes, procedures, and systems for communicating timely and accurate information to the public during crisis or emergency situations.

b. Preparedness
Effective incident management begins with a host of preparedness activities conducted on a "steady-state" basis, well in advance of any potential incident. Preparedness involves an integrated combination of planning, training, exercises, personnel qualification and certification standards, equipment acquisition and certification standards, and publication management processes and activities.

(1) Planning
Plans describe how personnel, equipment, and other resources are used to support incident management and emergency response activities. Plans provide mechanisms and systems for setting priorities, integrating multiple entities and functions, and ensuring that communications and other systems are available and integrated in support of a full spectrum of incident management requirements.

(2) Training
Training includes standard courses on multiagency incident command and management, organizational structure, and operational procedures; discipline-specific and agency-specific incident management courses; and courses on the integration and use of supporting technologies.

(3) Exercises
Incident management organizations and personnel must participate in realistic exercises—including multidisciplinary, multijurisdictional, and multisector interaction—to improve integration and interoperability and optimize resource utilization during incident operations.

(4) Qualification and Certification
Qualification and certification activities are undertaken to identify and publish national-level standards and measure performance against these standards to ensure that incident management and emergency responder personnel are appropriately qualified and officially certified to perform NIMS-related functions.

(5) Equipment Acquisition and Certification
Incident management organizations and emergency responders at all levels rely on various types of equipment to perform mission essential tasks. A critical component of operational preparedness is the acquisition of equipment that will perform to certain standards, including the capability to be interoperable with similar equipment used by other jurisdictions.

(6) Publications Management
Publications management refers to forms and forms standardization, developing publication materials, administering publications—including establishing naming and numbering conventions, managing the publication and promulgation of documents, and exercising control over sensitive documents—and revising publications when necessary.

c. Resource Management.
The NIMS defines standardized mechanisms and establishes requirements for processes to describe, inventory, mobilize, dispatch, track, and recover resources over the life cycle of an incident.

d. Communications and Information Management.
The NIMS identifies the requirement for a standardized framework for communications, information management (collection, analysis, and dissemination), and information-sharing at all levels of incident management.

These elements are briefly described as follows:

(1) Incident Management Communications

Incident management organizations must ensure that effective, interoperable communications processes, procedures, and systems exist to support a wide variety of incident management activities across agencies and jurisdictions.

(2) Information Management

Information management processes, procedures, and systems help ensure that information, including communications and data, flows efficiently through a commonly accepted architecture supporting numerous agencies and jurisdictions responsible for managing or directing domestic incidents, those impacted by the incident, and those contributing resources to the incident management effort. Effective information management enhances incident management and response and helps insure that crisis decision making is better informed.

e. Supporting Technologies.
Technology and technological systems provide supporting capabilities essential to implementing and continuously refining the NIMS. These include voice and data communications systems, information management systems (*i.e.*, record keeping and resource tracking), and data display systems. Also included are specialized technologies that facilitate ongoing operations and incident management activities in situations that call for unique technology-based capabilities.

f. Ongoing Management and Maintenance.
This component establishes an activity to provide strategic direction for and oversight of the NIMS, supporting both routine review and the continuous refinement of the system and its components over the long term.

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