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Terrorism and WMD

In the Contemporary Operational Environment

US Army Training and Doctrine Command
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Summary of Change

U.S. Army TRADOC G2 Handbook No. 1.04

This handbook dated 20 August 2007:

- Supersedes DCSINT Handbook No. 1.04, dated 15 August 2005.
- The 2006 revised final draft of DCSINT Handbook No. 1.04 is rescinded.
- The main "Threats" purpose of this 2007 handbook differs significantly in topic and content from the 2005 Handbook No.1.04.
- Appendix A provides factsheets from the Centers for Disease Control and Prevention.
- Appendix B provides a generic way of estimating CBRN threats based on a US Army field manual model.

Preface

Terrorism and WMD in the Contemporary Operational Environment is a supplemental handbook to the U.S. Army Training and Doctrine Command, TRADOC G2 capstone reference guide on terrorism, TRADOC G2 Handbook No. 1, ***A Military Guide to Terrorism in the Twenty-First Century***. Understanding terrorism and weapons of mass destruction (WMD) span foreign and domestic threats in strategy, tactics, and targets in a full spectrum contemporary operational environment (COE). Terrorism against the United States of America could include use of chemical, biological, radiological, nuclear, or high yield explosive (CBRNE) weapons.

Purpose. This informational handbook supports operational missions, institutional training, and professional military education for U.S. military forces in the War on Terrorism (WOT). This document promotes an improved understanding of terrorist objectives and motivation, and **terrorist intention to use WMD**. Compiled from open source materials, this handbook promotes a "Threats" perspective and enemy situational awareness of U.S. actions in combating terrorism.

Intended Audience. This handbook exists primarily for U.S. military members in operational units and installation-institutional activities. Other groups of interest include interdepartmental, interagency, intergovernmental, civilian contractor, or nongovernmental, private volunteer, and humanitarian relief organizations, and the general citizenry.

Handbook Use. Study of contemporary terrorist motivations and behavior, terrorist goals and objectives, and knowledge of terrorist historical or emergent tactics, techniques, and procedures (TTP) improves training awareness and readiness. A selected bibliography presents citations for detailed study of specific terrorism topics. Unless stated otherwise, nouns or pronouns do not refer exclusively to a specific gender.

Proponent Statement. Headquarters, U.S. Army Training and Doctrine Command (TRADOC) is the proponent for this publication. Both the capstone guide and supplemental handbook are prepared under the direction of the TRADOC TRADOC G2, TRADOC Intelligence Support Activity (TRISA) -Threats. This handbook will be updated to enhance a current and relevant resource based on user requirements. Send comments and recommendations on DA Form 2028 directly to Director, U.S. Army TRADOC Intelligence Support Activity (TRISA) – Threats, ATTN: ATIN-T, Threats Terrorism Team, 700 Scott Avenue, Bldg 53, Fort Leavenworth, Kansas 66027-1323.

This handbook is available at https://dcsint-threats.leavenworth.army.mil. and requires an Army Knowledge Online (AKO) login password for website access.

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Terrorism and WMD in the Contemporary Operational Environment

Contents

Introduction

America is at War…the grave challenge we face – the rise of terrorism fueled by an aggressive ideology of hatred and murder, fully revealed to the American people on September 11, 2001.

President George W. Bush
The National Security Strategy of the United States of America
March 2006

Terrorism and WMD in the Contemporary Operational Environment is a supplemental handbook to the U.S. Army TRADOC G2 Handbook No. 1, *A Military Guide to Terrorism in the Twenty-First Century*. The capstone reference guide describes terrorism[1] and its potential impacts on U.S. military forces in the conduct of mission operations. This supplemental handbook highlights the nature of terrorism present in a full spectrum contemporary operational environment (COE)[2] and terrorist intentions to use weapons of mass destruction.

Figure 1. **Terrorism WMD in the Contemporary Operational Environment**

[1] Joint Publication 1-02. *Department of Defense Dictionary of Military Terms and Associated Terms*, 12 April 2001, as amended through 13 June 2007.
[2] Army Field Manual 7-100. *Opposing Force Framework and Strategy*, (Washington, D.C.: Department of the Army, 1 May 2003).

Terrorist intent to obtain and use weapons of mass destruction (WMD) is one of the most serious contemporary threats to our Nation. The means of attack can span from a highly sophisticated weapon system such as a nuclear bomb to a rudimentary improvised radiological device. The specter of chemical contamination or biological infection adds to the array of weapons. Although high explosives have not been traditionally recognized as a WMD, high yield and some low yield explosives have caused significant devastating effects on people and places.

The threat of WMD terrorism to the United States is present across the entire spectrum of conflict. Potential exists for WMD terrorism with individual acts of wanton damage or destruction of property or person, as well as operations conducted by organized violent groups or rogue states with social, environmental, religious, economic, or political agendas. As the United States confronts terrorism, both foreign and domestic, the most significant U.S. concerns are terrorist organizations with demonstrated global reach capabilities and their intention to acquire and use weapons of mass destruction. Yet, recent events have demonstrated that devastating weapon effects can be caused by one or two people with the will and a simple way to terrorize.

The threat of WMD terrorism is a significant concern in the US Homeland and in the many locations of US presence abroad. In the Department of Defense's Level I Antiterrorism Training, the Chairman of the Joint Chiefs of Staff states,"…be aware that the international terrorist network may exist in the area where you're stationed or where you travel, both in and outside of the country…make security a part of your routine…patience and persistence are the watchwords for defeating the terrorists…these terrorists are patient and cunning…"

"The greater the threat, the greater the risk of inaction – and the more compelling the case for anticipatory action to defend ourselves, even if uncertainty remains as to the time and place of the enemy's attack.

There are few greater threats than a terrorist attack with WMD."

The National Security Strategy of the United States of America

This full range of terrorist activity can have major impacts on the conduct of missions by U.S. military forces. Weapon of mass destruction threats are normally grouped in categories of chemical, biological, radiological, and nuclear (CBRN). High yield explosives are included sometimes in a description of WMD within an acronym of CBRNE.

Purpose

This handbook, in conjunction with the Army TRADOC G2 capstone terrorism Handbook No. 1, *A Military Guide to Terrorism in the Twenty-First Century,* serves as an unclassified resource to inform U.S. military members on the nature of terrorism threats and weapons of mass destruction. Situational awareness studies terrorist intentions, characteristics and capabilities or limitations of WMD, and demonstrated or possible examples of WMD attack. These aspects complement the deliberate processes of U.S. military forces risk management, protection of the force, mission orders conduct, and leader decision-making.

This situational awareness is critical to individual, family member, unit, work group, and installation operations security and protection of the force.

From a "Threats" perspective, terrorism *intent and capabilities* indicate possible and probable types of threat action that may be directed against U.S. military members, units, and organizations. Factors other than military power may place limitations or restrictions on both threats and friendly forces. Commanders, organizational leaders, and other military members must understand and appreciate the "Threat" and can use this handbook to create opportunities to:

- Understand terrorist goals and objectives, as well as patterns, trends, and emerging techniques of terrorist operations and use of weapons of mass destruction.

- Appreciate the terrorism threat to U.S. military forces, equipment, and infrastructure for operational and institutional locations and missions. Institutional locations include training and education sites, installations, and support networks.

- Relate appropriate levels of protection of the force, operational security (OPSEC), and terrorism prevention and countermeasures to installations and units.

- Use terrorism awareness as integral to vulnerability analysis for Active Component (AC) forces, Army Reserve forces, and State National Guard forces: (1) deployed on an operational mission, (2) in-transit to or from an operational mission, or (3) designated as installation or institutional support not normally deployed in the conduct of their organizational mission.

Defining Terrorism

Terrorism is a special type of violence. While terrorism often seeks legitimacy as political action, terrorism is a criminal offense under nearly every national or international legal code. Although terrorism has not yet caused the physical devastation and large number of casualties normally associated with traditional warfare, terrorism can produce a significant adverse psychological impact and present a threat greater than a simple compilation of the number of people killed or the quantity of materiel destroyed.

Examples of this is the impact are the 9/11 attacks on the United States and the U.S. anthrax incidents in 2001. For some people, these attacks weakened their sense of safety and security. The experience of catastrophic terrorism was evidence that the United States was not immune to attacks by known international or transnational terrorist groups.

However successful in attracting attention or creating fear and anxiety, terrorist acts often fail to translate into concrete long-term gains or achieve an ultimate objective.[3] Escalating acts of terrorism can be self-defeating when the acts become so extreme that public reaction focuses on the acts rather than on the terrorist's intended purpose and issue. The 9/11 attacks had significant political, social, and economic impacts on the United States and the world. Yet for many citizens, these terrorist acts fortified their will and resolve. Consequently, a national resolve emerged from these catastrophic incidents to combat terrorism and reassert confidence in the Nation.

Terrorism

The calculated use of unlawful violence or threat of unlawful violence to inculcate fear; intended to coerce or to intimidate governments or societies in the pursuit of goals that are generally political, religious, or ideological.

Joint Pub 1-02

As a tactic, terror can be successful in its immediate purpose, but fail to achieve its ultimate aim unless dedicated political or military efforts coincide to produce tangible results.[4] A contrast is use of terrorism in coordination with other elements such as political or military power. Operational or strategic impact can be significant. Some people view the 2004 withdrawal of Spanish military forces from coalition forces in Iraq as an operational outcome of terrorism in Spain. The terrorist bombing of several trains in Spain were conducted in conjunction with pending national elections. Democratic elections voted for a change in Spanish national policy. Was the aim to fracture the coalition in the Mideast? Could this incident be viewed as part of a strategy to cause the eventual removal of U.S. and other Western government presence and prestige in the Mideast? Would reactions of elected officials and the general public have been different if several weapons of mass destruction had been used?

Scoping the Issue: Terrorism and WMD

Terrorism is a significant challenge for U.S. military forces in the twenty-first century. Terrorist violence has emerged in recent years from an agenda-forcing and attention-getting tool of the politically disenfranchised to a significant asymmetric form of conflict. While terrorist acts may have appeared to be extraordinary events several decades ago, today terrorism surpasses these former acts and demonstrates a profound impact on populations at the local, regional, national, and international levels.

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[3] Caleb Carr, *The Lessons of Terror: A History of Warfare Against Civilians: Why it has Always Failed and Why it will Fail Again* (New York: Random House, 2002), 11.

[4] Walter Lacquer, *The New Terrorism: Fanaticism and the Arms of Mass Destruction* (New York: Oxford University Press, 1999), 48.

Terrorists do not plan on defeating the U.S. in a direct military confrontation. As part of a larger list of threats, "…foes today are not trying to defeat us [U.S.] purely militarily. They're approaching this from a far broader strategic context, and in fact, they're least interested in taking us [U.S.] on head-on. They're interested in tying us down militarily, but they are really working on defeating us informationally, economically, and politically, the other dimensions of National power."[5]

What is terrorism? Terrorism is defined by the Department of Defense (DOD) as: "The calculated use of unlawful violence or threat of unlawful violence to inculcate fear; intended to coerce or to intimidate governments or societies in the pursuit of goals that are generally political, religious, or ideological."[6] This is not a universally accepted definition outside of the Department of Defense. The study of terrorism has often been mired in a conflict over definitions and frames of reference. The DOD doctrinal definition will be used for this handbook.

To spotlight the importance of terrorism and WMD, the *National Security Strategy* states that one of the Nation's essential tasks as: "Prevent our enemies from threatening us, our allies, and our friends with weapons of mass destruction."[7]

Essential Task

"Prevent our enemies from threatening us, our allies, and our friends with weapons of mass destruction."

The National Security Strategy of the United States of America

Understanding Operational Environment

The U.S. Department of Defense (DOD) defines operational environment (OE) as a composite of the conditions, circumstances, and influences that affect the employment of capabilities and bear on the decisions of the commander.[8] This environment includes air, land, maritime, space, and associated adversary presence, as well as friendly and neutral

[5] General Peter Schoomaker, Army Chief of Staff, "CSA Interview: Joint and Expeditionary Capabilities," (Washington, D.C.: Pentagon, 4 October, 2004), available from http://www.army.mil/leaders/leaders/csa/interviews/04Oct04.html; Internet; Accessed 11 January 2005.
[6] Joint Publication 1-02, *Department of Defense Dictionary of Military and Associated Terms*, 12 April 2001, as amended through 13 June 2007.
[7] *The National Security Strategy of the United States of America*, (Washington, D.C.: The White House, March 2006), 1.
[8] Joint Publication 1-02, *Department of Defense Dictionary of Military and Associated Terms*, 12 April 2001, as amended through 13 June 2007.

systems. These other systems associate political, military, economic, social, information, infrastructure, legal, and other elements in contemporary day-to-day life. Appreciation is a holistic awareness rather than a discrete assessment of a specific issue or action.

A way of appreciating these critical variables in a real-world context is to analyze environment through use of the acronym PMESII plus PT. These elements for analysis are political, military, economic, social, information, infrastructure, and other physical aspects such as geography-topography-hydrology and time (PMESII + PT).

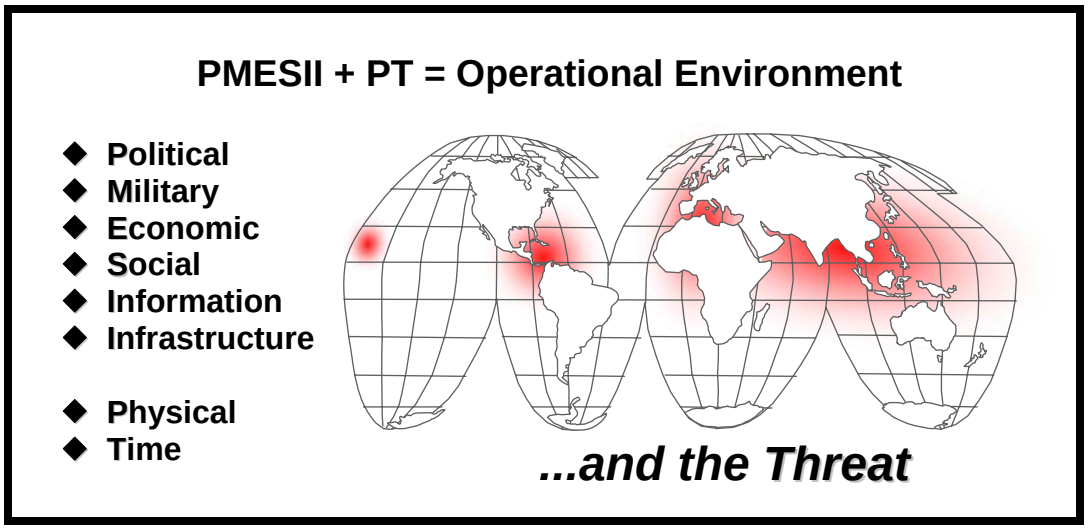

Figure 2. **Operational Environment and the Threat**

A model of PMESII+PT can be used to spotlight the complex reality of a C*ontemporary Operational Environment* (COE). This complexity must appreciate a synergistic combination of all critical variables and actors that create the conditions, circumstances, and influences that can affect military operations today and for the foreseeable future.[9]

The COE is an overarching construct to an operational environment. The COE comprises two primary dimensions. A sphere of tangible physical space can be associated but not limited to the geographic dimensions of various forms of operational area. Complementing this physical space, the COE must embrace the cognitive realm of interaction among friendly forces and partners, threats and enemies, and neutral groups. The composite of "conditions, circumstances, and influences"[10] from these two dimensions is essential to a continuum of effective thinking and acting in an operational environment (OE).

[9] U.S. Army Training and Doctrine Command, TRADOC G2, TRADOC Intelligence Support Activity (TRISA) White Paper, *The Contemporary Operational Environment*, July 2007.
[10] Joint Publication 3-0, *Joint Operations*, (Washington, D.C.: Joint Chiefs of Staff, 17 September 2006), II-15 to II-24.

As mission orders or directives define operational areas with graphic parameters to a military commander, the human dimension of thought, dialog, and action affects a constantly evolving system of systems. Cognitive and physical domains are integral to each other. Each operational environment (OE) exists within the real-world comprehension of the contemporary operational environment (COE).

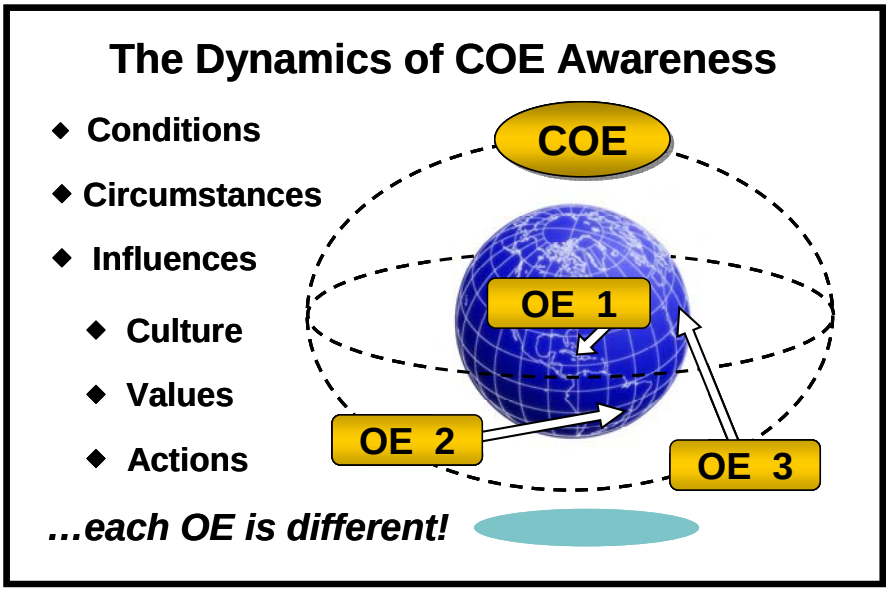

Figure 3. **The Dynamics of COE Awareness**

How does this contemporary construct impact on terrorism and WMD? The War on Terror is a "…battle of arms and a battle of ideas."[11] Shortly after the attack on the Twin Towers in New York City, a mass casualty jet crash in Pennsylvania caused by terrorists, and the attack on the Pentagon in Washington. D.C., the President of the United States said, "No group or nation should mistake America's intentions: We will not rest until terrorist groups of global reach have been found, have been stopped, and have been defeated."[12]

Actions are much more than one-dimensional physical confrontation; actions are a comprehensive multi-dimensional effort to maintain the initiative against terrorism and ideologies that promote indiscriminate violence. Fighting terror means precluding terrorist sanctuary and basing locations, advancing democracy in geographic regions of concern, and specific to WMD, denying weapons of mass destruction to rogue states or terrorist allies who seek to use them.[13] As national experience and priorities of action

[11] The White House, *National Strategy for Combating Terrorism*, (Washington, D.C.: The White House, September 2006), 1.
[12] George W. Bush, President of the United States of America, *National Security Strategy for Combating Terrorism*, (Washington, D.C.: the White House, February 2002), 1.
[13] The White House, *National Strategy for Combating Terrorism*, (Washington, D.C.: The White House, September 2006), 1.

have evolved since the grim reality in 2001, the Nation has stated a more conspicuous declaration against some terrorists who will not be dissuaded: "The hard core among our terrorist enemies cannot be reformed or deterred; they will be tracked down, captured, or killed."[14] Yet from a U.S. military perspective, an extensive number of military tasks exist in areas of WMD-related nonproliferation, counterproliferation, and consequence management missions.[15]

Translating these national priorities against terrorism for an installation or unit operations security and protection plan, key leaders and planners conduct detailed analysis of high risk targets (HRT) and mission essential capabilities. Both installations and units prioritize efforts and support based on the specific threat and time available.

Clearly, the terrorist is gathering intelligence too, and is seeking to identify or create points of vulnerability in a potential target area. Patience and persistence can be a two-edged sword. Any terrorist attack using a weapon of mass destruction will be a carefully crafted incident. Vigilance in protection of the force by each US military member, family member, government civilian employee, and government contractor is one of the most notable and obvious personal measures that can deter or dissuade a terrorist attack.

This handbook presents a definition of terrorism, scopes a presentation to the general nature of terrorism threats and weapons of mass destruction, and relates this means of terrorism to the contemporary operational environment (COE). Section I recognizes a full spectrum Threat that can be foreign and domestic in the COE. Studying a generic planning cycle is a way to start assessing and evaluating methods of planning and conducting a terrorist attack. Complementing deliberate methods, challenging norms and patterns of terrorism with different or asymmetrical analysis and action are certain requirements to any security program. Section II describes the major categories and characteristics of WMD and discusses special considerations such as dual use technology, toxic industrial material (TIM), or genetic engineering in biology. Complex factors must be considered in assessing dual use materials and processes for determining valid economic purposes or use as components-processes to create a weapon of mass destruction. Section III concludes with an appreciation of thinking like the Threat, and considering the vulnerabilities of U.S. Armed Forces while deployed, during in-transit movements, or in a non-deployable institution or fixed installation.

An overarching theme of this handbook is – We are at war on terror. ***Know the Enemy!***

[14] The White House, *National Strategy for Combating Terrorism*, (Washington, D.C.: The White House, September 2006), 11.
[15] Department of Defense, *National Military Strategy to Combat Weapons of Mass Destruction*, (Washington, D.C.: The White House, 13 February 2006), Preface and 5.

Section I: CBRN Threats and Terrorism

Transnational and domestic terrorists and state sponsors of terrorism continue to demonstrate an interest in acquiring and using chemical, biological, radiological, and nuclear weapons.

Honorable Robert S. Mueller, III
Director, Federal Bureau of Investigation
January 2007

"Defending the U.S. against its enemies is the first and fundamental commitment of the U.S. Federal Government…The gravest danger our Nation faces lies at the crossroads of radicalism and technology. Our enemies have openly declared that they are seeking weapons of mass destruction, and evidence indicates that they are doing so with determination…we must be prepared to defeat our enemies' plans, using the best intelligence and proceeding with determination."[16]

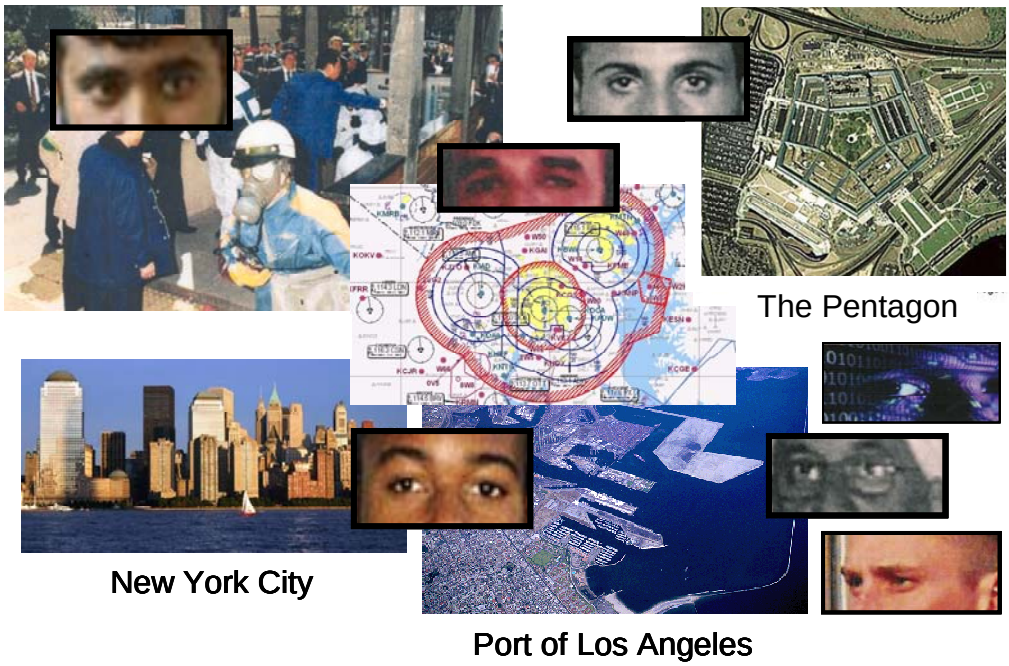

Figure I-1. **People, Places, and Symbolic Targets for WMD Terror**

[16] President, National Strategy, *National Security Strategy of the United States of America,* Washington, D.C. (December 2002): Introduction and Section III. See current March 2006 *NSS* available from http://www.whitehouse.gov/nsc/nss/2006/; Internet; accessed 12 May 2006.

Recognizing the CBRN Threat Spectrum

Terrorism exists in the contemporary operational environment and will remain a significant threat for the foreseeable future. Terrorists will target susceptible people, symbols, capabilities, and infrastructure to enhance terrorist objectives and diminish the resolve of an adversary. The terrorist attacks of September 11, 2001 caused the United States to recognize that the nation is at war.

Chemical, biological, radiological, nuclear, or high yield explosives will be the means of WMD addressed in this handbook. High yield explosives can be a contributing factor.

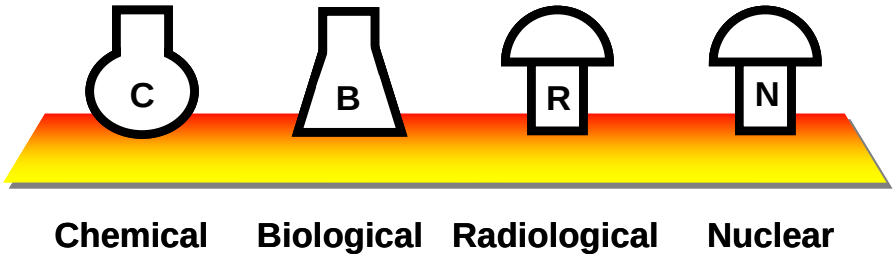

Figure I-2.[17] **Categories of Weapons of Mass Destruction**

Currently, the most dangerous type of terrorism threat to the United States is a transnational movement that exploits religious extremism for ideological ends. Emergent actions indicate that terrorism previously centralized and controlled by formal networks and organizations, is being conducted increasingly by loosely affiliated terrorists or groups that may generally identify themselves with an ideology or special agenda. Cyber attack is another means to cause or complement mass disruption, damage, or destruction of critical infrastructure and key assets.

The United States Government assesses the al-Qaida network as the most serious international threat to the United States. Targets and methods of attack will most likely continue to focus on economic targets such as commercial aviation, energy sector, or mass transportation. As security measures make attack that much more difficult on such targets, other "soft" targets may be selected such as large public gatherings or symbolic locations of monuments or notable buildings.[18]

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[17] Army Field Manual 1-02 (FM 101-5-1), *Operational Terms and Graphics*, (Washington, D.C.: Headquarters, Department of the Army, 21 September 2004), 7-58. These graphic symbols address three WMD categories of nuclear, biological and chemical attack, release event, or fallout in the case of a nuclear incident. No standardized symbol for a radiological incident is listed in the FM. However, for the purposes of this illustration an "R" is placed within the nuclear graphic to differentiate between a nuclear incident "N" and an incident involving radiological material "R" such as a "dirty bomb." An example of a "dirty bomb" is a conventional explosion that disperses radiological material.

[18] Robert S. Mueller III, *Congressional Testimony: Statement Before the Senate Select Committee on Intelligence, January 11, 2007*, available from http://www.fbi.gov/congress07/mueller011107.htm; Internet; accessed 1 April 2007.

Terrorists will seek to acquire and use weapons of mass destruction for spectacular attacks with catastrophic disruption, damage, or destruction. In addition to mass casualties and panic, the terrorist will seek a U.S. Government response perceived to be advantageous to the terrorist's objectives.

In a January 2007 annual assessment of worldwide threats, the U.S. Federal Bureau of Investigation (FBI) states that if al-Qaida can obtain some form of chemical, biological, radiological, or nuclear material, al-Qaida will use WMD.[19] Notwithstanding, terrorists other than those associated with the al-Qaida network continue to pursue weapons of mass destruction.[20]

Figure I-3. **al-Zwahiri**

Appreciating WMD Terror in the COE

The Secretary of Homeland Security states, "Measured by intent, capability, and consequence, fanatical Islamist ideologies have declared – and are prosecuting – what is, by any objective rendering, a real war." [21]

"Intent: Today's extreme Islamist groups such as al-Qaida do not merely seek political revolution in their own countries. They aspire to dominate all countries. Their goal is a totalitarian, theocratic empire to be achieved by waging perpetual war on soldiers and civilians alike.

That includes the use of weapons of mass destruction."

Honorable Michael Chertoff
Secretary, Department of Homeland Security
April 2007

To understand the complex interactions of the Contemporary Operational Environment (COE) with the intent and capability of terrorists to use WMD, critical variables of political, military, economic, social, infrastructure, and information (PMESII) provide context in analyzing and developing appreciation of the WMD terrorism threat. These

[19] Ibid., 1.
[20] *The National Security Strategy of the United States of America*, (Washington, D.C.: The White House, March 2006), 19.
[21] Michael Chertoff, "Make No Mistake : This is War – Chertoff, Secretary of DHS," available from http://www.washingtonpost.com/wp-dyn/content/article/2007/04/20/AR2007042001940_pf.html; Internet; accessed 24 April 2007.

variables and other variables such as physical environment and time (PMESII+PT) affect circumstances and influence operations throughout the domains of air, land, sea, and space.

Defining physical environmental conditions include rural terrain or urban settings (super-surface, surface, and subsurface features), weather, topography, and hydrology. Time is a constant. Yet, the variable of time influences actions such as planning, multi-echelon decision cycles, tempo of operations, and projected pacing of popular support for operations. Whether a real world threat or an opposing force (OPFOR) created to simulate relevant conditions for training readiness, PMESII and other variables such as physical environment and time describe an Operational Environment (OE).

Interaction among these elements may range from peaceful humanitarian assistance to high-intensity combat operations. Alliances and coalitions are the expectation in most operations, but U.S. unilateral action is always a consideration. Military operations interrelate with other elements of national power – diplomatic, economic, social-cultural, and informational – for both the U.S. and an adversary. Advanced technologies are available to almost anyone, yet sophistication of weapon systems, assumed to be superior, may be a liability. For example, intelligence and operational tools must overlap and integrate complex sensor-surveillance systems with fundamental human intelligence collection and analysis.

The Contemporary Operational Environment (COE) has several common themes or constants for defining the environment. The U.S. will not experience a peer competitor until 2020 or beyond. Armed forces will continue to be used as a tool to pursue national interests. The U.S. may direct military action within the context of an alliance, a coalition, or even as unilateral action, with or without United Nations sanctions. Actions will occur in an interwoven environment of diplomatic, informational, economic, and military operations. Modernization of capabilities by potential or known adversaries could negate U.S. overmatch for select periods of time or specific capabilities. Similarly, advanced technologies will be readily available on a world market for nation-states and non-state actors. Non-state actors can cause significant impacts on a military operation, as combatants and non-combatants.[22]

Describing Threats and WMD

Describing "Threats" in common terms can provide clarity in stating a problem and assessing the magnitude of danger. Key terms in the U.S. *National Defense Strategy* identify four types of challenging threats. Traditional challenges exist by states that employ recognized military capabilities and forces in the more conventional forms of military competition and conflict. Irregular challenges are the more unconventional ways and means to counter the traditional advantages of stronger opponents. Catastrophic challenges involve the acquisition,

Challenging Threats

- **Traditional**
- **Irregular**
- **Catastrophic**
- **Disruptive**

[22] Army Field Manual 7-100, *Opposing Force Doctrinal Framework and Strategy,* (Washington, D.C.: GPO, May 2003).

possession, and possible use of WMD. Disruptive challenges may be the use of breakthrough technologies to limit or negate the operational advantage of an opponent.[23]

The *National Military Strategic Plan for the War on Terrorism* (NMSP-WOT) addresses the WOT nature of the threat, and states priorities and responsibilities within the U.S. Armed Forces. As noted by the Secretary of Defense, "Success in this war [WOT] depends on a strategic offensive and efforts to counter extremist ideologies that fuel terrorism."[24] The nature of this environment is a war against extremists that advocate the use of violence to gain control over others, and in doing so, threaten a democratic way of life. Success will rely heavily on close cooperation and integration of all instruments of national power and the combined efforts of the international community. The overall goal of this war is to preserve and promote the way of life of free and open societies based on rule of law, defeat terrorist extremism as a threat to that way of life, and create a global environment inhospitable to terrorist extremists.

Recognizing the danger of WMD relates goals and aims of national security, homeland security and national defense to guide prevention and protection means in the US Homeland or abroad. From an installation or unit perspective, aligning tactical priorities of effort and support to such objectives link back to operational or strategic aims. The *Strategy for Homeland Defense and Civil Support* describes DOD responsibilities in terms of leading, supporting, or enabling activities and establishes the following prioritized objectives:

- Achieve Maximum Awareness of Threats
- Deter, Interdict, and Defeat Threats at a Safe Distance
- Achieve Mission Assurance
- Support Consequence Management for CBRNE Mass Casualty Attacks
- Improve National and International Capabilities for Homeland Defense

Terrorist Vulnerabilities

- **Ideological Support**
- **Leadership**
- **"Foot Soldiers"**
- **Safe Havens**
- **Weapons**
- **Funds**
- **Communications and Movement**
- **Access to Targets**

Source: National Defense Strategy, March 2005

Assessing Terrorist Vulnerabilities

The United States focuses on eight major terrorist vulnerabilities. The intent is to maintain the initiative and dictate the tempo, timing, and direction of operations against terrorism. Disrupting terrorist capabilities include the channels for accepting recruits to fill terrorist ranks; the terrorist ability to plan, train, and operate; the terrorist access to critical information and intelligence; and the terrorist ability to finance,

[23] *The National Defense Strategy of the United States of America,* 1 March 2005, 2.
[24] Department of Defense. *National Military Strategic Plan for the War on Terrorism,* 1 February 2006; available at http://defenselink.mil/qdr/docs/2005-01-25-Strategic-plan.pdf; Internet; accessed 17 July 2006.

travel and coordinate, conduct reconnaissance and surveillance, support, or command and control operations.

For example, denying resources to terrorists and terrorist networks is critical to countering the ideological support of terrorism. These efforts remove legitimacy to terrorism and seek to eliminate state and private support for terrorism, make it politically unsustainable for any country to support or condone terrorism, and support models for moderation in regions of the world.

Techniques in coordinating such actions may include a method of identifying or "mapping" key components that affect resources such as technology, key figures, and locations. Identifying the major connections among these components can spotlight weak assailable links of the networking and identify where targeting and action plans may be most effective.[25]

Assessing the Threat

- **Mapping the Threat**
- **Analyzing Networks**
- **Planning Actions**
- **Determining Metrics**
- **Tracking Actions**
- **Evaluating Outcomes**
- **Adapting Methods**
- **Improving Results**

For example, security limitations for weapons of mass destruction in the former Soviet Union provide a possible source for terrorists to acquire radiological or nuclear material or weapons. Additionally, radioactive materials or waste can be purchased legally and misused, or obtained illegally through black market transactions. Substances might be obtained from governmental or civilian research and medical facilities such as power plants, construction sites, laboratories, or hospitals. Other options include infiltration of military facilities concerned with the storage, production, and testing of materials.

A general concern exists that unemployed scientists or weapons experts from the former Soviet Union are willing to sell their knowledge and services to other countries. However, the former Soviet Union is not the only potential source of concern. Scientists such as Abdul Qadeer Khan of Pakistan have admitted to selling nuclear technology to Iran, Libya, and North Korea.

Several nations have declared their capability of possessing nuclear weapons: the United States of America, Russia, United Kingdom, France, India, Peoples Republic of China, and Pakistan. Other nations such as Israel have not declared but are suspected to possess nuclear weapon capability. In early 2005, The Democratic Peoples Republic of Korea (North Korea) claimed to have manufactured nuclear weapons. In October 2006, North Korea conducted a nuclear test with a yield under one kiloton.[26] Technology and materiel

[25] Joint Chiefs of Staff, J5 War on Terrorism, Strategic Planning Division, Briefing (U) *Countering Ideological Support for Terrorism,* Version 19Jan05, 5 April 2005.
[26] Emma Chanlett-Avery, "North Korea's Nuclear Test: Motivations, Implications, and U.S. Options,"

transfer by rogue nations experiencing significant economic problems and perceived threats from neighboring nations are a practical concern. Iran continues a nuclear energy development program.

Regardless of the national and international protocols intended to safeguard declared and developmental nuclear energy programs and the many other sources of radiological material on each continent, the Threat knows that a large array of means exist from which to acquire nuclear or radiological material.

Concurrent weak and assailable links can be found for acquiring or producing chemical and biological agents that can be used as WMD. The Aum Shinrikyo cult in Japan may have acquired its sarin formula from Russian expertise. Reports of sarin chemical agent analysis by Japanese authorities indicate that the cult's sarin was synthesized "...in a fashion that is unique to the Soviet arsenal of chemical agents."[27] Aum Shinrikyo also produced a very small quantity of VX chemical agent; the cult murdered one its own members with VX. Biological weapon attempts included botulism toxin and anthrax, but neither agent was effective in its intended purpose as a weapon.[28]

Other biological attacks have occurred in recent years with deadly results. The anthrax attacks in the United States of America in 2001 resulted in over 20 infections and caused several deaths. This isolated attack is still being investigated and the criminal or criminals are unknown at this time. Whoever attacked the US with anthrax demonstrated mass disruption and potential for mass casualties with a WMD. Other biological agent concerns such as ricin or botulism poisoning are possible vectors that can be used, but are indicative of production and dissemination drawbacks if a terrorist is intent on attacking a large population with WMD. Section II of this handbook discusses WMD agents, their characteristics, and probable methods of attack.

This section highlighted the dangerous issue of extremist intent to acquire and use weapons of mass destruction. These WMD threats are normally grouped as chemical, biological, radiological, or nuclear weapons, with the selective additional aspect of high yield explosives that can cause related damage and amplify the effects of a WMD. The contemporary operational environment illustrates the interconnected nature of critical variables that impact on the threat of CBRN attack by terrorists. Identifying and assessing the Threat and possible or probable access to WMD are critical to applying appropriate levels of protection of the force, operations security, and other preventive or terrorism countermeasures in military units, installations, and related support activities.

Congressional Research Service. RL 33709, December 12, 2006, 2.

[27] Brian A. Jackson, [et al.], John Parachini, "Aum Shinrikyo" in *Aptitude for Destruction, Volume 2: Case Studies of Organizational Learning in Five Terrorist Groups*, RAND Infrastructure, safety, and Environment (ISE), RAND Corporation, 2005, 24.

[28] Ibid., 19-21, 25.

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Section II: Weapons of Mass Destruction

The future may see a time when such a [nuclear] weapon may be constructed in secret and used suddenly and effectively with devastating power by a willful nation or group against an unsuspecting nation or group of much greater size and material power.

Honorable Henry Stimson
U.S. Secretary of War to Harry Truman
25 April 1945

General

The specter of weapons of mass destruction (WMD) has existed ever since the term arose in the mid-twentieth century. Actions in World War II witnessed the entry of atomic weapons and their destructive effects, and started a subsequent arms race among nations to obtain and wield such an instrument of power. On closer reflection, other weapons of mass destruction have existed for centuries. Examples include biological vectors used to spread disease among adversaries in ancient and modern periods, or the more recent use of massive chemical weapon attacks in World War I. The acronym "NBC" emerged in the post-World War II era to catalog the main types of mass destruction as nuclear,

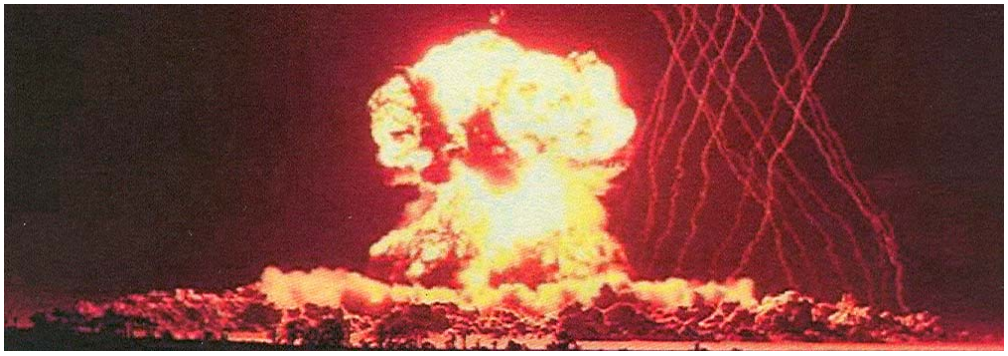


Figure II-1. **U.S. Nuclear Bomb Detonation**

biological, and chemical weapons. More recently, other means of mass destruction or mass disruption effects entered the lexicon. Radiological weapons, often called radiological dispersal devices (RDD), add to a grouping of weapon capabilities as

chemical, biological, radiological, and nuclear (CBRN). High yield explosives can be considered, in some cases, a weapon of mass destruction. The recognition of explosives with high yield effects adds a category to weapons of mass destruction. This characteristic is incorporated in a contemporary acronym of CBRNE.

The threat of terrorist use of a weapon of mass destruction is a practical concern in contemporary times. Incidents since the 1980s spotlight the attention that extremist agendas will obtain due to mass casualties or mass destruction. Near instantaneous global information access is a crucial element of terrorist media affairs. Terrorists know the value sensational events might prompt in change of national policies and regional security arrangements. Obscure issues can be quickly projected into an international spotlight.

Examples in previous decades illustrate the escalating notoriety in terrorist assaults: the vehicular bombing of the U.S. Embassy in Lebanon in 1983; the World Trade Center in New York City in 1993; the U.S. military housing complex at Khobar Towers in Saudi Arabia in 1996; the U.S. Embassies in Kenya and Tanzania in 1998, and the group of al-Qaida inspired attacks in the U.S. on September 11, 2001. Terrorists will often plan to organize and execute attacks to produce mass casualties and global attention.[29]

In an unclassified report to the U.S. Congress, the Central Intelligence Agency (CIA) stated that many of over 30 designated foreign terrorist organizations have expressed interest in acquiring WMD.[30] Additionally, terrorists state interest in conducting unconventional attacks and make public statements about unconventional weapons.[31] Some terrorists profess that the acquisition of WMD to be a [extremist] religious duty and threaten to use them.[32]

"The United States of America is fighting a war against terrorists of global reach. The enemy is not a single political regime or person or religion or ideology. The enemy is terrorism – premeditated, politically motivated violence perpetrated against innocents."

The National Security Strategy of the United Sates of America

[29] Department of State, *Patterns of Global Terrorism 2001* (Washington, D.C.: Department of State, May 2002), 66.
[30] Director of Central Intelligence, DCI Weapons Intelligence, Nonproliferation, and Arms Control Center, *Unclassified Report to Congress on the Acquisition of Technology Relating to Weapons of Mass Destruction and Advanced Conventional Munitions, 1 January Through 30 June 2003* (Washington, D.C., January 2002), 7; available from http://www.cia.gov/cia/reports/721_reports/pdfs/jan_jun2003.pdf; Internet; accessed 19 May 2004.
[31] Ibid., 8-9.
[32] Department of State, *Patterns of Global Terrorism 2001* (Washington, D.C., May 2002), 66.

Terrorist groups that acquire WMD pose a critical danger. Terrorists armed with these weapons can gain leverage for their demands by threatening use of WMD to influence political or military actions, or to achieve a specific economic or financial objective. Likewise, some groups simply want to employ WMD to create large numbers of casualties, both military and civilian, and capitalize on the effects of these events.[33]

In a May 1998 interview, Usama bin Laden stated, "We do not have to differentiate between military or civilian. As far as we are concerned, they are all targets, and this is what the fatwa says."[34] Additionally, al- Qaida spokesman Suleiman abu Ghaith stated: "We have the right to kill four million Americans – two million of them children – and to exile twice as many and injure and cripple hundreds of thousands. We have the right to fight them by chemical and biological weapons, so they catch the fatal and unusual diseases that Muslims have caught due to their [U.S.] chemical and biological weapons."[35]

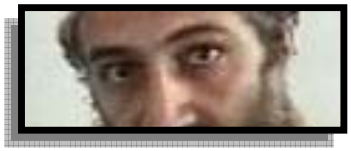


Figure II-2. **Usama bin Laden**

These statements by al-Qaida leave no doubt that some terrorists are committed to using weapons of mass destruction if they can acquire them. In the Cold War era of earlier decades in the twentieth century, weapons of mass destruction were considered weapons of last resort and threatened mutual devastation among super-powers. Today, some terrorists see weapons of mass destruction as weapons of choice.[36]

"Acquiring weapons for the defense of Muslims is a religious duty. If I have indeed acquired these weapons (WMD), then I thank God for enabling me to do so. And if I seek to acquire these weapons, I am carrying out a duty. It would be a sin for Muslims not to try to possess the weapons that would prevent the infidels from inflicting harm on Muslims."

Usama Bin Laden interview with *Time Magazine*, December 1998

[33] The White House, National Security Presidential Directive 17 (NSPD-17), *National Strategy to Combat Weapons of Mass Destruction*, (Washington, D.C., December 2002), 4 and 10; available from http://www.fas.org/irp/offdocs/nspd/nspd-17.html; Internet; accessed 8 December 2003.
[34] Ben N. Venzke and Aimee Ibrahim, *al Qaeda Tactic/Target Brief*, Version 1.5 (Alexandria, VA: IntelCenter, 2002), 8.
[35] Ibid., 10.
[36] *National Security Strategy of the United States of America*, 8.

Some terrorists pose an active acquisition and use of weapons of mass destruction against the United States. Mustafa Setmariam Nasar, also known as Abu Mus'ab al-Suri, has written extensively on justifying terrorism. He says, "...if those engaged in jihad establish that the evil of the infidels can be repelled only by attacking them with weapons of mass destruction, they may be used even if they annihilate all the infidels." [37] Aspects of his strategy for terrorism include the belief that CBRN weapons are the "difficult yet vital" means to eventually achieve their terrorist objectives. He further states that, "…the mujahadeen must obtain them [WMD] with the help of those who possess them either buying them…"[38] or producing and using "dirty bombs"[39] that spread radiological contamination.

Figure II-3. **Nasar**

"…option was to destroy the United States by means of decisive strategic operations with weapons of mass destruction including nuclear, chemical, or biological weapons if mujahidin are able to obtain them in cooperation with those who possess them, purchase them – or manufacture and use primitive atomic bombs or so called dirty bombs. …"

Mustafa Setmariam Nasar
December 2004 jihadist website

Another element of great concern is al-Nasar's strategic concept of conducting conflict in a much more decentralized planning and execution method, rather than in a manner of centralized control with a tiered formal organization.[40] This mode of operation can be very localized with small cell memberships of ten or less terrorists. Detection and compromise of these type terrorist cells is more difficult when linkages and indicators that might be available in a hierarchical structure do not exist. The issue is not just a foreign perspective and initiative. Timothy McVeigh conceived, planned, and conducted

[37] Robert Wesley, "Al-Qaeda's WMD Strategy After the U.S. Intervention in Afghanistan," The Jamestown Foundation *Terrorism Monitor*, 20 (October 21, 2005), 2.
[38] Ibid., 3.
[39] Paul Cruickshank and Mohannad Hage Ali, "Abu Musab Al Suri: Architect of the New Al Qarada," *Studies in Conflict & Terrorism*, 30, 2007, 1-14.; available from http://www.lawandsecurity.org/documenst/AbuMusabalSuriArchitectof the NewAlQaeda.pdf ; Internet; accessed 10 April 2007.
[40] Ibid., 8.

his terrorist attack against the Murrah Federal Building in Oklahoma City in 1995 with one primary accomplice.

Whether a terrorist is part of a structured organization or is a member of an independent terrorist cell, the range of weapons of mass destruction are normally classified into four categories: chemical, biological, radiological, and nuclear. High yield explosives are another consideration in effects. An emerging capability demonstrated in several recent terrorist incidents is use of toxic industrial chemicals or other toxic industrial material to increase the damage and disruption of conventional explosions. Combating the illegal use of chemical, biological, radiological, and nuclear materiel is a constant struggle to discern from legitimate commercial, medical, and scientific enterprises.

Dual Use and WMD Danger

Dual use material and technology, that is, means that have legitimate practical uses in commerce, medicine, and science warrant a contentious issue of monitoring and control when the same material can be used to produce weaponized effects of a WMD.

The basic knowledge needed to produce an effective weapon of mass destruction can be found in college and medical school textbooks, advanced engineering books, magazines and periodicals, and on the Internet. With minimal training, individuals can produce some types of CBRN devices or high yield explosive weapons with relative ease. Minimal special equipment, purchased on the open market, can produce certain biological or chemical weapons. Nonetheless, limited or lack of known effective WMD production by groups such as Aum Shinrikyo or al-Qaida indicate the difficulty in weaponizing potential CBRN material into an effective mass disruption or destruction weapon.

"When the spread of chemical and biological and nuclear weapons, along with ballistic missile technology – when that occurs, even weak states and small groups could attain catastrophic power to strike great nations. Our enemies have declared this very intention, and have been caught seeking these terrible weapons…"

"The targets of these attacks are our military forces and our civilian population."

The National Security Strategy of the United State of America

However, some aspects are still attractive for terrorist consideration. Weapons production cost can be relatively cheap compared to other types of weaponry. Some precursor

agents for biological and chemical production are inexpensive and legal to acquire or possess. Radiological material exists in a large number of medical and industrial devices. Theft, false documentation, and other techniques can overcome many of the normal regulatory control procedures for obtaining restricted precursor materials, equipment, or production processes.

For example, distinguishing legitimate biological, medical, or commercial production plants from a weapons production facility proves very difficult. Chemical and biological agents can be produced in small laboratories with little or no signature to identify the facility or their production. Biological warfare research facilities can resemble completely legitimate bio-technical and medical research facilities. The same production facilities that produce wine and beer, dried milk, food and agricultural products could produce biological warfare agents after process and equipment adjustments.

Biological agents occur naturally or can be genetically altered. They are relatively easy to obtain as compared to nuclear material. Biological material can be obtained from universities or medical schools. Chemical agents and their precursors can be obtained from civilian agriculture sites, textile, plastic, or civilian chemical production facilities, or government research facilities. Terrorist access to these weapons can also be through a state sponsor, or given the increasing sophistication of terrorist groups, might be manufactured in laboratories that terrorists have financed and established.

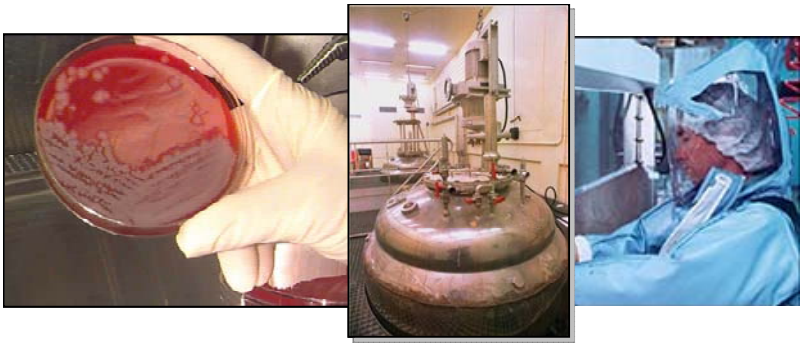
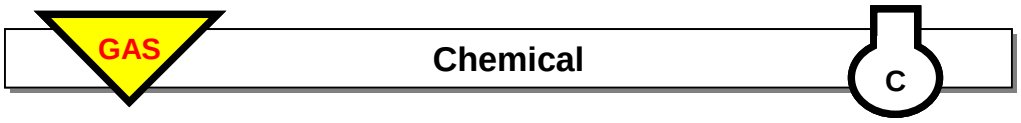


Figure II-3. **Dual Use or Industrial Enterprise and Science**

Genetic engineering has provided advances in science but can also be a grim landscape of microbiology and biotechnology for a terrorist. The ability to isolate specific genes and manipulate their basic DNA [deoxyribonucleic acid] has advanced numerous health care, agriculture, and aspects of animal husbandry. This recombinant DNA (rDNA) is the product of taking a gene from the DNA of one type of cell and splicing it to the DNA of another type of cell. Lethal components of a bacterium, toxin, organic substance, or fungus might be spliced to an otherwise harmless genetic substance in order to create a deadly biological agent. When used as a biological weapon, the new signature of the cell hides the actual genetic characteristics and prevents natural immune systems for countering an infection. Disease could be altered to increase their virility, survivability, and communicability. Timely medical diagnoses and treatments are all the more difficult.



Chemical Weapons

Chemicals can be used to kill or incapacitate personnel and to deny use of areas, materiel, or facilities. Agents can be both lethal and non-lethal, and can be either persistent or non-persistent in effects.[41] Terrorists have already used chemical weapons and although examples often display a basic use of chemicals, a tendency exists to demonstrate ever-increasing death, damage, and psychological stress on a target. One example of simple means occurred in 1978 when a group of Palestinian extremists injected oranges with cyanide to damage Israel's citrus exports. [42] A separate report states that Hamas added pesticides to homemade bombs in 1997.[43] Today, contemporary statements from organizations such as al-Qaida propose attack with much more lethality and damage using weapons of mass destruction. Yet, terrorist intent is very different from capability.

Figure II-4. **Halabja, Iraq Chemical Attack (1988)**

Nation states have also used chemical weapons with mass destruction effects against their own people. During 1987-1988, Saddam Hussein directed Iraqi military forces to use

[41] The US Army uses triangular signs [marking flags] to mark hazardous areas. A chemical hazardous area is marked with a yellow triangular sign with black border. The word "gas" is placed within the triangle in capital red letters.
[42] *Encyclopedia of World Terrorism*, 1997 ed., s.v. "Chemical."
[43] Assaf Moghadam, "Specter of Suicide Attacks with CBRN Weapons," available from http://counterterrorismblog.org/2007/03/the_chlorine_gas_atacks_in_ir.php; Internet; accessed 13 June 2007.

chemical weapons against the Kurdish population in northern Iraq. An 18-month campaign involved about 40 attacks that used chemical weapons. Mustard, a chemical blister agent, as well as tabun, sarin, and VX nerve agents were used as weapons of terror. They were employed in aerial bombs, 122-millimeter rockets, aerial spray dispensers on aircraft, and conventional artillery shells.[44]

> **"On the road to Anab [near Halabja, Iraq], many of the women and children began to die. The chemical clouds were on the ground. They were heavy. We could see them…People were dying all around…When a child could not go on, the parents, becoming hysterical with fear, abandoned [them]. ..Many children were left on the ground, by the side of the road… Old people as well. They were running, then they would stop breathing and die."**
>
> Survivor of Halabja, Iraq Chemical Attack

Iraq experimented with different combinations and sequences of conventional and chemical attack to cause the most Kurdish casualties and create terror in the population. Artillery bombardment caused many citizens to seek cover in underground shelters. Knowing this would occur, Iraqi military forces followed with repeated chemical attacks that in many cases would settle in low lying areas such as shelters. The March 1988 chemical attack on the city of Halabja, Iraq caused about 5,000 civilian deaths and a corresponding number of chemical injuries. Many civilians who survived suffered from eye and respiratory damage, neurological problems, physical scarring, and other long-term health problems.[45]

Extremist groups have used WMD too. In 1995, the Japanese cult Aum Shinrikyo released sarin nerve agent in the Tokyo subway network killing 12 people and injuring 5,500.[46] The Aum Shinrikyo attack shows the unpredictable nature of chemical weapons and problematic issues of dissemination. This Japanese cult was able to produce and release sarin in a closed environment, but fortunately, the effects were much less deadly than planned by the terrorists.

Figure II-5. **Shoko Asahara**

[44] "WMD: The Deadliest Threat of All," *International Information Programs, USINFO.STATE.GOV*, available from http://usinfo.state.gov/products/pubs/iraq/threat.htm; Internet; accessed 21 March 2007.
[45] "The Lessons of Halabja: An Ominous Warning," *International Information Programs, USINFO.STATE.GOV*, available from http://usinfo.state.gov/products/pubs/iraq/warning.htm; Internet; accessed 21 march 2007.
[46] Walter Laqueur, *The New Terrorism: Fanaticism and the Arms of Mass Destruction* (Oxford: Oxford University Press, 1999), 54.

The aerial attacks on September 11, 2001 by suicidal extremists in commercial jets raised the chemical industry's awareness of possible terrorist sabotage of facilities that store toxic industrial chemicals. These type attacks could provide the mass casualty effects of a chemical weapons attack, yet would not present the terrorist group with the problem of developing or acquiring chemical agents. A tragic scenario occurred in Bhopal, India in 1984 when conditions involving a disgruntled pesticide plant employee is believed to have released 40 metric tons of methyl isocyonate into the atmosphere. The resulting casualties were over 2,000 local residents killed and thousands of people in the region injured.[47]

Figure II-6. **Chemical Plot**

The probability of a terrorist organization using a chemical, biological, radiological, or nuclear weapon, or high yield explosive has increased significantly during the past decade.[48] The April 2004 terrorist attempt to simultaneously bomb locations in Jordan with explosives and chemical material spotlights the deliberate planning for use of toxic industrial materials in terrorism. Fortunately, Jordanian authorities foiled this attack on Jordanian and U.S. targets with a preemptive raid on terrorist facilities. Reports estimate that 20 tons of chemicals were confiscated and could have caused tens of thousands of casualties.[49] The explosives and chemicals had been intercepted in five trucks coming from cache sites in Syria. The intent for mass indiscriminate casualties was obvious and raised speculation of how fast and how large a future attack with mass destruction or effects would occur.[50]

The February-March 2007 attacks in Iraq using chlorine gas is a more recent example of intimidating a civilian population with improvised explosives and toxic industrial chemicals. A number of individual and grouped terrorist attacks caused death and injury to a civilian population. In one incident several people died and more than 350 people experienced health effects from the chlorine. According to an Iraqi spokesperson, "The chlorine attack was a kind of punishment against the people [Iraqi civilians] who stood against terrorist organizations."[51]

Other industrial chemicals besides chlorine can be easily purchased, stolen, or misappropriated for use in making bombs. An April 2007 incident uncovered an

[47] Steve Bowman, *Weapons of Mass Destruction: The Terrorist Threat* (Washington, D.C.: Congressional Research Service Report for Congress, 7 March 2002), 7; available from http://www.fas.org/irp/crs/RL31332.pdf; Internet; accessed 23 December 2002.
[48] The White House, *National Strategy for Combating Terrorism*, 9, February 2003; available at http://www.state.gov/s/ct/rls/rm/2003/17798.htm; Internet; accessed 30 April 2004.
[49] "Jordan 'was chemical bomb target'," *BBC News* UK Edition, 17 April 2004; available at http://news.bbc.co.uk/1/hi/world/middle_east/3635381.stm; Internet; accessed 28 April 2004.
[50] J.R. Nyquist, "The Chemical Bomb Plot in Jordan," *Geopolitical Global Analysis*, 04.28.2004; available from http://www.financialsense.com/stormwatch/geo/pastanalysis/2004/0428.html; internet; accessed 9 August 2005.
[51] "Al Qaeda Strike? U.S. points Finger for Iraq Chemical Attacks," Associated Press, available from http://abclocal.go.com/kgo/story?section=nation_world&id=5132392&ft=print; Internet; accessed 19 march 2007.

unsuccessful attempt to bomb a joint security station and police station in Iraq with nitric acid, explosives, and large rounds of ammunition.[52] Although visualized as more of a conventional attack than a weapon of mass destruction, the incident indicates the ability to combine chemicals and explosives in order to create an increased destructive effect. The Oklahoma City bombing was a relatively simple explosive device comprised of Tovex explosive, liquid nitromethane, and ammonium nitrate fertilizer.[53]

Categories of Chemical Warfare Agents

Chemical agents can be categorized by the effects they have on the target population. Effects may include death, temporary incapacitation, or permanent health damage. From a military perspective, chemical agents are in one of two major categories: chemical warfare agents (CW) or military chemical compounds that are less toxic and have characteristics such as irritant, smoke, incendiary, or obscurant properties.[54] For purposes of WMD discussion, military chemical compounds and incapacitating agents will not be a focus in this handbook. However, toxic industrial material (TIM) which is comprised of toxic industrial chemicals (TIC), and toxic industrial biological (TIB), and toxic industrial radiological (TIR) are addressed in this handbook, and have effects that can cause mass disruption, mass casualties, and mass destruction.

Categories of chemical warfare agents are: nerve, blood, blister, and choking agents.

Nerve agents are fast-acting chemical agents. Practically odorless and colorless, they attack the body's nervous system causing convulsions and eventually death. The body muscles and glands become overstimulated to a point where breathing stops.[55] Nerve agents are classified as either G or V agents, and further classified such as such as sarin (GB), tabun (GA), soman (GD), or VX. At low concentrations, the GB series incapacitates; GB can kill if inhaled or absorbed through the skin. The rate of action is very rapid if inhaled, but slower if absorbed through the skin. The V-agents are quicker acting and more persistent than the G-agents.

Blood agents are absorbed by breathing and block the oxygen transfer mechanisms in the body, leading to death by suffocation. A common blood agent is hydrogen cyanide (AC). Other blood agents include cyanogen chloride (CK) or arsine (SA). Each agent may have a different type of effect, but cause symptoms such as respiratory or cardiovascular collapse or myocardial failure.[56]

Blister agents, such as mustard (H) or lewisite (L), and combinations of the two compounds redden and blister skin. Contact can produce very large blisters. They also

[52] "Iraq: Truck Spills Acid, Explosives in Botched Arrack," April 17, 2007; available from http://abcnews.go.com/International/wireStory?id=3047649; Internet; accessed 20 April 2007.
[53] Lou Michel and Dan Herbeck, *American Terrorist: Timothy McVeigh and the Oklahoma City Bombing* (New York: Harper Collins Publishers Inc., 2001), 164.
[54] Army Field Manual 3-11.9, *Potential Military Chemical/Biological Agents and Compounds*, Fort Leonard Wood, MO: US Army Chemical School, 10 January 2005, I-4.
[55] Ibid., I-4.
[56] Ibid., I-4.

cause damage to the eyes, blood cells, and lungs. Eye exposure will cause reddening or temporary blindness, and may have permanent eye effects.[57] These agents are especially harmful when inhaled.

Choking agents, such as phosgene (CG) and diphosgene (DP), attack the respiratory system and make the membranes swell so the lungs fill with fluid. The pulmonary edema that results has been informally called "dry-land drowning."[58] As with blood agents, poisoning from choking agents comes through inhalation. Signs and symptoms of toxicity may be delayed up to 24 hours and can be fatal.

Chemical agents are also classified according to their persistency. Persistency is the length of time an agent remains effective on the battlefield or other target area after dissemination. The two basic classifications are persistent or non-persistent.

Persistent and Non-persistent Agents

Persistent nerve agents, such as V-agents, thickened G-agents, and the blister agent mustard, can retain their disabling or lethal characteristics for days to weeks (depending on environmental conditions). Persistent agents produce either immediate or delayed casualties. Immediate casualties occur when an individual inhales a chemical vapor. Delayed casualties occur when the chemical agent is absorbed through the skin. For example, the success secured by the use of mustard gas in World War I was chiefly due to the action of the vapor, that is, vapor emitted from persistent deposits of the liquid.[59] Mustard gas, as one example, was persistent and would remain in an environment for days and continue to cause sickness. If mustard gas contaminated a soldier's clothing and equipment, then other soldiers he came into contact with would also be affected. Towards the end of the war it was even used in high concentrations as an area denial weapon which often forced soldiers to abandon heavily contaminated positions.[60]

Non-persistent agents generally last a shorter period of time depending on the weather conditions. For example, the nerve agent sarin (GB) dissipates within minutes after dissemination. However, some liquid GB could remain for periods of time varying from hours to days, depending on the weather conditions and method of delivery. For example, during the Tokyo subway attacks (1995) with sarin by the Aum Shinrikyo cult, subway cleaning crews were not aware of the sarin threat when dispatched to clean platform or train car areas. Some crew personnel became casualties to the sarin. Due to insufficient training on how to decontaminate an area for this type of agent, some train yard areas were further contaminated.[61]

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[57] Ibid., I-4 and I-5
[58] Ibid., I-4.
[59] "General Description of War Gases," available from http://www.vlib.us/medical/gaswar/arp3.htm; Internet; accessed 25April 2007. This citation is a pre-WW II air raid handbook reference from the UK.
[60] "Mustard Gas," available from http://www.answers.com/topic/mustard-gas; Internet; accessed 25 April 2007.
[61] U.S. Department of Transportation, Federal Transit Administration, Office of Research, Demonstration and Innovation. US-Japan Mass Transit Security Workshop Proceedings and Meetings: January 2002 (March 2002) by the Federal Transit Administration (FTA) and the Japanese Ministry of Land

Dissemination of Effects

Dissemination can be a significant difficulty in using chemical weapons and achieving the desired weapon effects. The duration of effectiveness is also a factor that must consider the method of dissemination, weather and terrain conditions, and the properties of the specific chemical agent. Usual methods of dissemination are as vapors [gases], aerosols [mist], or liquids.[62] Vapors are affected by the direction of the wind as well as temperature, humidity, or precipitation. Additionally, there are biological activities that diminish the toxicity of the agent, therefore, the amount of chemical needed in the open air or in water to have its intended effect is much larger than what is successful in the laboratory.[63]

Numerous means to include mortars and bombs [and improvised explosive devices (IED)] can be used to deliver chemical warfare agents. Chemical military munitions are fitted with different burst capabilities, according to the agent properties and the intended effect. For example, a chemical munitions fitted with a long burst fuse releases the agent as a vapor or fine aerosol. This creates an immediate inhalation hazard with some of the fragmentation effect of conventional munitions.

Theoretically, terrorists could obtain these munitions, modify them and emplace them by hand. Other delivery means could be by vehicle, backpack, canisters or sprayers similar to those used for biological agents. Another means could be the criminal use of toxic industrial materials in massive quantities as a weapon. To manage risk, the degree of protection provided by protective equipment should be understood and recognize that some vectors of terrorist attack may require special protective filters and clothing. [64]

Figure II-7. **M40 Mask**

Other chemical agents, although not considered weapons of mass destruction, include incapacitants and irritants. Incapacitants include psychochemical agents and paralyzants. These agents can disrupt a victim's mental and physical capabilities. The victim may not lose consciousness, and the effects usually wear off without leaving permanent physical injuries.

Irritants, such as riot-control agents, cause a strong burning sensation in the eyes, mouth, skin, and respiratory tract. The effects of these agents, one commonly used term being "tear gas" (CS), are also temporary. Victims recover without having any serious aftereffects. Similar permanent or temporary health effects can occur from toxic industrial materials too.

Infrastructure and Transport, 9 and 10; available from http://ntl.bts.gov/lib/12000/12100/12190/; Internet; accessed 1 February 2005.

[62] Ibid., I-5.

[63] Walter Laqueur, *The New Terrorism: Fanaticism and the Arms of Mass Destruction* (Oxford: Oxford University Press, 1999), 60.

[64] Army Field manual 3-11.34, *Multiservice Tactics, Techniques, and Procedures for Nuclear, Biological, and Chemical NBC Defense of Theater Fixed Sites, Ports, and Airfields*, (Fort Monroe, VA: US Army Training and Doctrine Command, August 2000), G-2.

Toxic Industrial Material (TIM)

Toxic industrial material (TIM) is a generic term for toxic, infectious, or radioactive compounds in solid, liquid, aerosolized or gaseous forms. Some TIM can change its state between solid, liquid, or gas and make detection or protection even more difficult. Uses of TIM span industrial, commercial, medical, military, and other domestic enterprises. These materials are produced and stored in large quantities for multiple purposes and are nearly universal in their availability within urban areas, as well as some agrarian areas. Examples include factories and manufacturing plants, agriculture cooperatives [pesticides], water treatment facilities [chlorination] and other regular forms of business and livelihood. Joint Publication 1-02, *DOD Dictionary of Military and Associated Terms*, describes TIM and its three main components of toxic industrial chemicals (TIC), toxic industrial radiologicals (TIR), and toxic industrial biologicals (TIB).

Toxic Industrial Material and Toxic Components

Toxic Industrial Material. Any toxic industrial material manufactured, stored, transported, or used in industrial or commercial processes. It includes toxic industrial chemicals, toxic industrial radiologicals, and toxic industrial biologicals. Also called TIM.

- **Toxic Industrial Chemical.** Any chemical manufactured, used, transported, or stored by industrial, medical, or commercial processes. For example: pesticides, petrochemicals, fertilizers, corrosives, poisons, etc. Also called TIC.
- **Toxic Industrial Radiological.** Any radiological material manufactured, used, transported, or stored by industrial, medical, or commercial processes. For example: spent fuel rods, medical sources, etc. Also called TIR.
- **Toxic Industrial Biological.** Any biological material manufactured, used, transported, or stored by industrial, medical, or commercial processes. For example: infectious waste and as biological samples (e.g., biopsies, disease for research). Also called TIB.

Source: JP 1-02, *DOD Dictionary of Military and Associated Terms*, 12 April 2001, as amended through 13 June 2007.

The combination of material availability, proximity to urban areas, low cost, and the relative low security associated with many civilian storage facilities can encourage use of TIM as a convenient terrorist weapon. Corresponding hazards of TIM may include: ability to bypass or penetrate military protective equipment; exposure through inhalation, ingestion, or surface contact absorption; delayed symptoms; and varied levels of exposure and time to cause injury.[65] TIM can be a means to cause mass disruption or destruction.

[65] Army Field Manual 3-11.9, *Potential Military Chemical/Biological Agents and Compounds*, (Fort Leonard Wood, MO: US Army Chemical School, 10 January 2005), V-1 and V-2.

Managing risk is a fundamental responsibility for every military member, unit, activity, or institution-installation. Characteristics to consider in assessing TIM vulnerability include: toxicity, corrosiveness, flammability, explosiveness, reactivity, by products, and quantity of material. Persistency and non-persistency of TIM effects are additional considerations.

TIM Considerations

- Toxicity
- Corrosiveness
- Flammability
- Explosiveness
- Reactivity
- By Products
- Quantity

- Persistent
- Non-persistent

The US Secretary of the Department of Homeland Security (DHS) provides a concise description of managing risk and illustrates the issue related to toxic industrial chemicals and locale. He states," What do we mean by risk?...we look at three things. We look at threats, we look at vulnerabilities, and we look at consequences. We try to weigh where the threats are, where we are most vulnerable, and perhaps most important, what would the consequences be if a particular threat came to pass."[66]

Knowledge of where these type chemicals are stored in a locale or how they are transported through an environment is a factor in assessing possible terrorist use. Whether living and operating in the United States or abroad, comprehensive analyses that must be conducted and continually updated on probable high risk targets (HRT) that may appeal to a terrorist, and the potential impacts on critical infrastructure, functions, and populations in an area. The following Table II-1 provides a sampling of high and moderate risk toxic industrial chemicals:

Table II-1. Sample of High- and Moderate-Risk TIC

High Risk	*Moderate Risk*	
Ammonia	Acetone cyanohydrin	Methyl chloroformate
Arsine	Acrolein	n-Butyl isocyanate
Carbon disulfide	Allyl amine	Nitrogen dioxide
Chlorine	Allyl chlorocarbonate	Phosphine
Ethylene oxide	Carbonyl sulfide	Phosphorus oxychloride
Fluorine	Chlorosulfonic acid	Silicon tetrafluoride
Hydrogen cyanide	Crotonaldehyde	Stibine
Phosgene	Ethylene dibromide	Tert-Octyl mercaptan
Sulfuric acid	Methanesulfonyl chloride	Trifluoroacetyl chloride

In an example of a large inter-modal hub for highway and railroad transportation in a large metropolitan city, DHS Secretary Chertoff emphasizes that, "…one of the biggest priorities that we have to focus on, in terms of risk, is securing our transportation system. And by that I mean

[66] Michael Chertoff, "Managing Risk: Secretary Chertoff," [Speech to Sacramento, California, Chamber of Commerce 23 April 2007], available from http://www.dhs.gov/xnews/speeches/sp_1177426083887.shtm; Internet; accessed 25April 2007.

not just aviation security, although that's clearly very important, but all modes of transportation." With the significant risks to rail transportation as a terrorist target, "One of those is the risk of transportation of hazardous chemicals, including chemicals that could create a toxic inhalation hazard if they were accidentally or even deliberately released in to the air." Risk management includes improved procedures for closely tracking rail cars with hazardous chemicals, reducing the time a rail car remains in a specific location, and reducing the practical time that such rail cars are in highly populated areas. Positive accountability of rail cars throughout the entire transportation routing is part of the means to protect against the possibility of terrorist attack.[67]

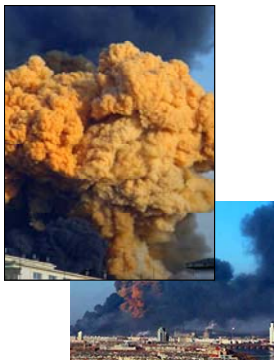

Fig. II-8. **Jilin Hazard**

Other potential targets of terrorist attack can include pipelines. Their stationary trace and long lengths are problematic for continual security and protection. Other possible targets are storage yards, maritime ports, airfields, and rail yards, which may all have large quantities of TIM. Recent U.S. Federal legislation aims to provide improved security partnerships between industry, transportation, and State or local authorities in the storage and transit of toxic industrial material.

Toxic industrial chemicals can present a vapor hazard and contact hazard. Evacuation from the immediate area is the best protective response to a TIC hazard.[68] A terrorist can use this normal planning and response feature to cause massive disruption. An accidental explosion at a petrochemical plant in Jilin, Peoples Republic of China in 2005 caused the evacuation of more than 10,000 area residents to avoid or minimize the health hazard.[69] Although the cause was determined to be from equipment and employee errors, a terrorist attack on major industrial facilities could be the focus or part of a nearly simultaneous group of attacks with TIM against a targeted population.

Fig. II-9. **Goiania Incident**

Toxic industrial radiologicals include any hazardous radioactive material produced, used or stored by medical, military, industrial or commercial processes. Examples include radioactive waste such as spent fuel rods and medical radiological material. Radioactive material can produce toxic long term health issues and also cause a radioactive contamination hazard.

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[67] Ibid.

[68] Army Field Manual 3-11.34, *Multiservice Tactics, Techniques, and Procedures for Nuclear, Biological, and Chemical NBC Defense of Theater Fixed Sites, Ports, and Airfields*, (Fort Monroe, VA: US Army Training and Doctrine Command, August 2000), Appendix G.

[69] "6 missing, 70 injured in chemical plant blasts," *People's Daily Online*, November 14, 2005, available from http://english.people.com.cn/200511/14/eng20051114_220904.html; Internet; accessed 9 June 2006.

One of the more well known radiological incidents was the contamination and injuries that occurred in Goiania, Brazil in the late 1980s. A private radiotherapy institute failed to properly remove a teletherapy unit from an abandoned facility. Local residents obtained the abandoned piece of equipment containing Cesium-137, and unknowingly contaminated community environments, and caused radiation injuries to a number of people. This was not an act of terrorism; however, the incident demonstrates the potential disruption and damage that even a small radioactive source can cause.

The incident at Goiania involved just over one ounce of Cesium-137. The dispersal of the radioactive material caused significant contamination of property, personal injury, and death. Over 100,000 people were screened for radioactive contamination. More than 50 people were hospitalized with many people developing radiation associated illnesses. Some of the obvious near term symptoms included skin burns; however, the long term health issues are still under evaluation for increased incidences of cancer or damage. More than 6,000 tons of household belongings and other material were removed, packed in concrete-lined steel containers, and placed in a restricted area.[70] Extensive decontamination and medical treatment occurred over the course of several years.

Toxic industrial biologicals include a similar range of civilian or military activities and could cause a potential infectious or toxic threat. One example is the accidental release of anthrax spores from a clandestine military research facility in Sverdlovsk, Russia in 1979. People and animals were contaminated in an area based on downwind drift from the military facility.

NOTE: Letters (Left) = Location of villages with animal contamination of anthrax.

Dots (Right) = Daytime locations of 62 victims of anthrax including 11 survivors.

White Arrows = General wind direction from northwest on 2 April 1979.

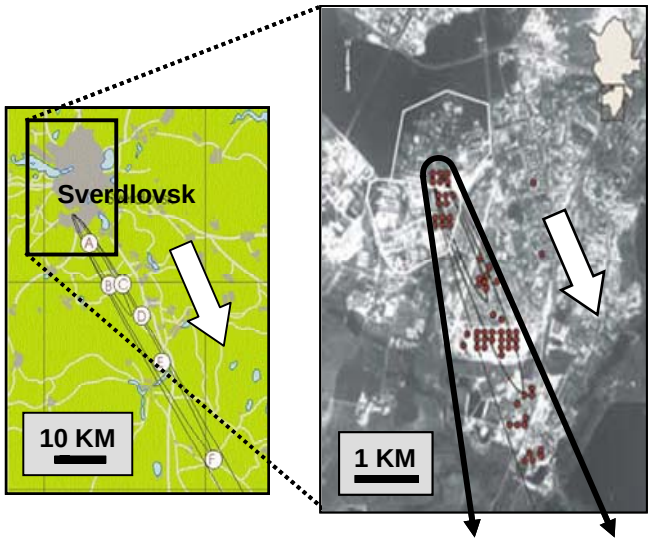

Fig. II-10. **Sverdlovsk Downwind Hazard and Anthrax Contamination**
Source: http://web.mit.edu/ssp/bsl4/scenarios.html

[70] Don Philpott, "Lesson Learned: Silent Killer – Goiania Brazil's Radiation Disaster!" *Homeland Defense*, April 2004, 21-23, 25-26.

Biological Weapons

Biological weapons can consist of pathogenic microbes, toxins, and bioregulator compounds. Depending on the specific type of vector, these weapons can incapacitate or kill people and animals; and destroy plants, food supplies, or materiel.[71] The type of targets being attacked determines the choice of agents and dissemination systems. When an incidence occurs, one of the initial issues may be the difficulty in determining if the occurrence is caused naturally or is an actual biological attack.

Biological warfare agents are difficult to detect while they are in transit to an attack site or area. Evidence of a biological attack may not show up for days after the actual release of the weapon. These agents are easier and cheaper to produce than either chemical or nuclear weapons, and the technology is readily available on the Internet. Any nation with a modestly sophisticated pharmaceutical industry is capable of producing these type agents.[72] Biological agents can be very lethal in comparison with other WMD agents or material. As one example assuming optimum conditions, about 1800 pounds of chemical agent sarin is required to inflict a large number of casualties over a square mile area, while only a quarter ounce of anthrax spores is required to achieve the same effect over the same area under ideal distribution conditions.[73]

The Fall 2001 anthrax attacks in the United States following the World Trade Center and Pentagon bombings show that an extremist or extremist group will use biological weapons. Although the anthrax attacks were originally suspected as linked to al-Qaida or Iraq, there is no compelling evidence yet that a known terrorist organization was involved. Current views indicate that the attacks were probably domestically initiated or conducted by a lone terrorist with previous access to weapon-quality anthrax.[74] Although the outcome of these attacks resulted in few casualties, the attacks did show the psychological and economic disruption such attacks cause. Washington, D.C. and other

[71] The universal marking for biological hazards is a unique symbol with a circular center shape that is superimposed with three connected yet open-ended arcs as in the section banner (above) for this biological section of the handbook. Color is fluorescent orange or orange-red. Background may be any color that provides sufficient contrast for the symbol. See http://www.cdc.gov/niosh/hcwold6a.html; Internet; accessed 1 April 2007.
[72] Canadian Security Intelligence Service, "Report 2000/05 Biological Weapons Proliferation," *Perspectives* (9 June 2000): 2; available from http://www.csis-scrs.gc.ca/eng/miscdocs/200005_e.html; Internet; accessed 6 February 2003.
[73] *Encyclopedia of World Terrorism*, 1997 ed., s.v. "Biological."
[74] Steve Bowman, *Weapons of Mass Destruction: The Terrorist Threat* (Washington, D.C.: Congressional Research Service Report for Congress, 7 March 2002), 3; available from http://www.fas.org/irp/crs/RL31332.pdf; Internet; accessed 23 December 2002.

East Coast cities were in crisis and disrupted in normal commerce and operations for several weeks. Psychological stress has lasted much longer. Additionally, numerous subsequent hoaxes using talcum powder or other materials showed the psychological and economic impact of the potential use of these type weapons.

Categories of Biological Warfare Agents

Biological warfare agents include three basic categories: pathogens, toxins, and bioregulators. Pathogens are disease producing microorganisms such as bacteria, rickettsiae, or viruses. Pathogens can occur naturally or can be altered with biotechnology. Toxins are poisons formed by a vegetable or animal, but can be produced synthetically also. Bioregulators affect cell processes in the body. Used as a bioweapon, they can cause severe adverse effects or death. Prions provide some special considerations as proteins and their ability to cause neurodegenerative diseases. The most commonly known example is the "mad cow" epidemic in the United Kingdom in 1996.[75]

Biological agents can be isolated from sources in nature, acquired from laboratories or bio-weapons stockpiles, or synthesized or genetically manipulated in a laboratory. Table II-1 lists some examples of each type of agent.

Table II-1. **Categories of Biological Warfare Agents**

Pathogens	*Toxins*	*Bioregulators*
Anthrax	Mycotoxins	Neurotransmitters
Plague	Venoms	Hormones
Smallpox	Shell fish	Enzymes
Tularemia	Botulism	
Cholera	Ricin	
Influenza		

Dissemination of Effects

Biological dissemination through aerosols, either as droplets from liquid or as particles from powders, is usually the most efficient method. This method does create a challenge since aerosol sprayers or other devices need to be properly designed for the agent used, and proper meteorological conditions must exist to conduct an effective attack.[76] The objective of biological weapon delivery is to expose humans to an agent in the form of a suspended cloud of very fine agent particles. Airborne particles, once inhaled, tend to lodge deep in the lungs and vulnerable body tissues and bloodstream. The agent must be cultured and processed to achieve an appropriate miniscule size in order to gain entry into the intended human body organs.

[75] Army Field Manual 3-11.9, *Potential Military Chemical/Biological Agents and Compounds*, (Fort Leonard Wood, MO: US Army Chemical School, 10 January 2005), I-7.
[76] Steve Bowman, *Weapons of Mass Destruction: The Terrorist Threat*, 5.

Other vectors may be through food or water. Although water supplies are sometimes noted as a key concern, water supplies are generally less vulnerable due to dilution, filtration, and other processes that kill most disease-causing organisms. Human carriers might transmit biological agents by coughing and spreading "aerosol-like" particles, through body fluids, or by contaminating surfaces that come in contact with other people. Animals and animal products can be a carrier means too. Insect bite, such as flea or tick, is another means to transmit an agent such as plague. Physical distribution by liquid droplet or dry powder, such as postal mail or other contact transfer, has been demonstrated.[77] Nonetheless, the most common delivery methods use aerosolized agents.

As estimated by the Centers for Disease Control and Prevention (CDC), Table II-2 presents biological agents considered to pose the highest threat for bioterrorism.

Table II-2. **Potential Bioterror Threats and Categories**	
Category A. Easily disseminated and/or contagious; high morality rates; might disrupt society; requires special action for public health preparedness.	
Bacteria	**Anthrax** **Plague** **Tularemia**
Viruses	**Smallpox** **Viral Hemorrhagic Fevers: Ebola, Marburg, Lassa, Machupo**
Biotoxins	**Botulism**
Category B. Moderately easy to disseminate; moderate illness rates; low morality; requires enhanced diagnostic capacity and surveillance.	
Bacteria	**Brucellosis** **Glanders** **Melioidosis** **Psittacosis** Food Safety Threats: ***Salmonella, Escherichia coli* 0157:H7, *Shigella*** Water Safety Threats: ***Vibrio cholerae, Cryptosporidium parvum***
Viruses	**Viral Encephalitis**
Rickettsia	**Q Fever** **Typhus Fever**
Biotoxins	**Epsilon toxin** of ***Clostridium perfringens*** **Ricin toxin** from **castor beans** **Staphylococcal enterotoxin B**
Category C. Emerging infectious diseases that could be a future threat. (This list is not all-inclusive but presents a sample.)	
Viruses	**Nipah virus** **Hantavirus**

[77] "Biological Attack: Human Pathogens, Biotoxins, and Agricultural Threats," *News & Terrorism: Communication in a Crisis*, Factsheet from the National Academics and the U.S. Department of Homeland Security, n.d. (2004 ?). See www.national-academies.org.

Some of the characteristics of biological agents are compared in Table II-3. One key consideration in weapon effects is whether or not the attack is transmissible, that is, can be transferred from person to person, or animal to animal. Attacks that are not contagious, such as anthrax, remain a very significant threat due to the lethality if not medially treated.

Table II-3. **Biological Agent Characteristics and Concerns**

Agent	Incubation	Transfer	Lethality	Sample Symptoms
Higher Threat Agents (Category A)				
Anthrax (Inhalational)	1-6 Days but up to 42 Days	No (only skin form spreads)	**High** for Inhalation	Fever, cough, profound sweats, fatigue… respiratory failure
Plague	1-7 Days Norm is 2-3	Moderate	**High** unless treated within 12-24 Hrs	Fever, cough, muscle pain, shortness of breath, sore lymph nodes
Tularemia	1-21 Days Norm is 3-6	No	Moderate	Fever, cough, pneumonia, headache, sore lymph nodes
Marburg	4-21 days	Via Fluids	>25 % Lethal	Sudden fever, headache, vomiting, diarrhea, rash, generalized bleeding
Ebola	4-21 days	Via Fluids	50-80 % Lethal	Sudden fever, headache, vomiting, diarrhea, rash, generalized bleeding
Smallpox	7-17 Days Average 12	Moderate	**High to Mod** ≥ 30% Lethal	Fever, aches, after 2-4 days rash appears, lesions, pustules to crusted scabs
Botulism	12 hours to 5 days	No	**High** without Respiratory Support	Nausea, urinary retention, blurred vision, gradual paralysis, respiratory failure
Lower Threat Agents (Selected Category B)				
Cholera	4 Hrs-5 Days Avg 2-3 Days	Rare. Rapid via untreated water	High without and Low with Treatment	Voluminous watery, diarrhea, vomiting, cramps, dehydration
Glanders	1-14 Days via Aerosol	No	Death in 7-10 Days in blood poison form	Pneumonia with or without blood poisoning, ulcers in nose, mouth, throat, lungs
Q Fever	7-41 Days	No	Very Low	Fever, fatigue, chills, severe headaches, can lead to pneumonia or hepatitis
Encephalitis	2-6 Days	Low	Low	Fever, aches, pain behind eyes, nausea, vomiting
Ricin	18-24 Hours	No	High (Injected)	Fever, cough, nausea, tightness in chest, excess chest fluid, respiratory failure

NOTE: Listed incubation periods are for naturally occurring outbreaks, which could differ for agents used as weapons. Incubation and lethality data from US Army Medical Research Institute of Infectious Disease *Blue Book*, August 2004. See also www.national-acdemies.org. and US Army Field Manual 3-11.9 for related data.

Masking a Biological Danger

Another critical factor in WMD is how long the biological agent normally incubates before displaying symptoms and can be correctly diagnosed as an attack. Incubation period, the degree and duration of incapacitation, and what other near-term and long-term effects occur may be part of terrorist planning and attack.

The enclosed table (Table II-3) with biological characteristics and concerns displays a simplified sample of planning factors that might determine what form of biological attack a terrorist might choose to use. A comparison of biological attack options, if a particular biological agent is acquired by a terrorist or terrorist group, spotlights the significant impact of attacks like anthrax, plague, or smallpox. Pathogens such as anthrax, plague, smallpox, tularemia, cholera, or various types of pathogens could be used against targets such as population centers, water and food supplies, and economic or infrastructure sites.

Anthrax invades in one of three ways: the skin (cutaneous), the digestive system (gastrointestinal), or the lungs (inhalation). Inhalation is the most serious vector of attack. The anthrax attack in 2001 via the US postal mail system was notable in things that did not occur. The attack could have been much worse. The attack, once alerted and confirmed by an attentive infectious disease clinician and laboratory testing, was relatively small in scope. The Centers for Disease Control and Prevention (CDC) note that the attack did not involve multiple biological agents, did not use multiple means of transmission, and did not challenge a surge capacity of health care response once anthrax was identified. In addition, the particular anthrax was not a drug-resistant organism.[78] In most cases, early treatment can cure cutaneous anthrax, and even when untreated, 80 percent of infected people survive. Gastrointestinal anthrax can result in death for 25 percent to 50 percent of infected people. Inhalation anthrax is much more severe. If untreated in a timely manner, the death rate of victims will be very high.[79]

Figure II-9. **Anthrax Letters in Attack 2001**

Smallpox is a particular concern even though the disease was declared eradicated in 1980 due to worldwide vaccination programs, the deliberate release of smallpox as a bioterrorist attack is a possibility.[80] Since it has an incubation period that can last over

[78] James Hughes and Julie Gerberding, "Anthrax Bioterrorism: Lessons Learned and Future Directions," *Emerging Infectious Diseases*, 8, October 2002, Centers for Disease Control and Prevention, available from http://www.cdc.gov/ncidod/eid/vol8no10/02-0466.htm; Internet; accessed 7 March 2007.
[79] "Anthrax: What You need to Know," *CDC Anthrax Factsheet*, Department of Health and Human Services, Centers for Disease control and Prevention, July 31, 2003, available from www.bt.cdc.gov/aget/anthrax; internet; accessed 24 April 2007.
[80] "Frequently Asked Questions About Smallpox" Factsheet, Department of Health and Human Services, Centers for Disease Control and Prevention, 29 December 2004.

two weeks without any symptoms, the release of smallpox could infect a large number of people in a short period of time without timely identification. Based on the declaration that smallpox has been eradicated, there is no routine of immunizations of U.S. military forces for smallpox.[81] The same lack of immunization exists for the civil population.

Figure II-9. **Smallpox**

The virus of smallpox no longer occurs naturally. Only two known stocks exist for scientific purpose. These facilities are the Centers for Disease Control and Prevention in the USA and the State Research Center of Virology and Biotechnology in Russia. But admissions by Russia cause significant concern. Reports mention that until at least 1992, Russian scientists were attempting to develop strains of anthrax bacteria, smallpox virus and other biological warfare agents with increased lethality through genetic engineering. For example, in 1997 Russian researchers reported that they had developed an anthrax strain with an inserted gene of a toxin that made the agent resistant to the existing Russian anthrax vaccine.[82]

Plague has an even shorter warning time of usually two to three days but can be confused initially with symptoms of a cold or the flu. Plague is one of two types: pneumonic plague or bubonic plague. Pneumonic plague can be transmitted from person to person, usually by breathing in respiratory droplets suspended in the air. An aerosol release during a terrorist attack would have the same effect. Bubonic plague cannot be transmitted from person to person, but untreated, could infect the lungs and cause a secondary case of pneumonic plague. Without early treatment, pneumonic plague usually leads to respiratory failure, shock, and rapid death.[83]

Living organisms, such as snakes, spiders, sea creatures, and plants, produce toxins. Toxins are faster acting and more stable than live pathogens. For example, the botulinum neurotoxin (BT) causes botulism; the toxin is produced by the soil bacteria *Clostridium botulinum*. Although one of the most deadly toxins and resulting disease, processing and weaponizing the toxin into an aerosol is very difficult.[84] Botulism cannot be transmitted from person to person. Another example is ricin. Ricin is a poison made from the waste "mash" of castor beans. Ricin poisoning is not contagious. No antidote exists for ricin poisoning but

[81] Army Field Manual 3-11.9, *Potential Military Chemical/Biological Agents and Compounds*, (Fort Leonard Wood, MO: US Army Chemical School, 10 January 2005), IV-21.
[82] Jonathan Tucker, "In the Shadow of Anthrax: Strengthening the Biological Disarmament Regime," The Nonproliferation review, Spring 2002, available from http://cns.miis,edu/pubs/npr/vol9/91/91tuck.pdf; Internet; accessed 27 April 2007.
[83] "Frequently Asked questions About Plague" Factsheet, Department of Health and Human Services, Centers for Disease Control and Prevention, 4 April 2005.
[84] "Botulinum Toxin Fact Sheet," Federation of American Scientists, available from http://www.fas.org/biosecurity/resource/factsheets/botulinum.htm; Internet; accessed 23 April 2007.

supportive medical care to remove ricin from a person's body might minimize effects.[85] Given both botulism and ricin can be very deadly, a terrorist would consider a range of options available for biological attack, and possibly decide on other vectors for a massive disruption or a large scale destruction attack.

Bioregulators are chemical compounds that are essential for the normal psychological and physiological functions. These compounds could be used in conjunction with other CBRN to complicate timely identification of specific attacks and diffuse medical treatment responses within a larger crisis. A wide variety of bioregulators are normally present in the human body in extremely minute concentrations. These compounds can produce a wide range of harmful effects if introduced into the body at higher than normal concentrations or if they have been altered. Psychological effects could include exaggerated fear and pain. In addition, bioregulators can cause severe physiological effects such as rapid unconsciousness, and depending on such factors as dose and route of administration, they could be lethal. Unlike pathogens that take hours or days to act, bioregulators could act in only minutes.

Agro-terrorism is another way to categorize biological attack and extremist-terrorist action. The four targets of attack are antipersonal, antiplant, antianimal, and antimaterial. Agro-terrorism affects plants, food, and animals. To date, agro-terrorism has not been a favored vector for terrorism, but effects if used could be significant. Although not a terrorist action, the outbreaks of foot-and-mouth disease and mad cow disease in Europe and the isolated case of mad cow in the U.S. state of Washington[86] are recent examples of the devastating economic impact of such diseases.

Fig. II-10. **Mad Cow Disease**

For example, foot-and-mouth disease (FMD) is a severe, highly communicable viral disease of cattle and swine, and also affects sheep, goats, deer, and other cloven-hooved animals. The disease is characterized by fever and blister-like lesions followed by erosions on the tongue and lips, in the mouth, on the teats, and between the hooves. Many affected animals recover, but the disease leaves them debilitated and causes severe losses in the production of meat and milk. The 2001 natural outbreak of foot and mouth disease (FMD) in the United Kingdom shows the economic impact that can occur. By the end of 2001, compensation to framers affected by the mass culling operations exceeded the equivalent of US $1.6 billion. Area quarantine of farms, public anxiety, and reduced regional tourism caused an economic loss estimated at US $4.0 billion.[87]

[85] "Facts About Ricin," Factsheet, Department of Health and Human Services, Centers for Disease Control and Prevention, 5 February 2007.
[86] "Final BSE Update – Monday, February 9, 2004," USDA United States Department of Agriculture website; available from http://usda.gov/Newsroom/0074.04.html; Internet; accessed 12 July 2004.
[87] Peter Chalk, "The Bio-Terrorist Threats to Agricultural Livestock and Produce," Testimony presented before the Government Affairs Committee of the US Senate on November 19, 2003 by Dr. Chalk, Policy Analyst, RAND, available fromhttp://www.rand.org/publications/CT/Ct213/; Internet; accessed 19 April 2007.

Depending on terrorist aims, an agro-terrorist act could inflict significant economic and social disruption without the stigma of inflicting large numbers of human casualties.[88] Based on statements from al-Qaida that they intend to target key sectors of the U.S. economy.

Terrorists can deliver biological weapons by unconventional dissemination means. These include commercially available or specially designed sprayers or other forms of aerosol generators mounted in automobiles, trucks, or ships. Smaller, more portable devices could be used to effectively disseminate biological agent aerosols. Such devices could be used to introduce an agent into heating, ventilating, and air conditioning systems. Drinking water can be contaminated by means of high-pressure agent injectors attached to plumbing system components. Insects, rodents, or other arthropod vectors are other feasible vectors of dissemination. Methods of dissemination are varied and limited only by the terrorist imagination. Human beings can be the willing or unsuspecting carriers of an incubating biological agent.

Whether pathogen, toxin, or bioregulator compound, the type of biological attack will focus on a particular type of target and seek specific effects. Depending on the specific type of vector, these bio-weapons can incapacitate or kill people and animals, and damage or destroy plants, food supplies, or materiel. Table II-4 provides a summary of categorizing the biological weapons threat.

Table II-4. **Type of Targets for Biological Agents**

Target Type	*Agent Effect*
Antipersonnel	Agents used to cause physical or psychological incapacitation, disease, or death.
Antiplant	Agents used to cause blight, disease or destruction of agricultural products and eco-systems.
Antianimal	Agents used to cause incapacitation, disease, or death to domestic animals, or to contaminate food production and by-products.
Antimaterial	Agents used to deteriorate or destroy critical materiel such as fuels, insulators, or electronics.

[88]Steve Bowman, *Weapons of Mass Destruction: The Terrorist Threat* (Washington, D.C.: Congressional Research Service Report for Congress, 7 March 2002), 6; available from http://www.fas.org/irp/crs/RL31332.pdf; Internet; accessed 23 December 2002.

Radiological Weapons

Radiological terrorism, a relatively new aspect of WMD and terrorism, is usually conceived as the use of a radiological device or an attack on a nuclear facility such as a nuclear power plant.[89] The aim is to release radioactive contamination into the atmosphere. Radioactivity is the release of energy in the form of radiation, as some naturally occurring elements attempt to change their fundamental atomic structure. Isotopes are forms of these particular elements that have distinct nuclear properties. When an isotope is unstable, it emits radiation and is called a radioisotope. Radiation from radioisotopes can damage human cells and cause problematic health issues. [90]

"When 100 years ago authorities had to worry about the anarchist placing a bomb in the downtown square…now we must worry about the terrorist who places the bomb in the square, but packed with radiological material."

Spencer Abraham, U.S. Secretary of Energy 2003

Although physical destruction with a radiological device will be much less than a nuclear detonation, structure contamination, or the fear of radiation and long-term health issues, may be key physical and psychological impacts. Trauma of a radiological threat can have significant negative effects on the economic, financial, and political programs of a region and nation.

Categories of Radiological Dissemination

Radiological contamination caused by terrorists can occur in multiple ways. One of the more well-known dissemination descriptions is a radiological dispersal device (RDD). This capability uses any number of mechanical means to spread radiation throughout a

[89] The universal radiation symbol is a trefoil with a center point connecting a three blade-like design. The symbol is black. Background is usually yellow but in any case must show clearly the radiation symbol. See also, http://osha.gov/...images/rdd.gif, or http://iaea.org/.../images/trefoil_usual.jpg; Internet; accessed 1 April 2007.

[90] ""Chemistry 101": The Make-up and Importance of Radioisotopes," *Introduction to Radiological Terrorism,* 1; available from http://www.nti.org/h_learnmore/radtutorial/chapter01_03.html; Internet; accessed 19 May 2004.

designated area. Another common term, the "dirty bomb," is an example of using conventional explosives to disperse radioactive material.

Other forms of RDD could distribute radioactive material in the atmosphere or in confined areas such as an office complex ventilation system. An aircraft might be used to disperse powdered or aerosolized forms of radioactive material.[91] A passive method of radiological attack could be the use of a radiation-emitting device (RED). In this example, a RED could be positioned to expose a population to intense radiation for a short period of time, or expose a selected population to low radiation over an extended period. Knowledge of such contamination and the fear of physical or psychological harm would be significant.[92]

Radioactive Materials A Selected Sample
Cobalt-60 (Co-60) used in: • Cancer Therapy • Industrial Radiography • Industrial Gauges • Food Irradiation
Cesium-137 (Cs-137) used in: • (Same uses as Cobalt-60) • Well Logging
Iridium-192 (ir-192) used in: • Industrial Radiography • Implants cancer therapy
Strontium-90 (Sr-90) used in: • Radioisotope • Thermoelectric Generators
Plutonium-238 (Pu-238) used in: • Research • Well Logging • Thermoelectric Generators
Americium-241 (Am-241) used in: • Industrial Gauges • Well Logging

The many industrial, scientific, agricultural, and public uses of radiation make access to certain radiological equipment and materiel a distinct probability for a dedicated individual or terrorist group. The 1995 demonstration of Chechen rebels burying a container of radioactive material in a Moscow public park received international attention. Not as well known is a 1999 incident of thieves in Grozny, Chechnya attempting to steal a container of radioactive material from a chemical facility. One of the thieves died almost immediately after exposure to the container, and an accomplice was hospitalized in serious condition.[93]

As an additional example of radioactive material, the former Soviet Union employed highly radioactive thermoelectric generators (RTG) to remotely power naval navigational systems and other military facilities.[94] In one 2001 incident report, two people scavenging for lead in a Russian facility were hospitalized after dangerous exposure to

[91] "Radiological Attack: Dirty Bombs and Other Devices," *News & Terrorism: Communication in a Crisis*, Factsheet from the National Academics and the U.S. Department of Homeland Security, n.d. (2004 ?). See www.national-academies.org.
[92] "What is Radiological Terrorism?" *Introduction to Radiological Terrorism,* 1 and 2; available from http://www.nti.org/h_learnmore/radtutorial/chapter01_02.html; Internet; accessed 19 May 2004.
[93] "History of Radiological Terrorism," *Introduction to Radiological Terrorism,* 1 to 3; available from http://www.nti.org/h_learnmore/radtutorial/chapter03_01.html; Internet; accessed 19 May 2004.
[94] "Medical Uses," *Introduction to Radiological Terrorism,* 3; available from http://www.nti.org/h_learnmore/radtutorial/chapter01_05.html; Internet; accessed 19 May 2004.

radioactive material. In a 2001 report from the nation of Georgia, individuals received significant radiation contamination after they handled abandoned containers holding a radioactive substance. In 2003, a report notes that police in the nation of Georgia discovered radioactive containers and other materials in a routine vehicle search.

Although radiation type devices may not necessarily cause mass casualties, they could present a significant radiation contamination effect on the target area.[95] Radiation casualties could be low initially, but would potentially increase over time. The U.S. Environmental Protection Agency (EPA) guidelines recommend that if a cancer risk due to remaining radiation cannot be reduced to less than one person per 10,000 people, the area should be abandoned. Disaster response and recovery issues of decontamination would include medical treatment of people in the affected area, possible evacuation or relocation of populations, and multiple actions to make physical property and materiel useable with no fear of radiation.[96]

Instances of acquiring materiel to build rudimentary radiological devices can be easy with basic knowledge of processes and a dedicated action plan. One example in 1994 is the attempt by a U.S. citizen to build a breeder reactor in his mother's garden shed. This incident had nothing to do with terrorism but does highlight risk, and at the time, demonstrated the relative ease of obtaining radioactive material. As a teenager, an individual used his knowledge of chemistry, an inquisitive mind, false documents and statements, and false cover stories to acquire radiological material. He constructed a crude radiological device that could have endangered 40,000 local residents. Questioned by local police for an unrelated citizen complaint, the unexpected discovery of radioactive material triggered the Federal Radiological Emergency Response Plan.[97]

"Dirty Bomb" Danger

To date, the U.S. has not been attacked with a radiological weapon by terrorists. Nonetheless, theoretical case study examples illustrate the potential impacts of a radiological "dirty bomb." Most injuries would probably occur from the heat, debris, radiological dust and force of the conventional explosion. A "dirty bomb" cannot create an atomic blast.[98] Nonetheless, assumptions may appear too simple or too critical in stating the damage of a radiological event.

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[95] Steve Bowman, *Weapons of Mass Destruction: The Terrorist Threat* (Washington, D.C.: Congressional Research Service Report for Congress, 7 March 2002), 4; available from http://www.fas.org/irp/crs/RL31332.pdf; Internet; accessed 23 December 2002.

[96] "Economic Effects," *Introduction to Radiological Terrorism,* 1; available from http://www.nti.org/h_learnmore/radtutorial/chapter02_02.html; Internet; accessed 19 May 2004.

[97] Ken Silverstein, "David Hahn, Boy Atomic Scientist," *ASEPCO*, [Originally printed in *Harper's Magazine*, November 1998]; available from http://www.asepco.com/David_Hahn_Boy_Scientist.htm; Internet; accessed 31 August 2004.

[98] "Dirty Bombs," Factsheet, Department of Health and Human Services, Centers for Disease Control and Prevention, March 21, 2005. See also, "Radiological Attack: Dirty Bombs and Other Devices," *News & Terrorism: Communication in a Crisis*, Factsheet from the National Academics and the U.S. Department of Homeland Security, n.d. (2004 ?). See www.national-academies.org.

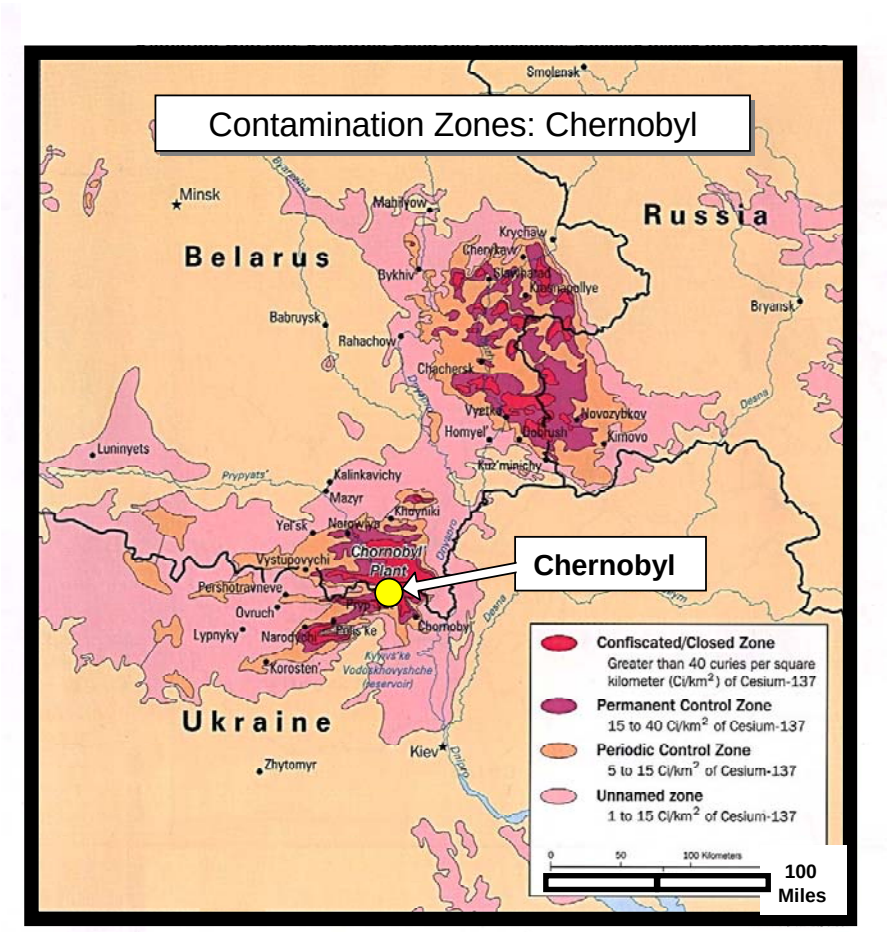
In testimony before the U.S. Senate Foreign Relations Committee, illustrations and degrees of contamination were estimated on several factors.[99] These model assumptions included amount of material released, the specific radiological material, dispersal technique, wind speed and direction and other weather conditions, size of particles released into the wind, and types of urban building construction and urban pattern of populations. Complex models have inherent uncertainties in predictive results, however, one example assumed a conventional explosion that dispersed radiological contamination in dust-like particles capable of being inhaled. Dust settling in the affected area, as well as contaminated food or water sources, could be vectors of potential radiation exposure. Any real incident of radiological contamination would cause significant disruption of social, medical, economic, fiscal, and governmental operations, compounded with overarching psychological trauma.

Attack on a nuclear facility is another means to cause radiological contamination. Even with the redundant safeguards and security measures at nuclear facility locations, the possibility of terrorist assault and breach of these measures is not impossible. Considerable precautions and security measures are in effect to preclude successful attacks by vehicle borne explosive devices or aerial borne means. Although remote in expectation, the possibility of a member of a nuclear facility workforce negating facility safeguards and assisting a terrorist act receives constant review and evaluation.[100]

Figure II-10. **Nuclear Plant**

Although the 1986 Chernobyl accident at a nuclear power station in the Ukraine had no connection to terrorism, the resulting political, financial, and social impacts are profound and provide an illustration of what damage radiological contamination can cause. An 18-mile radius around the nuclear plant was closed to everyone except official teams, the large local city near the site was completely evacuated and abandoned. Evacuation numbers vary. Between 400,000 people[101] and 130,000[102] people were resettled to safe areas.

[99] "Dirty Bombs: Response to a Threat," FAS Public Interest Report, *The Journal of the Federation of American Scientists* vol 55 no2 (March/April 2002), 1-11; available from http://ww.fas.org/faspir/2002/v55n2/dirtybomb.htm; Internet; accessed 15 April 2004.
[100] "Terrorists and Radiological Terrorism," *Introduction to Radiological Terrorism,* 2 and 3; available from http://www.nti.org/h_learnmore/radtutorial/chapter04_02.html; Internet; accessed 19 May 2004.
[101] "History of the United Nations and Chernobyl," The United Nations and Chernobyl, 1; available from http://www.un.org/ha/Chernobyl; Internet; accessed 1 July 2004.
[102] "Fact Sheet on the Accident at the Chernobyl Nuclear Power Plant," U.S. Nuclear Regulatory Commission, 1 to 4; available from http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/fschernobyl.html; Internet; accessed 1 July 2004.



(Source: http://www.lib.utexas.edu/maps/commonwealth/chornobyl_radiation96.jpg)

Reports note that over 20 towns and 3000 settlements were affected by radiation doses of significance. Over 400 settlements had to be evacuated.[103] Over 30 people died from the accident while long-term effects on a regional population remain an open-ended issue. Health, economic, and agricultural impacts are still being assessed as various international programs deal with safety, decontamination, and stabilization of equipment, facilities, and the region at a growing cost in the hundreds of millions of dollars.[104]

The 1979 accident at Three Mile Island (TMI-2) is the most serious nuclear power plant accidents in the United States to date. No terrorism was involved in this accident. The incident highlights the potential for radiological disaster and psychological stress on a regional population. The plant experienced a partial core meltdown that could have breached the containment building and dispersed massive quantities of radiation into the

[103] "History of the Chernobyl disaster,' 1 and 2; available from http://www.Chernobyl.org.uk/page 2.htm; Internet; accessed 30 June 2004.
[104] "Fact Sheet on the Accident at the Chernobyl Nuclear Power Plant," U.S. Nuclear Regulatory Commission, 1 to 4; available from http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/fschernobyl.html; Internet; accessed 1 July 2004.

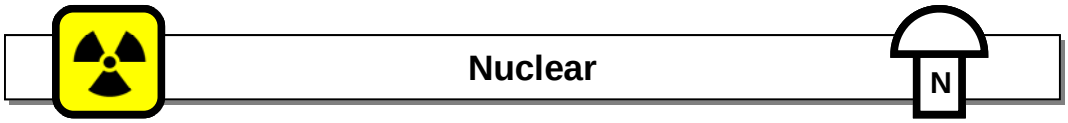
environment. Fortunately, this breach did not occur, even though a significant amount of radiation was released into the atmosphere. No death or injury occurred to plant workers or citizens of nearby communities during the Three Mile Island accident. Multiple government and independent studies conclude that most of the radiation was contained and what radiation was released caused negligible effects on the physical health of individuals or the environment. Nonetheless, the safety and cleanup operations have spanned decades with a corresponding major fiscal cost. [105]

Given al-Qaida aims to damage or cripple economic prosperity of the United States as one of its priorities, a RDD detonation in a major metropolitan area, according to some reports, could equal or exceed the economic impact of the 9-11 (2001) attacks on New York City and Washington, D.C. One report states that the estimated cost to return the lower Manhattan area of New York City to the condition of pre-911 attack was in excess of $30 billion. The immediate response costs exceeded $11 billion.[106]

Could terrorists conduct a radiological "dirty bomb" attack? Intent to attack with a weapon of mass destruction has been openly stated by terrorists groups such as al-Qaida as far back as the 1990s and continues with warnings to the present day. Recent plots have been uncovered for intent, but little practical capability to attack has been discovered, at least as stated in open source material. Threats have been announced and investigated,[107] but determining actual terrorist capability versus terrorist misinformation and media exploitation is very difficult.

What is certain to date? No "dirty bomb" has been exploded with the purpose to harm people and contaminate area.

[105] "Fact Sheet on the Accident at Three Mile Island," U.S. Nuclear Regulatory Commission, 1 to 5; available from http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/3mile-isle.html; Internet; accessed 1 July 2004.
[106] Peter Zimmerman and Cheryl Loeb, "Dirty Bombs: The Threat Revisited," *Defense Horizons*, January 2004, 9.
[107] "Al-Qaida warns Muslims: Time to get out of U.S.," *WorldNetDaily.com*, September 17, 2006, available from http://www.worldnetdaily.com/news/article.asp?ARTICLE-ID=52018; Internet; accessed 20 September 2006.



Nuclear Weapons

The use of a sophisticated nuclear weapon is a possible attack scenario but would require extraordinary terrorist financial and technical resources. A more likely scenario deals with nuclear material and sabotage or a siege-hostage situation at a nuclear facility.[108] This type scenario aligns more correctly with a radiological incident.[109] The potential effects would be catastrophic to a surrounding area and population. Depending on the degree of radioactive fallout related to wind patterns, contaminated area could be an ecological disaster for decades.

Figure II-11. **Targeting Nuclear facilities**

Peril of Nuclear Material

Some groups may have state sponsors that possess or can obtain nuclear weapons, but the CIA has no credible reporting at this time of terrorists successfully acquiring nuclear weapons or sufficient material to make them.[110] However, since the collapse of the

[108] *Encyclopedia of World Terrorism*, 1997 ed., s.v. "Nuclear."
[109] The universal radiation symbol is a trefoil with a center point connecting a three blade-like design. The symbol is black. Background is usually yellow but in any case must show clearly the radiation symbol. See also, http://osha.gov/...images/rdd.gif, or http://iaea.org/.../images/trefoil_usual.jpg; Internet; accessed 1 April 2007.
[110] Director of Central Intelligence, DCI Weapons Intelligence, Nonproliferation, and Arms Control Center, *Unclassified Report to Congress on the Acquisition of Technology Relating to Weapons of Mass*

Soviet Union in 1989, there has been a growing concern in nuclear material trafficking. Reports suggest that three shipments of Plutonium 239 intercepted by the German police in 1994 came from Russia.[111] Since 1991, Russian authorities say there have been 23 attempts to steal fissile material, some of which have been successful. Intelligence officials believe enough nuclear material has left Russia to make a bomb.[112] Public announcements of missing, stolen, or recovered fissile material in the last 15 years indicate a market for such critical material to make a crude nuclear weapon. Such material incidents range from less than .02 kilograms to several instances of 1 to 3 kilograms.[113] The International Atomic Energy Agency (IAEA) notes that the significant amount of nuclear material required for the possible manufacturing of a nuclear explosive device, depending on the type material, can range from eight kilograms to 75 kilograms.[114] As publicized in al-Qaida statements, when and if a terrorist group such as al-Qaida does obtain a nuclear weapon, attack with a nuclear weapon of mass destruction is a distinct probability.

Sinister "Suitcase" Phobia

A 1997 comment by the former Secretary of the Russian Security Council alleged that small nuclear weapons were unaccounted for, and that these weapons may have been lost or stolen. Immediate counter-statements declared all weapons were accounted for and safeguarded; some reports even stated that the weapons had never been built.[115]

Special Atomic Demolition Munition (SADM) is the proper description for what many media articles call a "suitcase nuke." Images of "backpack" or "small suitcase" nuclear bombs in various media accounts convey too simple an appreciation of acquiring and using such a sophisticated nuclear weapon.

The SADM was a weapon system in the US weapons inventory through the 1960s to 1980s according to some reports.[116] The application was to mine critical sites. This technology was probably replicated by Russian military forces. The US SADM kit weighed about 165 pounds and had a yield of 0.01 or 0.02 kiloton. The warhead alone probably weighed about 60 pounds.[117] A 0.01 kiloton detonation, that is, the equivalent of about 10 tons of TNT, would be an explosion about two to four times the effect of the

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Destruction and Advanced Conventional Munitions, 1 January Through 30 June 2001 (Washington, D.C., January 2002), 9.

[111] *Encyclopedia of World Terrorism*, 1997 ed., s.v. "Nuclear."

[112] Lewis M. Simons, "Weapons of Mass Destruction: An Ominous New Chapter Opens on the Twentieth Century's Ugliest Legacy," *National Geographic* 202, no. 5 (November 2002): 16.

[113] Richard Rhodes, "Living With The Bomb," *National Geographic,* 208, No. 2 (August 2005): 104.

[114] *IAEA Safeguards Glossary,* 2001 Edition, International Nuclear Verification Series No. 3, Table II, 23; available from http:/www-pub.iaea.org/MTCD/publications; Internet; accessed 22 July 2005.

[115] "Did Russia Lose Some "Suitcase Nukes"?" *WMD411,* NTI, updated November 2006, available from http://www.nti.org/f_wmd411/fla6_6.html; Internet; accessed 24 April 2007.

[116] "Special Atomic Demolition (SADM), available from http://johntayor.com.foe/sadm.htm; Internet; accessed 25 April 2007.

[117] "Atomic Demolition Munitions – Back Pack Size Nuclear Weapons," available from http://www.active-duty.com/backPackNukes.htm; Internet; accessed 25 April 2007.

blast damage to the Murrah Federal Building in the 1995 Oklahoma City bombing with a conventional explosive.

The concept of terrorists covertly delivering small nuclear weapons is problematic. First, a terrorist must posses the nuclear weapon. Next, the required maintenance of the weapon takes specific technical expertise and capability to ensure that the weapon is operational. Safeguards and other antitampering aspects would need to be understood and neutralized. The signature of radioactive components in the weapon would add to the difficulty of discretely transporting or emplacing the weapon.

Periodically, terrorist websites or other announcements will warn of impending intent to strike with a weapon of mass destruction. Terrorist media occasionally produce nuclear attack related information. A recent example is a terrorist website that published a nuclear survival guide in Arabic and English, using portions of an already existing English survival information guide. The cover looks dramatic in the photograph of a very large mushroom-shaped detonation cloud.[118] However, pictures must be understood in what the image actually displays. This particular cover illustrates a nuclear explosion much greater in explosive effect than any SADM or similar device. About the same time, reports from the United Kingdom suggested that al-Qaida leaders in Iraq were planning large-scale mass casualty terrorist attacks on the United Kingdom or other "western target."[119] The reports state further that the attack threat may refer to a large conventional explosion or a "dirty bomb" using conventional explosions and radioactive material.

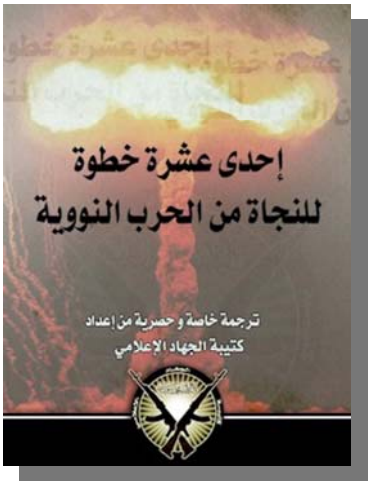

Fig. II-12. **Terror Propaganda**

Terrorists have directed similar threats recently against the United States. In September 2006, a journalist says sources linked to al-Qaida claimed to have smuggled nuclear material into the U.S. and that an attack would be conducted during Ramadan in late 2006.[120]

Is terrorist acquisition of a small atomic demolition munition possible? Yes. Is it probable? No. Nonetheless, the ability to acquire radioactive material from any number of industrial, educational, or scientific sources and combine this material to a conventional explosion is a credible threat and concern.

[118] Randy Taylor, "Al Qaeda in Iraq Planning Attacks in the UK," available from http://www.homelnadsecurityus.cim/Taylor042507; Internet; accessed 1 May 2007.
[119] Dipesh Gadher, "Al-Qaeda 'planning big British attack'," available from http://www.timelsonline.co.uk/tol/news/uk/article1687360.ec3; internet; accessed 1 May 2007.
[120] 'al-Qaeda Will Nuke US in Late September," 12 September 2006, available from http://mypetjawa.mu.nu/archives/184621.php; Internet; accessed 1 May 2007.

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High Yield Explosives

High yield explosives[121] are another significant threat for weapon effects of mass destruction or mass disruption. Definitions vary for high yield detonations and what comprises mass destruction or effects. Nonetheless, conventional explosives and material have been used to cause damage, death, and injury that have been labeled as weapons of mass destruction. Low yield explosives can cause mass effects in special conditions.

Terrorists can be relentless and patient. They will seize on opportunity and can demonstrate flexibility in strategy and tactics. Terrorist targeting includes critical infrastructure and key assets, and can also aim at causing mass casualties. Attack may occur against a critical node, system, or function. Beyond the physical damage or destruction, attack may cause a cascading disruption for government, social order, and economics as the public and private sectors react. Terrorist intent may focus on damage to national prestige, morale, or confidence. Other intentions may include discrediting public health and public safety.[122] An attack can also be exploited to assist in near-simultaneous or follow-on assault against separate targets in varied locales.

Figure II-12. **Oklahoma City**

Acts of terrorism using various yield explosives have been conducted by foreign and domestic terrorists against the United States. The incidents of the foreign terrorist bombing of the U.S. Embassy and Marine Barracks in Lebanon in 1983, the domestic terrorist bombing of the Murrah Federal Building in Oklahoma City, USA in 1995, and the terrorist bombing of Khobar Towers in Saudi Arabia in 1996 are notorious examples.

[121] Department of the Army Pamphlet 385-64, *Ammunition and Explosives Safety Standards*, 15 December 1999, 20-23. The octagonal symbol and cross symbol are fire division hazard symbols. The orange octagonal symbol identifies ammunition or explosives that have mass detonation characteristics and are a most significant safety hazard. The orange cross symbol identifies ammunition or explosives with a significant non-mass detonating but fragmentation producing characteristic. These two symbols are used in this handbook as a visual aid to complement the more familiar US Army military graphic control measures for a chemical or biological release event, or nuclear fallout as illustrated in Army Field Manual 1-02, September 2004.

[122] *The National Strategy for the Physical Protection of Critical Infrastructures and Key Assets*, viii.

Simple Means with Mass Effects

In April 1983, a truck loaded with about 400 pounds of explosives rammed into the U.S. Embassy in Beirut, Lebanon. This suicidal attack killed 63 people, including 17 Americans.[123] Eight members were employees of the Central Intelligence Agency. In October 1983, a suicide bomber detonated a truck full of explosives at a U.S. Marine Corps barracks located at Beirut International Airport. Casualties were 241 members of the U.S. Armed Forces killed and more than 100 other people injured.[124]

In the United States, a domestic terrorist parked a truck bomb at the base of the Alfred P. Murrah Federal Building in April 1995, and casually detonated the truck bomb with a timed fuse. The high yield explosive was a relatively simple device using several thousand pounds of ammonium nitrate fertilizer, other materials, and explosives.[125] The blast and immediate aftermath killed 168 men, women, and children; and injured over 800 other people. The explosion devastated a large area of downtown Oklahoma City, Oklahoma.

Figure II-13. **McVeigh**

Another example illustrates the mass destruction effects of low yield combustible material such as jet fuel in the near-simultaneous suicidal attacks on the World Trade Center and Pentagon in September 2001, and the foiled aerial suicide attack that resulted in the crash of a large commercial jet in Pennsylvania. Prior to 9-11, did anyone really think that structures as big as the Twin Towers would collapse based on the effects of plane impacts, fire, and subsequent weakening of the buildings?

Other considerations for high yield explosive effects include railroad transportation, major storage facilities, and commercial waterway shipping. Maritime vectors could include inland, coastal, and ocean waterways. For example, liquefied natural gas (LNG) is a significant potential threat. In its liquid state, natural gas is not explosive. However, liquid natural gas that spills will form a highly combustible vapor cloud, that if ignited, will cause a tremendous explosion. Security experts note that al-Qaida has specifically recognized the value of using LNG as a weapon to create mass effects.[126] In addition to the potential for mass casualties in metropolitan port areas, significant infrastructure damage could include terminals and inter-modal processing facilities, loss of tanker ships, and the disruption to expected gas distribution.

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[123] "April 1983 US Embassy bombing," 1; available from http://encyclopedia.the freedictionary.com/April%2011983%20US%20Embassy%20bombing; Internet; accessed 1 July 2004.
[124] "Terrorist attacks on Americans 1979-1988," 2; available from http://www.pbs.org/wgbh/pages/frontline/shows/target/etc/cron.html; Internet; accessed 1 July 2004.
[125] Lou Michel and Dan Herbeck, *American Terrorist: Timothy McVeigh and the Oklahoma City Bombing* (New York: Harper Collins Publishers Inc., 2001), 164.
[126] Eben Kaplan, "Q&A: Liquefied natural gas: A Potential Terrorist Target?" 11 February 2006, available from http://www.nytimes.com/cfr/international/slot2_021106.html?_r=1&oref=slogin&pagewant...; internet; accessed 1 May 2007.

Terrorist consideration in broad planning options may look for relatively low cost operations that indicate demonstrate the expectation for mega-impact. Terrorist attack may look for means such as multiple jet aircraft using suicide pilots or conventional types of attack against a LNG tanker. A Sandia National laboratories report considered four ways of terrorist attack against a tanker: ramming with another large ship or vessel, triggered explosion such as a sub-surface mine, an external assault with an explosive charge, and a hijacking.[127]

Of the several more notorious attacks on U.S. military forces or U.S. citizens in the last two decades, conventional explosions have caused the highest number of mass casualties or created the greatest sense of anxiety in a population. A group of terrorism case studies is available for more detailed analysis of selected terrorism incidents.[128] The case studies include but are not limited to the Khobar Towers bombing by terrorists using a large tanker truck filled with explosives; the Murrah Federal Building bombing by a terrorist with a medium cargo truck filled with explosives; the London Subway bombings of 7 July 2005 by a group of terrorists using conventional explosives in backpacks; and the USS *Cole* bombing by terrorists in a small boat packed with conventional explosives.

Fig. II-13. **Handbook No. 1.01, *Terror Operations: Case Studies in Terror***

Defining a weapon of mass destruction may have multiple definitions depending on the outcome desired by the terrorist. What is the aim of the terrorist? Who or what is the high value target of the attack? Is it mass destruction in the sense we normally visualize of weapons such a nuclear bomb? Is damage or contamination the intent as in a "dirty bomb" radiological dispersal device? How much disruption must occur with a chemical

[127] Ibid.
[128] Army Training and Doctrine Command, Deputy Chief of Staff for Intelligence, TRADOC Intelligence Support Activity-Threats, *Terror Operations: Case Studies in Terror*, 10 August 2006, available from https;//dcsint-threats.leavenworth.army.mil; Internet; accessed 1 may 2007. Access requires a US Army Knowledge Online (AKO) password.

or biological weapon before the attack is called a WMD attack? Terrorists recognize the value of notorious events that capture the immediate attention of a global media and exploit the anxieties of a population with threats and scenes of carnage. In reflection, the attacks of major destruction or disruption to date have been relatively low in fiscal cost when weighed against the physical and emotional mega-impact on the targets. The attacks of major destruction or disruption to date have been primarily with conventional explosives. Will terrorists pursue obtaining WMD? Probably. Hopefully, a weapon of mass destruction will never be acquired by a terrorist. In the meantime, high yield explosives are a significant consideration in recognizing the terrorist threat with weapons of mass destruction effects in the contemporary operational environment. This section described the major categories and characteristics of WMD and discussed special considerations such as dual use technology, toxic industrial material, or genetic engineering in biology. Although categories of chemical, biological, radiological, and nuclear weapons receive significant attention when addressing weapons of mass destruction, another area of concern is the use of high yield explosives to cause mass disruption or destruction.

Section III: CBRN Terrorism in the COE

In response to our efforts [since 9/11 we have made substantial progress in degrading terrorist capabilities],…the terrorists have adjusted, and so we must continue to refine our strategy to meet the evolving threat.

National Strategy for Combating Terrorism
September 2006

Terrorist groups are seeking to acquire WMD with the stated purpose of killing large numbers of U.S. citizens and U.S. friends and allies - without remorse.[129] A WMD attack has several desired outcomes by terrorists. These expectations range from extensive disruption of everyday lifestyles to massive damage of physical infrastructure, the economy, or mass casualties and death or effects requiring long-term health care. Ultimately, a significant impact on a large citizenry would be an intimidating psychological effect from physical and emotional stress. Simply stated, the potential for mass injury or death, as well as mass damage or destruction, presents a compelling requirement for protective measures and increased assurance to counter public harm, anxiety, and fear.[130]

Figure III-1. **CBRNE Terrorism in the Contemporary Operational Environment**

[129] National Security Presidential Directive-17. *National Strategy to Combat Weapons of Mass Destruction*, NSPD-17, December 2002, 1. See also, http://www.defenselink.mil/pdf/NMS-CWMD.pdf.
[130] Steven Bowman, *Weapons of Mass Destruction: The Terrorist Threat,* CRS Order Code RL31332, 7 March 2002; available from http://www.fas.org/irp/crs/RL31332.pdf; Internet; accessed 15 April 2004.

Know the Enemy and WMD Capability

Defined in U.S. Title 18, a *Weapon of Mass Destruction (WMD)* is (1) any explosive, incendiary, or poison gas, bomb, grenade, rocket having a propellant charge of more than four ounces, or a missile having an explosive or incendiary charge of more than one quarter ounce, or mine or device similar; (2) any weapon that is designed or intended to cause death or serious bodily injury through the release, dissemination, or impact of toxic or poisonous chemicals or their precursors; (3) any weapon involving a disease organism; or (4) any weapon that is designed to release radiation or radioactivity at a level dangerous to human life.

The Department of Defense defines a weapon of mass destruction with qualifiers of significant destruction to material or people, and includes an acceptance of conventional explosives with similar high order effects.[131]

Weapon of Mass Destruction

Weapons that are capable of a high order of destruction and/or of being used in such a manner as to destroy large numbers of people….can be high explosives or nuclear, biological, chemical, and radiological weapons, but exclude the means of transporting or propelling the weapon where such means is a separable and divisible part of the weapon. Also called WMD.

Joint Publication 1-02

Three general trends on terrorism in recent years are: micro-actors, sophistication, and overlap with transnational crime. Each of these trends can pose a critical danger to linking terrorist intent with WMD capability. A growing numbers of small independent terrorist cells can manipulate advanced technologies to gain knowledge and means while masking their operational or tactical plans. Sophistication exemplifies a combination of global information systems, financial resources, and practical exchange of ideas. Transnational criminals demonstrate themselves to be a valuable network to assist terrorists with enhanced mobility, improved support, and concealed actions.[132]

Concerning WMD, "…Few if any terrorist groups are likely to have the capability to produce complex biological or chemical agents needed for a mass casualty attack, but their capability will improve as they pursue enhancing their scientific knowledge base…"

[131] Joint Publication 1-02, *Department of Defense Dictionary of Military and Associated Terms*, 12 April 2001, as amended through 13 June 2007.
[132] Department of State, Office for the Coordinator for Counterterrorism, *Country Reports on Terrorism 2005*, (Washington, D.C.: Department of State, April 2005), 11.

Similarly, obtaining a nuclear weapon is least likely to occur due to the significant technical expertise and requirements for processing weapons-usable material to construct a nuclear weapon. However, a more probable threat is terrorist acquisition of radiological material combined with conventional explosives to cause the damage and contamination of a radiological dispersal device (RDD).[133]

Beyond the ideological commitment of a terrorist group to use WMD, the conduct of such an attack may be problematic. Of the small number of terrorist CBRN attacks prior to 2007, group self-imposed restraints and practical constraints often limited weapon effectiveness. In 1990, the Liberation Tigers of Tamil Eelam (LTTE) attacked Sri Lankan military forces with chlorine released from cylinders stolen from a paper mill. Terrorists attacked a limited tactical objective of a Sri Lankan military outpost, but some terrorists were affected too as chlorine drifted on them due to wind and the dispersion pattern of the chlorine. The LTTE did not use chemicals again due to concern of alienating regional support from the indigenous population, as well as alienating support from an extended "Tamil Tigers" support network around the world.[134]

In a much more deliberate and technology oriented terrorist program, the sarin nerve agent attacks in 1994 and 1995 by the Aum Shinrikyo cult in Japan required extensive financing, facilities, and scientific expertise to produce a practical chemical weapon. Even with such significant resources, the cult produced a low grade of chemical agent and its rudimentary means of employment limited, fortunately, the intended mass casualty effects. The attack planned for the safe withdrawal of the terrorists from the attack sites, but at least one terrorist experienced symptoms from the sarin based on his ineffective release of the sarin. Had a more concentrated form of sarin and a more effective distribution method been used, civilian casualties would have been significantly higher in and around the Tokyo subway stations.

Figure III-2. **Tokyo Triage**

Biological agents are another vector to be concerned about in terrorist intent, and if acquired, terrorist use for attack. Yet, some concern exists that the actual threat and use of biological agents by terrorists is greatly exaggerated. These perceptions may even be an instigating reason for some terrorist groups to have an interest in bioterrorism.[135]

Nonetheless, threat assessments continue to pose what is possible or probable. A U.S. Central Intelligence Agency (CIA) report issued in 2004 discussed the al-Qaida threat as "…threat of terrorists using chemical, biological, radiological, and nuclear (CBRN)

[133] Robert S. Mueller III, *Congressional Testimony: Statement Before the Senate Select Committee on Intelligence, January 11, 2007*, available from http://www.fbi.gov/congress07/mueller011107.htm; Internet; accessed 1 April 2007.
[134] John Parachini, Putting WMD Terrorism into Perspective," *The Washington Quarterly*, Autumn 2003, 37-50.
[135] Milton Leitenberg, *Assessing the Biological Weapons and Bioterrorism Threat*, (Carlisle, PA: Stratgeic Studies Institute, U.S. Army War College, December 2005), 87-89.

materials remained high…most attacks probably will be small-scale, incorporating improvised delivery means and easily produced or obtained chemicals, toxins, or radiological substances…increased publicity surrounding the anthrax incidents since the September 11 [2001] attacks has highlighted the vulnerability of civilian and government targets to CBRN attacks."[136]

The anthrax attacks on the U.S. in 2001 are one of a very, very small number of known successful biological attacks. A peculiar aspect of this attack, different from much of the speculation of terrorist interest or desire to produce or obtain biological agents is the high-quality of anthrax spores that were used. Intent versus capability to obtain a biological agent is a critical issue in indicating likelihood of terrorist attack with bioterrorism.

Other known terrorist attempts at anthrax production and dissemination failed, such as the efforts of the Aum Shinrikyo cult in Japan during the early 1990s.[137] Similar facts of al-Qaida interest in bioterrorism indicate no proof of actual biological weapon production, even though numerous reports suggested a threat during the U.S. and coalition military operations in Afghanistan. A 2002 U.S. military report states, "…the United States has yet to find evidence that al-Qaida was able to create a chemical or biological weapon at any of its camps, command centers, or caves in Afghanistan…We have seen evidence that al-Qaida had a desire to weaponize chemical and biological capability, but we have not yet found evidence that indicates they were able to do so." [138]

As an example, anthrax offers several key attributes as a weapon. Anthrax is highly lethal when inhaled, but is not contagious. An attack can be focused to a specific target area and population. Protection can be achieved through vaccination or antibiotics to mitigate effects. Anthrax spores are resistant to climate change and can remain viable for decades in natural environments, even in extended periods of sunlight (ultraviolet rays). Spores also can be disseminated by varied means such as powders, aerosols, or bomblet detonations and still maintain their infective properties. The relatively short incubation period of one to six days allows for reliable timing of disease effects to appear. Surprise attack is likely due to difficulty in early detection and treatment. Some reports state availability of anthrax spores is less

Anthrax Aspects

- **Lethality**
- **Noncontagious**
- **Vaccination**
- **Antitbiotics**
- **Storage Resilient**
- **UV Ray Resistent**
- **Short Incubation**
- **Availability of Spores**
- **Process-Production**
- **Dissemination**
- **Quantity: Effect**

[136] Anthony Cordesman, and Arleigh Burke, *The Challenge of Biological Terrorism: When to "Cry Wolf," What to Cry, and How to Cry It*, (Washington, D.C.: Center for Strategic and International Studies, May 5, 2005), 18.
[137] Milton Leitenberg, *Assessing the Biological Weapons and Bioterrorism Threat*, v, 22.
[138] Ibid., 31.

problematic than many other potential biological agents, and can be weaponized as a powder or liquid.[139] Although weaponizing anthrax spores does require a sophistication of equipment and technical skill, dual use type equipment can be obtained from commercial sources. Even with international protocols that restrict sales of select dual use processing equipment, these capabilities can still be obtained with a dedicated intent.

Prepare for Action: Deployed, In-Transit, and Institutional Forces

Figure III-3. **WMD Threat for Deployed, In-Transit, and Institutional Forces**

Terrorist threat is ever-present as U.S. military forces conduct their duties in the U.S. Homeland and throughout the world. Terrorist action can occur during operational missions, at force projection installations, and in other institutional locations in support of the Armed Forces at home and abroad.

Deployed Forces

U.S. military forces remain a regular presence in many areas of the world. As such, these types of organizations, activities, and grouped individuals offer a prime target to terrorists.

Khobar Towers Bomb Attack

Base camps or other semi-fixed locations and routes among them can provide a lucrative target

[139] Jim Davis and Anna Johnson, "The Anthrax Terror: DOD's Number-One Biological Threat," *Aerospace Power Journal*, Winter 2000; available from http://www.airpower.maxwell.af.mil/airchronicles/apj/apj00/win00/davis.htm; Internet; accessed 1 April 2007.

for WMD to cause mass destruction or disruption. The attack on the Khobar Towers housing area in Saudi Arabia specifically targeted the high density of U.S. and coalition military members billeted near the compound perimeter.

Urban terrain is a popular haven and operating area for terrorists. Hiding and observing within a native population provides a degree of security to the terrorist. Actions prior to an attack can be masked to preclude detection. Sites that concentrate military members near forward operating locations, or deployment and redeployment points can be terrorist high value targets too. For example, the suicide conventional bombing of the US Marine Corps billeting in 1983 caused operational and strategic impacts as US international policy, and changed overt presence of US military forces in the region drastically soon after the attack.

Beirut Bombing 1983

Infiltration and penetration of such sites continues to occur in contemporary operations. The suicide bombing of a coalition dining facility in Mosul in 2004 used suicide and a conventional improvised explosive. Although clearly not a WMD, similar penetration of infrastructure could be a terrorist objective with the intention of causing mass infection from a biological agent. Such attacks will be more difficult to prevent when the attacker is a human carrier of the biological agent and may be willing to commit suicide. Given incubation periods for some biological agents, attack may occur without the target audience realizing they have been attacked before deadly effects start to appear.

In-Transit Forces

Movements as part of deployment and redeployment operations can be susceptible to terrorist attack. Whether intra-theater or inter-theater in scope, various methods of transportation have critical points to embark, transload, refuel, refit, assemble, and debark.

USS *Cole* Attack 2000

Sustaining U.S. military forces may also have single points of failure in equipment, system capabilities, or technical skills. These types of critical nodes and people, if attacked, may delay or disrupt the in-transit flow and power projection capability of U.S. military forces.

Beyond the conventional explosion that attempted to sink the USS *Cole* in Aden Harbor, Yemen in 2000, a conventional terrorist attack on a critical node that included radiological contamination would significantly increase the disruption of facilities, operational support, and logistical sustainment to ongoing missions.

Institutional Forces

U.S. military forces require a sustaining base or network. This support system can be a localized permanent U.S. station, base, or post, as well as a forward deployed installation or staging area for specific missions of uncertain duration.

Traditional organizational celebrations and special days with high densities of people could be selected for terrorist attack. Single points of failure in equipment, system support, or technical interface, once identified, could become prime high value targets for a terrorist group. Critical operational or institutional infrastructure, on or near a military installation, could be a key target. Attacking a potential point of vulnerability in a system that appears secure overall is a practical way for surveillance and selection of a lucrative target. The symbolism of particular locations or types of equipment could be a terrorist objective with psychological impact considered more important than actual damage or destruction.

Naval Complex

Given these general examples of terrorist attack on deployed, in-transit, or institutional military forces and locations, catastrophic incidents caused by terrorists will often result in unprecedented levels of damage and disruption that severely affect population, infrastructure, environment, and economy. Attacks on institutional icons that include U.S. military facilities and people would create significant physical and psychological impacts over a prolonged period of time.

CBRN Trends in the Foreseeable Future

A complex contemporary environment becomes even more complex as governments, nation-states, and non-state organizations and people grapple with issues on weapons of mass destruction, counterproliferation, and nonproliferation, and an increasing ability to access technology and delivery means. Nations around the world that have nuclear energy programs, biological business conglomerates, and chemical industries remain susceptible to terrorist penetration, compromise, and attack.

Weapons of mass destruction related technologies are ever more available in a world market, sometimes sanctioned by legitimate government regulation and sometimes beyond the constraint of rational controls. Rogue states demonstrate the willingness to supply specific WMD-related technology and expertise to other countries. In extraordinary situations, these same states could supply WMD expertise to non-state actors.[140]

[140] Director of Central Intelligence, DCI Weapons Intelligence, Nonproliferation, and Arms Control Center, *Unclassified Report to Congress on the Acquisition of Technology Reacting to Weapons of Mass Destruction and Advanced Conventional Munitions, 1 January Through 30 June 2003*, (Washington, D.C., January 2002), 11; available from http://www.cia.gov/cia/reports/721_reports/pdfs/jan_jun2003.pdf; Internet; accessed 19 May 2004.

WMD is one of the most dangerous security issues that face the United States of America in the twenty-first Century. The United States must continue efforts – with friends, allies, and adversaries – to deter and dissuade the acquisition and use of weapons of mass destruction. The U.S. military and civilian organizations must understand the threat of WMD and remain ready to defend the Nations' people and resources. When appropriate, preemptive action may be warranted to deny acquisition to WMD capabilities.

"Rogue states and terrorists do not seek to attack us using conventional means. They know such attacks would fail. Instead, they rely on acts of terror and, potentially, the use of weapons of mass destruction – weapons that can be easily concealed, delivered covertly, and used without warning."

The National Security Strategy of the United States of America

The War on Terror and Way Ahead

The overarching aim of this handbook is to create situational awareness and understanding of current terrorism and potential WMD threats, and to complement the deliberate processes of military risk management, protection of the force, mission orders conduct, and leader decision-making.

"The gravest danger our Nation faces lie at the crossroads of radicalism and technology. Our enemies have openly declared that they are seeking weapons of mass destruction, and evidence indicates that they are doing so with determination. The United States will not allow these efforts to succeed.... History will judge harshly those who saw this coming danger but failed to act. In the new world we have entered, the only path to peace and security is the path of action."

President George W. Bush
September 17, 2002

U.S. Armed Forces are at war – a **War on Terrorism**. In this long-term war of uncertain duration, the United States of America will continue to defend its values,

liberties, and culture; its economic prosperity; and its security. Significant enemies are extremist organizations, networks, and individuals employing transnational movements – and their state or non-state supporters – which may have a commonality in exploiting Islam and using terrorism for ideological ends.[141]

Terrorism is a tool to coerce, to intimidate, and to undermine governments or societies that otherwise might pursue a more democratic political, religious, and ideological goals. The effort to alter those conditions requires a long-term, sustained approach to promote an international environment that will not tolerate terrorists and their supporters.

The conclusion to the *National Military Strategy to Combat Weapons of Mass Destruction* states an appreciation of the contemporary and future tasks ahead for our Armed Forces: "To ensure that the United states, its Armed Forces, allies, partners, and interests are neither threatened nor attacked by WMD, U.S. Armed forces must be prepared to: defeat and deter WMD use and deter next use; defend against, respond to, and recover from WMD use; prevent, dissuade, or deny WMD proliferation or possession; and reduce, eliminate, or reverse WMD possession."

The U.S. Armed Forces will accomplish these military strategic objectives (MSO) though eight missions: offensive operations, elimination, interdiction, active defense, passive defense, consequence management, security cooperation and partner activities, and threat reduction cooperation.[142] Consequence management is essential to the U.S. arsenal bearing against the WMD terrorist threat.[143] The U.S. Government is prepared to deal with the consequences of chemical, biological, radiological, or nuclear weapon use within and outside of the United States.[144] The Department of Defense remains the greatest U.S. Federal repository of resources and subject matter expertise for responding to a chemical, biological, radiological, or nuclear incident.[145]

The intent of U.S. strategy is to stop terrorist attacks against the United States, its citizens, its interests, and its friends and allies around the world, and ultimately, to create an international environment inhospitable to terrorists and all those who support them.[146]

The U.S. will not ignore regional or emerging threats, however, the operational efforts and intelligence will focus primarily on the most dangerous groups, namely, those terrorist groups with global reach or aspirations to acquire and use WMD.[147]

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[141] Department of Defense. *National Military Strategic Plan for the War on Terrorism,* 1 February 2006; available at http://defenselink.mil/qdr/docs/2005-01-25-Strategic-plan.pdf; Internet; accessed 17 July 2006.
[142] Department of Defense, *National Strategy to Combat Weapons of Mass Destruction (NMS-CWMD),* 13 February 2006; available at http://www.defenselink.mil/pdf/NMS-CWMD2006.pdf; internet; accessed 17 July 2006.
[143] NSPD-17, December 2002, 17
[144] Ibid., 6.
[145] Congressional Research Service, *Homeland Security: The Department of Defense's Role*, CRS Order Code RL 31615, 8.
[146] *National Strategy for Combating Terrorism,* 11.
[147] Ibid., 16.

The devastating impacts of WMD include chemical, biological, radiological, nuclear, and enhanced high explosive weapons as well as other, more asymmetrical weapons. WMD may rely more on disruptive impacts than on destructive kinetic effects. Cyber attacks on U.S. commercial information systems or attacks against transportation networks may have a greater economic or psychological effect than a relatively small release of a lethal agent.[148]

Figure III-4. **Global Reach Terrorism and WMD**

Reports of possible plans to conduct a catastrophic chemical attack on New York City's subway system, and indications that senior al-Qaida leaders canceled or postponed the attack because effects would not be as destructive as desired for a follow-on sequence to the 911 attacks raises the concern on al-Qaida. Extremist intention to cause thousands or millions of casualties, if possible, comprises a dangerous direction of terrorist organizations such as al-Qaida or terrorists affiliated ideologically with al-Qaida.

The terrorist threat and intended use of WMD is real. If this type of attack occurs, "Warning times will be very short, evidence of an impending act may be slim, the number of people involved can be comparatively small, and clarity is unlikely since extraordinary measures will be taken to conceal what is being planned or attempted."[149]

What can you do? Improve personal awareness of the US security measures against terrorism and use of WMD. The U.S. promotes several complementing national strategies. Two of these strategies are the *National Strategy for Combating Terrorism* and the *National Strategy to Combat Weapons of Mass Destruction*. Another companion directive, for example, is the *National Strategy for Homeland Security*. While the strategy for homeland security focuses on preventing terrorist attacks within the United States, the strategy for combating terrorism focuses on identifying and defusing threats before they

[148] Joint Chiefs of Staff, *National Military Strategy of the United States of America*, 1, May 2004.
[149] Patrick Hughes, "Prepared Testimony for the Senate Committee on Government Affairs," 26 June 2002, available from http://www.fas.org/irp/congress/2002_hr/062602hughes.html; Internet; accessed 10 April 2007.

reach our [US] borders.[150] Nonetheless, concepts of homeland security, homeland defense, and combating terrorism, especially WMD and terrorism, are inseparable. U.S. strategic objectives seek to protect the U.S. from terrorism, reduce U.S. vulnerabilities, minimize damage, and recover from attacks that do occur.[151]

What must you understand? Understand that the War on Terror is a "…battle of arms and a battle of ideas." Study aspects of culture such as ideology, theology, philosophy – the anthropology – appreciate why particular people think and act the way they do. Whatever the individual or group motivation, war is violent conflict among people. The social organization of people can range from a loose communal structure to a strict closed grouping with various levels of allegiance to a nuclear family or larger clan, tribe, or sect. Distribution of power, responsibility, and authority among members can be just as diverse and span absolute domination by a person or select number of leaders to a general influence on a decentralized network of associates.

Who is the enemy? Who are the threats and potential adversaries now and in the near or mid term future? How should an "opposing force" (OPFOR) accurately portray an enemy or potential adversaries to provide the best training conditions toward readiness? In the realm of terrorism, these conditions must replicate foreign and domestic terrorism in specified operational environments that encompass the politics, armed and civil forces, economics, social composition, information systems, and infrastructure of a locale for assigned or contingency missions. Physical dimensions include conditions of land, air, sea, and space.

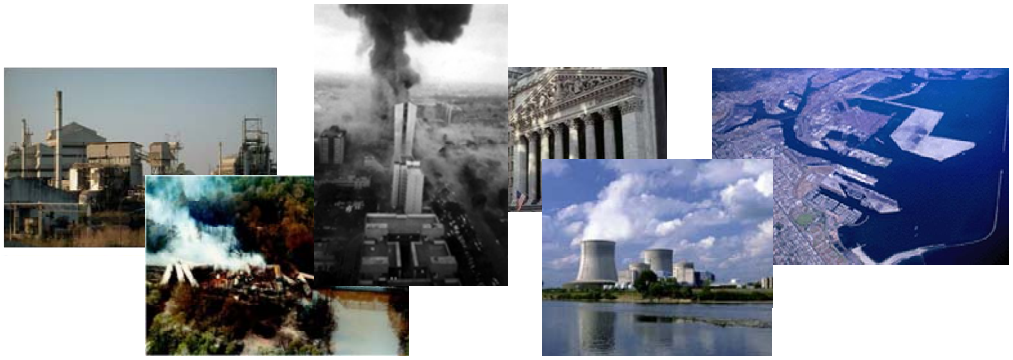

Figure III-5. **WMD Vectors and Targets in the COE**

Ultimately, the cognitive domain – how a person thinks and acts -- will be decisive. As the U.S. Army trains in order to accomplish assigned missions in a contemporary operational environment, the study of national, international, and transnational patterns and trends of terror have one salient point in common.

[150] *National Strategy for Combating Terrorism*, 2.
[151] *National Strategy for Homeland Security*, vii.

Terror intends to cause a psychological impact on a target population that diminishes morale, dispenses doubt, and degrades the resolve to resist a terrorist's objective. As noted by the National Center for Infectious Diseases, Centers for Disease Control and Prevention, "The anthrax attack [USA 2001] was relatively small and did not involve the use of multiple agents, multiple modes of transmission, a drug-resistant organism, transmission to animals, or global spread. The surge capacity of the health-care delivery system was not challenged. In addition, unlike some other threat agents, the causative organism was easily isolated in clinical laboratories; there was no risk of person-to-person transmission and no risk of vector-borne transmission."[152]

Figure III-6. **CBRN Terrorism in the COE**

The introduction to this handbook stated a primary purpose to understand terrorist goals and objectives, as well as patterns, trends, and emerging techniques of terrorist operations, and terrorist intention of using WMD. The specter of chemical, biological, radiological, or nuclear weapons of mass destruction is compelling in what is known historically, what is ongoing in the contemporary operational environment, and what could occur in the near future.

One point is certain: an enemy with the commitment and the means to use a weapon of mass destruction and the catastrophe of WMD consequences has yet to be truly experienced.

Know the Enemy!

[152] James Hughes and Julie Gerberding, "Anthrax Bioterrorism: Lessons Learned and Future Directions," Emerging infectious diseases, 8 (October 2002); 1013-1014. At time of article publication, Dr. Hughes was Director of the National Center for Infectious Diseases, Centers for Disease Control and Prevention, and Dr. Gerberding was the Director, Centers for Disease Control and Prevention in Atlanta, GA.

APPENDICES

Appendix A. U.S. Centers for Disease Control and Prevention Factsheets

This appendix provide a sampling of factsheets produced by the CDC on CBR threats.

Chemical.

CDC Factsheet: **Chlorine**
CDC Factsheet: **Cyanide**
CDC Factsheet: **Lewisite**
CDC Factsheet: **Phosgene**
CDC Factsheet: **Phosgene-Oxime**
CDC Factsheet: **Sarin**
CDC Factsheet: **Soman**
CDC Factsheet: **Sulfur-Mustard**
CDC Factsheet: **Tabun**
CDC Factsheet: **VX**

Biological.

CDC Factsheet: **Anthrax**
CDC Factsheet: **Botulism (Paper No. 1)**
CDC Factsheet: **Botulism (Paper No. 2)**
CDC Factsheet: **Plague**
CDC Factsheet: **Ricin**
CDC Factsheet: **Smallpox (Paper No. 1)**
CDC Factsheet: **Smallpox (Paper No. 2)**
CDC Factsheet: **Tularemia**

Radiological.

CDC Factsheet: **Dirty Bombs-Radiation Emergencies**
CDC Factsheet: **Polonium-210 Contamination – Radiation Emergencies**

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CHEMICAL EMERGENCIES

FACT SHEET

Facts About Chlorine

What chlorine is

- Chlorine is an element used in industry and found in some household products.
- Chlorine is sometimes in the form of a poisonous gas. Chlorine gas can be pressurized and cooled to change it into a liquid so that it can be shipped and stored. When liquid chlorine is released, it quickly turns into a gas that stays close to the ground and spreads rapidly.
- Chlorine gas can be recognized by its pungent, irritating odor, which is like the odor of bleach. The strong smell may provide an adequate warning to people that they have been exposed.
- Chlorine gas appears to be yellow-green in color.
- Chlorine itself is not flammable, but it can react explosively or form explosive compounds with other chemicals such as turpentine and ammonia.

Where chlorine is found and how it is used

- Chlorine was used during World War I as a choking (pulmonary) agent.
- Chlorine is one of the most commonly manufactured chemicals in the United States. Its most important use is as a bleach in the manufacture of paper and cloth, but it is also used to make pesticides (insect killers), rubber, and solvents.
- Chlorine is used in drinking water and swimming pool water to kill harmful bacteria. It is also as used as part of the sanitation process for industrial waste and sewage.
- Household chlorine bleach can release chlorine gas if it is mixed with other cleaning agents.

How people can be exposed to chlorine

- People's risk for exposure depends on how close they are to the place where the chlorine was released.
- If chlorine gas is released into the air, people may be exposed through skin contact or eye contact. They may also be exposed by breathing air that contains chlorine.
- If chlorine liquid is released into water, people may be exposed by touching or drinking water that contains chlorine.
- If chlorine liquid comes into contact with food, people may be exposed by eating the contaminated food.
- Chlorine gas is heavier than air, so it would settle in low-lying areas.

How chlorine works

- The extent of poisoning caused by chlorine depends on the amount of chlorine a person is exposed to, how the person was exposed, and the length of time of the exposure.
- When chlorine gas comes into contact with moist tissues such as the eyes, throat, and lungs, an acid is produced that can damage these tissues.

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Facts About Chlorine
(continued from previous page)

Immediate signs and symptoms of chlorine exposure

- During or immediately after exposure to dangerous concentrations of chlorine, the following signs and symptoms may develop:
  - Coughing
  - Chest tightness
  - Burning sensation in the nose, throat, and eyes
  - Watery eyes
  - Blurred vision
  - Nausea and vomiting
  - Burning pain, redness, and blisters on the skin if exposed to gas, skin injury similar to frostbite if exposed to liquid chlorine
  - Difficulty breathing or shortness of breath (may appear immediately if high concentrations of chlorine gas are inhaled, or may be delayed if low concentrations of chlorine gas are inhaled)
  - Fluid in the lungs (pulmonary edema) within 2 to 4 hours
- Showing these signs or symptoms does not necessarily mean that a person has been exposed to chlorine.

What the long-term health effects are

- Long-term complications from chlorine exposure are not found in people who survive a sudden exposure unless they suffer complications such as pneumonia during therapy. Chronic bronchitis may develop in people who develop pneumonia during therapy.

How people can protect themselves, and what they should do if they are exposed to chlorine

- Leave the area where the chlorine was released and get to fresh air. Quickly moving to an area where fresh air is available is highly effective in reducing exposure to chlorine.
  - If the chlorine release was outdoors, move away from the area where the chlorine was released. Go to the highest ground possible, because chlorine is heavier than air and will sink to low-lying areas.
  - If the chlorine release was indoors, get out of the building.
- If you think you may have been exposed, remove your clothing, rapidly wash your entire body with soap and water, and get medical care as quickly as possible.
- *Removing and disposing of clothing:*
  - Quickly take off clothing that has liquid chlorine on it. Any clothing that has to be pulled over the head should be cut off the body instead of pulled over the head. If possible, seal the clothing in a plastic bag. Then seal the first plastic bag in a second plastic bag. Removing and sealing the clothing in this way will help protect you and other people from any chemicals that might be on your clothes.
  - If you placed your clothes in plastic bags, inform either the local or state health department or emergency personnel upon their arrival. Do not handle the plastic bags.
  - If you are helping other people remove their clothing, try to avoid touching any contaminated areas, and remove the clothing as quickly as possible.
- *Washing the body:*
  - As quickly as possible, wash your entire body with large amounts of soap and water. Washing with soap and water will help protect people from any chemicals on their bodies.
  - If your eyes are burning or your vision is blurred, rinse your eyes with plain water for 10 to 15 minutes. If you wear contacts, remove them before rinsing your eyes, and place them in

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Facts About Chlorine
(continued from previous page)

the bags with the contaminated clothing. Do not put the contacts back in your eyes. You should dispose of them even if you do not wear disposable contacts. If you wear eyeglasses, wash them with soap and water. You can put the eyeglasses back on after you wash them.

- If you have ingested (swallowed) chlorine, do not induce vomiting or drink fluids.
- Seek medical attention right away. Dial 911 and explain what has happened.

How chlorine exposure is treated

No antidote exists for chlorine exposure. Treatment consists of removing the chlorine from the body as soon as possible and providing supportive medical care in a hospital setting.

How people can get more information about chlorine

People can contact one of the following:

- Regional poison control center (1-800-222-1222)
- Centers for Disease Control and Prevention
  - Public Response Hotline (CDC)
    - (800) 232-4636 (English and Spanish)
    - TTY (888) 232-6358
  - Emergency Preparedness and Response Web site (http://www.bt.cdc.gov/)
  - E-mail inquiries: cdcinfo@cdc.gov

This fact sheet is based on CDC's best current information. It may be updated as new information becomes available.

Last reviewed on 03/23/05.

The Centers for Disease Control and Prevention (CDC) protects people's health and safety by preventing and controlling diseases and injuries; enhances health decisions by providing credible information on critical health issues; and promotes healthy living through strong partnerships with local, national, and international organizations

For more information, visit www.bt.cdc.gov/chemical, or call CDC at 800-CDC-INFO (English and Spanish) or 888-232-6348 (TTY).

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CHEMICAL EMERGENCIES

FACT SHEET

Facts About Cyanide

What cyanide is

- Cyanide is a rapidly acting, potentially deadly chemical that can exist in various forms.
- Cyanide can be a colorless gas, such as hydrogen cyanide (HCN) or cyanogen chloride (CNCl), or a crystal form such as sodium cyanide (NaCN) or potassium cyanide (KCN).
- Cyanide sometimes is described as having a "bitter almond" smell, but it does not always give off an odor, and not everyone can detect this odor.
- Cyanide is also known by the military designations AC (for hydrogen cyanide) and CK (for cyanogen chloride).

Where cyanide is found and how it is used

- Hydrogen cyanide, under the name Zyklon B, was used as a genocidal agent by the Germans in World War II.
- Reports have indicated that during the Iran-Iraq War in the 1980s, hydrogen cyanide gas may have been used along with other chemical agents against the inhabitants of the Kurdish city of Halabja in northern Iraq.
- Cyanide is naturally present in some foods and in certain plants such as cassava. Cyanide is contained in cigarette smoke and the combustion products of synthetic materials such as plastics. Combustion products are substances given off when things burn.
- In manufacturing, cyanide is used to make paper, textiles, and plastics. It is present in the chemicals used to develop photographs. Cyanide salts are used in metallurgy for electroplating, metal cleaning, and removing gold from its ore. Cyanide gas is used to exterminate pests and vermin in ships and buildings.
- If accidentally ingested (swallowed), chemicals found in acetonitrile-based products that are used to remove artificial nails can produce cyanide.

How people can be exposed to cyanide

- Poisoning caused by cyanide depends on the amount of cyanide a person is exposed to, the route of exposure, and the length of time that a person is exposed.
- Breathing cyanide gas causes the most harm, but ingesting cyanide can be toxic as well.
- Cyanide gas is most dangerous in enclosed places where the gas will be trapped.
- Cyanide gas evaporates and disperses quickly in open spaces, making it less harmful outdoors.
- Cyanide gas is less dense than air, so it will rise.
- Cyanide prevents the cells of the body from getting oxygen. When this happens, the cells die.
- Cyanide is more harmful to the heart and brain than to other organs because the heart and brain use a lot of oxygen.

Immediate signs and symptoms of cyanide exposure

- People exposed to a small amount of cyanide by breathing it, absorbing it through their skin, or eating foods that contain it may have some or all of the following symptoms within minutes:

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Facts About Cyanide
(continued from previous page)

  - Rapid breathing
  - Restlessness
  - Dizziness
  - Weakness
  - Headache
  - Nausea and vomiting
  - Rapid heart rate
- Exposure to a large amount of cyanide by any route may cause these other health effects as well:
  - Convulsions
  - Low blood pressure
  - Slow heart rate
  - Loss of consciousness
  - Lung injury
  - Respiratory failure leading to death
- Showing these signs and symptoms does not necessarily mean that a person has been exposed to cyanide.

What the long-term health effects may be

Survivors of serious cyanide poisoning may develop heart and brain damage.

How people can protect themselves and what they should do if they are exposed to cyanide

- First, get fresh air by leaving the area where the cyanide was released. Moving to an area with fresh air is a good way to reduce the possibility of death from exposure to cyanide gas.
  - If the cyanide release was outside, move away from the area where the cyanide was released.
  - If the cyanide release was indoors, get out of the building.
- If leaving the area that was exposed to cyanide is not an option, stay as low to the ground as possible.
- Remove any clothing that has liquid cyanide on it. If possible, seal the clothing in a plastic bag, and then seal that bag inside a second plastic bag. Removing and sealing the clothing in this way will help protect people from any chemicals that might be on their clothes.
- If clothes were placed in plastic bags, inform either the local or state health department or emergency coordinators upon their arrival. Do not handle the plastic bags.
- Rinse the eyes with plain water for 10 to 15 minutes if they are burning or vision is blurred.
- Wash any liquid cyanide from the skin thoroughly with soap and water.
- If cyanide is known to be ingested (swallowed), do not induce vomiting or give fluids to drink.
- Seek medical attention right away. Dial 911 and explain what has happened.

How cyanide poisoning is treated

Cyanide poisoning is treated with specific antidotes and supportive medical care in a hospital setting. The most important thing is for victims to seek medical treatment as soon as possible.

How people can get more information about cyanide

People can contact one of the following:

- Regional poison control center (1-800-222-1222)
- Centers for Disease Control and Prevention

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Facts About Cyanide
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- Public Response Hotline (CDC)
  - (800) 232-4636 (English and Spanish)
  - TTY (888) 232-6358
- Emergency Preparedness and Response Web site (http://www.bt.cdc.gov/)
- E-mail inquiries: cdcinfo@cdc.gov

This fact sheet is based on CDC's best current information. It may be updated as new information becomes available.

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CHEMICAL EMERGENCIES

FACT SHEET

Facts About Lewisite

What lewisite is

- Lewisite is a type of chemical warfare agent. This kind of agent is called a vesicant or blistering agent, because it causes blistering of the skin and mucous membranes on contact.
- Lewisite is an oily, colorless liquid in its pure form and can appear amber to black in its impure form.
- Lewisite has an odor like geraniums.
- Lewisite contains arsenic, a poisonous element.
- Lewisite is also known by its military designation, "L."

Where lewisite is found and how it is used

- Lewisite was produced in 1918 to be used in World War I, but its production was too late for it to be used in the war.
- Lewisite has been used only as a chemical warfare agent. It has no medical or other practical use.
- Lewisite is not found naturally in the environment.

How people can be exposed to lewisite

- People's risk for exposure depends on how close they are to the place where the lewisite was released.
- If lewisite gas is released into the air, people may be exposed through skin contact or eye contact. They may also be exposed by breathing air that contains lewisite.
- If lewisite liquid is released into water, people may be exposed by drinking water that contains lewisite or by getting the water on their bodies.
- If lewisite liquid comes into contact with food, people may be exposed by eating the contaminated food.
- People can be exposed by coming into direct contact with liquid lewisite.
- Lewisite vapor is heavier than air, so it will settle in low-lying areas.
- Lewisite remains a liquid under a wide range of environmental conditions, from below freezing to very hot temperatures. Therefore, it could last for a long time in the environment.

How lewisite works

- Adverse health effects caused by lewisite depend on the amount people are exposed to, the route of exposure, and the length of time that people are exposed.
- Lewisite is a powerful irritant and blistering agent that immediately damages the skin, eyes, and respiratory (breathing) tract.
- Because it contains arsenic, lewisite has some effects that are similar to arsenic poisoning, including stomach ailments and low blood pressure.

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Facts About Lewisite
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Immediate signs and symptoms of lewisite exposure

- Most information on the health effects of lewisite is based on animal studies.
- Signs and symptoms occur immediately following a lewisite exposure. Lewisite can have the following effects on specific parts of the body:
  - *Skin:* pain and irritation within seconds to minutes, redness within 15 to 30 minutes followed by blister formation within several hours. The blister begins as a small blister in the middle of the red areas and then expands to cover the entire reddened area of skin. The lesions (sores) from lewisite heal much faster than lesions caused by the other blistering agents, sulfur mustard and nitrogen mustards, and the discoloring of the skin that occurs later is much less noticeable.
  - *Eyes:* irritation, pain, swelling, and tearing may occur on contact.
  - *Respiratory tract:* runny nose, sneezing, hoarseness, bloody nose, sinus pain, shortness of breath, and cough
  - *Digestive tract:* diarrhea, nausea, and vomiting.
  - *Cardiovascular:* "Lewisite shock" or low blood pressure may occur
- Showing these signs and symptoms does not necessarily mean that a person has been exposed to lewisite.

What the long-term health effects may be

- Extensive skin burning, as seen with sulfur mustard, is less likely.
- Extensive breathing in of the vapors may cause chronic respiratory disease.
- Extensive eye exposure may cause permanent blindness.
- Unlike sulfur mustard, lewisite is not known to suppress the immune system.

How people can protect themselves and what they should do if they are exposed to lewisite

- Leave the area where the lewisite was released and get to fresh air. Quickly moving to an area where fresh air is available is highly effective in reducing the possibility of death from exposure to lewisite.
  - If the lewisite release was outdoors, move away from the area where the lewisite was released. Go to the highest ground possible, because lewisite is heavier than air and will sink to low-lying areas.
  - If the lewisite release was indoors, get out of the building.
- If you think you may have been exposed, remove your clothing, rapidly wash your entire body with soap and water, and get medical care as quickly as possible.
- *Removing and disposing of clothing:*
  - Quickly take off clothing that has liquid lewisite on it. Any clothing that has to be pulled over the head should be cut off the body instead of pulled over the head. If possible, seal the clothing in a plastic bag. Then seal the first plastic bag in a second plastic bag. Removing and sealing the clothing in this way will help protect you and other people from any chemicals that might be on your clothes.
  - If you placed your clothes in plastic bags, inform either the local or state health department or emergency personnel upon their arrival. Do not handle the plastic bags.
  - If you are helping other people remove their clothing, try to avoid touching any contaminated areas, and remove the clothing as quickly as possible.
- *Washing the body:*
  - As quickly as possible, wash any liquid lewisite from your skin with large amounts of soap and water. Washing with soap and water will help protect people from any chemicals on their bodies.

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Facts About Lewisite
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  - If your eyes are burning or your vision is blurred, rinse your eyes with plain water for 10 to 15 minutes. If you wear contacts, remove them and place them in the bags with the contaminated clothing. Do not put the contacts back in your eyes. If you wear eyeglasses, wash them with soap and water. You can put the eyeglasses back on after you wash them.
- If you have ingested (swallowed) lewisite, do not induce vomiting or drink fluids.
- **Seek medical attention right away. Dial 911 and explain what has happened.**

How lewisite exposure is treated

Treatment consists of removing lewisite from the body as soon as possible and providing supportive medical care in a hospital setting. An antidote for lewisite is available and is most useful if given as soon as possible after exposure.

How people can get more information about lewisite

People can contact one of the following:

- Regional poison control center (1-800-222-1222)
- Centers for Disease Control and Prevention
  - Public Response Hotline (CDC)
    - (800) 232-4636 (English and Spanish)
    - TTY (888) 232-6358
  - Emergency Preparedness and Response Web site (http://www.bt.cdc.gov/)
  - E-mail inquiries: cdcinfo@cdc.gov

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Last reviewed on 03/23/05.

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CHEMICAL EMERGENCIES

FACT SHEET

Facts About Phosgene

What phosgene is

- Phosgene is a major industrial chemical used to make plastics and pesticides.
- At room temperature (70°F), phosgene is a poisonous gas.
- With cooling and pressure, phosgene gas can be converted into a liquid so that it can be shipped and stored. When liquid phosgene is released, it quickly turns into a gas that stays close to the ground and spreads rapidly.
- Phosgene gas may appear colorless or as a white to pale yellow cloud. At low concentrations, it has a pleasant odor of newly mown hay or green corn, but its odor may not be noticed by all people exposed. At high concentrations, the odor may be strong and unpleasant.
- Phosgene itself is nonflammable (not easily ignited and burned).
- Phosgene is also known by its military designation, "CG."

Where phosgene is found and how it is used

- Phosgene was used extensively during World War I as a choking (pulmonary) agent. Among the chemicals used in the war, phosgene was responsible for the large majority of deaths.
- Phosgene is not found naturally in the environment.
- Phosgene is used in industry to produce many other chemicals such as pesticides.
- Phosgene can be formed when chlorinated hydrocarbon compounds are exposed to high temperatures. Chlorinated hydrocarbon compounds are substances sometimes used or created in industry that contain the elements chlorine, hydrogen, and carbon.
- The vapors of chlorinated solvents exposed to high temperatures have been known to produce phosgene. Chlorinated solvents are chlorine-containing chemicals that are typically used in industrial processes to dissolve or clean other materials, such as in paint stripping, metal cleaning, and dry cleaning.
- Phosgene gas is heavier than air, so it would be more likely found in low-lying areas.

How people are exposed to phosgene

- People's risk for exposure depends on how close they are to the place where the phosgene was released.
- If phosgene gas is released into the air, people may be exposed through skin contact or eye contact. They may also be exposed by breathing air that contains phosgene.
- If phosgene liquid is released into water, people may be exposed by touching or drinking water that contains phosgene.
- If phosgene liquid comes into contact with food, people may be exposed by eating the contaminated food.

How phosgene works

- Poisoning caused by phosgene depends on the amount of phosgene to which a person is exposed, the route of exposure, and the length of time that a person is exposed.

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Facts About Phosgene
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- Phosgene gas and liquid are irritants that can damage the skin, eyes, nose, throat, and lungs.

Immediate signs and symptoms of phosgene exposure

- During or immediately after exposure to dangerous concentrations of phosgene, the following signs and symptoms may develop:
  - Coughing
  - Burning sensation in the throat and eyes
  - Watery eyes
  - Blurred vision
  - Difficulty breathing or shortness of breath
  - Nausea and vomiting
  - Skin contact can result in lesions similar to those from frostbite or burns
  - Following exposure to high concentrations of phosgene, a person may develop fluid in the lungs (pulmonary edema) within 2 to 6 hours.
- Exposure to phosgene may cause delayed effects that may not be apparent for up to 48 hours after exposure, even if the person feels better or appears well following removal from exposure. Therefore, people who have been exposed to phosgene should be monitored for 48 hours afterward. Delayed effects that can appear for up to 48 hours include the following:
  - Difficulty breathing
  - Coughing up white to pink-tinged fluid (a sign of pulmonary edema)
  - Low blood pressure
  - Heart failure
- Showing these signs or symptoms does not necessarily mean that a person has been exposed to phosgene.

What the long-term health effects are

- Most people who recover after an exposure to phosgene make a complete recovery. However, chronic bronchitis and emphysema have been reported as a result of phosgene exposure.

How people can protect themselves and what they should do if they are exposed to phosgene

- Leave the area where the phosgene was released and get to fresh air. Quickly moving to an area where fresh air is available is highly effective in reducing the possibility of death from exposure to phosgene.
  - If the phosgene release was outdoors, move away from the area where the phosgene was released. Go to the highest ground possible, because phosgene is heavier than air and will sink to low-lying areas.
  - If the phosgene release was indoors, get out of the building.
- If you think you may have been exposed, remove your clothing, rapidly wash your entire body with soap and water, and get medical care as quickly as possible.
- *Removing and disposing of clothing:*
  - Quickly take off clothing that has liquid phosgene on it. Any clothing that has to be pulled over the head should be cut off the body instead of pulled over the head. If possible, seal the clothing in a plastic bag. Then seal the first plastic bag in a second plastic bag. Removing and sealing the clothing in this way will help protect you and other people from any chemicals that might be on your clothes.
  - If you placed your clothes in plastic bags, inform either the local or state health department or emergency personnel upon their arrival. Do not handle the plastic bags.

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Facts About Phosgene
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  - If you are helping other people remove their clothing, try to avoid touching any contaminated areas, and remove the clothing as quickly as possible.
- *Washing the body:*
  - As quickly as possible, wash your entire body with large amounts of soap and water. Washing with soap and water will help protect people from any chemicals on their bodies.
  - If your eyes are burning or your vision is blurred, rinse your eyes with plain water for 10 to 15 minutes. If you wear contacts, remove them and place them in the bags with the contaminated clothing. Do not put the contacts back in your eyes. If you wear eyeglasses, wash them with soap and water. You can put the eyeglasses back on after you wash them.
- If you have ingested (swallowed) phosgene, do not induce vomiting or drink fluids.
- Seek medical attention right away. Dial 911 and explain what has happened.

How phosgene exposure is treated

Treatment for phosgene exposure consists of removing phosgene from the body as soon as possible and providing supportive medical care in a hospital setting. No antidote exists for phosgene. Exposed people should be observed for up to 48 hours, because it may take that long for symptoms to develop or reoccur.

How people can get more information about phosgene

People can contact one of the following:

- Regional poison control center (1-800-222-1222)
- Centers for Disease Control and Prevention
  - Public Response Hotline (CDC)
    - (800) 232-4636 (English and Spanish)
    - TTY (888) 232-6358
  - Emergency Preparedness and Response Web site (http://www.bt.cdc.gov/)
  - E-mail inquiries: cdcinfo@cdc.gov

Centers for Disease Control and Prevention (CDC), National Institute for Occupational Safety and Health (NIOSH), Pocket Guide to Chemical Hazards (http://www.cdc.gov/niosh/npg/npgd0504.html)

For more information, visit www.bt.cdc.gov/chemical, or call CDC at 800-CDC-INFO (English and Spanish) or 888-232-6348 (TTY).

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CHEMICAL EMERGENCIES

FACT SHEET

Facts About Phosgene Oxime

What phosgene oxime is

- Phosgene oxime is a manufactured chemical warfare agent.
- Phosgene oxime is a type of agent called an urticant or nettle agent. This is because on contact with the skin, it produces intense itching and a rash similar to hives.
- Phosgene oxime is also referred to as a corrosive agent because of the type of skin and tissue damage it causes.
- Phosgene oxime was first produced in 1929, but it has never been used on the battlefield. Specific information on this chemical is very limited.
- Phosgene oxime is colorless in its solid form and yellowish-brown when it is a liquid.
- Phosgene oxime has a disagreeable, irritating odor.
- Phosgene oxime is also known by its military designation, "CX."

Where phosgene oxime is found and how it is used

- Although phosgene oxime has been produced only as a chemical warfare agent, it has never been used during wartime.
- Phosgene oxime is not found naturally in the environment.
- Phosgene oxime vapor is heavier than air, so it will settle in low-lying areas.
- Phosgene oxime does not last in the environment for very long. It breaks down in soil within 2 hours when temperatures are normal, and it breaks down in water within a few days.

How people can be exposed to phosgene oxime

- People's risk for exposure depends on how close they are to the place where the phosgene oxime was released.
- If phosgene oxime gas is released into the air, people can be exposed through skin contact or eye contact. They may also be exposed by breathing air that contains phosgene oxime.
- If phosgene oxime liquid is released into water, people can be exposed by touching or drinking water that contains phosgene oxime.
- If phosgene oxime liquid comes into contact with food, people can be exposed by eating the contaminated food.
- People can be exposed directly by coming in contact with liquid phosgene oxime

How phosgene oxime works

- The extent of poisoning that phosgene oxime causes depends on the amount of phosgene oxime to which a person is exposed, how the person is exposed, and the length of time of the exposure.
- Phosgene oxime produces instant and almost unbearable pain on exposed skin and exposed eyes. When inhaled, it causes immediate irritation to the respiratory (breathing) tract.
- Phosgene oxime can penetrate clothing and rubber faster than other chemical warfare agents.

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Facts About Phosgene Oxime
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Immediate signs and symptoms of phosgene oxime exposure

- Signs and symptoms occur immediately following a phosgene oxime exposure.
- Phosgene oxime can have the following effects on specific parts of the body:
  - *Skin:* pain occurring within a few seconds, and blanching (whitening) of the skin surrounded by red rings occurring on the exposed areas within 30 seconds. Within about 15 minutes, the skin develops hives. After 24 hours, the whitened areas of skin become brown and die, and then a scab is formed. Itching and pain may continue throughout the healing process.
  - *Eyes:* severe pain and irritation, tearing, and possibly temporary blindness.
  - *Respiratory tract:* immediate irritation to the upper respiratory tract, causing runny nose, hoarseness, and sinus pain. Absorbing phosgene oxime through the skin or inhaling it may result in fluid in the lungs (pulmonary edema) with symptoms of shortness of breath and cough.
  - *Digestive tract:* no information exists on digestive tract effects in humans.
- Showing these signs or symptoms does not necessarily mean that a person has been exposed to phosgene oxime.

What the long-term health effects may be

No information is available on the long-term health effects of phosgene oxime in humans.

How people can protect themselves, and what they should do if they are exposed to phosgene oxime

- Leave the area where the phosgene oxime was released and get to fresh air. Quickly moving to an area where fresh air is available is highly effective in reducing exposure to phosgene oxime.
  - If the phosgene oxime release was outdoors, move away from the area where the phosgene oxime was released. Go to the highest ground possible, because phosgene oxime is heavier than air and will sink to low-lying areas.
  - If the phosgene oxime release was indoors, get out of the building.
- If you think you may have been exposed, remove your clothing, rapidly wash your entire body with soap and water, and get medical care as quickly as possible.
- *Removing and disposing of clothing:*
  - Quickly take off clothing that has liquid phosgene oxime on it. Any clothing that has to be pulled over the head should be cut off the body instead of pulled over the head. If possible, seal the clothing in a plastic bag. Then seal the first plastic bag in a second plastic bag. Removing and sealing the clothing in this way will help protect people from any chemicals that might be on their clothes.
  - If you placed your clothes in plastic bags, inform either the local or state health department or emergency personnel upon their arrival. Do not handle the plastic bags.
  - If you are helping other people remove their clothing, try to avoid touching any contaminated areas, and remove the clothing as quickly as possible.
- *Washing the body:*
  - As quickly as possible, wash any liquid phosgene oxime from your skin with large amounts of soap and water. Washing with soap and water will help protect you and other people from any chemicals on your body.
  - If your eyes are burning or your vision is blurred, rinse your eyes with plain water for 10 to 15 minutes. If you wear contacts, remove them before rinsing your eyes, and place them in the bags with the contaminated clothing. Do not put the contacts back in your eyes. You should dispose of them even if you do not wear disposable contacts. If you wear eyeglasses, wash them with soap and water. You can put the eyeglasses back on after you wash them.

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Facts About Phosgene Oxime
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- If you have ingested (swallowed) phosgene oxime, do not induce vomiting or drink fluids.
- Seek medical attention right away. Dial 911 and explain what has happened.

How phosgene oxime exposure is treated

- No antidote exists for phosgene oxime. Treatment consists of removing the phosgene oxime from the body as soon as possible and providing supportive medical care in a hospital setting.

How people can get more information about phosgene oxime

People can contact one of the following:

- Regional poison control center (1-800-222-1222)
- Centers for Disease Control and Prevention
  - Public Response Hotline (CDC)
    - (800) 232-4636 (English and Spanish)
    - TTY (888) 232-6358
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Last reviewed on 03/18/03.

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CHEMICAL EMERGENCIES

FACT SHEET

Facts About Sarin

What sarin is

- Sarin is a human-made chemical warfare agent classified as a nerve agent. Nerve agents are the most toxic and rapidly acting of the known chemical warfare agents. They are similar to certain kinds of pesticides (insect killers) called organophosphates in terms of how they work and what kind of harmful effects they cause. However, nerve agents are much more potent than organophosphate pesticides.
- Sarin originally was developed in 1938 in Germany as a pesticide.
- Sarin is a clear, colorless, and tasteless liquid that has no odor in its pure form. However, sarin can evaporate into a vapor (gas) and spread into the environment.
- Sarin is also known as GB.

Where sarin is found and how it is used

- Sarin and other nerve agents may have been used in chemical warfare during the Iran-Iraq War in the 1980s.
- Sarin was used in two terrorist attacks in Japan in 1994 and 1995.
- Sarin is not found naturally in the environment.

How people can be exposed to sarin

- Following release of sarin into the air, people can be exposed through skin contact or eye contact. They can also be exposed by breathing air that contains sarin.
- Sarin mixes easily with water, so it could be used to poison water. Following release of sarin into water, people can be exposed by touching or drinking water that contains sarin.
- Following contamination of food with sarin, people can be exposed by eating the contaminated food.
- A person's clothing can release sarin for about 30 minutes after it has come in contact with sarin vapor, which can lead to exposure of other people.
- Because sarin breaks down slowly in the body, people who are repeatedly exposed to sarin may suffer more harmful health effects.
- Because sarin vapor is heavier than air, it will sink to low-lying areas and create a greater exposure hazard there.

How sarin works

- The extent of poisoning caused by sarin depends on the amount of sarin to which a person was exposed, how the person was exposed, and the length of time of the exposure.
- Symptoms will appear within a few seconds after exposure to the vapor form of sarin and within a few minutes up to 18 hours after exposure to the liquid form.
- All the nerve agents cause their toxic effects by preventing the proper operation of the chemical that acts as the body's "off switch" for glands and muscles. Without an "off switch," the glands and

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Facts About Sarin
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muscles are constantly being stimulated. They may tire and no longer be able to sustain breathing function.

- Sarin is the most volatile of the nerve agents, which means that it can easily and quickly evaporate from a liquid into a vapor and spread into the environment. People can be exposed to the vapor even if they do not come in contact with the liquid form of sarin.
- Because it evaporates so quickly, sarin presents an immediate but short-lived threat.

Immediate signs and symptoms of sarin exposure

- People may not know that they were exposed because sarin has no odor.
- People exposed to a low or moderate dose of sarin by breathing contaminated air, eating contaminated food, drinking contaminated water, or touching contaminated surfaces may experience some or all of the following symptoms within seconds to hours of exposure:
  - Runny nose
  - Watery eyes
  - Small, pinpoint pupils
  - Eye pain
  - Blurred vision
  - Drooling and excessive sweating
  - Cough
  - Chest tightness
  - Rapid breathing
  - Diarrhea
  - Increased urination
  - Confusion
  - Drowsiness
  - Weakness
  - Headache
  - Nausea, vomiting, and/or abdominal pain
  - Slow or fast heart rate
  - Low or high blood pressure
- Even a small drop of sarin on the skin can cause sweating and muscle twitching where sarin touched the skin.
- Exposure to large doses of sarin by any route may result in the following harmful health effects:
  - Loss of consciousness
  - Convulsions
  - Paralysis
  - Respiratory failure possibly leading to death
- Showing these signs and symptoms does not necessarily mean that a person has been exposed to sarin.

What the long-term health effects are

Mild or moderately exposed people usually recover completely. Severely exposed people are not likely to survive. Unlike some organophosphate pesticides, nerve agents have not been associated with neurological problems lasting more than 1 to 2 weeks after the exposure.

How people can protect themselves, and what they should do if they are exposed to sarin

- Recovery from sarin exposure is possible with treatment, but the antidotes available must be used quickly to be effective. Therefore, the best thing to do is avoid exposure:

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Facts About Sarin
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    - Leave the area where the sarin was released and get to fresh air. Quickly moving to an area where fresh air is available is highly effective in reducing the possibility of death from exposure to sarin vapor.
        - If the sarin release was outdoors, move away from the area where the sarin was released. Go to the highest ground possible, because sarin is heavier than air and will sink to low-lying areas.
        - If the sarin release was indoors, get out of the building.
- If people think they may have been exposed, they should remove their clothing, rapidly wash their entire body with soap and water, and get medical care as quickly as possible.
- *Removing and disposing of clothing:*
    - Quickly take off clothing that has liquid sarin on it. Any clothing that has to be pulled over the head should be cut off the body instead of pulled over the head. If possible, seal the clothing in a plastic bag. Then seal the first plastic bag in a second plastic bag. Removing and sealing the clothing in this way will help protect people from any chemicals that might be on their clothes.
    - If clothes were placed in plastic bags, inform either the local or state health department or emergency personnel upon their arrival. Do not handle the plastic bags.
    - If helping other people remove their clothing, try to avoid touching any contaminated areas, and remove the clothing as quickly as possible.
- *Washing the body:*
    - As quickly as possible, wash any liquid sarin from the skin with large amounts of soap and water. Washing with soap and water will help protect people from any chemicals on their bodies.
    - Rinse the eyes with plain water for 10 to 15 minutes if they are burning or if vision is blurred.
- If sarin has been swallowed, do not induce vomiting or give fluids to drink.
- Seek medical attention immediately. Dial 911 and explain what has happened.

How sarin exposure is treated

Treatment consists of removing sarin from the body as soon as possible and providing supportive medical care in a hospital setting. Antidotes are available for sarin. They are most useful if given as soon as possible after exposure.

How people can get more information about sarin

People can contact one of the following:

- Regional poison control center (1-800-222-1222)
- Centers for Disease Control and Prevention
    - Public Response Hotline (CDC)
        - (800) 232-4636 (English and Spanish)
        - TTY (888) 232-6358
    - Emergency Preparedness and Response Web site (http://www.bt.cdc.gov/)
    - E-mail inquiries: cdcinfo@cdc.gov

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Facts About Sarin
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Last reviewed on 03/07/03.

The Centers for Disease Control and Prevention (CDC) protects people's health and safety by preventing and controlling diseases and injuries; enhances health decisions by providing credible information on critical health issues; and promotes healthy living through strong partnerships with local, national, and international organizations.

For more information, visit www.bt.cdc.gov/chemical, or call CDC at 800-CDC-INFO (English and Spanish) or 888-232-6348 (TTY).

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DEPARTMENT OF HEALTH AND HUMAN SERVICES
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CHEMICAL EMERGENCIES

FACT SHEET

Facts About Soman

What soman is

- Soman is a human-made chemical warfare agent classified as a nerve agent. Nerve agents are the most toxic and rapidly acting of the known chemical warfare agents. They are similar to pesticides (insect killers) called organophosphates in terms of how they work and the kinds of harmful effects they cause. However, nerve agents are much more potent than organophosphate pesticides.
- Soman was originally developed as an insecticide in Germany in 1944.
- Soman is also known as "GD."
- Soman is a clear, colorless, tasteless liquid with a slight camphor odor (for example, Vicks Vapo-Rub®) or rotting fruit odor. It can become a vapor if heated.

Where soman is found and how it is used

- It is possible that soman or other nerve agents were used in chemical warfare during the Iran-Iraq War in the 1980s.
- Soman is not found naturally in the environment.

How people can be exposed to soman

- Following release of soman into the air, people can be exposed through skin contact, eye contact, or inhalation (breathing in the soman).
- Soman mixes easily with water, so it could be used to poison water. Following release of soman into water, people can be exposed by drinking contaminated water or getting contaminated water on their skin.
- Following contamination of food with soman, people can be exposed by eating the contaminated food.
- A person's clothing can release soman for about 30 minutes after contact with soman vapor, which can lead to exposure of other people.
- Soman breaks down slowly in the body, meaning that repeated exposures to soman and/or other nerve agents can have a cumulative effect (build up in the body).
- Because soman vapor is heavier than air, it will sink to low-lying areas and create a greater exposure hazard there.

How soman works

- The extent of poisoning caused by soman depends on the amount of soman to which a person was exposed, how the person was exposed, and the length of time of the exposure.
- Symptoms will appear within a few seconds after exposure to the vapor form of soman, and within a few minutes to up to 18 hours after exposure to the liquid form.
- All the nerve agents cause their toxic effects by preventing the proper operation of the chemical that acts as the body's "off switch" for glands and muscles. Without an "off switch," the glands and muscles are constantly being stimulated. They may tire and no longer be able to sustain breathing function.

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Facts About Soman
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- Compared with other nerve agents, soman is more volatile than VX but less volatile than sarin. The higher a chemical's volatility, the more likely it will evaporate from a liquid into a vapor and disperse into the environment. People can be exposed to the vapor even if they do not come in contact with the liquid form.
- Because of its high volatility, soman is an immediate but short-lived threat and does not last a long time in the environment.
- Because soman is more volatile than the nerve agent VX (the most potent nerve agent), it will remain on exposed surfaces for a shorter period of time compared with VX.

Immediate signs and symptoms of soman exposure

- Although soman has a camphor or fruity odor, the odor may not be noticeable enough to give people sufficient warning against a toxic exposure.
- People exposed to a low or moderate dose of soman by inhalation, ingestion (swallowing), or skin absorption may experience some or all of the following symptoms within seconds to hours of exposure:
    - Runny nose
    - Watery eyes
    - Small, pinpoint pupils
    - Eye pain
    - Blurred vision
    - Drooling and excessive sweating
    - Cough
    - Chest tightness
    - Rapid breathing
    - Diarrhea
    - Increased urination
    - Confusion
    - Drowsiness
    - Weakness
    - Headache
    - Nausea, vomiting, and/or abdominal pain
    - Slow or fast heart rate
    - Abnormally low or high blood pressure
- Even a tiny drop of nerve agent on the skin can cause sweating and muscle twitching where the agent touched the skin.
- Exposure to a large dose of soman by any route may result in these additional health effects:
    - Loss of consciousness
    - Convulsions
    - Paralysis
    - Respiratory failure possibly leading to death
- Showing these signs and symptoms does not necessarily mean that a person has been exposed to soman.

What the long-term health effects are

Mild or moderately exposed people usually recover completely. Severely exposed people are not likely to survive. Unlike some organophosphate pesticides, nerve agents have not been associated with neurological problems lasting more than 1 to 2 weeks after the exposure.

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Facts About Soman
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How people can protect themselves, and what they should do if they are exposed to soman

- Recovery from soman exposure is possible with treatment, but the antidotes available must be used quickly (within minutes) to be effective. Therefore, the best thing to do is avoid exposure:
  - Leave the area where the soman was released and get to fresh air. Quickly moving to an area where fresh air is available is highly effective in reducing the possibility of death from exposure to soman vapor.
    - If the soman release was outdoors, move away from the area where the soman was released. Go to the highest ground possible, because soman is heavier than air and will sink to low-lying areas.
    - If the soman release was indoors, get out of the building.
- If people think they may have been exposed, they should remove their clothing, rapidly wash their entire body with soap and water, and get medical care as quickly as possible.
- *Removing and disposing of clothing:*
  - Quickly take off clothing that has liquid soman on it. Any clothing that has to be pulled over the head should be cut off the body instead of pulled over the head. If possible, seal the clothing in a plastic bag. Then seal the first plastic bag in a second plastic bag. Removing and sealing the clothing in this way will help protect people from any chemicals that might be on their clothes.
  - If clothes were placed in plastic bags, inform either the local or state health department or emergency personnel upon their arrival. Do not handle the plastic bags.
  - If helping other people remove their clothing, try to avoid touching any contaminated areas, and remove the clothing as quickly as possible.
- *Washing the body:*
  - As quickly as possible, wash any liquid soman from the skin with large amounts of soap and water. Washing with soap and water will help protect people from any chemicals on their bodies.
  - Rinse the eyes with plain water for 10 to 15 minutes if they are burning or if vision is blurred.
- If soman has been ingested (swallowed), do not induce vomiting or give fluids to drink.
- Seek medical attention right away. Dial 911 and explain what has happened.

How soman exposure is treated

Treatment consists of removing soman from the body as soon as possible and providing supportive medical care in a hospital setting. Antidotes are available for soman. They are most useful if given as soon as possible after exposure.

How people can get more information about soman

People can contact one of the following:

- Regional poison control center (1-800-222-1222)
- Centers for Disease Control and Prevention
  - Public Response Hotline (CDC)
    - (800) 232-4636 (English and Spanish)
    - TTY (888) 232-6358
  - Emergency Preparedness and Response Web site (http://www.bt.cdc.gov/)
  - E-mail inquiries: cdcinfo@cdc.gov

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Facts About Soman
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Last reviewed on 03/23/05

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CHEMICAL EMERGENCIES

FACT SHEET

Facts About Sulfur Mustard

What sulfur mustard is

- Sulfur mustard is a type of chemical warfare agent. These kinds of agents are called vesicants or blistering agents, because they cause blistering of the skin and mucous membranes on contact.
- Sulfur mustard is also known as "mustard gas or mustard agent," or by the military designations H, HD, and HT.
- Sulfur mustard sometimes smells like garlic, onions, or mustard and sometimes has no odor. It can be a vapor (the gaseous form of a liquid), an oily-textured liquid, or a solid.
- Sulfur mustard can be clear to yellow or brown when it is in liquid or solid form.

Where sulfur mustard is found and how it is used

- Sulfur mustard is not found naturally in the environment.
- Sulfur mustard was introduced in World War I as a chemical warfare agent. Until recently, it was available for use in the treatment of a skin condition called psoriasis. Currently, it has no medical use.

How people can be exposed to sulfur mustard

- If sulfur mustard is released into the air as a vapor, people can be exposed through skin contact, eye contact, or breathing. Sulfur mustard vapor can be carried long distances by wind.
- If sulfur mustard is released into water, people can be exposed by drinking the contaminated water or getting it on their skin.
- People can be exposed by coming in contact with liquid sulfur mustard.
- Sulfur mustard can last from 1 to 2 days in the environment under average weather conditions and from weeks to months under very cold conditions.
- Sulfur mustard breaks down slowly in the body, so repeated exposure may have a cumulative effect (that is, it can build up in the body).

How sulfur mustard works

- Adverse health effects caused by sulfur mustard depend on the amount people are exposed to, the route of exposure, and the length of time that people are exposed.
- Sulfur mustard is a powerful irritant and blistering agent that damages the skin, eyes, and respiratory (breathing) tract.
- It damages DNA, a vital component of cells in the body.
- Sulfur mustard vapor is heavier than air, so it will settle in low-lying areas.

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Facts About Sulfur Mustard
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Immediate signs and symptoms of sulfur mustard exposure

- Exposure to sulfur mustard is usually not fatal. When sulfur mustard was used during World War I, it killed fewer than 5% of the people who were exposed and got medical care.
- People may not know right away that they have been exposed, because sulfur mustard often has no smell or has a smell that might not cause alarm.
- Typically, signs and symptoms do not occur immediately. Depending on the severity of the exposure, symptoms may not occur for 2 to 24 hours. Some people are more sensitive to sulfur mustard than are other people, and may have symptoms sooner.
- Showing these signs and symptoms does not necessarily mean that a person has been exposed to sulfur mustard.
- Sulfur mustard can have the following effects on specific parts of the body:
  - *Skin*: redness and itching of the skin may occur 2 to 48 hours after exposure and change eventually to yellow blistering of the skin.
  - *Eyes*: irritation, pain, swelling, and tearing may occur within 3 to12 hours of a mild to moderate exposure. A severe exposure may cause symptoms within 1 to 2 hours and may include the symptoms of a mild or moderate exposure plus light sensitivity, severe pain, or blindness (lasting up to 10 days).
  - *Respiratory tract*: runny nose, sneezing, hoarseness, bloody nose, sinus pain, shortness of breath, and cough within 12 to 24 hours of a mild exposure and within 2 to 4 hours of a severe exposure.
  - *Digestive tract*: abdominal pain, diarrhea, fever, nausea, and vomiting.
- Showing these signs and symptoms does not necessarily mean that a person has been exposed to sulfur mustard.

What the long-term health effects may be

- Exposure to sulfur mustard liquid is more likely to produce second- and third- degree burns and later scarring than is exposure to sulfur mustard vapor. Extensive skin burning can be fatal.
- Extensive breathing in of the vapors can cause chronic respiratory disease, repeated respiratory infections, or death.
- Extensive eye exposure can cause permanent blindness.
- Exposure to sulfur mustard may increase a person's risk for lung and respiratory cancer.

How people can protect themselves and what they should do if they are exposed to sulfur mustard

- Because no antidote exists for sulfur mustard exposure, the best thing to do is avoid it. Immediately leave the area where the sulfur mustard was released. Try to find higher ground, because sulfur mustard is heavier than air and will settle in low-lying areas.
- If avoiding sulfur mustard exposure is not possible, rapidly remove the sulfur mustard from the body. Getting the sulfur mustard off as soon as possible after exposure is the only effective way to prevent or decrease tissue damage to the body.
- Quickly remove any clothing that has liquid sulfur mustard on it. If possible, seal the clothing in a plastic bag, and then seal that bag inside a second plastic bag.
- Immediately wash any exposed part of the body (eyes, skin, etc.) thoroughly with plain, clean water. Eyes need to be flushed with water for 5 to 10 minutes. Do NOT cover eyes with bandages, but do protect them with dark glasses or goggles.
- If someone has ingested sulfur mustard, do NOT induce vomiting. Give the person milk to drink.
- Seek medical attention right away. Dial 911 and explain what has happened.

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Facts About Sulfur Mustard
(continued from previous page)

How sulfur mustard exposure is treated

The most important factor is removing sulfur mustard from the body. Exposure to sulfur mustard is treated by giving the victim supportive medical care to minimize the effects of the exposure. Though no antidote exists for sulfur mustard, exposure is usually not fatal.

Where people can get more information about sulfur mustard

For more information about sulfur mustard, people can contact the following:

- Regional poison control center (1-800-222-1222)
- Centers for Disease Control and Prevention
  - Public Response Hotline (CDC)
    - 800-CDC-INFO
    - 888-232-6348 (TTY)
  - Emergency Preparedness and Response Web site (http://www.bt.cdc.gov/)
  - E-mail inquiries: cdcinfo@cdc.gov

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For more information, visit www.bt.cdc.gov/chemical, or call CDC at
800-CDC-INFO (English and Spanish) or 888-232-6348 (TTY).

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CHEMICAL EMERGENCIES

FACT SHEET

Facts About Tabun

What tabun is

- Tabun is a man-made chemical warfare agent classified as a nerve agent. Nerve agents are the most toxic and rapidly acting of the known chemical warfare agents. They are similar to pesticides (insect killers) called organophosphates in terms of how they work and what kinds of harmful effects they cause. However, nerve agents are much more potent than organophosphate pesticides.
- Tabun was originally developed as a pesticide in Germany in 1936.
- Tabun is also known as "GA."
- Tabun is a clear, colorless, tasteless liquid with a faint fruity odor. Tabun can become a vapor if heated.

Where tabun is found and how it is used

- It is possible that tabun or other nerve agents were used in chemical warfare during the Iran-Iraq War in the 1980s.
- Tabun is not found naturally in the environment.

How people can be exposed to tabun

- Following release of tabun into the air, people can be exposed through skin contact, eye contact, or inhalation (breathing in the tabun).
- Tabun mixes easily with water, so it could be used to poison water. Following release of tabun into water, people can be exposed by drinking contaminated water or getting contaminated water on their skin.
- Following contamination of food with tabun, people can be exposed by eating the contaminated food.
- A person's clothing can release tabun for about 30 minutes after contact with tabun vapor, which can lead to exposure of other people.
- Tabun breaks down slowly in the body, meaning that repeated exposures to tabun and/or other nerve agents can have a cumulative effect (build up in the body).
- Because tabun vapor is heavier than air, it will sink to low-lying areas and create a greater exposure hazard there.

How tabun works

- The extent of poisoning caused by tabun depends on the amount of tabun to which a person was exposed, how the person was exposed, and the length of time of the exposure.
- Symptoms will appear within a few seconds after exposure to the vapor form of tabun, and within a few minutes to up to 18 hours after exposure to the liquid form.
- All the nerve agents cause their toxic effects by preventing the proper operation of the chemical that acts as the body's "off switch" for glands and muscles. Without an "off switch," the glands and

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Facts About Tabun
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muscles are constantly being stimulated. They may tire and no longer be able to sustain breathing function.

- Compared with other nerve agents, tabun is more volatile than VX but less volatile than sarin. The higher a chemical's volatility, the more likely it will evaporate from a liquid into a vapor and disperse into the environment. People can be exposed to the vapor even if they do not come in contact with the liquid form.
- Because of its high volatility, tabun is an immediate but short-lived threat and does not last a long time in the environment.
- Because tabun is more volatile than VX, it will remain on exposed surfaces for a shorter period of time compared with VX.
- Because tabun is less volatile than sarin, it will remain on exposed surfaces for a longer period of time compared with sarin.

Immediate signs and symptoms of tabun exposure

- Although tabun has a faint fruity odor, the odor may not be noticeable enough to give people sufficient warning about a toxic exposure.
- People exposed to a low or moderate dose of tabun by inhalation, ingestion (swallowing), or skin absorption may experience some or all of the following symptoms within seconds to hours of exposure:
  - Runny nose
  - Watery eyes
  - Small, pinpoint pupils
  - Eye pain
  - Blurred vision
  - Drooling and excessive sweating
  - Cough
  - Chest tightness
  - Rapid breathing
  - Diarrhea
  - Increased urination
  - Confusion
  - Drowsiness
  - Weakness
  - Headache
  - Nausea, vomiting, and/or abdominal pain
  - Slow or fast heart rate
  - Abnormally low or high blood pressure
- Even a tiny drop of nerve agent on the skin can cause sweating and muscle twitching where the agent touched the skin.
- Exposure to a large dose of tabun by any route may result in these additional health effects:
  - Loss of consciousness
  - Convulsions
  - Paralysis
  - Respiratory failure possibly leading to death
- Showing these signs and symptoms does not necessarily mean that a person has been exposed to tabun.

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Facts About Tabun
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What the long-term health effects are

Mild or moderately exposed people usually recover completely. Severely exposed people are not likely to survive. Unlike some organophosphate pesticides, nerve agents have not been associated with neurological problems lasting more than 1 to 2 weeks after the exposure.

How people can protect themselves, and what they should do if they are exposed to tabun

- Recovery from tabun exposure is possible with treatment, but the antidotes available must be used quickly to be effective. Therefore, the best thing to do is avoid exposure:
  - Leave the area where the tabun was released and get to fresh air. Quickly moving to an area where fresh air is available is highly effective in reducing the possibility of death from exposure to tabun vapor.
    - If the tabun release was outdoors, move away from the area where the tabun was released. Go to the highest ground possible, because tabun is heavier than air and will sink to low-lying areas.
    - If the tabun release was indoors, get out of the building.
- If people think they may have been exposed, they should remove their clothing, rapidly wash their entire body with soap and water, and get medical care as quickly as possible.
- *Removing and disposing of clothing*:
  - Quickly take off clothing that has liquid tabun on it. Any clothing that has to be pulled over the head should be cut off the body instead of pulled over the head. If possible, seal the clothing in a plastic bag. Then seal the first plastic bag in a second plastic bag. Removing and sealing the clothing in this way will help protect people from any chemicals that might be on their clothes.
  - If clothes were placed in plastic bags, inform either the local or state health department or emergency personnel upon their arrival. Do not handle the plastic bags.
  - If helping other people remove their clothing, try to avoid touching any contaminated areas, and remove the clothing as quickly as possible.
- *Washing the body*:
  - As quickly as possible, wash any liquid tabun from the skin with large amounts of soap and water. Washing with soap and water will help protect people from any chemicals on their bodies.
  - Rinse the eyes with plain water for 10 to 15 minutes if they are burning or if vision is blurred.
- If tabun has been ingested (swallowed), do not induce vomiting or give fluids to drink.
- Seek medical attention right away. Dial 911 and explain what has happened.

How tabun exposure is treated

Treatment consists of removing tabun from the body as soon as possible and providing supportive medical care in a hospital setting. Antidotes are available for tabun. They are most useful if given as soon as possible after exposure.

How people can get more information about tabun

People can contact one of the following:

- Regional poison control center (1-800-222-1222)
- Centers for Disease Control and Prevention
  - Public Response Hotline (CDC)

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Facts About Tabun
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- (800) 232-4636 (English and Spanish)
- TTY (888) 232-6358

- Emergency Preparedness and Response Web site (http://www.bt.cdc.gov/)
- E-mail inquiries: cdcinfo@cdc.gov

This fact sheet is based on CDC's best current information. It may be updated as new information becomes available.

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For more information, visit www.bt.cdc.gov/chemical, or call CDC at 800-CDC-INFO (English and Spanish) or 888-232-6348 (TTY).

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CHEMICAL EMERGENCIES

FACT SHEET

Facts About VX

What VX is

- VX is a human-made chemical warfare agent classified as a nerve agent. Nerve agents are the most toxic and rapidly acting of the known chemical warfare agents. They are similar to pesticides (insect killers) called organophosphates in terms of how they work and what kinds of harmful effects they cause. However, nerve agents are much more potent than organophosphate pesticides.
- VX was originally developed in the United Kingdom in the early 1950s.
- VX is odorless and tasteless.
- VX is an oily liquid that is amber in color and very slow to evaporate. It evaporates about as slowly as motor oil.

Where VX is found and how it is used

- It is possible that VX or other nerve agents were used in chemical warfare during the Iran-Iraq War in the 1980s.
- VX is not found naturally in the environment.

How people can be exposed to VX

- Following release of VX into the air, people can be exposed through skin contact, eye contact, or inhalation (breathing in the VX mist).
- Though VX does not mix with water as easily as other nerve agents do, it could be released into water. Following release of VX into water, people can be exposed by drinking contaminated water or getting contaminated water on their skin.
- Following contamination of food with VX, people can be exposed by eating the contaminated food.
- VX is primarily a liquid exposure hazard, but if it is heated to very high temperatures, it can turn into small amounts of vapor (gas).
- A person's clothing can release VX for about 30 minutes after contact with VX vapor, which can lead to exposure of other people.
- VX breaks down slowly in the body, meaning that repeated exposures to VX and/or other nerve agents can have a cumulative effect (build up in the body).
- Because VX vapor is heavier than air, it will sink to low-lying areas and create a greater exposure hazard there.

How VX works

- The extent of poisoning caused by VX depends on the amount of VX to which a person was exposed, how the person was exposed, and the length of time of the exposure.
- Symptoms will appear within a few seconds after exposure to the vapor form of VX, and within a few minutes to up to 18 hours after exposure to the liquid form.

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Facts About VX
(continued from previous page)

- VX is the most potent of all nerve agents. Compared with the nerve agent sarin (also known as GB), VX is considered to be much more toxic by entry through the skin and somewhat more toxic by inhalation.
- It is possible that any visible VX liquid contact on the skin, unless washed off immediately, would be lethal.
- All the nerve agents cause their toxic effects by preventing the proper operation of the chemical that acts as the body's "off switch" for glands and muscles. Without an "off switch," the glands and muscles are constantly being stimulated. They may tire and no longer be able to sustain breathing function.
- VX is the least volatile of the nerve agents, which means that it is the slowest to evaporate from a liquid into a vapor. Therefore, VX is very persistent in the environment. Under average weather conditions, VX can last for days on objects that it has come in contact with. Under very cold conditions, VX can last for months.
- Because it evaporates so slowly, VX can be a long-term threat as well as a short-term threat. Surfaces contaminated with VX should therefore be considered a long-term hazard.

Immediate signs and symptoms of VX exposure

- People may not know they were exposed to VX because it has no odor.
- People exposed to a low or moderate dose of VX by inhalation, ingestion (swallowing), or skin absorption may experience some or all of the following symptoms within seconds to hours of exposure:
    - Runny nose
    - Watery eyes
    - Small, pinpoint pupils
    - Eye pain
    - Blurred vision
    - Drooling and excessive sweating
    - Cough
    - Chest tightness
    - Rapid breathing
    - Diarrhea
    - Increased urination
    - Confusion
    - Drowsiness
    - Weakness
    - Headache
    - Nausea, vomiting, and/or abdominal pain
    - Slow or fast heart rate
    - Abnormally low or high blood pressure
- Even a tiny drop of nerve agent on the skin can cause sweating and muscle twitching where the agent touched the skin.
- Exposure to a large dose of VX by any route may result in these additional health effects:
    - Loss of consciousness
    - Convulsions
    - Paralysis
    - Respiratory failure possibly leading to death
- Showing these signs and symptoms does not necessarily mean that a person has been exposed to VX.

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Facts About VX
(continued from previous page)

What the long-term health effects are

Mild or moderately exposed people usually recover completely. Severely exposed people are not likely to survive. Unlike some organophosphate pesticides, nerve agents have not been associated with neurological problems lasting more than 1 to 2 weeks after the exposure.

How people can protect themselves, and what they should do if they are exposed to VX

- Recovery from VX exposure is possible with treatment, but the antidotes available must be used quickly to be effective. Therefore, the best thing to do is avoid exposure:
  - Leave the area where the VX was released and get to fresh air. Quickly moving to an area where fresh air is available is highly effective in reducing the possibility of death from exposure to VX vapor.
    - If the VX release was outdoors, move away from the area where the VX was released. Go to the highest ground possible, because VX is heavier than air and will sink to low-lying areas.
    - If the VX release was indoors, get out of the building.
- If people think they may have been exposed, they should remove their clothing, rapidly wash their entire body with soap and water, and get medical care as quickly as possible.
- *Removing and disposing of clothing:*
  - Quickly take off clothing that has liquid VX on it. Any clothing that has to be pulled over the head should be cut off the body instead of pulled over the head. If possible, seal the clothing in a plastic bag. Then seal the first plastic bag in a second plastic bag. Removing and sealing the clothing in this way will help protect people from any chemicals that might be on their clothes.
  - If clothes were placed in plastic bags, inform either the local or state health department or emergency personnel upon their arrival. Do not handle the plastic bags.
  - If helping other people remove their clothing, try to avoid touching any contaminated areas, and remove the clothing as quickly as possible.
- *Washing the body:*
  - As quickly as possible, wash any liquid VX from the skin with large amounts of soap and water. Washing with soap and water will help protect people from any chemicals on their bodies.
  - Rinse the eyes with plain water for 10 to 15 minutes if they are burning or if vision is blurred.
- If VX has been ingested (swallowed), do not induce vomiting or give fluids to drink.
- Seek medical attention right away. Dial 911 and explain what has happened.

How VX exposure is treated

- Treatment consists of removing VX from the body as soon as possible and providing supportive medical care in a hospital setting. Antidotes are available for VX. They are most useful if given as soon as possible after exposure.

How people can get more information about VX

People can contact one of the following:

- Regional poison control center (1-800-222-1222)
- Centers for Disease Control and Prevention
  - Public Response Hotline (CDC)

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Facts About VX
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- (800) 232-4636 (English and Spanish)
- TTY (888) 232-6358

- Emergency Preparedness and Response Web site (http://www.bt.cdc.gov/)
- E-mail inquiries: cdcinfo@cdc.gov

This fact sheet is based on CDC's best current information. It may be updated as new information becomes available.

Last reviewed on 03/23/05.

The Centers for Disease Control and Prevention (CDC) protects people's health and safety by preventing and controlling diseases and injuries; enhances health decisions by providing credible information on critical health issues; and promotes healthy living through strong partnerships with local, national, and international organizations.

For more information, visit www.bt.cdc.gov/chemical, or call CDC at
800-CDC-INFO (English and Spanish) or 888-232-6348 (TTY).
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ANTHRAX

FACT SHEET

Anthrax: What You Need To Know

What Is Anthrax?

Anthrax is a serious disease caused by ***Bacillus anthracis***, a bacterium that forms spores. A bacterium is a very small organism made up of one cell. Many bacteria can cause disease. A spore is a cell that is dormant (asleep) but may come to life with the right conditions.

There are three types of anthrax:

- **skin (cutaneous)**
- **lungs (inhalation)**
- **digestive (gastrointestinal)**

How Do You Get It?

Anthrax is not known to spread from one person to another.

Anthrax from animals. Humans can become infected with anthrax by handling products from infected animals or by breathing in anthrax spores from infected animal products (like wool, for example). People also can become infected with gastrointestinal anthrax by eating undercooked meat from infected animals.

Anthrax as a weapon. Anthrax also can be used as a weapon. This happened in the United States in 2001. Anthrax was deliberately spread through the postal system by sending letters with powder containing anthrax. This caused 22 cases of anthrax infection.

How Dangerous Is Anthrax?

The Centers for Disease Control and Prevention classifies agents with recognized bioterrorism potential into three priority areas (A, B and C). Anthrax is classified as a Category A agent. Category A agents are those that:

- pose the greatest possible threat for a bad effect on public health
- may spread across a large area or need public awareness
- need a great deal of planning to protect the public's health

In most cases, early treatment with antibiotics can cure cutaneous anthrax. Even if untreated, 80 percent of people who become infected with cutaneous anthrax do not die. Gastrointestinal anthrax is more serious because between one-fourth and more than half of cases lead to death. Inhalation anthrax is much more severe. In 2001, about half of the cases of inhalation anthrax ended in death.

What Are the Symptoms?

The symptoms (warning signs) of anthrax are different depending on the type of the disease:

- Cutaneous: The first symptom is a small sore that develops into a blister. The blister then develops into a skin ulcer with a black area in the center. The sore, blister and ulcer do not hurt.
- Gastrointestinal: The first symptoms are nausea, loss of appetite, bloody diarrhea, and fever, followed by bad stomach pain.

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Anthrax: What You Need To Know
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- Inhalation: The first symptoms of inhalation anthrax are like cold or flu symptoms and can include a sore throat, mild fever and muscle aches. Later symptoms include cough, chest discomfort, shortness of breath, tiredness and muscle aches. (Caution: Do not assume that just because a person has cold or flu symptoms that they have inhalation anthrax.)

How Soon Do Infected People Get Sick?
Symptoms can appear within 7 days of coming in contact with the bacterium for all three types of anthrax. For inhalation anthrax, symptoms can appear within a week or can take up to 42 days to appear.

How Is Anthrax Treated?
Antibiotics are used to treat all three types of anthrax. Early identification and treatment are important.

Prevention after exposure. Treatment is different for a person who is exposed to anthrax, but is not yet sick. Health-care providers will use antibiotics (such as ciprofloxacin, levofloxacin, doxycycline, or penicillin) combined with the anthrax vaccine to prevent anthrax infection.

Treatment after infection. Treatment is usually a 60-day course of antibiotics. Success depends on the type of anthrax and how soon treatment begins.

Can Anthrax Be Prevented?
Vaccination. There is a vaccine to prevent anthrax, but it is not yet available for the general public. Anyone who may be exposed to anthrax, including certain members of the U.S. armed forces, laboratory workers, and workers who may enter or re-enter contaminated areas, may get the vaccine. Also, in the event of an attack using anthrax as a weapon, people exposed would get the vaccine.

What Should I Do if I Think I Have Anthrax?
If you are showing symptoms of anthrax infection, call your health-care provider right away.

What Should I Do if I Think I Have Been Exposed to Anthrax?
Contact local law enforcement immediately if you think that you may have been exposed to anthrax. This includes being exposed to a suspicious package or envelope that contains powder.

What Is CDC Doing To Prepare For a Possible Anthrax Attack?
CDC is working with state and local health authorities to prepare for an anthrax attack. Activities include:

- Developing plans and procedures to respond to an attack using anthrax.
- Training and equipping emergency response teams to help state and local governments control infection, gather samples, and perform tests. Educating health-care providers, media, and the general public about what to do in the event of an attack.
- Working closely with health departments, veterinarians, and laboratories to watch for suspected cases of anthrax. Developing a national electronic database to track potential cases of anthrax.
- Ensuring that there are enough safe laboratories for quickly testing of suspected anthrax cases.
- Working with hospitals, laboratories, emergency response teams, and health-care providers to make sure they have the supplies they need in case of an attack.

For more information, visit www.bt.cdc.gov/agent/anthrax,
or call CDC at 800-CDC-INFO (English and Spanish) or 888-232-6348 (TTY).

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BOTULISM

FACT SHEET

Facts about Botulism

Botulism is a muscle-paralyzing disease caused by a toxin made by a bacterium called *Clostridium botulinum*.

There are three main kinds of botulism:

- Foodborne botulism occurs when a person ingests pre-formed toxin that leads to illness within a few hours to days. Foodborne botulism is a public health emergency because the contaminated food may still be available to other persons besides the patient.
- Infant botulism occurs in a small number of susceptible infants each year who harbor *C. botulinum* in their intestinal tract.
- Wound botulism occurs when wounds are infected with *C. botulinum* that secretes the toxin.

With foodborne botulism, symptoms begin within 6 hours to 2 weeks (most commonly between 12 and 36 hours) after eating toxin-containing food. Symptoms of botulism include double vision, blurred vision, drooping eyelids, slurred speech, difficulty swallowing, dry mouth, muscle weakness that always descends through the body: first shoulders are affected, then upper arms, lower arms, thighs, calves, etc. Paralysis of breathing muscles can cause a person to stop breathing and die, unless assistance with breathing (mechanical ventilation) is provided.

Botulism is not spread from one person to another. Foodborne botulism can occur in all age groups. A supply of antitoxin against botulism is maintained by CDC. The antitoxin is effective in reducing the severity of symptoms if administered early in the course of the disease. Most patients eventually recover after weeks to months of supportive care.

For more information, visit www.bt.cdc.gov or call the CDC public response hotline at (888) 246-2675 (English), (888) 246-2857 (Español), or (866) 874-2646 (TTY)

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Division of Bacterial and Mycotic Diseases

Botulism

For comprehensive CDC information about bioterrorism and related issues, please visit http://www.bt.cdc.gov.

General Information |

Frequently Asked Questions

- What is botulism?
- What kind of germ is *Clostridium botulinum*?
- How common is botulism?
- What are the symptoms of botulism?
- How is botulism diagnosed?
- How can botulism be treated?
- Are there complications from botulism?
- How can botulism be prevented?
- What are public health agencies doing to prevent or control botulism?

What is botulism?

Botulism is a rare but serious paralytic illness caused by a nerve toxin that is produced by the bacterium *Clostridium botulinum*. There are three main kinds of botulism. Foodborne botulism is caused by eating foods that contain the botulism toxin. Wound botulism is caused by toxin produced from a wound infected with *Clostridium botulinum*. Infant botulism is caused by consuming the spores of the botulinum bacteria, which then grow in the intestines and release toxin. All forms of botulism can be fatal and are considered medical emergencies. Foodborne botulism can be especially dangerous because many people can be poisoned by eating a contaminated food.

What kind of germ is *Clostridium botulinum*?

Clostridium botulinum is the name of a group of bacteria commonly found in soil. These rod-shaped organisms grow best in low oxygen conditions. The bacteria form

spores which allow them to survive in a dormant state until exposed to conditions that can support their growth. There are seven types of botulism toxin designated by the letters A through G; only types A, B, E and F cause illness in humans.

How common is botulism?

In the United States an average of 110 cases of botulism are reported each year. Of these, approximately 25% are foodborne, 72% are infant botulism, and the rest are wound botulism. Outbreaks of foodborne botulism involving two or more persons occur most years and usually caused by eating contaminated home-canned foods. The number of cases of foodborne and infant botulism has changed little in recent years, but wound botulism has increased because of the use of black-tar heroin, especially in California.

What are the symptoms of botulism?

The classic symptoms of botulism include double vision, blurred vision, drooping eyelids, slurred speech, difficulty swallowing, dry mouth, and muscle weakness. Infants with botulism appear lethargic, feed poorly, are constipated, and have a weak cry and poor muscle tone. These are all symptoms of the muscle paralysis caused by the bacterial toxin. If untreated, these symptoms may progress to cause paralysis of the arms, legs, trunk and respiratory muscles. In foodborne botulism, symptoms generally begin 18 to 36 hours after eating a contaminated food, but they can occur as early as 6 hours or as late as 10 days.

How is botulism diagnosed?

Physicians may consider the diagnosis if the patient's history and physical examination suggest botulism. However, these clues are usually not enough to allow a diagnosis of botulism. Other diseases such as Guillain-Barré syndrome, stroke, and myasthenia gravis can appear similar to botulism, and special tests may be needed to exclude these other conditions. These tests may include a brain scan, spinal fluid examination, nerve conduction test (electromyography, or EMG), and a tensilon test for myasthenia gravis. The most direct way to confirm the diagnosis is to demonstrate the botulinum toxin in the patient's serum or stool by injecting serum or stool into mice and looking for signs of botulism. The bacteria can also be isolated from the stool of persons with foodborne and infant botulism. These tests can be performed at some state health department laboratories and at CDC.

How can botulism be treated?

The respiratory failure and paralysis that occur with severe botulism may require a patient to be on a breathing machine (ventilator) for weeks, plus intensive medical and nursing care. After several weeks, the paralysis slowly improves. If diagnosed early, foodborne and wound botulism can be treated with an antitoxin which blocks the action of toxin circulating in the blood. This can prevent patients from worsening, but recovery still takes many weeks. Physicians may try to remove contaminated food still in the gut by inducing vomiting or by using enemas. Wounds should be treated, usually surgically, to remove the source of the toxin-producing bacteria. Good supportive care in a hospital is the mainstay of therapy for all forms of botulism. Currently, antitoxin is not routinely given for treatment of infant botulism.

Are there complications from botulism?

Botulism can result in death due to respiratory failure. However, in the past 50 years the proportion of patients with botulism who die has fallen from about 50% to 8%. A patient with severe botulism may require a breathing machine as well as intensive medical and nursing care for several months. Patients who survive an episode of

botulism poisoning may have fatigue and shortness of breath for years and long-term therapy may be needed to aid recovery.

How can botulism be prevented?

Botulism can be prevented. Foodborne botulism has often been from home-canned foods with low acid content, such as asparagus, green beans, beets and corn. However, outbreaks of botulism from more unusual sources such as chopped garlic in oil, chile peppers, tomatoes, improperly handled baked potatoes wrapped in aluminum foil, and home-canned or fermented fish. Persons who do home canning should follow strict hygienic procedures to reduce contamination of foods. Oils infused with garlic or herbs should be refrigerated. Potatoes which have been baked while wrapped in aluminum foil should be kept hot until served or refrigerated. Because the botulism toxin is destroyed by high temperatures, persons who eat home-canned foods should consider boiling the food for 10 minutes before eating it to ensure safety. Instructions on safe home canning can be obtained from county extension services or from the US Department of Agriculture. Because honey can contain spores of *Clostridium botulinum* and this has been a source of infection for infants, children less than 12 months old should not be fed honey. Honey is safe for persons 1 year of age and older. Wound botulism can be prevented by promptly seeking medical care for infected wounds and by not using injectable street drugs.

What are public health agencies doing to prevent or control botulism?

Public education about botulism prevention is an ongoing activity. Information about safe canning is widely available for consumers. State health departments and CDC have persons knowledgeable about botulism available to consult with physicians 24 hours a day. If antitoxin is needed to treat a patient, it can be quickly delivered to a physician anywhere in the country. Suspected outbreaks of botulism are quickly investigated, and if they involve a commercial product, the appropriate control measures are coordinated among public health and regulatory agencies. Physicians should report suspected cases of botulism to a state health department.

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PLAGUE

Frequently Asked Questions About Plague

What is plague?
Plague is a disease caused by *Yersinia pestis* (*Y. pestis*), a bacterium found in rodents and their fleas in many areas around the world.

Why are we concerned about pneumonic plague as a bioweapon?
Yersinia pestis used in an aerosol attack could cause cases of the pneumonic form of plague. One to six days after becoming infected with the bacteria, people would develop pneumonic plague. Once people have the disease, the bacteria can spread to others who have close contact with them. Because of the delay between being exposed to the bacteria and becoming sick, people could travel over a large area before becoming contagious and possibly infecting others. Controlling the disease would then be more difficult. A bioweapon carrying *Y. pestis* is possible because the bacterium occurs in nature and could be isolated and grown in quantity in a laboratory. Even so, manufacturing an effective weapon using *Y. pestis* would require advanced knowledge and technology.

Is pneumonic plague different from bubonic plague?
Yes. Both are caused by *Yersinia pestis*, but they are transmitted differently and their symptoms differ. Pneumonic plague can be transmitted from person to person; bubonic plague cannot. Pneumonic plague affects the lungs and is transmitted when a person breathes in *Y. pestis* particles in the air. Bubonic plague is transmitted through the bite of an infected flea or exposure to infected material through a break in the skin. Symptoms include swollen, tender lymph glands called buboes. Buboes are not present in pneumonic plague. If bubonic plague is not treated, however, the bacteria can spread through the bloodstream and infect the lungs, causing a secondary case of pneumonic plague.

What are the signs and symptoms of pneumonic plague?
Patients usually have fever, weakness, and rapidly developing pneumonia with shortness of breath, chest pain, cough, and sometimes bloody or watery sputum. Nausea, vomiting, and abdominal pain may also occur. Without early treatment, pneumonic plague usually leads to respiratory failure, shock, and rapid death.

How do people become infected with pneumonic plague?
Pneumonic plague occurs when *Yersinia pestis* infects the lungs. Transmission can take place if someone breathes in *Y. pestis* particles, which could happen in an aerosol release during a bioterrorism attack. Pneumonic plague is also transmitted by breathing in *Y. pestis* suspended in respiratory droplets from a person (or animal) with pneumonic plague. Respiratory droplets are spread most readily by coughing or sneezing. Becoming infected in this way usually requires direct and close (within 6 feet) contact with the ill person or animal. Pneumonic plague may also occur if a person with bubonic or septicemic plague is untreated and the bacteria spread to the lungs.

Does plague occur naturally?
Yes. The World Health Organization reports 1,000 to 3,000 cases of plague worldwide every year. An average of 5 to 15 cases occur each year in the western United States. These cases are usually scattered and occur in rural to semi-rural areas. Most cases are of the bubonic form of the disease. Naturally occurring pneumonic plague is uncommon, although small outbreaks do occur. Both types of plague are readily controlled by standard public health response measures.

Can a person exposed to pneumonic plague avoid becoming sick?
Yes. People who have had close contact with an infected person can greatly reduce the chance of

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Frequently Asked Questions About Plague
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becoming sick if they begin treatment within 7 days of their exposure. Treatment consists of taking antibiotics for at least 7 days.

How quickly would someone get sick if exposed to plague bacteria through the air?
Someone exposed to *Yersinia pestis* through the air—either from an intentional aerosol release or from close and direct exposure to someone with plague pneumonia—would become ill within 1 to 6 days.

Can pneumonic plague be treated?
Yes. To prevent a high risk of death, antibiotics should be given within 24 hours of the first symptoms. Several types of antibiotics are effective for curing the disease and for preventing it. Available oral medications are a tetracycline (such as doxycycline) or a fluoroquinolone (such as ciprofloxacin). For injection or intravenous use, streptomycin or gentamicin antibiotics are used. Early in the response to a bioterrorism attack, these drugs would be tested to determine which is most effective against the particular weapon that was used.

Would enough medication be available in the event of a bioterrorism attack involving pneumonic plague?
National and state public health officials have large supplies of drugs needed in the event of a bioterrorism attack. These supplies can be sent anywhere in the United States within 12 hours.

What should someone do if they suspect they or others have been exposed to plague?
Get immediate medical attention: To prevent illness, a person who has been exposed to pneumonic plague must receive antibiotic treatment without delay. If an exposed person becomes ill, antibiotics must be administered within 24 hours of their first symptoms to reduce the risk of death. Notify authorities: Immediately notify local or state health departments so they can begin to investigate and control the problem right away. If bioterrorism is suspected, the health departments will notify the CDC, FBI, and other appropriate authorities.

How can the general public reduce the risk of getting pneumonic plague from another person or giving it to someone else?
If possible, avoid close contact with other people. People having direct and close contact with someone with pneumonic plague should wear tightly fitting disposable surgical masks. If surgical masks are not available, even makeshift face coverings made of layers of cloth may be helpful in an emergency. People who have been exposed to a contagious person can be protected from developing plague by receiving prompt antibiotic treatment.

How is plague diagnosed?
The first step is evaluation by a health worker. If the health worker suspects pneumonic plague, samples of the patient's blood, sputum, or lymph node aspirate are sent to a laboratory for testing. Once the laboratory receives the sample, preliminary results can be ready in less than two hours. Confirmation will take longer, usually 24 to 48 hours.

How long can plague bacteria exist in the environment?
Yersinia pestis is easily destroyed by sunlight and drying. Even so, when released into air, the bacterium will survive for up to one hour, depending on conditions.

Is a vaccine available to prevent pneumonic plague?
Currently, no plague vaccine is available in the United States. Research is in progress, but we are not likely to have vaccines for several years or more.

For more information, visit www.bt.cdc.gov/agent/plague,
or call CDC at 800-CDC-INFO (English and Spanish) or 888-232-6348 (TTY).
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CHEMICAL EMERGENCIES

FACT SHEET

Facts About Ricin

What ricin is

- Ricin is a poison that can be made from the waste left over from processing castor beans.
- It can be in the form of a powder, a mist, or a pellet, or it can be dissolved in water or weak acid.
- It is a stable substance. For example, it is not affected much by extreme conditions such as very hot or very cold temperatures.

Where ricin is found and how it is used

- Castor beans are processed throughout the world to make castor oil. Ricin is part of the waste "mash" produced when castor oil is made.
- Ricin has some potential medical uses, such as bone marrow transplants and cancer treatment (to kill cancer cells).

How you could be exposed to ricin

- It would take a deliberate act to make ricin and use it to poison people. Accidental exposure to ricin is highly unlikely.
- People can breathe in ricin mist or powder and be poisoned.
- Ricin can also get into water or food and then be swallowed.
- Pellets of ricin, or ricin dissolved in a liquid, can be injected into people's bodies.
- Depending on the route of exposure (such as injection or inhalation), as little as 500 micrograms of ricin could be enough to kill an adult. A 500-microgram dose of ricin would be about the size of the head of a pin. A greater amount would likely be needed to kill people if the ricin were swallowed.
- In 1978, Georgi Markov, a Bulgarian writer and journalist who was living in London, died after he was attacked by a man with an umbrella. The umbrella had been rigged to inject a poison ricin pellet under Markov's skin.
- Some reports have indicated that ricin may have been used in the Iran-Iraq war during the 1980s and that quantities of ricin were found in Al Qaeda caves in Afghanistan.
- Ricin poisoning is not contagious. It cannot be spread from person to person through casual contact.

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Facts About Ricin
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How ricin works

- Ricin works by getting inside the cells of a person's body and preventing the cells from making the proteins they need. Without the proteins, cells die. Eventually this is harmful to the whole body, and death may occur.
- Effects of ricin poisoning depend on whether ricin was inhaled, ingested, or injected.

Signs and symptoms of ricin exposure

- The major symptoms of ricin poisoning depend on the route of exposure and the dose received, though many organs may be affected in severe cases.
- Initial symptoms of ricin poisoning by inhalation may occur within 8 hours of exposure. Following ingestion of ricin, initial symptoms typically occur in less than 6 hours.
- **Inhalation:** Within a few hours of inhaling significant amounts of ricin, the likely symptoms would be respiratory distress (difficulty breathing), fever, cough, nausea, and tightness in the chest. Heavy sweating may follow as well as fluid building up in the lungs (pulmonary edema). This would make breathing even more difficult, and the skin might turn blue. Excess fluid in the lungs would be diagnosed by x-ray or by listening to the chest with a stethoscope. Finally, low blood pressure and respiratory failure may occur, leading to death. In cases of known exposure to ricin, people having respiratory symptoms that started within 12 hours of inhaling ricin should seek medical care.
- **Ingestion:** If someone swallows a significant amount of ricin, he or she would develop vomiting and diarrhea that may become bloody. Severe dehydration may be the result, followed by low blood pressure. Other signs or symptoms may include hallucinations, seizures, and blood in the urine. Within several days, the person's liver, spleen, and kidneys might stop working, and the person could die.
- Skin and eye exposure: Ricin in the powder or mist form can cause redness and pain of the skin and the eyes.
- Death from ricin poisoning could take place within 36 to 72 hours of exposure, depending on the route of exposure (inhalation, ingestion, or injection) and the dose received. If death has not occurred in 3 to 5 days, the victim usually recovers.
- Showing these signs and symptoms does not necessarily mean that a person has been exposed to ricin.

How ricin poisoning is treated

Because no antidote exists for ricin, the most important factor is avoiding ricin exposure in the first place. If exposure cannot be avoided, the most important factor is then getting the ricin off or out of the body as quickly as possible. Ricin poisoning is treated by giving victims supportive medical care to minimize the effects of the poisoning. The types of supportive medical care would depend on several factors, such as the route by which victims were poisoned (that is, whether poisoning was by inhalation, ingestion, or skin or eye exposure). Care could include such measures as helping victims breathe, giving them intravenous fluids (fluids given through a needle inserted into a vein), giving them medications to treat conditions such as seizure and low blood pressure, flushing their stomachs with activated charcoal (if the ricin has been very recently ingested), or washing out their eyes with water if their eyes are irritated.

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Facts About Ricin
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How you can know whether you have been exposed to ricin

- If we suspect that people have inhaled ricin, a potential clue would be that a large number of people who had been close to each other suddenly developed fever, cough, and excess fluid in their lungs. These symptoms could be followed by severe breathing problems and possibly death.
- No widely available, reliable test exists to confirm that a person has been exposed to ricin.

How you can protect yourself, and what to do if you are exposed to ricin

- First, get fresh air by leaving the area where the ricin was released. Moving to an area with fresh air is a good way to reduce the possibility of death from exposure to ricin.
  - If the ricin release was outside, move away from the area where the ricin was released.
  - If the ricin release was indoors, get out of the building.
- If you are near a release of ricin, emergency coordinators may tell you to either evacuate the area or to "shelter in place" inside a building to avoid being exposed to the chemical. For more information on evacuation during a chemical emergency, see "Facts About Evacuation" at http://www.bt.cdc.gov/planning/evacuationfacts.asp. For more information on sheltering in place during a chemical emergency, see "Facts About Sheltering in Place" at http://www.bt.cdc.gov/planning/shelteringfacts.asp.
- If you think you may have been exposed to ricin, you should remove your clothing, rapidly wash your entire body with soap and water, and get medical care as quickly as possible.
- *Removing your clothing:*
  - Quickly take off clothing that may have ricin on it. Any clothing that has to be pulled over the head should be cut off the body instead of pulled over the head.
  - If you are helping other people remove their clothing, try to avoid touching any contaminated areas, and remove the clothing as quickly as possible.
- *Washing yourself:*
  - As quickly as possible, wash any ricin from your skin with large amounts of soap and water. Washing with soap and water will help protect people from any chemicals on their bodies.
  - If your eyes are burning or your vision is blurred, rinse your eyes with plain water for 10 to 15 minutes. If you wear contacts, remove them and put them with the contaminated clothing. Do not put the contacts back in your eyes (even if they are not disposable contacts). If you wear eyeglasses, wash them with soap and water. You can put your eyeglasses back on after you wash them.
- *Disposing of your clothes:*
  - After you have washed yourself, place your clothing inside a plastic bag. Avoid touching contaminated areas of the clothing. If you can't avoid touching contaminated areas, or you aren't sure where the contaminated areas are, wear rubber gloves, turn the bag inside out and use it to pick up the clothing, or put the clothing in the bag using tongs, tool handles, sticks, or similar objects. Anything that touches the contaminated clothing should also be placed in the bag. If you wear contacts, put them in the plastic bag, too.
  - Seal the bag, and then seal that bag inside another plastic bag. Disposing of your clothing in this way will help protect you and other people from any chemicals that might be on your clothes.

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Facts About Ricin
(continued from previous page)

- When the local or state health department or emergency personnel arrive, tell them what you did with your clothes. The health department or emergency personnel will arrange for further disposal. Do not handle the plastic bags yourself.

- For more information about cleaning your body and disposing of your clothes after a chemical release, see "Chemical Agents: Facts About Personal Cleaning and Disposal of Contaminated Clothing" at http://www.bt.cdc.gov/planning/personalcleaningfacts.asp.
- If someone has ingested ricin, do not induce vomiting or give fluids to drink.
- Seek medical attention right away. Dial 911 and explain what has happened.

How you can get more information about ricin

You can contact one of the following:

- Regional poison control center (1-800-222-1222)
- Centers for Disease Control and Prevention
  - Public Response Hotline (CDC)
    - 800-CDC-INFO
    - 888-232-6348 (TTY)
  - Emergency Preparedness and Response Web site (http://www.bt.cdc.gov/)
  - E-mail inquiries: cdcinfo@cdc.gov

This fact sheet is based on CDC's best current information. It may be updated as new information becomes available.

For more information, visit www.bt.cdc.gov/chemical, or call CDC at 800-CDC-INFO (English and Spanish) or 888-232-6348 (TTY).

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SMALLPOX

Frequently Asked Questions About Smallpox

IN GENERAL

What should I know about smallpox?

Smallpox is an acute, contagious, and sometimes fatal disease caused by the variola virus (an orthopoxvirus), and marked by fever and a distinctive progressive skin rash. In 1980, the disease was declared eradicated following worldwide vaccination programs. However, in the aftermath of the events of September and October, 2001, the U.S. government is taking precautions to be ready to deal with a bioterrorist attack using smallpox as a weapon. As a result of these efforts: 1) There is a detailed nationwide smallpox preparedness program to protect Americans against smallpox as a biological weapon. This program includes the creation of preparedness teams that are ready to respond to a smallpox attack on the United States. Members of these teams – health care and public health workers - are being vaccinated so that they might safely protect others in the event of a smallpox outbreak. 2) There is enough smallpox vaccine to vaccinate everyone who would need it in the event of an emergency. (updated Feb 24, 2003)

How serious is the smallpox threat?

The deliberate release of smallpox as an epidemic disease is now regarded as a possibility, and the United States is taking precautions to deal with this possibility. (added Nov 13, 2002)

How dangerous is the smallpox threat?

Smallpox is classified as a Category A agent by the Centers for Disease Control and Prevention. Category A agents are believed to pose the greatest potential threat for adverse public health impact and have a moderate to high potential for large-scale dissemination. The public is generally more aware of category A agents, and broad-based public health preparedness efforts are necessary. Other Category A agents are anthrax, plague, botulism, tularemia, and viral hemorrhagic fevers. (added Nov 13, 2002)

If I am concerned about a smallpox attack, can I go to my doctor and get the smallpox vaccine?

At the moment, the smallpox vaccine is not available for members of the general public. In the event of a smallpox outbreak, however, there is enough smallpox vaccine to vaccinate everyone in the United States. (updated Dec 29, 2004)

THE DISEASE

What are the symptoms of smallpox?

The symptoms of smallpox begin with high fever, head and body aches, and sometimes vomiting. A rash follows that spreads and progresses to raised bumps and pus-filled blisters that crust, scab, and fall off after about three weeks, leaving a pitted scar. (added Nov 13, 2002)

If someone comes in contact with smallpox, how long does it take to show symptoms?

After exposure, it takes between 7 and 17 days for symptoms of smallpox to appear (average incubation time is 12 to 14 days). During this time, the infected person feels fine and is not contagious. (added Nov 13, 2002)

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Is smallpox fatal?
The majority of patients with smallpox recover, but death may occur in up to 30% of cases. Many smallpox survivors have permanent scars over large areas of their body, especially their face. Some are left blind. (added Nov 13, 2002)

How is smallpox spread?
Smallpox normally spreads from contact with infected persons. Generally, direct and fairly prolonged face-to-face contact is required to spread smallpox from one person to another. Smallpox also can be spread through direct contact with infected bodily fluids or contaminated objects such as bedding or clothing. Indirect spread is less common. Rarely, smallpox has been spread by virus carried in the air in enclosed settings such as buildings, buses, and trains. Smallpox is not known to be transmitted by insects or animals. (added Nov 13, 2002)

If smallpox is released in aerosol form, how long does the virus survive?
The smallpox virus is fragile. In laboratory experiments, 90% of aerosolized smallpox virus dies within 24 hours; in the presence of ultraviolet (UV) light, this percentage would be even greater. If an aerosol release of smallpox occurs, 90% of virus matter will be inactivated or dissipated in about 24 hours. (added Nov 13, 2002)

How many people would have to get smallpox before it is considered an outbreak?
One confirmed case of smallpox is considered a public health emergency. (added Nov 13, 2002)

Is smallpox contagious before the smallpox symptoms show?
A person with smallpox is sometimes contagious with onset of fever (prodrome phase), but the person becomes most contagious with the onset of rash. The infected person is contagious until the last smallpox scab falls off. (added Nov 13, 2002)

Is there any treatment for smallpox?
Smallpox can be prevented through use of the smallpox vaccine. There is no proven treatment for smallpox, but research to evaluate new antiviral agents is ongoing. Early results from laboratory studies suggest that the drug cidofovir may fight against the smallpox virus; currently, studies with animals are being done to better understand the drug's ability to treat smallpox disease (the use of cidofovir to treat smallpox or smallpox reactions should be evaluated and monitored by experts at NIH and CDC). Patients with smallpox can benefit from supportive therapy (e.g., intravenous fluids, medicine to control fever or pain) and antibiotics for any secondary bacterial infections that may occur. (updated Dec 2, 2002)

For more information, visit www.cdc.gov/smallpox, or call CDC at 800-CDC-INFO (English and Spanish) or 888-232-6348 (TTY).
December 29, 2004 Page 2 of 2

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SMALLPOX

SMALLPOX FACT SHEET

Smallpox Overview

The Disease

Smallpox is a serious, contagious, and sometimes fatal infectious disease. There is no specific treatment for smallpox disease, and the only prevention is vaccination. The name *smallpox* is derived from the Latin word for "spotted" and refers to the raised bumps that appear on the face and body of an infected person.

There are two clinical forms of smallpox. Variola major is the severe and most common form of smallpox, with a more extensive rash and higher fever. There are four types of variola major smallpox: ordinary (the most frequent type, accounting for 90% or more of cases); modified (mild and occurring in previously vaccinated persons); flat; and hemorrhagic (both rare and very severe). Historically, variola major has an overall fatality rate of about 30%; however, flat and hemorrhagic smallpox usually are fatal. Variola minor is a less common presentation of smallpox, and a much less severe disease, with death rates historically of 1% or less.

Smallpox outbreaks have occurred from time to time for thousands of years, but the disease is now eradicated after a successful worldwide vaccination program. The last case of smallpox in the United States was in 1949. The last naturally occurring case in the world was in Somalia in 1977. After the disease was eliminated from the world, routine vaccination against smallpox among the general public was stopped because it was no longer necessary for prevention.

Where Smallpox Comes From

Smallpox is caused by the variola virus that emerged in human populations thousands of years ago. Except for laboratory stockpiles, the variola virus has been eliminated. However, in the aftermath of the events of September and October, 2001, there is heightened concern that the variola virus might be used as an agent of bioterrorism. For this reason, the U.S. government is taking precautions for dealing with a smallpox outbreak.

Transmission

Generally, direct and fairly prolonged face-to-face contact is required to spread smallpox from one person to another. Smallpox also can be spread through direct contact with infected bodily fluids or contaminated objects such as bedding or clothing. Rarely, smallpox has been spread by virus carried in the air in enclosed settings such as buildings, buses, and trains. Humans are the only natural hosts of variola. Smallpox is not known to be transmitted by insects or animals.

A person with smallpox is sometimes contagious with onset of fever (prodrome phase), but the person becomes most contagious with the onset of rash. At this stage the infected person is usually very sick and not able to move around in the community. The infected person is contagious until the last smallpox scab falls off.

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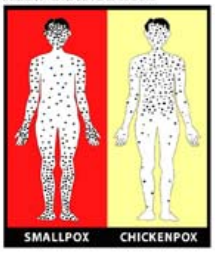
Smallpox Disease	
Incubation Period **(Duration: 7 to 17 days)** ***Not contagious***	**Exposure to the virus** is followed by an incubation period during which people do not have any symptoms and may feel fine. This incubation period averages about 12 to 14 days but can range from 7 to 17 days. During this time, people are not contagious.
Initial Symptoms ***(Prodrome)*** **(Duration: 2 to 4 days)** ***Sometimes contagious****	The **first symptoms** of smallpox include fever, malaise, head and body aches, and sometimes vomiting. The fever is usually high, in the range of 101 to 104 degrees Fahrenheit. At this time, people are usually too sick to carry on their normal activities. This is called the *prodrome* phase and may last for 2 to 4 days.
Early Rash **(Duration: about 4 days)** ***Most contagious*** **Rash distribution:**  	A **rash emerges** first as small red spots on the tongue and in the mouth. These spots develop into sores that break open and spread large amounts of the virus into the mouth and throat. At this time, the person becomes **most contagious**. Around the time the sores in the mouth break down, a rash appears on the skin, starting on the face and spreading to the arms and legs and then to the hands and feet. Usually the rash spreads to all parts of the body within 24 hours. As the rash appears, the fever usually falls and the person may start to feel better. By the third day of the rash, the rash becomes raised bumps. By the fourth day, the bumps fill with a thick, opaque fluid and often have a depression in the center that looks like a bellybutton. (This is a major distinguishing characteristic of smallpox.) Fever often will rise again at this time and remain high until scabs form over the bumps.
Pustular Rash **(Duration: about 5 days)** ***Contagious***	The bumps become **pustules**—sharply raised, usually round and firm to the touch as if there's a small round object under the skin. People often say the bumps feel like BB pellets embedded in the skin.
Pustules and Scabs **(Duration: about 5 days)** ***Contagious***	The pustules begin to form a crust and then **scab**. By the end of the second week after the rash appears, most of the sores have scabbed over.
Resolving Scabs **(Duration: about 6 days)** ***Contagious***	The scabs begin to fall off, leaving marks on the skin that eventually become pitted **scars**. Most scabs will have fallen off three weeks after the rash appears. The person is contagious to others until all of the scabs have fallen off.
Scabs resolved ***Not contagious***	Scabs have fallen off. Person is no longer contagious.

*Smallpox may be contagious during the *prodrome* phase, but is most infectious during the first 7 to 10 days following rash onset.

For more information, visit www.cdc.gov/smallpox, or call CDC at 800-CDC-INFO (English and Spanish) or 888-232-6348 (TTY).

August 9, 2004

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TULAREMIA

FACT SHEET

Key Facts About Tularemia

This fact sheet provides important information that can help you recognize and get treated for tularemia. For more detailed information, please visit the Centers for Disease Control and Prevention (CDC) Tularemia Web site (www.bt.cdc.gov/agent/tularemia).

What is Tularemia?

Tularemia is a potentially serious illness that occurs naturally in the United States. It is caused by the bacterium *Francisella tularensis* found in animals (especially rodents, rabbits, and hares).

What are the Symptoms of Tularemia?

Symptoms of tularemia could include:

- sudden fever
- chills
- headaches
- diarrhea
- muscle aches
- joint pain
- dry cough
- progressive weakness

People can also catch pneumonia and develop chest pain, bloody sputum and can have trouble breathing and even sometimes stop breathing.

Other symptoms of tularemia depend on how a person was exposed to the tularemia bacteria. These symptoms can include ulcers on the skin or mouth, swollen and painful lymph glands, swollen and painful eyes, and a sore throat.

How Does Tularemia Spread?

People can get tularemia many different ways:

- being bitten by an infected tick, deerfly or other insect
- handling infected animal carcasses
- eating or drinking contaminated food or water
- breathing in the bacteria, *F. tularensis*

Tularemia is not known to be spread from person to person. People who have tularemia do not need to be isolated. People who have been exposed to the tularemia bacteria should be treated as soon as possible. The disease can be fatal if it is not treated with the right antibiotics.

How Soon Do Infected People Get Sick?

Symptoms usually appear 3 to 5 days after exposure to the bacteria, but can take as long as 14 days.

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Key Facts About Tularemia
(continued from previous page)

What Should I Do if I Think I Have Tularemia?

Consult your doctor at the first sign of illness. Be sure to let the doctor know if you are pregnant or have a weakened immune system.

How Is Tularemia Treated?

Your doctor will most likely prescribe antibiotics, which must be taken according to the directions supplied with your prescription to ensure the best possible result. Let your doctor know if you have any allergy to antibiotics.

A vaccine for tularemia is under review by the Food and Drug Administration and is not currently available in the United States.

What Can I Do To Prevent Becoming Infected with Tularemia?

Tularemia occurs naturally in many parts of the United States. Use insect repellent containing DEET on your skin, or treat clothing with repellent containing permethrin, to prevent insect bites. Wash your hands often, using soap and warm water, especially after handling animal carcasses. Be sure to cook your food thoroughly and that your water is from a safe source.

Note any change in the behavior of your pets (especially rodents, rabbits, and hares) or livestock, and consult a veterinarian if they develop unusual symptoms.

Can Tularemia Be Used As a Weapon?

Francisella tularensis is very infectious. A small number (10-50 or so organisms) can cause disease. If F. tularensis were used as a weapon, the bacteria would likely be made airborne for exposure by inhalation. People who inhale an infectious aerosol would generally experience severe respiratory illness, including life-threatening pneumonia and systemic infection, if they are not treated. The bacteria that cause tularemia occur widely in nature and could be isolated and grown in quantity in a laboratory, although manufacturing an effective aerosol weapon would require considerable sophistication.

What is CDC Doing About Tularemia?

The CDC operates a national program for bioterrorism preparedness and response that incorporates a broad range of public health partnerships. Other things CDC is doing include:

- Stockpiling antibiotics to treat infected people
- Coordinating a nation-wide program where states share information about tularemia
- Creating new education tools and programs for health professionals, the public, and the media.

For more information, visit www.bt.cdc.gov/agent/tularemia, or call the CDC public response hotline at (888) 246-2675 (English), (888) 246-2857 (Español), or (866) 874-2646 (TTY)

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RADIATION EMERGENCIES

FREQUENTLY ASKED QUESTIONS (FAQS)

Dirty Bombs

People have expressed concern about dirty bombs and what they should do to protect themselves if a dirty bomb incident occurs. Because your health and safety are our highest priorities, the health experts at the Centers for Disease Control and Prevention (CDC) have prepared the following list of frequently asked questions and answers about dirty bombs.

What is a dirty bomb?

A dirty bomb is a mix of explosives, such as dynamite, with radioactive powder or pellets. When the dynamite or other explosives are set off, the blast carries radioactive material into the surrounding area.

A dirty bomb is *not* the same as an atomic bomb

An atomic bomb, like those bombs dropped on Hiroshima and Nagasaki, involves the splitting of atoms and a huge release of energy that produces the atomic mushroom cloud.

A dirty bomb works completely differently and *cannot create an atomic blast*. Instead, a dirty bomb uses dynamite or other explosives to scatter radioactive dust, smoke, or other material in order to cause radioactive contamination.

What are the main dangers of a dirty bomb?

The main danger from a dirty bomb is from the explosion, which can cause serious injuries and property damage. The radioactive materials used in a dirty bomb would probably not create enough radiation exposure to cause immediate serious illness, except to those people who are very close to the blast site. However, the radioactive dust and smoke spread farther away could be dangerous to health if it is inhaled. Because people cannot see, smell, feel, or taste radiation, you should take immediate steps to protect yourself and your loved ones.

What immediate actions should I take to protect myself?

These simple steps—recommended by doctors and radiation experts—will help protect you and your loved ones. The steps you should take depend on where you are located when the incident occurs: outside, inside, or in a vehicle.

If you are outside and close to the incident

- Cover your nose and mouth with a cloth to reduce the risk of breathing in radioactive dust or smoke.
- Don't touch objects thrown off by an explosion—they might be radioactive.
- Quickly go into a building where the walls and windows have not been broken. This area will shield you from radiation that might be outside.
- Once you are inside, take off your outer layer of clothing and seal it in a plastic bag if available. Put the cloth you used to cover your mouth in the bag, too. Removing outer clothes may get rid of up to 90% of radioactive dust.
- Put the plastic bag where others will not touch it and keep it until authorities tell you what to do with it.

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Frequently Asked Questions (FAQs) About Dirty Bombs
(continued from previous page)

- Shower or wash with soap and water. Be sure to wash your hair. Washing will remove any remaining dust.
- Tune to the local radio or television news for more instructions.

If you are inside and close to the incident

- If the walls and windows of the building are not broken, stay in the building and do not leave.
- To keep radioactive dust or powder from getting inside, shut all windows, outside doors, and fireplace dampers. Turn off fans and heating and air-conditioning systems that bring in air from the outside. It is not necessary to put duct tape or plastic around doors or windows.
- If the walls and windows of the building are broken, go to an interior room and do not leave. If the building has been heavily damaged, quickly go into a building where the walls and windows have not been broken. If you must go outside, be sure to cover your nose and mouth with a cloth. Once you are inside, take off your outer layer of clothing and seal it in a plastic bag if available. Store the bag where others will not touch it.
- Shower or wash with soap and water, removing any remaining dust. Be sure to wash your hair.
- Tune to local radio or television news for more instructions.

- **If you are in a car when the incident happens**
  - Close the windows and turn off the air conditioner, heater, and vents.
  - Cover your nose and mouth with a cloth to avoid breathing radioactive dust or smoke.
  - If you are close to your home, office, or a public building, go there immediately and go inside quickly.
  - If you cannot get to your home or another building safely, pull over to the side of the road and stop in the safest place possible. If it is a hot or sunny day, try to stop under a bridge or in a shady spot.
  - Turn off the engine and listen to the radio for instructions.
  - Stay in the car until you are told it is safe to get back on the road.

What should I do about my children and family?

- If your children or family are with you, stay together. Take the same actions to protect your whole family.
- If your children or family are in another home or building, they should stay there until you are told it is safe to travel.
- Schools have emergency plans and shelters. If your children are at school, they should stay there until it is safe to travel. Do not go to the school until public officials say it is safe to travel.

How do I protect my pets?

- If you have pets outside, bring them inside if it can be done safely.
- Wash your pets with soap and water to remove any radioactive dust.

Should I take potassium iodide?

- Potassium iodide, also called KI, only protects a person's thyroid gland from exposure to radioactive iodine. KI will not protect a person from other radioactive materials or protect other parts of the body from exposure to radiation.
- Since there is no way to know at the time of the explosion whether radioactive iodine was used in the explosive device, taking KI would probably not be beneficial. Also, KI can be dangerous to some people.

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Frequently Asked Questions (FAQs) About Dirty Bombs
(continued from previous page)

Will food and water supplies be safe?

- Food and water supplies most likely will remain safe. However, any unpackaged food or water that was out in the open and close to the incident may have radioactive dust on it. Therefore, do not consume water or food that was out in the open.
- The food inside of cans and other sealed containers will be safe to eat. Wash the outside of the container before opening it.
- Authorities will monitor food and water quality for safety and keep the public informed.

How do I know if I've been exposed to radiation or contaminated by radioactive materials?

- People cannot see, smell, feel, or taste radiation; so you may not know whether you have been exposed. Police or firefighters will quickly check for radiation by using special equipment to determine how much radiation is present and whether it poses any danger in your area.
- Low levels of radiation exposure (like those expected from a dirty bomb situation) do not cause any symptoms. Higher levels of radiation exposure may produce symptoms, such as nausea, vomiting, diarrhea, and swelling and redness of the skin.
- If you develop any of these symptoms, you should contact your doctor, hospital, or other sites recommended by authorities.

Where do I go for more information?

- For more information about dirty bombs, radiation, and health, contact:
  - The Conference of Radiation Control Program Directors (CRCPD) http://www.crcpd.org (502) 227-4543
  - The U.S. Environmental Protection Agency (EPA) http://www.epa.gov/radiation/rert/
  - The Nuclear Regulatory Commission (NRC) http://www.nrc.gov/ (301) 415-8200
  - The Federal Emergency Management Agency (FEMA) http://www.fema.gov/ (202) 646-4600
  - The Radiation Emergency Assistance Center/Training Site (REAC/TS) http://www.orau.gov/reacts/ (865) 576-3131
  - The U.S. National Response Team (NRT) http://www.nrt.org/
  - The U.S. Department of Energy (DOE) http://www.energy.gov/engine/content.do 1-800-dial-DOE

For more information, visit www.bt.cdc.gov/radiation, or call CDC at 800-CDC-INFO (English and Spanish) or 888-232-6348 (TTY).

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RADIATION EMERGENCIES

Information about Public Health Issues Related to Polonium-210 Contamination in the United Kingdom

In November 2006, public health officials in the United Kingdom announced that they would be assessing individuals who visited several London locations on October 31, November 1, or November 2, for possible exposure to Polonium-210 (Po-210), a radioactive material. British officials found Po-210 contamination at several sites, including the Millennium Hotel Pine Bar, during an investigation related to the death of an individual from acute radiation poisoning. The Millennium Hotel Pine Bar was closed during the early morning hours of November 24, 2006. Extensive risk analyses based on environmental measurements inside the Pine Bar and urine samples of people who were in the Pine Bar have led British authorities to conclude that no additional persons are at significant risk from exposure to Po-210. However, anyone who visited the Pine Bar between October 31 and November 24, 2006, may have come in contact with Po-210. The U.K. Health Protection Agency (HPA) has information about Po-210 and this event on their website at www.hpa.org.uk/.

The HPA has identified those people who it considers may have been exposed to Po-210 contamination, and since December 2006 has been working closely with public health agencies in 48 other countries, including the Centers for Disease Control and Prevention (CDC) in the United States, to contact people who may have visited the contaminated sites in London. The CDC, in turn, has been working with state and local health officials in 20 states to contact about 160 people to inform them about the potential for exposure and to assess their need for specific testing for Po-210 exposure. As of January 30, all urine test results for the approximately 17 people who chose to be tested indicate no person had amounts of Po-210 of concern for immediate health effects.

CDC advises that if you have visited the Pine Bar of the Millennium Hotel between the end of October through its closure on November 24, 2006, and have specific concerns about your health, you should see your health care provider, who should be able to advise whether further evaluation or testing is needed. Your health care provider may contact your state health department for additional information on assessing your Po-210 exposure or contamination. CDC is also available to assist you, your health care provider, and your state health department in interpreting results of any tests that you and your health care provider may decide to undertake. (You may call CDC's Radiation Studies Branch at 404/498-1800 or send an e-mail to rsb@cdc.gov .)

The following questions and responses provide some additional information about this topic.

What is Polonium 210?

Polonium-210 (Po-210) is a radioactive material that occurs in nature at very low levels. Although Po-210 can be made in university or government nuclear reactors, it requires expertise to do so. The exposures to this radioactive material in London are a very rare event. Po-210 emits alpha particles, which carry high amounts of energy that can damage or destroy genetic material in cells inside the body. Po-210 is used in some devices to eliminate static electricity in processes such as rolling paper, manufacturing sheet plastics, and spinning synthetic fibers.

Is Po-210 harmful to humans?

Po-210 is a radiation hazard only if it is taken into the body through breathing or eating or by entering a wound. This "internal contamination" can cause radiation exposure (irradiation) of internal organs, which can result in serious medical symptoms or death. Po-210 is not a hazard to the outside of the body—

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Radioisotope Brief: Iodine-131 (I-131)
(continued from previous page)

neither polonium nor its radiation will go through unbroken skin or membranes. Careful washing will remove most external traces of Po-210. For more information about contamination and irradiation, see CDC's fact sheet "Radiological Contamination and Radiation Exposure" (www.bt.cdc.gov/radiation/contamination.asp).

Are other people at risk if they come into close contact with a contaminated person?
People will not be exposed to radiation just by being near a person who is internally contaminated with Po-210. Health care workers who are providing care for a contaminated patient will not be exposed to Po-210 unless they inhale or ingest contaminated bodily fluids. Normal hygiene practices in hospitals for microbial contamination will protect workers from radiological contamination. For more information on radiation protection for health care workers, see CDC's "Radiological Terrorism: Tool Kit for Emergency Services Clinicians" (www.bt.cdc.gov/radiation/toolkit.asp).

What should US Citizens do if they were visitors to London between October 31 and November 23, 2006, and are concerned about exposure to Po-210?
If you were at any of the affected locations and you have specific concerns about your health (see CDC fact sheet at www.bt.cdc.gov/radiation/ars.asp), see your health care provider, who should be able to advise whether further evaluation or testing is needed. Your health care provider may contact your state health department for additional information on assessing your Po-210 exposure or contamination (www.bt.cdc.gov/radiation/isotopes/polonium/clinician.asp).

Should you be concerned about possible polonium exposure if you are planning to travel to London now?
The U.K. authorities have informed CDC that they have undertaken extensive environmental testing in locations which were of concern. Any areas shown to have contamination of significance are either still sealed off or have been decontaminated. There is no evidence to suggest that you are at any risk for radiation exposure or contamination if you are traveling to the United Kingdom.

For more information, visit www.bt.cdc.gov/radiation,
or call CDC at 800-CDC-INFO (English and Spanish) or 888-232-6348 (TTY).

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Appendix B. How We Think? CBR Attack Probability

This appendix presents a concept for estimating the probability of CBRN attack. This is a generic and subjective model that can be used as one of several ways of estimating terrorist intent and capability to use CBRN attack. Sample figures display chemical, TIM, biological, and [radiological] nuclear threat estimation processes and can apply to conventional and unconventional threats.

A terrorist with the intent to use WMD will make a methodical study of the target population and how they think and normally act. Recent incidents of toxic industrial chemicals and material weaponized with conventional explosives is relatively insignificant when compared to a full range of terrorist intention to cause catastrophic effects with a weapon of mass destruction.

What is the threat of WMD attack while deployed, in-transit, and part of an institutional force. What High Risk Targets (HRT) and Mission Essential Vulnerable Areas (MEVA) are possible or probable terrorist objectives? What does situational awareness of the operational environment indicate as likely or most likely targeting? Will a less than likely target be selected by a terrorist because it is vulnerable to a particular type of WMD and has identified weaknesses to exploit for attack?

What are the threat advantages and disadvantages of each type of weapon of mass destruction? Will multiple attacks be planned to occur nearly simultaneous to each other? Will a single person penetration of protection measures provide the necessary access to a high risk target or mission essential area to indicate attack success?

Targets and objectives relate to timing and intent and capabilities. An installation may consider large special events such as a 4th of July celebration or regular congregation of massed people as lucrative targets. Infrastructure may include water treatment facilities and associated chemical reservoirs or electrical connections to regional electrical power grids. Targets may exist outside of institutional or operational forces that would have crippling effects on the military forces and mission conduct. Examples include sea and air ports of embarkation and debarkation, transportation transfer points, or temporary staging and training areas.

Besides physical damage and destruction with kinetic blast effects or toxic chemicals, biological and radiological contamination can be far more devastating to a target population. The specter of contagious disease or long term radiation effects on people and property will be planned by terrorists to cause massive physical and psychological impacts.

The terrorist plans and conducts missions with the expectation of success. What is achievable by a terrorist will be based on target analysis of what is critical or mission essential, recognizable, accessible, and vulnerable?

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"How We Think" (Will a terrorist use our doctrine and practices against us?)

CHEMICAL

WMD Terrorism

How will I assess target CBRN vulnerability?

- ***MEVA?***
  What mission essential vulnerability areas exist?
- ***HRT?***
  What high risk targets exist?
  Do any single points of failure exist for a system?
- **What other critical considerations exist?**

What force protection measures are in effect?
Does a terrorist observe elements of a:
Random Antiterrorism Measures Program (RAMP)?
Quick Reaction Force (QRF)?

- ***What is CBRN ATTACK probability?***

Will a terrorist conduct a diversion in an attack?

How will a terrorist conduct surveillance?
How will a terrorist conduct reconnaissance?

How many cell members will be required?
How will a terrorist resource the mission?
How will a terrorist plan?
How will a terrorist train and rehearse?
How will a terrorist attack?
How will a terrroist escape?
Will the mission require terrorist suicide?

How will a terrroist share observations and lessons learned?

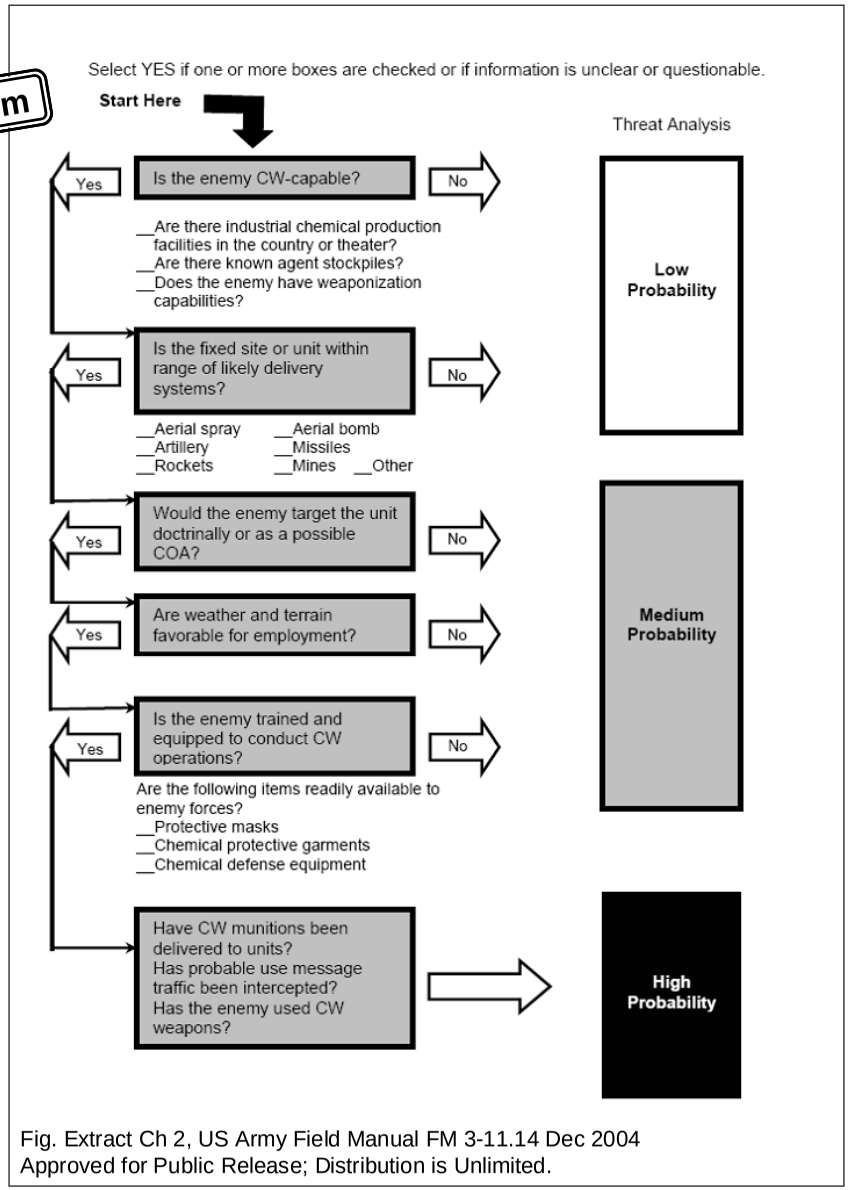

Fig. Extract Ch 2, US Army Field Manual FM 3-11.14 Dec 2004
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"How We Think" (Will a terrorist use our doctrine and practices against us?)

TIC/TIM

WMD Terrorism

How will I assess target CBRN vulnerability?

- ***MEVA?***
  - **What mission essential vulnerability areas exist?**
- ***HRT?***
  - **What high risk targets exist?**
  - **Do any single points of failure exist for a system?**
- **What other critical considerations exist?**

What force protection measures are in effect?
- **Does a terrorist observe elements of a:**
- **Random Antiterrorism Measures Program (RAMP)?**
- **Quick Reaction Force (QRF)?**

- ***What is CBRN ATTACK probability?***

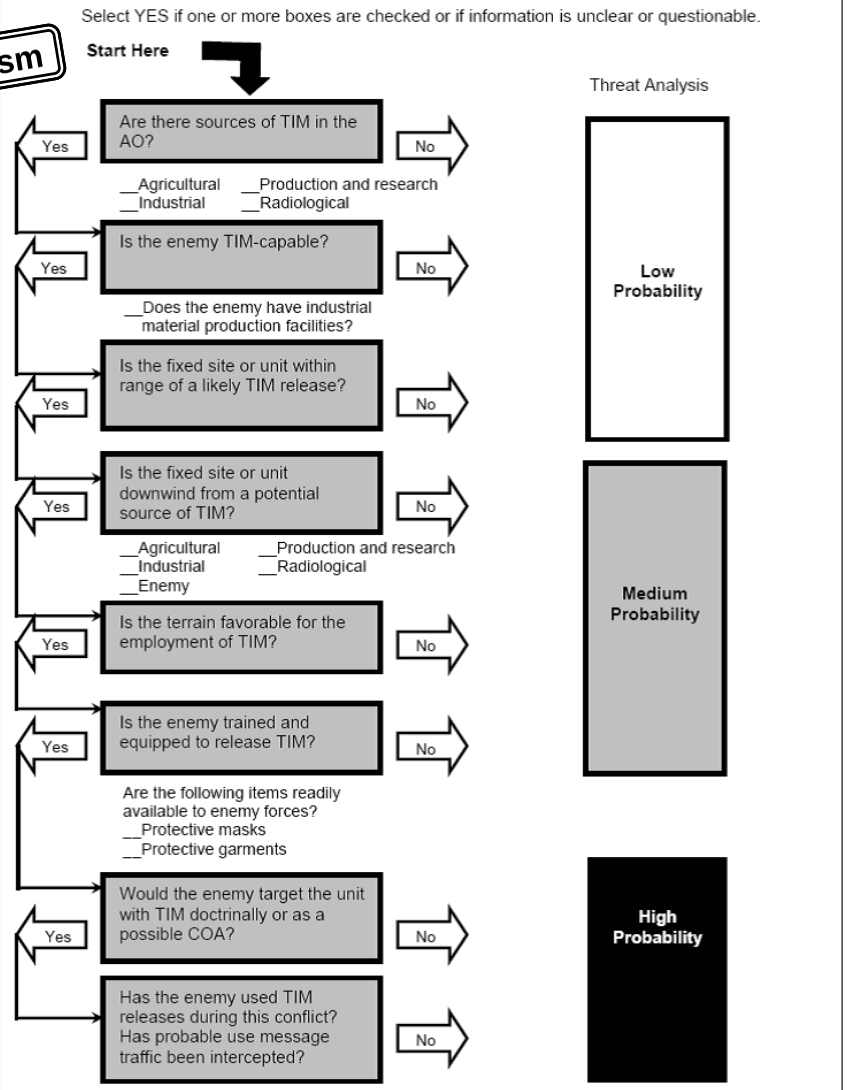
Will a terrorist conduct a diversion in an attack?

How will a terrorist conduct surveillance?
How will a terrorist conduct reconnaissance?

How many cell members will be required?
How will a terrorist resource the mission?
How will a terrorist plan?
How will a terrorist train and rehearse?
How will a terrorist attack?
How will a terrroist escape?
Will the mission require terrorist suicide?

How will a terrroist share observations and lessons learned?

Fig. Extract Ch 2, US Army Field Manual FM 3-11.14 Dec 2004



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***"How We Think"* (*Will a terrorist use our doctrine and practices against us?*)**

BIOLOGICAL

WMD Terrorism

How will I assess target CBRN vulnerability?

- ***MEVA?***
  What mission essential vulnerability areas exist?
- ***HRT?***
  What high risk targets exist?
  Do any single points of failure exist for a system?
- **What other critical considerations exist?**

What force protection measures are in effect?
Does a terrorist observe elements of a:
Random Antiterrorism Measures Program (RAMP)?
Quick Reaction Force (QRF)?

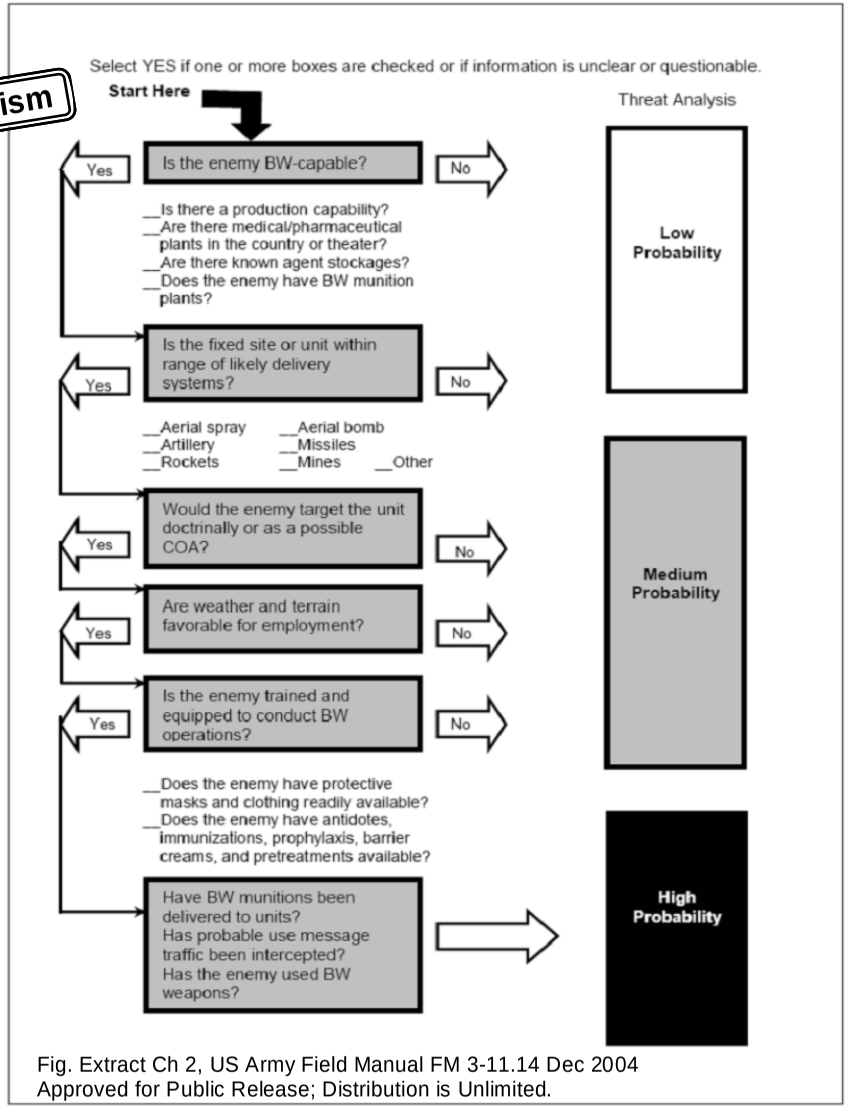
- ***What is CBRN ATTACK probability?***

Will a terrorist conduct a diversion in an attack?

How will a terrorist conduct surveillance?
How will a terrorist conduct reconnaissance?

How many cell members will be required?
How will a terrorist resource the mission?
How will a terrorist plan?
How will a terrorist train and rehearse?
How will a terrorist attack?
How will a terrroist escape?
Will the mission require terrorist suicide?

How will a terrroist share observations and lessons learned?



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"How We Think" (Will a terrorist use our doctrine and practices against us?)

NUCLEAR

WMD Terrorism

How will I assess target CBRN vulnerability?

- ***MEVA?***
  What mission essential vulnerability areas exist?
- ***HRT?***
  What high risk targets exist?
  Do any single points of failure exist for a system?
- **What other critical considerations exist?**

What force protection measures are in effect?
Does a terrorist observe elements of a:
Random Antiterrorism Measures Program (RAMP)?
Quick Reaction Force (QRF)?

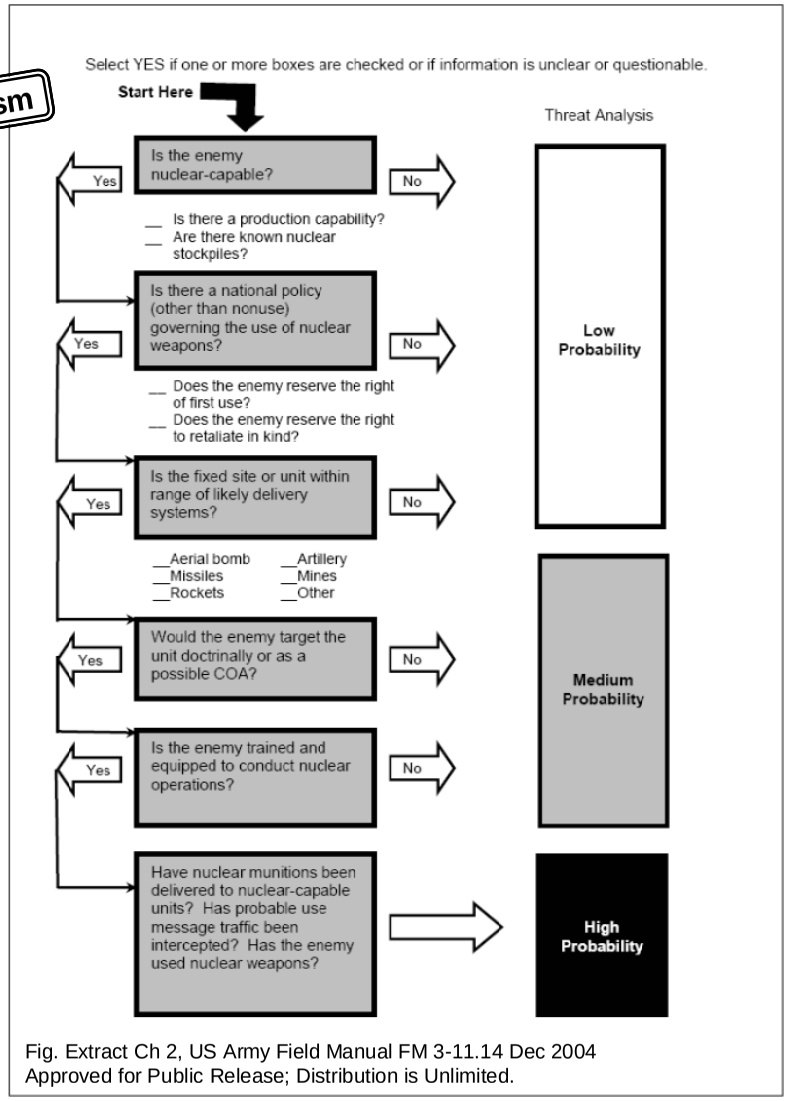
- ***What is CBRN ATTACK probability?***

Will a terrorist conduct a diversion in an attack?

How will a terrorist conduct surveillance?
How will a terrorist conduct reconnaissance?

How many cell members will be required?
How will a terrorist resource the mission?
How will a terrorist plan?
How will a terrorist train and rehearse?
How will a terrorist attack?
How will a terrroist escape?
Will the mission require terrorist suicide?

How will a terrroist share observations and lessons learned?



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Glossary

antiterrorism: (AT) (JP 1-02) — Defensive measures used to reduce the vulnerability of individuals and property to terrorist acts, to include limited response and containment by local military forces.

AOR: Area of Responsibility

asset (terrorist): A resource — person, group, relationship, instrument, installation, or supply — at the disposition of a terrorist organization for use in an operational or support role. Often used with a qualifying term such as suicide asset or surveillance asset. Based upon JP 1-02 asset (intelligence).

biological agent: (JP 1-02) — A microorganism that causes disease in personnel, plants, or animals or causes the deterioration of materiel.

biological weapon: (JP 1-02) — An item of materiel, which projects, disperses, or disseminates a biological agent including arthropod vectors.

CBIRF: Chemical-Biological Incident Response Force.

CBRNE: Chemical, biological, radiological, nuclear, and high yield explosive categories normally associated with weapons of mass destruction.

chemical weapon: (JP 1-02) — Together or separately, (a) a toxic chemical and its precursors, except when intended for a purpose not prohibited under the Chemical Weapons Convention; (b) a munition or device, specifically designed to cause death or other harm through toxic properties of those chemicals specified in (a), above, which would be released as a result of the employment of such munition or device; (c) any equipment specifically designed for use directly in connection with the employment of munitions or devices specified in (b) above.

conflict: (Army) — A political-military situation between peace and war, distinguished from peace by the introduction of organized political violence and from war by its reliance on political methods. It shares many of the goals and characteristics of war, including the destruction of governments and the control of territory. See FM 100-20.

COCOM: Combatant command, that is, command authority. See page 247 footnote of handbook. (JP 1-02)

consequence management: Traditionally, consequence management has been predominantly an emergency management function and included measures to protect public health and safety, restore essential government services, and provide emergency relief to governments, businesses, and individuals affected by the consequences of terrorism. The requirements of consequence management and crisis management are combined in the NRP.

CONUS: Continental United States

counterterrorism: (CT) Offensive measures taken to prevent, deter, and respond to terrorism.

crisis management: Traditionally, crisis management was predominantly a law enforcement function and included measures to identify, acquire, and plan the use of resources needed to anticipate, prevent, and/or resolve a threat or act of terrorism. The requirements of consequence management and crisis management are combined in the NRP.

cyber-terrorism: (FBI) — A criminal act perpetrated by the use of computers and telecommunications capabilities, resulting in violence, destruction and/or disruption of services to create fear by causing confusion and uncertainty within a given population, with the goal of influencing a government or population to conform to a particular political, social, or ideological agenda.

Designated Foreign Terrorist Organization: (DFTO) A political designation determined by the U.S. Department of State. Listing as a DFTO imposes legal penalties for membership, prevents travel into the U.S., and proscribes assistance and funding activities within the U.S. or by U.S. citizens. From Patterns of Global Terrorism 2001, U.S. Department of State.

DIRLAUTH: Direct liaison authorized

DHS: Department of Homeland Security

Emergency Support Functions: (ESF) See *National Response Plan* (NRP).

failed state: For the purposes of this circular, a dysfunctional state which also has multiple competing political factions in conflict within its borders, or has no functioning governance above the local level. This does not imply that a central government facing an insurgency is automatically a failed state. If essential functions of government continue in areas controlled by the central authority, it has not "failed."

force protection: Security program designed to protect Service members, civilian employees, family members, facilities, and equipment, in all locations and situations, accomplished through planned and integrated application of combating terrorism, physical security, operations security, personal protective services, and supported by intelligence, counterintelligence, and other security programs.

force protection condition (FPCON): There is a graduated series of Force Protection Conditions ranging from Force Protection Conditions Normal to Force Protection Conditions Delta. There is a process by which commanders at all levels can raise or lower the Force Protection Conditions based on local conditions, specific threat information and/or guidance from higher headquarters. The four Force Protection Conditions above normal are:

Force Protection Condition ALPHA --This condition applies when there is a general threat of possible terrorist activity against personnel and facilities, the nature and extent of which are unpredictable, and circumstances do not justify full implementation of Force Protection Conditions BRAVO measures. The measures in this Force Protection Conditions must be capable of being maintained indefinitely.

Force Protection Condition BRAVO --This condition applies when an increased and more predictable threat of terrorist activity exists. The measures in this Force Protection Conditions must be capable of being maintained for weeks without causing undue hardship, affecting operational capability, and aggravating relations with local authorities.

Force Protection Condition CHARLIE --This condition applies when an incident occurs or intelligence is received indicating some form of terrorist action against personnel and facilities is imminent. Implementation of measures in this Force Protection Conditions for more than a short period probably will create hardship and affect the peacetime activities of the unit and its personnel.

Force Protection Condition DELTA --This condition applies in the immediate area where a terrorist attack has occurred or when intelligence has been received that terrorist action against a specific location or person is likely. Normally, this Force Protection Conditions is declared as a localized condition.

guerrilla warfare: (JP 1-02, NATO) — Military and paramilitary operations conducted in enemy-held or hostile territory by irregular, predominantly indigenous forces. (See also unconventional warfare (UW).

HD: Homeland Defense.

HS: Homeland Security.

Homeland Security Advisory System (HSAS): The advisory system provides measures to remain vigilant, prepared, and ready to deter terrorist attacks. The following Threat Conditions each represent an increasing risk of terrorist attacks. Beneath each Threat Condition are suggested protective measures, recognizing that the heads of Federal departments and agencies are responsible for developing and implementing appropriate agency-specific protective measures:

- **Low Condition (Green)**. This condition is declared when there is a low risk of terrorist attacks. Federal departments and agencies should consider the following general measures in addition to the agency-specific Protective Measures they develop and implement: refining and exercising as appropriate preplanned Protective Measures; ensuring personnel receive proper training on the Homeland Security Advisory System and specific preplanned department or agency Protective Measures; and institutionalizing a process to assure that all facilities and regulated sectors are regularly assessed for vulnerabilities to terrorist attacks, and all reasonable measures are taken to mitigate these vulnerabilities.

- **Guarded Condition (Blue)**. This condition is declared when there is a general risk of terrorist attacks. In addition to the Protective Measures taken in the previous Threat Condition, Federal departments and agencies should consider the following general measures in addition to the agency-specific Protective Measures that they will develop and implement: checking communications with designated emergency response or command locations; reviewing and updating emergency response procedures; and providing the public with any information that would strengthen its ability to act appropriately.

- **Elevated Condition (Yellow)**. An Elevated Condition is declared when there is a significant risk of terrorist attacks. In addition to the Protective Measures taken in the previous Threat Conditions, Federal departments and agencies should consider the following general measures in addition to the Protective Measures that they will develop and implement: increasing surveillance of critical locations; coordinating emergency plans as appropriate with nearby jurisdictions; assessing whether the precise characteristics of the threat require the further refinement of preplanned Protective Measures; and implementing, as appropriate, contingency and emergency response plans.

- **High Condition (Orange)**. A High Condition is declared when there is a high risk of terrorist attacks. In addition to the Protective Measures taken in the previous Threat Conditions, Federal departments and agencies should consider the following general measures in addition to the agency-specific Protective Measures that they will develop and implement: coordinating necessary security efforts with Federal, State, and local law enforcement agencies or any National Guard or other appropriate armed forces organizations; taking additional precautions at public events and possibly considering alternative venues or even cancellation; preparing to execute contingency procedures, such as moving to an alternate site or dispersing their workforce; and restricting threatened facility access to essential personnel only.

- **Severe Condition (Red)**. A Severe Condition reflects a severe risk of terrorist attacks. Under most circumstances, the Protective Measures for a Severe Condition are not intended to be sustained for substantial periods of time. In addition to the Protective Measures in the previous Threat Conditions, Federal departments and agencies also should consider the following general measures in addition to the agency-specific Protective Measures that they will develop and implement: increasing or redirecting personnel to address critical emergency needs; signing emergency response personnel and pre-positioning and mobilizing specially trained teams or resources; monitoring, redirecting, or constraining transportation systems; and closing public and government facilities.

HSPD: Homeland Security Presidential Directive.

HUMINT: Human intelligence.

HYE: High Yield Explosive.

IED: Improvised Explosive Device. Devices that have been fabricated in an improvised manner and that incorporate explosives or destructive, lethal, noxious, pyrotechnic, or incendiary chemicals in their design.

insurgency: (JP 1-02, NATO) — An organized movement aimed at the overthrow of a constituted government through the use of subversion and armed conflict.

international: of, relating to, or affecting two or more nations (Webster's). For our purposes, affecting two or more nations.

JTF: Joint Task Force.

millenarian: Apocalyptic; forecasting the ultimate destiny of the world; foreboding imminent disaster or final doom; wildly unrestrained; ultimately decisive. (Merriam –Webster's)

narco-terrorism: (JP 3-07.4) Terrorism conducted to further the aims of drug traffickers. It may include assassinations, extortion, hijackings, bombings, and kidnappings directed against judges, prosecutors, elected officials, or law enforcement agents, and general disruption of a legitimate government to divert attention from drug operations.

nation: A community of people composed of one or more nationalities and possessing a more or less defined territory and government or a territorial division containing a body of people of one or more nationalities and usually characterized by relatively large size and independent status.

nation-state: A form of political organization under which a relatively homogeneous people inhabits a sovereign state; especially a state containing one as opposed to several nationalities.

National Incident Management System: (NIMS). See *National Incident Management System* published by the Department of Homeland Security, 1 March 2004. The NIMS represents a core set of doctrine, concepts, principles, technology and organizational processes to enable effective, efficient, and collaborative incident management. Nationwide context is an all-hazards, all jurisdictional levels, and multi-disciplines approach to incident management.

National Response Plan: (NRP) The *National Response Plan* (December 2004) is an all-discipline, all-hazards plan that establishes a single, comprehensive framework for the management of domestic incidents. It provides the structure and mechanisms for the coordination of Federal support to State, local, and tribal incident managers and for exercising direct Federal authorities ad responsibilities.

nuclear weapon: (JP 1-02) — A complete assembly (i.e., implosion type, gun type, or thermonuclear type), in its intended ultimate configuration which, upon completion of the prescribed arming, fusing, and firing sequence, is capable of producing the intended nuclear reaction and release of energy.

OPCON: Operational control, that is, transferable command authority. See Appendix H of terrorism handbook. (JP 1-02).

operations security: (OPSEC) A process of identifying critical information and subsequently analyzing friendly actions attendant to military operations and other activities to: a. Identify those actions that can be observed by adversary intelligence systems. b. Determine indicators hostile intelligence systems might obtain that could be interpreted or pieced together to derive critical information in time to be useful to adversaries. c. Select and execute measures that eliminate or reduce to an acceptable level the vulnerabilities of friendly actions to adversary exploitation. Also called OPSEC. (Joint Pub 1-02)

physical security: That part of security concerned with physical measures designed to safeguard personnel; to prevent unauthorized access to equipment, installations, material and documents; and to safeguard them against espionage, sabotage, damage, and theft. (Joint Pub1-02)

POTUS: President of the United States.

Radiological Emitting Device: (RED) A device designed to disseminate radioactive material in order to cause destruction, damage, or injury by means of the radiation produced by the decay of such material. RED dissemination techniques can include intense, short duration exposure or progressive, long-term exposure to radiation.

radiological operation: (JP 1-02) — The employment of radioactive materials or radiation producing devices to cause casualties or restrict the use of terrain. It includes the intentional employment of fallout from nuclear weapons.

setback: Distance between outer perimeter and nearest point of buildings or structures within. Generally referred to in terms of explosive blast mitigation.

state: A politically organized body of people usually occupying a definite territory; especially one that is sovereign.

TACON: Tactical control, that is, command authority with detailed limitations and responsibilities inherent to operational control. (JP 1-02).

terror tactics: Given that the Army defines tactics as **"**the art and science of employing available means to win battles and engagements," then terror tactics should be considered "the art and science of employing violence, terror and intimidation to inculcate fear in the pursuit of political, religious, or ideological goals."

terrorism: (JP 1-02) — The calculated use of violence or threat of violence to inculcate fear; intended to coerce or to intimidate governments or societies in the pursuit of goals that are generally political, religious, or ideological.

terrorist: (JP 1-02) — An individual who uses violence, terror, and intimidation to achieve a result.

terrorist goals: The term *goals* will refer to the strategic end or end state that the terrorist objectives are intended to obtain.

terrorist group: Any group practicing, or that has significant subgroups that practice, international terrorism (U.S. Dept of State)

terrorist objectives: The standard definition of *objective* is – "The clearly defined, decisive, and attainable aims which every military operation should be directed towards" (JP 1-02). For the purposes of this work, terrorist objectives will refer to the intended outcome or result of one or a series of terrorist operations or actions.

toxic chemical: (JP 1-02) (DOD) Any chemical which, through its chemical action on life processes, can cause death, temporary incapacitation, or permanent harm to humans or animals. This includes all such chemicals, regardless of their origin or of their method of production, and regardless of whether they are produced in facilities, in munitions or elsewhere.

toxin agent: (JP 1-02) **—** A poison formed as a specific secretion product in the metabolism of a vegetable or animal organism, as distinguished from inorganic poisons. Such poisons can also be manufactured by synthetic processes.

toxic industrial biologicals (JP 1-02) Any biological material manufactured, used, transported, or stored by industrial, medical, or commercial processes. For example: infectious waste and as biological samples (e.g., biopsies, disease for research). Also called TIB.

toxic industrial chemicals: (JP 1-02) Any chemical manufactured, used, transported, or stored by industrial, medical, or commercial processes. For example: pesticides, petrochemicals, fertilizers, corrosives, poisons, etc. Also called TIC; and (National Military Strategy to Combat Weapons of Mass Destruction) Any chemical substance that can render forces ineffective under normal mission-oriented protective posture conditions. Primarily an inhalation hazard, but forces can receive dosage through ingestions or absorption through the skin. NOTE: "Toxic industrial chemicals" is implied within the general discussion of the term "chemical agents," but this term does not apply within the definition of "chemical warfare agents" due to their dual-use capability.

toxic industrial material: (JP 1-02) Any toxic industrial material manufactured, stored, transported, or used in industrial or commercial processes. It includes toxic industrial chemicals, toxic industrial radiologicals, and toxic industrial biologicals. Also called TIM; and (National Military Strategy to Combat Weapons of Mass Destruction) Any substance that, in a given quantity, produces toxic effect in exposed personnel through inhalation, ingestion, or absorption.

toxic industrial radiologicals. (JP 1-02) Any radiological material manufactured, used, transported, or stored by industrial, medical, or commercial processes. For example: spent fuel rods, medical sources, etc. Also called TIR.

transnational: Extending or going beyond national boundaries (Webster's). In this context, not limited to or centered within a single nation.

unified command: As a term in the Federal application of the Incident Command System (ICS), defines agencies working together through their designated Incident Commanders at a single Incident Command Post (ICP) to establish a common set of objectives and strategies, and a single Incident Action Plan. This is NOT "unified command" as defined by the Department of Defense.

USNORTHCOM: U.S. Northern Command.

UXO: Unexploded ordnance

VBIED: Vehicle Borne Improvised Explosive Device

WOT: War on Terrorism

WEG: Worldwide Equipment Guide. A document produced by the TRADOC G2 – Threats that provides the basic characteristics of selected equipment and weapons systems readily available for use by the OPFOR.

WMD: (JP 1-02) - Weapons of Mass Destruction. Weapons that are capable of a high order of destruction and/or of being used in such a manner as to destroy large numbers of people. Weapons of mass destruction can be high explosives or nuclear, biological, chemical, and radiological weapons, but exclude the means of transporting or propelling the weapon where such means is a separable and divisible part of the weapon.

WMD-CST: Weapons of Mass Destruction – Civil Support Team

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