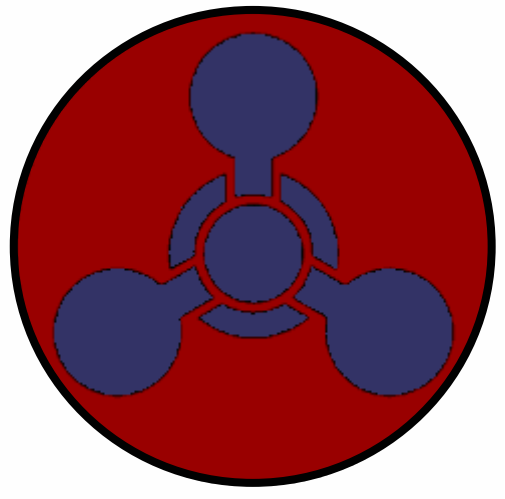
PARTNERSHIP FOR A SECURE AMERICA

# CHEMICAL TERRORISM

## US Policies to Reduce The Chemical Terror Threat

- Professor Margaret E. Kosal -

September 2008



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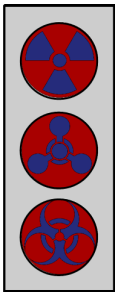

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Past decades have witnessed a hardening of partisan divisions on national security and foreign policy, limiting productive debate and blocking effective action by Congress and the Executive Branch on critical policy issues. This rising partisanship has soured working relationships among policymakers and their counterparts across the aisle at all levels of government, and our national security and foreign policy discourse has suffered as a result.

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# PREFACE

We are fortunate to live in a period of unprecedented peace among the world's major powers. Senior US officials meet routinely with representatives of our former Cold War rivals to discuss issues of shared concern, including security, the global economy, and the environment. While the US and our international partners cannot always come to agreement on these important issues, states are far more likely to deploy diplomatic, economic, and political tools to support their foreign policies than to order military action against one another.

But as the likelihood of military conflict among powerful states has declined, a grave new threat has emerged: International terrorists, operating in small cells and loosely organized global networks, could harness the world's most dangerous weapons to unleash massive destruction on our vulnerable population and economic centers. The 9/11 attacks reminded Americans that terror can strike anywhere at any time, and that terrorists can transform the proudest technological achievements of modern open societies into devastating weapons of mass destruction.

Pursuing its mandate to advise Congress and the President how best to prevent future terror attacks on the United States, the 9/11 Commission identified the potentially deadly combination of the world's most dangerous people and history's most destructive weapons as the single greatest threat to US security. In its 2004 report, the Commission concluded that Al Qaeda and other terrorists were in the market for Weapons of Mass Destruction (WMD), including nuclear, chemical and biological weapons, and that the US must therefore invest maximum effort in preventing them from falling into terrorist hands.

The following report, which examines current US government policies and programs to prevent chemical terrorism, is one piece of PSA's larger effort to assess US government progress in implementing the recommendations of the 9/11 Commission. The findings of this report, combined with similar expert assessments focused on prevention of nuclear and biological terror attacks, are summarized in PSA's Report Card on WMD Terror Prevention *(available online at www.PSAonline.org)*. These assessments underline the conclusion of the 9/11 Commission that the intersection of international terrorism and WMD proliferation poses an unparalleled and unacceptable threat our national security.

This study recognizes significant US government progress in detecting and mitigating chemical terror threats, including enhancements in interagency coordination. It finds similarly note-

worthy progress in elimination of military chemical stockpiles, though the pace could be faster and much remains to be done. Challenges remain, however, in the need for stronger multilateral cooperation to prevent proliferation, and for a more serious and comprehensive effort to secure chemical facilities and transportation infrastructure against theft or attack. Future progress will depend first and foremost on recognition by government and industry of the full range of chemical terror threats, so that policy responses may be effectively prioritized.

To fulfill the 9/11 Commission's call for "maximum effort" against WMD terrorism will require the full attention and enduring commitment of leaders on both sides in Congress, and from the next President. Working together, Congress and the Administration must bring funding levels, statutory authority and agency structures into line with the core objective of denying terrorists access to nuclear, chemical and biological weapons around the globe. Ensuring that our policymakers take the most effective steps toward this objective will require ongoing evaluation by outside experts, along the lines of this study and others cited herein, as well as by the government itself.

This report is not intended as the final word on the subject from PSA, the author, or any of our Advisory Board members, including the former Chair and Vice Chair of the 9/11 Commission. As those distinguished Americans put it in their own statement in 2005, this is an endeavor that will require "sustained attention, over several years, perhaps even generations, from our political leaders."[1] In publishing the Report Card, we too seek to help maintain a sense of urgency, focus the resources and attention of government, and contribute to making the American people safer and more secure.

Matthew A. Rojansky
PSA Executive Director

[1] **Thomas H. Kean and Lee H. Hamilton**, "Report on the Status of 9/11 Commission Recommendations Part III: Foreign Policy, Public Diplomacy and Non-Proliferation", accessed at <http://www.9-11pdp.org/press/2005-11-14_remarks.pdf>

# REPORT CARD

## Pillars Of Chemical Terror Prevention:

### Status in 2008:

| | GRADE |
|---|---|
| **Recognition and prevention of chemical terror threat**<br>Multilateral non- & counter-proliferation initiatives lacking US follow through; Failure to recognize adequately chemical terrorism threat. | C - |
| **Response: Detection, resilience and mitigation programs**<br>Strong efforts for interagency coordination at federal level; Revolutionary defense countermeasures research budget cut in FY08; State laboratories unprepared; Response exercises occurring but unrealistic/inadequate. | B |
| **Protecting Critical Infrastructure (industrial chemicals, facilities, transport)**<br>Physical security of industry facilities low priority; Chemical transport security assessment long overdue. | C+ |
| **Elimination: Demilitarization of chemical weapons**<br>Half US stockpile destroyed; Additional funding needed for construction of remaining destruction facilities to reduce the overall risk; Additional funding and active engagement needed for destruction of Russian and Libyan weapons stockpiles. | B |
| **OVERALL GRADE** | B- |

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# INTRODUCTION

Chemical weapons have been used both by military forces on the battlefield and by terrorists in cities and towns. In this respect, they are unique among the weapons of mass destruction (WMD) that have been used in the twentieth century. The world's recognition of the horror of chemical weapons prompted the only disarmament treaty that eliminates an entire category of weapons under strict international verification.

International terrorists have clearly demonstrated intent to obtain, develop, and use chemical weapons. As the leader of a larger radical Islamist movement, Al Qa'eda has advocated the use of terrorism as a means to cause the economic collapse of the US and the Western world. The exploits of Al Qa'eda in Afghanistan to test unspecified lethal chemical agents on animals have been well-covered in the news media. [1]

Additional evidence and analysis of al Qa'eda's extensive interest in chemical agents was highlighted in a 2005 Intelligence Commission report.[2] Other domestic and international terrorists have sought, planned, obtained, and used chemical agents:

- "The greatest threat before humanity today is the possibility of a secret and sudden attack with chemical, or biological, or nuclear weapons." President George W. Bush, Remarks at the National Defense University, February 11, 2004. [3]
- "We must be prepared to stop rogue states and their terrorist clients before they are able to threaten or use WMD." National Security Strategy of the United States of America.
- "Al Qa'eda and more than two dozen other terrorist groups are pursuing CBRN [chemical, biological, radiological, and nuclear] materials." Testimony of Director of Central Intelligence George J. Tenet before the Senate Select Committee on Intelligence, February 2004.
- "The gravest danger our nation faces lies at the crossroads of radicalism and technology." National Strategy to Combat Weapons of Mass Destruction.
- "Chemicals continue to be weapons of choice for terrorist attacks. They are readily available and have the potential to inflict significant casualties (from a few to perhaps many thousands in technically possible, if improbable, high-end attacks). And they have characteristics that make them attractive for deployment against an open society: easily concealed, undetectable at a distance, and visually indistinguishable from materials in everyday use." National Research Council, Making the Nation Safer: The Role of Science and Technology in Countering Terrorism, 2002.

The fundamental technology intrinsic to chemical weapons is more widespread than that of any other WMD; synthetic chemistry is ubiquitous to the industrial world. Making chemical weapons requires some technical skill, but over time much of the information needed to make these materials has drifted into the public domain. Technology is rapidly enabling new methods for creating novel agents and easier dissemination. All of which combines to increase terrorist capability and our vulnerability to the threat of chemical terrorism.

US efforts to prevent terrorist acquisition and use of chemical weapons can be grouped into four broad policy pillars:

- **RECOGNITION & PREVENTION:** Recognize & reduce the risk of chemical terrorism.
  - Nonproliferation
  - Counterproliferation
  - International cooperation to prevent chemical weapons terrorism
  - Dispersal of small-scale production facilities
  - Emerging threats – new agents, toxic industrial chemicals, improvised agents, and delivery systems
- **RESPONSE: IMPROVED DETECTION, RESILIENCE, AND MITIGATION:** Foster countermeasure development, response capacity, and consequence management.
  - Invest in research and development for new physical and medical countermeasures, such as detectors and therapeutics
  - Consequence management
  - Lessons learned and standardized Best Practices
  - Invest in training and materials for first responders
  - Risk communication to the public
  - Domestic capacity
- **CRITICAL INFRASTRUCTURE:** Reduce the risk of terrorists exploiting our own infrastructure via a deliberate attack on an industrial chemical facility as a means to cause either mass-effect terrorism – release of toxic vapor – or destruction of the nation's critical infrastructure.
  - Efforts to reduce risk at industrial chemical facilities and other industrial facilities that use or store toxic industrial chemicals (TICS) or toxic industrial materials (TIMS)
  - Efforts to strengthen and limit vulnerabilities within US chemical critical infrastructure, including rail transport
- **ELIMINATION:** Destruction of remaining chemical weapons stockpiles.
  - Reduce the risk of chemical terrorism involving unsecured or under-secured traditional chemical warfare agents and munitions
  - Reduce domestic risk through safe and timely destruction of US stockpile
  - Reduce international risk through assistance to accelerate safe and timely destruction of the Russian chemical weapons stockpile

# RECOGNITION/ PREVENTION

International terrorists have clearly demonstrated the intent to obtain, develop, and use chemical weapons. In the 1990's, the Japanese cult, the Aum Shinrikyo, employed hydrogen cyanide, VX nerve agent, and sarin nerve agent against civilians. As the leader of a larger, radical Islamist movement, Al Qa'eda has advocated the use of terrorism as a means to cause economic collapse of the US and the Western world. The exploits of Al Qa'eda in Afghanistan to test unspecified lethal chemical agents on animals have been well-covered in the news media.[4] The recovered tactical manual, *Muswatul Jihad al-Afghani* (*The Encyclopedia of Jihad*), contains 11 volumes detailing development and concepts of terrorist operations for chemical agents and explosives. Another radical Islamic group, Ansar al-Islam in northern Iraq, was reportedly developing cyanide-based chemical agents in 2002.[5] Use of looted Iraqi chemical munitions against U.S. troops was reportedly threatened by Iraqi insurgents.[6] In addition, Iraqi insurgents incorporated chlorine tanks into improvised explosive devices on a number of occasions in early 2007, releasing clouds of toxic gas that inflicted civilian and military casualties. There is a communicated and clear intent and capability by terrorists to use traditional or improvised chemicals.

The President's National Security Strategy[7] directs executive agencies on national security issues. With regard to chemical *(and biological)* defense, it emphasizes the importance of proactive counterproliferation efforts described as "[p]reventing our enemies from threatening us, our allies, and our friends with WMD."[8] The National Strategy to Combat Weapons of Mass Destruction identified three pillars as core to the comprehensive strategy.[9] The first two pillars, Nonproliferation (impeding proliferation through diplomacy) and Counterproliferation (impeding proliferation through deterrence, passive defense, interdiction and military action) relate directly to the first part of this assessment; the third pillar, Consequence Management, is addressed in the second section on detection, resilience, and mitigation. Reducing the risk from state-based chemical weapons helps to lower the risk of chemical terrorism by eliminating one possible route for terrorists to obtain traditional chemical agents, precursors, or weaponization materials, whether via transfers from state to non-state actors, by theft or deception, or other means. Traditional and innovative new approaches to nonproliferation and counterproliferation are key elements of a policy to reduce the risk of chemical terrorism.

The Chemical Weapons Convention (CWC) – a multilateral arms control and disarmament agreement – is central to international limitations on chemical weapons proliferation, reducing the risk of chemical terrorism through the universality of the convention and full implementation of its program.

> "The Chemical Weapons Convention [CWC] stands as a monument to the world's determination to eliminate one

of the most inhumane weapons ever conceived." United Nations Secretary General Ban Ki Moon.[10]

The US should foster and encourage provisions to strengthen the international regime and its implementing body. In conjunction with the Second Review Conference of the CWC, the Senate reaffirmed its strong support of the treaty.[11] In furtherance of the treaty aims, the US should back efforts to control the transfers of dual-use chemicals.[12] CWC member countries that have not enacted domestic export-control legislation and nonmember countries with weak export controls can compromise international efforts to limit the risk from the increasing global trade in dual-use chemical technologies and materials. Additionally, the Schedules of Chemicals in the CWC – the lists of toxic chemicals and precursors – have not been updated since the treaty entered into force in 1997. The US should take a leadership position with regard to effective incorporation of additional chemicals and precursors into the list of Scheduled Chemicals in order to be able to better respond to emerging and other novel agents, including those at the intersection of chemistry and biology and potential hostile applications of nanotechnology.[13] In his statement at the recent Review Conference, US Ambassador Eric Javits emphasized the need for increased funding and more frequent meetings of the CWC's Science Advisory Board, which considers new technological advances relevant to the treaty.[14]

Complementing the traditional multilateral arms control approach to reducing the risk of chemical agents, the President's Proliferation Security Initiative (PSI) represents an innovative new approach to counterproliferation that should be strengthened further. All of the issues highlighted with respect to the PSI in the companion paper[15] on policies to reduce threats of bioterrorism are applicable to chemical terrorism.

Another tool contributing to reducing the risk of chemical terrorism is the State Department's Nonproliferation of Weapons of Mass Destruction Expertise (NWMDE) program, which encompasses the programs formerly referred to as "Science Centers/Bio Redirection" and reflects this broader scope. The growing global threat to U.S. national security from available WMD-relevant expertise prompted Congress to broaden the program's coverage to countries beyond the former Soviet Union. Most of the effort has been directed to limiting the hostile application of knowledge gleaned from the Soviet Union's former offensive biological weapons program, which largely reflected technology of thirty years ago. Technical knowledge associated with the former Soviet offensive chemical weapons program needs to be recognized and incorporated into such programs.

A significant success of U.S. foreign policy with respect to chemical terrorism is Libya's renunciation of weapons of mass destruction, which was announced in December 2003. This former state sponsor of terrorism agreed to eliminate all elements of its chemical weapons programs, eliminate all chemical weapons stocks and munitions, accede to the Chemical Weapons Convention, and allow immediate inspections and monitoring to verify all of these actions. The United States agreed to assist in the destruction of Libya's chemical weapons stockpile, which includes 23 met-

ric tons of chemical agents. The two governments initially agreed to a contract under which the U.S. would have contributed $45 million and Libya around $15 million, but Libya withdrew from the agreement in June 2007. The specific reasons for terminating the contract remain undisclosed.[16]

Within the framework of the Group of Eight (G8) Global Partnership Against the Spread of Weapons and Materials of Mass Destruction, launched in 2002, the United States promised to match up to $10 billion provided by other states for the elimination of surplus unconventional weapons in the former Soviet Union and to provide assistance on export controls. This pledge, however, has not resulted in offers of additional funding beyond the regular Cooperative Threat Reduction (CTR) appropriations, and progress in meeting the G8 program's goals has been limited at best.

**Improvised chemical terrorism expands the agents of concern from the approximately fifty classical chemical warfare agents to thousands of toxic industrial chemicals.**

Specifically highlighting the need for international agreements to counter weapons of mass destruction terrorism, the UN Security Council unanimously adopted Resolution 1540 on April 28, 2004, mandating that all states enact domestic legislation and systematic controls to prevent terrorists from acquiring weapons of mass destruction, including the adoption of appropriate controls over WMD-related materials, and establishing a 1540 Committee to oversee national implementation. Two years later, the Security Council unanimously extended the mandate of the 1540 Committee under Resolution 1673. The effectiveness of the resolutions has been questioned because of their lack of specificity regarding "appropriate effective national export and transshipment controls."[17] The U.S. should take a more proactive role in insuring that consistent and technically robust definitions are developed. Thus far the U.S. has been the only major provider of export control assistance. The need for enhanced technical assistance to carry out the resolution remains.

While effective controls on classical chemical warfare agents have been put in place over the last five years, there has been a failure of creativity in considering and responding to the expansion of terrorist tactics to include nontraditional chemical agents and delivery systems, such as improvised chemical devices (ICDs)[18] Attacks on industrial chemical facilities may be seen as one element of the expansion of chemical warfare from the traditional state-based chemical weapons programs of the Cold War and Saddam Hussein's Iraq to improvised agents, munitions, and methods for terrorism. Improvised chemical terrorism does not entail sophisticated knowledge or engineering requirements, nor advanced dissemination methods: "The *ease* or difficulty for terrorists to cause mass *casualties* with an improvised chemical weapon or biological device *depends* on the *chemical or biological agent selected*."[19] Chemical terrorism is likely to be a crime of opportunity, and improvised chemical terrorism expands the agents of concern from the approximately fifty classical chemical warfare (CW)

agents to thousands of toxic industrial chemicals.

Regarding the threat of chemical terrorism, the relevant knowledge and materials (such as commercial dual-use chemicals) are globally dispersed. Thus, the threat of chemical terrorism differs markedly from that of nuclear terrorism, in which the ability to build an improvised nuclear device is limited by of the availability of fissile material. Stocks of fissile material from the Cold War can and should be secured. In the case of bioterrorism, some biological pathogens are widely available, but the practical knowledge and infrastructure needed to produce mass-effect biological weapons may be much more limited than is widely perceived. Former Secretary of the Navy Richard Danzig has written about what he calls the "reload" phenomenon: "Our national power to manage the consequences of repeated biological attacks could be exhausted while the terrorist ability to reload remains intact."[20] With chemical terrorism, the "reload" factor – the ability to conduct multiple, dispersed attacks within a short time period – is equivalent to or higher than that for biological terrorism given the ubiquity of toxic chemical compounds throughout the industrialized world. Because it is both infeasible and economically undesirable to impose severe control measures on the commercial chemical sector, the best threat reduction policy may be to reduce the motivation to acquire and use such weapons.

## PREVENTION: C -

## RECOGNITION/

# RESPONSE

Passive defense and consequence management contribute substantially to the resilience of the nation and the ability to minimize the impact of a chemical attack on the affected population. Early detection of a chemical attack could enable first responders to treat the exposed and protect the unexposed, thereby significantly reducing the number and severity of casualties. Methods to detect a chemical terrorist attack can either focus on the detection of toxic clouds or rely on more sophisticated techniques that probe a given sample for particular chemical agents.

Since its inception, the Department of Homeland Security (DHS) has been a major actor in addressing the risk of chemical terrorism. *The National Strategy for Homeland Security* and *Securing Our Homeland: The 2004 DHS Strategic Plan* both contain significant recommendations on detecting chemical materials and attacks, improving chemical sensors and decontamination techniques, and harnessing science and technology to counter terrorism.[21] *Securing Our Homeland* emphasizes capabilities development and making use of "the vast resources and expertise from the Federal Government, private sector, academic community, non-governmental organizations, and other scientific bodies."[22] A cross-cutting theme of the U.S. national strategies is the need for increased interagency coordination.

Among the DHS Science and Technology Directorate's six divisions, the Chemical and Biological Division "conducts analyses for better characterization and prioritization of the threat, develops detection systems to provide early warning of a possible attack so as to minimize exposure and speed treatment of victims, conducts forensic analyses to support attribution, and works with federal partners who have lead responsibilities in decontamination and restoration, agrodefense, and food security."[23] The Chemical Countermeasures Program has established a Chemical Security Analysis Center with a national chemical defense architecture and pre-event assessment, discovery, and interdiction capabilities for chemical threats; completed development and validation for forensic analysis of sulfur mustard and nerve agents; developed and transitioned to the Environmental Protection Agency (EPA) a mobile laboratory for environmental analysis of chemical agent contamination; and prototyped multiple chemical detectors.[24] Additional efforts are needed to enhance rapid recovery from chemical attacks. The DHS program also works with the Departments of Agriculture, Health and Human Services, Justice, and the EPA and coordinates the interaction between those agencies and the intelligence and defense communities. When appropriate, the Science and Technology Directorate also aims to develop "integrated chemical, biological, radiological, nuclear, and explosives defense across civil and military sectors."[25]

The Department of Defense (DoD) is a critical resource and stakeholder in the development, testing, and fielding of new

countermeasures against chemical warfare agents and chemical terrorism. Key DoD elements that are active in this area include the Joint Chemical and Biological Defense Program (CBDP),[26] the DoD service laboratories, and the US Army Chemical Corps. The CBDP provides research, development, and acquisition programs to support passive defense capabilities (e.g., detectors, personal protective equipment ["gas masks"], decontaminants, medical countermeasures [vaccines and therapeutics], and diagnostics), counterproliferation, and consequence management. In support of counterproliferation, the CBDP provides operational capabilities tailored to the unique characteristics of the various chemical and biological weapons, including emerging threat agents, to facilitate passive defense and force protection. These capabilities also provide U.S. forces with the ability to rapidly and effectively mitigate the effects of a chemical attack against U.S. forces, whether at home or abroad.

**The Defense Department should continue to advocate assertively for revolutionary science and technology programs, and Congress should restore funding for these efforts.**

While the DoD has excelled at fielding and transitioning to the commercial sector items of chemical defense equipment, more attention is needed to develop new enabling technologies for chemical defense. The Transformational Medical Countermeasures Initiative (TMTI)[27] was launched in December 2006 and includes the development of new antidotes and treatments for chemical warfare agent exposure; it was highlighted in the 2006 Quadrennial Defense Review (QDR).[28] The physical countermeasures counterpart of TMTI is an even more recent effort to develop revolutionary countermeasures against the evolving WMD threat. Nevertheless, the FY08 Defense Appropriations Bill cut $100 million from the TMTI and $39 million from the revolutionary physical countermeasures initiative. The Defense Department should continue to advocate assertively for revolutionary science and technology programs, and Congress should restore funding for these efforts, which engage academia and the private sector.

A critical component of consequence management and response to incidents of chemical terrorism is the capacity and capability of public health laboratories across the nation, including the Laboratory Response Network. This leading indicator has been assessed twice since the release of the original findings of the National Commission on Terrorist Attacks upon the United States. In 2003, a survey of the capacity of public health laboratories to respond to a chemical terrorism incident, conducted by the Association of Public Health Laboratories (APHL), "uncovered serious inadequacies as well as needed improvements in worker safety, facility security and methods for agent analysis of environmental samples."[29] Fifty percent of state laboratory directors rated their capacity to respond to a chemical terrorism event as poor. A follow-up survey in 2005 found that "laboratory preparedness for chemical terrorism continues to lag behind activities associated with bioterrorism, primarily as a result of the delay in the allocation of federal funds." This under-

funding has led to inadequate hiring of laboratory staff and modernization of facilities and equipment.[30]

The Top Officials (TOPOFF) series of terrorism preparedness exercises have involved senior officials at every level of the U.S. government as well as representatives from the international community and private sector. Lessons learned from these exercises should serve as the basis for developing standardized Best Practices for the nation's first-responder community, building domestic capacity and coordination across the levels of government, and developing strategies for better risk communication to the public in the event of a chemical terrorism event. TOPOFF 1 and 3, in May 2000 and April 2005, respectively, both incorporated notional terrorist events with sulfur mustard (a blister agent). Unfortunately, the release of after-action reports has been slow, limited, and marginal in content. In addition, the value of TOPOFF 3 was limited by the artificiality of the response to the incident scenario: first-responder vehicles were lined up like a parade in a staging area and preceded to the incident site in an orderly, staged manner. There was no attempt to simulate the effects of traffic, multiple uncoordinated units arriving at the same time, or responses at different locations. Similarly, during the start-up of the Joint Operations Center (JOC), all of the disparate agencies assembled at the same time. Decontamination, long-term mitigation, and remediation were treated as afterthoughts. Finally, there is little evidence that the lessons learned from TOPOFF 1 and 3 have been transferred to states and cities that did not participate in the exercises.[31]

**RESPONSE: B**

# CRITICAL INFRASTRUCTURE

Policies to reduce the threat of a terrorist attack against industrial chemical facilities – critical infrastructure with the potential to cause mass casualties – have been driven by incomplete and, in some cases, unrealistic assumptions. Yet it is essential to reduce the risk that terrorists could attack an industrial chemical facility as a means to cause the release of a plume of toxic vapor and inflict mass casualties, or to inflict economic damage by destroying a key element of the nation's critical infrastructure.[32]

The worst-case scenario for a terrorist attack on a domestic industrial chemical facility would result in up to 2.4 million people killed or injured, as calculated by the U.S. Army Surgeon General's Office.[33] More than 15,000 facilities throughout the U.S. produce, store, and transport industrial chemicals in substantial quantities.[34] In 1996, the U.S. Environmental Protection Agency (EPA) determined that "a worst-case release" could endanger more than one million people located near one of the 123 identified chemical facilities.[35] More recent assessments assert, "at present, about 600 facilities could potentially threaten between 100,000 and a million people. About 2,000 facilities could potentially threaten between 10,000 and 100,000 people."[36] The numbers are staggering.

The Union Carbide disaster in Bhopal, India, in December 1984 is illustrative of the scale of catastrophe that is possible from a terrorist attack on a chemical industry plant. This incident, whose cause remains uncertain, resulted in over 3,800 fatalities from the initial release of the toxic gas methyl isocyanate, and well over 200,000 exposed individuals who have suffered chronic symptoms over the ensuing twenty years. Possible motivations for attacking chemical industry infrastructure include economic terrorism, disruption of the government in power, protest of a single incident or event, or protest of U.S. foreign policy.[37]

Current analysis and policy on protecting chemical industry facilities from terrorist attack has focused – *to an almost myopic extent* – on reducing vulnerability.[38] Too many analysts and observers have emphasized the potential for sabotage and focused on the perceived "insider" threat: "Possibly the most serious threat is posed by external adversaries aided by insiders."[39] Most preparedness and response plans have dealt mainly with human security (employees, contractors, and workers); for example, "obvious strategies" advocated by chemical industry representatives include the "use of employee identification cards, background checks for employees and contractors, and additional surveillance in the form of obvious cameras as well as the more covert."[40] The only physical security upgrade that is often mentioned is "additional fencing." While widely perpetuated, there does not appear to be any evidence or indication of sophisticated attempts to infiltrate an industrial chemical facility as a temporary employee or to co-opt a permanent employee in or-

der to cause a mass-casualty toxic chemical release. Only minor, speculative accounts of subterfuge by terrorists motivated to attack chemical infrastructure appear in the historical record. Additionally, data on the causes of industrial incidents over a thirty year period indicates that only 1% was attributable to sabotage or arson: the leading cause of accidents was found to be mechanical failure (44%).[41] A survey of U.S. workers by the Paper, Allied-Industrial, Chemical & Energy Workers International Union (PACE) found that fewer than 17% of chemical industry facilities have enacted "fundamental changes that would lower the impact of an accident or attack by making chemical processes inherently safer or by storing smaller amounts of hazardous materials on-site."[42] Increasing basic perimeter security to prevent a bomb or other incendiary device from impacting a facility and the development of inherently safer, economically beneficial, and efficient technology should be prioritized.

**Washington has caved to pressures from interest groups, like the chemical industry, that have fought increased security measures.**

The risk associated with a terrorist attack on chemical plants has been singled out as "one of the most urgent threats to our safety" that has not been given adequate attention in U.S. government efforts to increase domestic security.[43] According to an editorial in the *New York Times*, "the nation's chemical plants are still a horrific accident waiting to happen. And Washington has caved to pressures from interest groups, like the chemical industry, that have fought increased security measures."[44]

Another component of critical infrastructure protection is the need to reduce risks associated with the commercial transportation of chemicals, whether by road or rail. Approximately 1 millions tons of "hazardous materials," along with another 3 million tons of highly toxic, corrosive chlorine, are transported by rail each year.[45] These materials are routinely transported through a variety of major metropolitan areas, including Washington, D.C., Newark (adjacent to New York City), Los Angeles, and Atlanta.

In late 2006, the Department of Transportation proposed revisions to the current requirements in the Hazardous Materials Regulations for the transportation of hazardous chemicals by rail.[46] Of particular note is the proposed requirement that rail carriers compile annual data on certain shipments of chemicals. This information would then be used to conduct safety and security assessments, assess alternative routing options, and make routing decisions based on the annual findings. A final rule has yet to be issued because of "unanticipated issues requiring further analysis."[47] The Transportation Security Administration (TSA) has been tasked with overseeing the development and implementation of a system to track the location of rail cars carrying certain toxic chemicals.[48] Included among the Implementing Recommendations of the 9/11 Commission Act of 2007, signed into law by President Bush in August 2007, were the major legislative points of the Surface Transportation and Rail Security (STARS) Act of 2007 (as Title XIII & XV of the "9/11

Bill"), which authorized new rail security assessments, grant programs, research and development initiatives, and requested specific plans to address transportation of hazardous materials. For the first time, the Act provides a statutory framework for the nation's rail security efforts setting specific goals, tasks, and timelines for security improvements.

The final component of this pillar concerns chemical facilities that are part of the nation's critical infrastructure. The chemical industry is the largest U.S. exporter (more than $80 billion in 2001 alone), accounting for more than 10 percent of all exports by dollar.[49] This $454 billion a year industry employs more than one million people domestically, is responsible for one of every seven U.S. patents, and contributes more than $31 billion annually to research and development (more than double the R&D contribution from the entire biotechnology industry).[50]

The raw chemicals, specialty chemicals, life-science products, and consumer products manufactured by the chemical industry are part of a nation's critical infrastructure.[51] This industry affects agriculture through fertilizers and pesticides, and the aerospace and defense industries through composite materials, coatings, and chemical feedstocks. If the ability of the U.S. chemical industry to produce raw and fine chemicals were compromised, it would have a major deleterious impact on U.S. defense, economic security, and short-term sustainability. Because chemical industry sites generate products that contribute to the maintenance of domestic security, public health, and the economy, they are considered part of the U.S. critical infrastructure.[52] Targeted attacks on a few discrete chemical industry facilities that play a critical role in the nation's economy, general welfare, and defense could have disabling effects far exceeding the immediate death and destruction.[53]

In 2007, the Department of Homeland Security finally issued the interim final rule on Chemical Facility Anti-Terrorism Standards (CFATS), which established risk-based performance standards for physical security at chemical facilities holding threshold amounts of 342 chemicals.[54] Until January 2006, DHS had not received a congressional mandate to implement and enforce industry-wide security measures.[55] Industry-backed pressure and lack of strong advocacy from the administration had prevented the adoption of stronger Congressional Committee-reported bills, such as S.2145 and HR.5695. In 2006, a compromise was incorporated into the FY2007 DHS Appropriations Bill, which was backed by the chemical industry and the administration but was opposed by many chemical safety proponents. Federal representatives have estimated that fewer than 1,000 facilities will be assessed to fall into the highest risk categories, called Tier 1 and Tier 2 facilities.[56] Another 5,000-8,000 chemical facilities are anticipated to fall into the Tier 3 and Tier 4 categories. The regulations incorporate flexibility through multiple options, such as the Alternate Security Programs (ASPs).

Nevertheless, a strong emphasis remains on the perceived risk of the insider threat, rather than strengthening external barriers or providing incentives for the adoption of safer, alternative chemical manufacturing

technologies and processes to reduce the use of highly toxic materials and thereby reduce risks. Other criticisms include the lack of milestones for compliance, the lack of whistleblower protections, potential conflicts with stricter state or local regulations, and the lack of applicability to water- and waste-treatment facilities that utilize chlorine.[57]

# CRITICAL INFRASTRUCTURE:

# C+

# ELIMINATION

The final pillar in reducing the threat of chemical terrorism concerns unsecured or under-secured stockpiles of chemical warfare agents and munitions. After the September 2001 terrorist attacks, the Department of Defense decided to accelerate destruction of the remaining U.S. chemical weapons stocks because these sites were potential terrorist targets. Each eliminated weapon and manufacturing facility is one less that could be targeted by terrorists. Internationally, the principal hazard remains the chemical weapon stockpiles of the former Soviet Union.[58]

In January 2008, the U.S. Army Chemical Materials Agency announced the safe, effective, and complete destruction of 50% of the US chemical agent stockpile.[59] The U.S. met the 2007 deadline for destroying 45% of its stockpile under the Chemical Weapons Convention. Between 2005 and 2007, destruction activities were completed at the chemical weapons storage depot in Aberdeen Proving Ground, Maryland, and destruction operations were initiated at the depots in Pine Bluff, Arkansas, and Newport, Indiana. At present, five chemical weapons destruction facilities are operational and are scheduled to complete destruction of more than 78% of the U.S. stockpile by 2017. Of the two remaining facilities, the Blue Grass Army Depot in Kentucky – with 523 tons of mustard and VX and sarin nerve agents in rockets and projectiles – is still in the planning phase, and initial work on construction of the facility at the Pueblo Chemical Depot in Colorado – with 2,611 tons of mustard agent in mortars and artillery shells –began in April 2008.[60]

Blue Grass and Pueblo are the two Assembled Chemical Weapons Alternatives (ACWA) sites pursuing non-incineration methods for destruction of chemical agents. The Army currently plans for the Pueblo facility to begin operations in 2015 and the Blue Grass facility to commence destruction in 2017.[61] The U.S. chemical weapons destruction effort has been funded at around $1.3 to $1.4 billion per year. Increased funding over the past three years could have expedited the con-

| | FY2005 | FY2006 | FY2007 | FY2008 |
|---|---|---|---|---|
| **Domestic CW destruction budget** | $1,373.0 M (appropriated)[i] | $1,386.8 M (appropriated)[ii] | $1,277.3 M (appropriated)[iii] | $1,512.7 M (proposed) |
| **Construction for Blue Grass and Pueblo** | $813.4 M [iv] | | $131.0 M | Pueblo: $35.2 M Blue Grass: $69.0 M[v] |
| **ACWA Budget** | $175.0 M (appropriated)[vi] | $52.5 M (appropriated)[vii] | | |

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struction of the Blue Grass and Pueblo destruction facilities. Funding for construction at the two sites in this fiscal year is slightly more than $104 million. In order to complete weapons disposal in line with CWC treaty requirements, that amount would have to be substantially increased over multiple years. More importantly, destruction of the stockpile will directly reduce the threat to the surrounding communities, and to the nation, that stems from these aging munitions.

Congress has repeatedly expressed its concern over the slow progress at Pueblo and Blue Grass. The 2007 Defense Authorization Act includes a "sense of Congress" provision asking the Secretary of Defense to "make every effort to ensure adequate funding to complete the elimination of the United States chemical weapons stockpile in the shortest time possible" and to keep Congress informed with an annual schedule for stockpile destruction.

In December 2007, the Government Accountability Office (GAO) issued an updated report of the status of recommended changes to management of the chemical weapons disposal program.[62] Among the thirteen recommendations to reduce the risk of future program schedule extensions and cost growth, the GAO noted that the Army's Chemical Materials Agency risk management process has not been fully developed or integrated with DOD's risk management process, "[a]s a result, managers lack an integrated and systematic approach to evaluate and manage risk." The Defense Department fully or partially concurred with 12 of GAO's recommendations.

The United States has been assisting Russia with the destruction of its chemical weapons stockpile since the collapse of the Soviet Union. In 1992, Congress authorized funding for the construction of a nerve agent destruction facility at Shchuch'ye, which contains one-seventh of Russia's declared chemical weapons stockpile. Initial cost estimates have doubled since then, and a U.S.-Russian dispute over subcontracting led to lengthy delays. A recently signed bilateral agreement obligates Russia to assume all costs and responsibilities for the destruction program beyond current U.S. appropriations. In its FY 2008 budget request, the Bush administration did not request further funding for the Shchuch'ye facility.[63]

The U.S. government has also helped Albania and Libya to eliminate their stocks of chemical weapons. Although Libya withdrew from the U.S. assistance agreement in the summer of 2007, Albania successfully incinerated its entire stockpile of 16 metric tons of blister from February to July 2007 at a cost of $4 million provided by DoD's Cooperative Threat Reduction program.[64]

## ELIMINATION: B

# RECOMMENDATIONS

## Improving Recognition and Prevention

**1:** The threat of chemical weapons terrorism – traditional, improvised, and novel – must be recognized as real rather than dismissed as a relic of history. Traditional and innovative new approaches to nonproliferation and counterproliferation are key elements of a policy to reduce the risk of chemical terrorism. The US should support efforts to strengthen the international regime to control transfers of dual-use chemicals and expand the list of scheduled chemicals.

## Preparing the First Response: Strengthening Detection, Resilience, and Mitigation

**2:** While individual program managers across the federal government may coordinate extensively on individual programs, higher level strategic interagency coordination is needed. The Departments of Homeland Security and Defense should advocate assertively for investments in basic research that will enable revolutionary science and technology capabilities that engage academia and the private sector and Congress should fund them.

## Protecting Critical Infrastructure

**3:** The federal government is late on implementing policies with respect to reducing the threat of terrorism directed at industrial chemical facilities. Execution of such policies is yet to be observed. It is strongly recommended that vulnerability and the myth of the insider threat be deemphasized and that the concept of fostering development of inherently safer, economically beneficial, and efficient technology be supported. Information on the Transportation Security Administration (TSA) tracking system for rail cars carrying certain toxic chemicals should be made available for review and oversight.

## Ensuring Weapons Elimination

**4:** Increase funding and accelerate destruction of the aging U.S. chemical stockpile, particularly the Blue Grass Army Depot and Pueblo Chemical Depot, in order to reduce risk of accidental on-site release of lethal materials and targets for terrorists. The Defense Department should implement the Government Accountability Office (GAO) recommendations on improving management of its chemical weapons demilitarization and disposal program. Funding for Cooperative Threat Reduction Programs should be increased and new programs should be initiated to address the ongoing challenges of destruction of the Russian and Libyan chemical stockpiles.

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She currently serves on the editorial board of Studies in Conflict and Terrorism. Her awards include the OSD Award for Excellence, 2007 UIUC Alumni Association Recent Alumni Award, the President's Volunteer Service Award, AAAS Defense Policy Fellow, and the Society of Porphyrins and Phthalocyanines Research Award. Kosal is currently completing a book exploring scenarios and strategies regarding the benefits and potential proliferation threats of nanotechnology and other emerging sciences for national security.

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