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COMBATING TERRORISM: ASSESSING THE THREAT

HEARING

BEFORE THE

SUBCOMMITTEE ON NATIONAL SECURITY, VETERANS AFFAIRS, AND INTERNATIONAL RELATIONS

OF THE

COMMITTEE ON GOVERNMENT REFORM

HOUSE OF REPRESENTATIVES

ONE HUNDRED SIXTH CONGRESS

FIRST SESSION

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CONTENTS

	Page
Hearing held on October 20, 1999	1
Statement of:	
Hinton, Henry L., Jr., Assistant Comptroller General, National Security and International Affairs Division, General Accounting Office, accompanied by Deborah A. Colantonio, Senior Evaluator; and Davi M. D'Agostino, Assistant Director	9
Jenkins, Brian M., senior advisor to the president, RAND; John V. Parachini, senior associate, Center for Nonproliferation Studies, Monterrey Institute of International Studies; and Raymond Zilinskas, senior scientist in residence, Biological and Toxin Arms Control, Monterey Institute of International Studies	37
Letters, statements, et cetera, submitted for the record by:	
Blagojevich, Hon. Rod R., a Representative in Congress from the State of Illinois, prepared statement of	6
Hinton, Henry L., Jr., Assistant Comptroller General, National Security and International Affairs Division, General Accounting Office:	
Information concerning the Chemical Weapons Convention	30
Prepared statement of	13
Jenkins, Brian M., senior advisor to the president, RAND, prepared statement of	40
Parachini, John V., senior associate, Center for Nonproliferation Studies, Monterrey Institute of International Studies, prepared statement of	49
Shays, Hon. Christopher, a Representative in Congress from the State of Connecticut, prepared statement of	3
Zilinskas, Raymond, senior scientist in residence, Biological and Toxin Arms Control, Monterey Institute of International Studies, prepared statement of	77

COMBATING TERRORISM: ASSESSING THE THREAT

WEDNESDAY, OCTOBER 20, 1999

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON NATIONAL SECURITY, VETERANS AFFAIRS, AND INTERNATIONAL RELATIONS,
COMMITTEE ON GOVERNMENT REFORM,
Washington, DC.

The subcommittee met, pursuant to notice, at 10:30 a.m., in room 2247, Rayburn House Office Building, Hon. Christopher Shays (chairman of the subcommittee) presiding.

Present: Representatives Shays, Souder, Terry, and Blagojevich.

Staff present: Lawrence J. Halloran, staff director and counsel; Michele Lang and Robert Newman, professional staff members; Jason Chung, clerk; David Rapallo, minority counsel; and Earley Green, minority staff assistant.

Mr. SHAYS. I would like to call this hearing to order.

We are going to be having a vote, but I will see if I can get some of the preliminaries done.

This is our fifth hearing on Federal efforts to combat terrorism at home and abroad. In previous sessions, we examined governmentwide spending coordination and specific programs to train first responders, deploy National Guard rapid response teams and strengthen public health capabilities to deal with weapons of mass destruction.

Underlying all that testimony was one question: How should we fix spending priorities and establish programs to meet an inherently unpredictable, constantly changing threat?

To address that question, we asked the General Accounting Office [GAO], to examine one dimension of the threat: the scientific and practical aspects of terrorists carrying out large-scale chemical or biological attacks on U.S. soil. Their report discusses the degrees of difficulty terrorists face when trying to acquire, process, improvise and disseminate certain chemical and biological agents to inflict mass casualties of 1,000 or more. GAO recommends using that type of information to improve systematic threat assessments and refine Federal program targeting.

That will not be easy. By its nature, terrorism partakes of the irrational and will not always succumb to rational dissection by the tools of threat assessment and risk management. Any rigid ranking of terrorists' histories, capabilities, and intentions appears to equate likelihood with lethality, understating the threat posed by low probability, yet highly consequential, chemical and biological attacks.

But the threat can just as easily be overstated. Vulnerability alone is an inadequate measure, drawing scarce resources in 1,000 directions. Preparing for every worst case scenario is neither practical nor affordable and carries the additional risk we terrorize ourselves by starving other fiscal priorities and surrendering civil liberties.

As the threat of biological and chemical terrorism evolves, so should our response. Just as we learned to assess, and to a degree accept, the nuclear threat in the 1950's and 1960's, our assessment of the risks posed by terrorism will need to adapt to the changing world environment of the next century.

Federal programs, not known for flexibility or adaptability, will need to change as well. What will guide those changes? Increasingly sophisticated judgments or generalized fears? Prudent planning or budgetary momentum? These are the issues we will confront today, and in future hearings, as our oversight continues.

Our witnesses this morning bring significant expertise and insight to our discussion of an important national security issue. We appreciate their time and look forward to their testimony.

At this time, I ask if Mr. Souder has any comments he would like to make.

[The prepared statement of Hon. Christopher Shays follows:]

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Statement of Rep. Christopher Shays

October 20, 1999

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Mr. SOUDER. No.

Mr. SHAYS. Let me take care of unanimous consents. I ask unanimous consent that all members of the subcommittee be permitted to place an opening statement in the record and that the record remain open for 3 days for that purpose, and without objection, so ordered.

[The prepared statement of Hon. Rod R. Blagojevich follows:]

Opening Statement
Representative Rod Blagojevich, Ranking Member
Subcommittee on National Security,
Veterans Affairs, and International Relations

October 20, 1999

GOOD MORNING. LET ME WELCOME OUR WITNESSES FROM THE GENERAL ACCOUNTING OFFICE, AS WELL AS OUR DISTINGUISHED WITNESSES FROM THE RAND CORPORATION AND THE MONTEREY INSTITUTE FOR INTERNATIONAL STUDIES.

I AM GLAD YOU ALL COULD BE WITH US.

TODAY WE WILL DISCUSS THE PROCESS OF DETERMINING HOW WE FUND AND OTHERWISE SUPPORT FEDERAL EFFORTS TO COUNTER TERRORIST THREATS WITH CHEMICAL AND BIOLOGICAL WEAPONS.

THIS IS AN EXTREMELY DIFFICULT AND IMPORTANT BALANCING ACT, ESPECIALLY CONSIDERING THE VARIOUS UNKNOWNS WITHIN THE DEBATE.

FIRST, WE HAVE TO ANALYZE THE POTENTIAL THREATS. DO TERRORISTS HAVE ACCESS TO CHEMICAL AND BIOLOGICAL WEAPONS? CAN THEY OBTAIN THEM SOMEHOW -- PRODUCE THEM, BUY THEM, STEAL THEM? IN WHAT MANNER COULD THESE WEAPONS BE USED AGAINST US?

SECOND, WHAT IS THE LIKELIHOOD THAT SUCH TERRORIST ATTACKS WILL OCCUR? IN OTHER WORDS, WHAT IS THE PROBABILITY THAT TERRORIST GROUPS WILL BE SUCCESSFUL? IS IT POSSIBLE TO RANK THESE RISKS AND GAUGE OUR LIABILITIES?

IN ADDITION, WE ALSO HAVE TO TAKE INTO ACCOUNT THE POTENTIAL REPERCUSSIONS OF A SUCCESSFUL ATTACK. EVEN IF THE USE OF A CERTAIN AGENT IS EXTREMELY UNLIKELY, THE EFFECTS COULD BE DEVASTATING. HOW DO WE COMPARE EVENTS THAT ARE LIKELY BUT RELATIVELY MINOR WITH EVENTS THAT ARE UNLIKELY BUT POTENTIALLY CATASTROPHIC?

OF COURSE, INTELLIGENCE ANALYSES CAN HELP TO REDUCE THE NUMBER OF UNKNOWNS AND THUS ENHANCE OUR ABILITY TO PREDICT THE LIKELIHOOD OF CERTAIN EVENTS.

THEREFORE, I COMMEND G.A.O.'S EFFORTS TO IMPOSE GREATER STRUCTURE ONTO THIS PROCESS, TO ENCOURAGE ADDITIONAL INFORMATION-GATHERING, AND TO STIMULATE THE ORGANIZED SHARING AND PRIORITIZATION OF THIS INFORMATION AMONG EXECUTIVE AGENCIES.

I WOULD LIKE TO WARN AGAINST ONE TREND, HOWEVER. IT IS IMPORTANT -- ESPECIALLY WHEN COUNTERING BASELESS DOOMSDAY PREDICTIONS -- THAT WE NOT ERR TOO FAR IN THE OTHER DIRECTION.

IN OUR EFFORTS TO COUNTER THEORIES BASED SOLELY ON WORST-CASE SCENARIOS, WE MUST NOT ALLOW THE PENDULUM TO SWING RECKLESSLY TOWARD COMPLACENCY.

WE MUST NOT DISMISS TOO LIGHTLY THREATS THAT ARE REAL.

FOR EXAMPLE, WE SHOULD NOT NECESSARILY CONFINE OUR ANALYSIS TO ACTUAL INCIDENTS THAT HAVE OCCURRED ON U.S. SOIL.

RATHER, WE MUST CONSIDER CAREFULLY THE WORLDWIDE HISTORICAL RECORD, AS WELL AS THE NEWLY DEVELOPING TRENDS THIS RECORD SUGGESTS.

KEEPING IN MIND THAT OUR GOAL IS A BALANCED, THOUGHTFUL APPROACH, I LOOK FORWARD TO THE TESTIMONY OF ALL OUR WITNESSES.

THANK YOU, MR. CHAIRMAN.

Mr. SHAYS. I ask further unanimous consent that all witnesses be permitted to include their written statements in the record and, without objection, so ordered.

As our first witness, we have Henry Hinton, Jr., Assistant Comptroller General, National Security and International Affairs Division, General Accounting Office; and Deborah A. Colantonio and Davi M. D'Agostino. And would you state your titles?

Ms. COLANTONIO. I am a Senior Evaluator.

Ms. D'AGOSTINO. I am an Assistant Director.

Mr. SHAYS. Why don't you start your testimony? I think you will be able to finish, and then we will have a vote.

Mr. HINTON. Mr. Chairman, Mr. Souder——

Mr. SHAYS. Excuse me, we do swear everyone in, including yourself.

[Witnesses sworn.]

Mr. SHAYS. For the record, everyone has responded in the affirmative.

We will do 5 minutes and then roll the clock over for another 5 minutes.

STATEMENT OF HENRY L. HINTON, JR., ASSISTANT COMPTROLLER GENERAL, NATIONAL SECURITY AND INTERNATIONAL AFFAIRS DIVISION, GENERAL ACCOUNTING OFFICE, ACCOMPANIED BY DEBORAH A. COLANTONIO, SENIOR EVALUATOR; AND DAVI M. D'AGOSTINO, ASSISTANT DIRECTOR

Mr. HINTON. Mr. Chairman, Mr. Souder, I am pleased to be here this morning to discuss our recent report on combating terrorism that you referred to.

I will first discuss the ease or difficulty for terrorists to conduct large-scale chemical and biological attacks.

Second, I will cover the extent to which the threat of such attacks have been assessed.

But before I begin, Mr. Chairman, I want to clarify for you what we did and what we did not do in our work.

We consulted with experts in numerous fields to look at the scientific and practical aspects of terrorists successfully carrying out large-scale chemical or biological attacks that might cause mass casualties of at least 1,000. We also considered the fact that the terrorists would be operating illegally and outside a state-run laboratory or weapon program. We did not address the possibility of a rogue scientist or official from a state program providing agents or their weapons from their programs to a terrorist organization, nor did we examine the ease or difficulty for states to successfully produce these weapons.

Overall, Mr. Chairman, we found that terrorists trying to make chemical or biological weapons would have to overcome a number of significant technical challenges to cause mass casualties. Some people might be surprised because this conflicts with the many suggestions that have been made in the media and elsewhere that it is easy to prepare agents in your kitchen, your bathtub and your garage.

Chemical and biological experts and intelligence agency officials believe that ease or difficulty for terrorists to cause mass casualties

with an improvised weapon or device depends on the agent selected. Experts from the scientific intelligence and law enforcement communities told us that terrorists did not need sophisticated knowledge or dissemination methods to use toxic industrial chemicals such as chlorine. In contrast, terrorists would need a relatively high degree of sophistication to successfully cause mass casualties with some other chemical and most biological agents. Specialized knowledge would be needed to acquire the right biological agent or precursor chemicals, process the chemical or biological agent, improvise a weapon and disseminate it. Throughout the different stages of the process, terrorists would run the risk of hurting themselves and being detected and would have to overcome these challenges.

Let me break these down further, Mr. Chairman, and call your attention to this chart that is before you. It gives you an idea of some of the stages and the challenges that go into making these types of weapons.

Note the cloud in the upper left-hand corner. A terrorist would need to possess certain technical skills. Experts in the various fields, including those formerly with state-sponsored weapons programs, told us that many skills are required to successfully research, develop, produce and disseminate weapons of this type. For example, knowledge and expertise in the fields of physics, meteorology, microbiology and chemistry would come into play.

Also, when dealing with biological weapons, experts agree that only those individuals who work on weaponizing agents in a state biological warfare program are likely to possess the specialized knowledge.

Next as shown in the top box, a terrorist would need to acquire basic chemicals or infectious biological seed cultures. Basic chemicals necessary for the production of some chemical agents are controlled by the 1993 Chemical Weapons Convention.

Chemical experts told us that illegal acquisition of large quantities of precursor chemicals would raise red flags, and most nerve agents like sarin have to be delivered in large quantities. The critical exception to this and other challenges for making a chemical attack is toxic industrial chemicals. Chemicals like chlorine or phosgene are ready available. They don't require any mixing. They are dangerous just the way that they are.

A hurdle for terrorists trying to make biological weapons is to get sufficiently deadly or infectious seed stocks of the bacteria or virus, especially since controls over these stocks have improved. In our former biological warfare program the United States investigated numerous strains of biological warfare agents before finding ones that were highly infectious.

In the second box, terrorists would need to synthesize chemical agents or grow biological agents. For some chemical agents, a terrorist must mix the right amounts of different types of chemicals together in an appropriate container. Biological agents are relatively easy to grow, but a terrorist has to be very careful not to contaminate them with other bacteria or viruses that might kill or interfere with the agents' effects.

Even if a terrorist goes through this stage, there are more stages to complete. As shown in the third box, a terrorist would need to

process the agents into a form that can be effectively delivered. Specialized knowledge is needed because some steps in the production process of nerve agents are difficult and hazardous. A technical challenge includes containing highly toxic gases. For biological agents, a terrorist has to make a wet or dry product with the right particle size to form a stable aerosol so that the particles reach the small air sacs deep in the lungs. And if a terrorist is trying to make the dry product, special precautions would need to be taken to avoid killing the biological agent in the process.

As depicted in the fourth box, a terrorist would have to improvise an agent delivery device to cause mass casualties. Even if the chemical agents can be produced successfully, they must be released effectively as a vapor or as an aerosol to be inhaled.

Another method for certain chemicals is to spray large droplets for skin penetration, and for biological agents a terrorist would have to use the right equipment with the right speed to disseminate the agent effectively. If the biological agent is not stabilized and disseminated with the proper energy rate, then the biological agent can lose its ability to cause injury.

Last, in the fifth box, and the remaining cloud, a terrorist would have to effectively release the selected agent to cause mass casualties. Both chemical and biological agents need to maintain their strength during release. This is a challenge posed by the very nature of the agents themselves.

Terrorists must also deal with additional hurdles. For example, outdoor delivery of agents can be disrupted by environmental and meteorological conditions. If wind conditions are too erratic or strong, the agent might dissipate.

Terrorists risk capture and personal safety in acquiring and processing materials, disposing of by-products and releasing the agents. Many agents are dangerous to handle. In some cases, the lack of an effective vaccine, antibiotic, antiviral treatment or antidote poses the same risk to the terrorist as it does to the targeted population.

Let me turn now to the second issue regarding the extent to which threat and risk assessments have been done. As you know, numerous Federal agencies—and you have made reference to that in your remarks—are spending billions of dollars and initiating several new programs to prepare for the possibility of a terrorist attack. It is not clear that these investments are targeted toward the right program solutions in the right amounts.

We have found that the intelligence community has assessed the more likely chemical and biological threat agents to be used by foreign terrorists, but there is no comparable formal assessment that has been done by the FBI for domestic origin threats.

Also, we determined that there is need for a national level assessment that would enable the Nation to focus on the more likely chemical and biological threats. If done properly, this risk assessment would also target our programs and resources more effectively and economically.

In our report we recommended that the Attorney General direct the FBI to perform these assessments to help establish and prioritize program requirements. The Justice Department agreed

with us on the need for these assessments, as did the Department of Defense and the CIA.

Mr. Chairman, that concludes my summary remarks. My colleagues and I will be pleased to respond to your questions.

Mr. SHAYS. Thank you very much.

[The prepared statement of Mr. Hinton follows:]

United States General Accounting Office

GAO

Testimony

Before the Subcommittee on National Security, Veterans Affairs, and International Relations, Committee on Government Reform, House of Representatives

For Release on Delivery
Expected at
10:00 a.m., EDT
Wednesday,
October 20, 1999

COMBATING TERRORISM

Observations on the Threat of Chemical and Biological Terrorism

Statement of Henry L. Hinton, Jr., Assistant Comptroller General, National Security and International Affairs Division

GAO/T-NSIAD-00-50

Mr. Chairman and Members of the Subcommittee:

I am pleased to be here to discuss our report Combating Terrorism: Need for Comprehensive Threat and Risk Assessments of Chemical and Biological Attacks,[1] issued last month to you, the Chairman and the Ranking Minority Member of the Senate Veterans' Affairs Committee, and the Ranking Minority Member of the House Armed Services Committee. My testimony today summarizes the two principal messages of that report. First, it discusses the ease or difficulty for a terrorist to create mass casualties (defined as at least 1,000 deaths or illnesses) by making and using chemical or biological agents without the assistance of a state-sponsored program. Second, it addresses the need to use intelligence estimates and risk assessments to better guide and prioritize appropriate countermeasures and programs.

Because of the technical nature of the topic, we consulted numerous experts in the course of our work. For example, we obtained from intelligence agencies, the Federal Bureau of Investigation (FBI), military medical experts, and others lists of specific chemical and biological agents that might be used by terrorists. Experts formerly with U.S. and foreign government warfare programs provided detailed information on the production, weaponization, and delivery of chemical and biological agents. In addition, we interviewed experts in the fields of science, medicine, law enforcement, intelligence, and terrorism. We spoke with and obtained documentation from a number of federal agencies, including the U.S. Army Medical Research Institute of Infectious Diseases, the Centers for Disease Control and Prevention, the U.S. Army Soldier and Biological Chemical Command, and the Defense Threat Reduction Agency. We also analyzed manuals, handbooks, texts, reports, and studies on infectious diseases and on biological and chemical casualties.

SUMMARY

According to the experts we consulted, in most cases terrorists would have to overcome significant technical and operational challenges to successfully make and release chemical or biological agents of sufficient quality and quantity to kill or injure large numbers of people without substantial assistance from a state sponsor. With the exception of toxic industrial

[1] Combating Terrorism: Need for Comprehensive Threat and Risk Assessments of Chemical and Biological Attacks (GAO/NSIAD-99-163, Sept. 7, 1999).

chemicals such as chlorine, specialized knowledge is required in the manufacturing process and in improvising an effective delivery device for most chemical and nearly all biological agents that could be used in terrorist attacks. Moreover, some of the required components of chemical agents and highly infective strains of biological agents are difficult to obtain. Finally, terrorists may have to overcome other obstacles for a successful attack, such as unfavorable environmental conditions and personal safety risks.

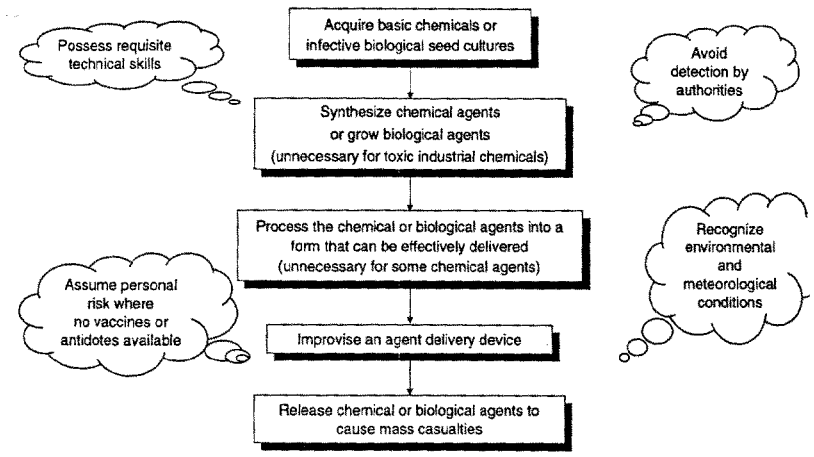
The President's fiscal year 2000 budget proposes $10 billion for counterterrorism programs—an increase of more than $3 billion over the requested funding of $6.7 billion for fiscal year 1999. To assess whether the government is spending appropriate levels on counterterrorism and spending these funds on the most appropriate programs, policymakers need the best estimates of the specific threats the U.S. faces. The intelligence community has recently produced estimates of the foreign-origin terrorist threat involving chemical and biological weapons. However, the intelligence community has not produced comparable estimates of the domestic threat. In our report we recommended that the FBI prepare these estimates and use them in a national-level risk assessment that can be used to identify and prioritize the most effective programs to combat terrorism. The FBI agreed.

PRODUCTION AND DELIVERY OF CHEMICAL AND BIOLOGICAL AGENTS GENERALLY REQUIRES SPECIALIZED KNOWLEDGE

Terrorists face serious technical and operational challenges at different stages of the process of producing and delivering most chemical and all biological agents. The Special Assistant to the Director of Central Intelligence for Nonproliferation testified in March 1999 that "the preparation and effective use of BW [biological weapons] by both potentially hostile states and by non-state actors, including terrorists, is harder than some popular literature seems to suggest."[2] We agree. A number of obstacles exist for terrorists. Figure 1 shows the stages involved in making and using chemical or biological agents. It also illustrates some of the other impediments that terrorists may have to overcome such as obtaining source materials, risks to the terrorists, and environmental challenges.

[2]Unclassified statement on the worldwide biological warfare threat to the House Permanent Select Committee on Intelligence, March 3, 1999.

Figure 1: Stages and Obstacles for Chemical and Biological Terrorism



Source: GAO, on the basis of analysis of technical data and discussions with chemical and biological warfare experts.

Some chemical agents are commercially available and require little sophistication or expertise to obtain or use, but other chemical agents are technically challenging to make and deliver. Toxic industrial chemicals such as chlorine, phosgene, and hydrogen cyanide are used in commercial manufacturing and could be easily acquired and adapted as terrorist weapons. In contrast, most chemical nerve agents such as tabun (GA), sarin (GB), soman (GD), and VX are difficult to produce. To begin with, developing nerve agents requires the synthesis of multiple chemicals that, according to the experts we consulted, are very difficult to obtain in large quantities due to the provisions of the 1993 Chemical Weapons Convention, which has been in force since April

1997. In addition, a 1993 Office of Technology Assessment report on the technologies underlying weapons of mass destruction indicated that some steps in the production process of these nerve agents are difficult and hazardous. For example, although tabun is one of the easier chemical agents to make, containment of the highly toxic hydrogen cyanide gas that is produced during the process is a technical challenge. In general, production of chemical nerve agents could be technically unfeasible for terrorists without a sophisticated laboratory infrastructure because their production requires the use of high temperatures and generates corrosive and dangerous by-products. On the other hand, chemical blister agents such as sulfur mustard, nitrogen mustard, and lewisite can be manufactured with little to moderate difficulty; but again, according to experts, purchasing large quantities of certain chemicals needed to make blister agents is difficult due to the Chemical Weapons Convention. Even if chemical agents can be produced successfully, they must be released effectively as a vapor, or aerosol, for inhalation exposure, or they need to be in a spray of large droplets or liquid for skin penetration. To serve as terrorist weapons, chemical agents require high toxicity and volatility (tendency of a chemical to vaporize), and need to maintain their strength during storage and release.

Causing mass casualties with biological agents also presents extraordinary technical and operational challenges for terrorists without the assistance of a state-sponsored program. For example, highly infectious seed stock for nearly all biological agents is difficult to obtain, particularly since controls over the stocks have improved. The only known sources of the smallpox virus, for example, are within government-controlled facilities in the United States and Russia. Ricin, a biological toxin, is easy to obtain and produce but requires such large quantities to cause mass casualties that the risk of arousing suspicion or detection prior to dissemination would be great.

Although most biological agents are easy to grow if the seed stock can be obtained, they are difficult to process into a lethal form and successfully deliver to achieve large scale casualties. Processing biological agents into the right particle size and delivering them effectively requires expertise in a wide range of scientific disciplines. Since the most effective way to deliver a biological agent is by aerosol (to allow the simultaneous respiratory infection of a large number of people), the particles need to be small enough to reach the small air sacs in the lungs and bypass the body's natural filtering and defense mechanisms. Terrorists can try to process biological agents into liquid or dry forms for release, but both forms pose difficult technical

challenges. Experts told us that although liquid agents are easy to produce, it is difficult to effectively deliver them in the right particle size without reducing the strength of the mixture. Further, a liquid agent requires larger quantities, which can increase the possibility of raising suspicion and detection. Dry biological agents are easier to deliver, but they are more difficult to manufacture than liquid agents, are less stable, and are dangerous to work with. Other important technical hurdles include obtaining the right equipment to generate properly sized aerosols, calculating the correct output rate (i.e., speed at which the equipment operates), and having the required liquid composition.

Terrorists have additional hurdles to overcome. For example, outdoor delivery of chemical and biological agents can be disrupted by environmental (e.g., pollution) and meteorological (e.g., sun, rain, mist, and wind) conditions. Once released, an aerosol cloud gradually dissipates over time and as a result of exposure to oxygen, pollutants, and ultraviolet rays. If wind conditions are too erratic or strong, the agent might dissipate too rapidly or fail to reach the desired area. Indoor dissemination of an agent could be affected by the air exchange rate of the building. In addition, terrorists risk capture and personal safety in acquiring and processing materials, disposing byproducts, and releasing the agent. Many agents are dangerous to handle. In some cases the lack of an effective vaccine, antibiotic/antiviral treatment, or antidote poses the same risk to the terrorist as it does to a targeted population.

NATIONAL-LEVEL ASSESSMENT OF THE RISK OF CHEMICAL AND BIOLOGICAL TERRORISM IS NEEDED TO FOCUS RESOURCES

A national-level assessment of the risk of chemical and biological terrorism, based on analyses of both the foreign-and domestic-origin threats, could help determine the requirements and priorities for combating terrorism and target resources where most needed. Much of the intelligence information that can be incorporated into a national-level risk assessment already exists. The U.S. foreign intelligence community has issued classified National Intelligence Estimates and Intelligence Community Assessments that discuss the foreign-origin chemical and biological terrorist threat in some detail. These intelligence assessments identify the agents that would more likely be used by foreign-origin terrorists.

The FBI is responsible for assessing domestic-origin threats. However, FBI analysts' judgments concerning the more likely chemical and biological agents that may be used by domestic-origin

terrorists have not been captured in a formal assessment. The FBI has not specified or ranked individual chemical or biological agents as threats, but instead ranked groups of agents according to the likelihood that a category of chemical or biological agent would be used. The FBI analysis was based on law enforcement cases where chemical or biological agents were used or their use was threatened, including hoaxes. The FBI's categories are:

- Biological toxins: any toxic substance of natural origin produced by an animal or plant. An example of a toxin is ricin, a poisonous protein extracted from castor beans. (Ricin, due in part to the ton quantities required to cause mass casualties, is more appropriate for attacking individuals or small numbers of people and is not generally considered to be useful as a mass casualty weapon.)

- Toxic industrial chemicals: chemicals developed or manufactured for use in industrial operations such as manufacturing solvents, pesticides, and dyes. These chemicals are not primarily manufactured for the purpose of producing human casualties. Chlorine, phosgene, and hydrogen cyanide are industrial chemicals that have also been used as chemical warfare agents.

- Biological pathogens: any organism (usually living) such as a bacteria or virus capable of causing serious disease or death. Anthrax is an example of a bacterial pathogen.

- Chemical agents: a chemical substance that is intended for use in military operations to kill, seriously injure, or incapacitate people. Excluded from consideration are riot control agents and smoke and flame materials. Two examples of chemical agents are sarin (nerve agent) and mustard gas (blister agent).

By combining an FBI estimate of the domestic-origin threat with existing intelligence estimates and assessments of the foreign-origin threat, analysts could provide policymakers with a better understanding of the threat from terrorists' use of chemical or biological weapons. A national-level risk assessment based in part on the threat estimates would better enable federal agencies to establish soundly defined program requirements and prioritize and focus the nation's

investments to combat terrorism. For example, in March 1999 we testified[3] that the Department of Health and Human Services is establishing a national pharmaceutical and vaccine stockpile to prepare medical responses for possible terrorist use of chemical or biological weapons. We pointed out that the Department's effort was initiated without the benefit of a sound threat and risk assessment process. We also found that some of the items the Department plans to procure do not match intelligence agencies' judgments of the more likely chemical and biological agents that terrorists might use and seem to be based on worst-case scenarios. We questioned whether stockpiling for the items listed in the Department's plan was the best approach for investing in medical preparedness. A sound threat and risk assessment could provide a cohesive roadmap to justify and target spending for medical and other countermeasures to deal with a chemical or biological terrorist threat. We recommended that the FBI sponsor a national-level threat and risk assessment, and the FBI agreed to do so.

Mr. Chairman, Members of the Subcommittee, that concludes my prepared remarks. I would be happy to answer any questions you may have.

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[3]Combating Terrorism: Observations on Biological Terrorism and Public Health Initiatives (GAO/T-NSIAD-99-112, Mar. 16, 1999).

RELATED GAO PRODUCTS

Combating Terrorism: Need for Comprehensive Threat and Risk Assessments of Chemical and Biological Attacks (GAO/NSIAD-99-163, Sept. 7, 1999).

Combating Terrorism: Observations on Growth in Federal Programs (GAO/T-NSIAD-99-181, June 9, 1999).

Combating Terrorism: Analysis of Potential Emergency Response Equipment and Sustainment Costs (GAO/NSIAD-99-151, June 9, 1999).

Combating Terrorism: Issues to Be Resolved to Improve Counterterrorist Operations (GAO/NSIAD-99-135, May 13, 1999).

Combating Terrorism: Observations on Biological Terrorism and Public Health Initiatives (GAO/T-NSIAD-99-112, Mar. 16, 1999).

Combating Terrorism: Observations on Federal Spending to Combat Terrorism (GAO/T-NSIAD/GGD-99-107, Mar. 11, 1999).

Combating Terrorism: FBI's Use of Federal Funds for Counterterrorism-Related Activities (FYs 1995-98) (GAO/GGD-99-7, Nov. 20, 1998).

Combating Terrorism: Opportunities to Improve Domestic Preparedness Program Focus and Efficiency (GAO/NSIAD-99-3, Nov. 12, 1998).

Combating Terrorism: Observations on the Nunn-Lugar-Domenici Domestic Preparedness Program (GAO/T-NSIAD-99-16, Oct. 2, 1998).

Combating Terrorism: Observations on Crosscutting Issues (GAO/T-NSIAD-98-164, Apr. 23, 1998).

Combating Terrorism: Threat and Risk Assessments Can Help Prioritize and Target Program Investments (GAO/NSIAD-98-74, Apr. 9, 1998).

Combating Terrorism: Spending on Governmentwide Programs Requires Better Management and Coordination (GAO/NSIAD-98-39, Dec. 1, 1997).

Combating Terrorism: Federal Agencies' Efforts to Implement National Policy and Strategy (GAO/NSIAD-97-254, Sept. 26, 1997).

Chemical Weapons Stockpile: Changes Needed in the Management Structure of Emergency Preparedness Program (GAO/NSIAD-97-91, June 11, 1997).

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Mr. SHAYS. I just want to note for the record that Lee Terry is here as well.

I am going to recognize you, Mr. Souder, first, but that is after I ask one question. Mr. Hinton, do you believe a nuclear, biological or chemical attack will take place in the United States sometime in the next 20 years?

Mr. HINTON. Based on what we have seen in our work, Mr. Chairman, we are being advised by the intelligence community that the likelihood that this could happen, an attempt of this sort, is growing.

Mr. SHAYS. Thank you.

Mr. Souder.

Mr. SOUDER. Pardon my voice. I don't have much of one today.

In the bulk of your presentation you were talking about the difficulty of terrorists kind of having the ability to execute an attack that I believe you said in your opening paragraph, defined as at least 1,000 deaths. Does this change if you lower that? Could there be less than a mass catastrophe?

Mr. HINTON. Just going through the process, it is very difficult to successfully pull that off—to cause casualties at levels of 1,000 or a couple hundred. I think, as we saw in Japan not too long ago, it wasn't a quality effort. It did affect a small population. That event, even though small, was serious. What was larger was probably the psychological impact that resuslts from such an incident regardless of the number of casualties.

My answer is, as you look at whether 1,000, several hundred, I think the steps that we have talked about, the operational and technical parts have to be done in such a way as to be effective before you can have that level of casualty.

Mr. SHAYS. Would the gentleman just suspend? I am going to vote quickly and have you carry on, and just leave with 5 minutes to go, and then we will reconvene when I return.

Mr. SOUDER [presiding]. In the difficulty of delivery systems, the knowledge that this requires and so on, would that not suggest on the surface that foreign threats are probably more serious than domestic threats?

Mr. HINTON. I think, Mr. Souder, until we see an analysis of the various threats, both that have been done by the intelligence community and those that we have asked the FBI to undertake, and that using that information and going through a risk assessment process which isolates scenarios, which might have as their base the different types of agents that would be involved, to look at the likelihood of these events occurring and if they did occur, what would be the criticality of the events, I don't know which part of those threats are more serious than the other.

I think this is very important as part of the process that governmental agencies that are working this issue need to go through. And in doing that and in coming to those solutions it gives them a way to manage the most serious risk that they see. It might not alleviate all of the risk, but it puts us into a position to come up with countermeasures to go after the higher order of risks that are out there. I don't think that there is any substitute for having good intelligence and contingency planning along these lines.

Mr. SOUDER. It has been hard to get a handle around the different types of threat. By showing the difficulty, it narrows it. This is especially true when you are talking about a domestic situation and American citizens and trying to analyze this without getting into overly classified and high-risk information. We have had public testimony here that most of the foreign threat to American citizens have come from Osama bin Laden and his network because they had some of the delivery systems, at least in a regional way, and then Japan, the FARC, but very few networks have done that.

When you start to get into domestic, it starts to get really hairy. I have talked to Mr. Blitzer a number of times about what kinds of groups do you target. Do you say, we have had some pro-life protesters protest at clinics; therefore, any of them at this time could theoretically do this. What about people who are part of the Montana group or whatever, the citizen rights groups? And all of a sudden you are speculative.

How would you start to apply some of what you have here to a domestic analysis, because you have raised that? And given the type of technical things that you say here, for example, would people who have worked at a biological or a chemical lab who have been fired or who have been unstable, would you start tracking those kinds of people? You are saying that there are technical things that are needed and it is not just an ideological anger. You need technical people. How do you bring that together along with the question of their American citizenship?

Mr. HINTON. One, getting the FBI to be supportive of the recommendation that we made to move domestically in this regard is a good first step. It starts dealing with the question of who/what might be the type of threat that is out there.

This is evolving. It is not quick and easy, and it is something that we constantly have to come back to revisit, and update as events around the country change or change overseas.

I think that a first step, then allows you to identify what that threat might be and then start putting that threat along with other information from the law enforcement community, the intelligence community that we have and other sources together to start assessing each of those threats from where they might come. Then look upon what is the likelihood that you might have an event and come up with countermeasures against various dependent scenarios.

That threat might be multiple things that you have to look at, chemical and biological agents being a part of it, as well as any threats along conventional lines of using bombs, or explosives, which seem to be the more prominent part that we see here now in the United States.

Mr. SOUDER. Thank you.

I will yield to Mr. Terry.

Mr. TERRY. A couple of quick questions so we can go vote.

Just picking up on a couple of your answers in the portion of your testimony that I heard—sorry about being late—is there a problem at the FBI? Are they dragging their feet on this issue? It seems that some of the answers—you are not saying it overtly, but is one of the barriers to implementing a more cohesive policy involving the FBI; and if you say that the FBI needs to become more involved, is there a problem there?

Mr. HINTON. No, Mr. Terry, I don't want you to think that. When we first got into this our thinking was at a much broader community level, but as we worked with the intelligence community, DOD, HHS, and the others, the FBI came up and said, we ought to be the agency that sponsors a national-level risk assessment.

Mr. TERRY. Do you agree with that?

Mr. HINTON. Yes. All of the Federal players felt that we should put that responsibility with the FBI.

Mr. TERRY. Why should they be the hub of the spokes?

Mr. HINTON. They have the lead responsibility in crisis events, and they have a pretty good ability to tap into the communities out there in terms of different intelligence sources and the threats that are out there.

I don't want you to think, too, that they have been inactive in this debate. They have gone through quite a bit of research on their own and have come up with broad groupings of the different types of threats out there, but we have not advanced domestically like I think we have internationally in looking at the specific threats that are out there, and that is what we were trying to move to, to isolate the specific threats that might be reason for concern.

Mr. TERRY. Where are we in the process here?

Another hint that I interpreted from your answers and your statement is that we have a lot of people talking and studying and looking at it. Now we need to tie everybody together. That has probably been haphazard to date but is probably the first step. First of all, you have to identify that there is an issue and then a need. The second part is becoming cohesive and tying that into a plan.

Where are we in that process? Do we need to focus everybody? Are we to that next phase where we can be more comprehensive?

Mr. HINTON. We are at that stage. We have been looking at this for several years, and what we have seen is a growth in the Federal expenditures throughout the government to address in this whole arena.

What we have not seen through our work a process to put in place the identification of the various threats and an assessment process that will allow you to take those threats and related scenarios to come up with countermeasures for those in some coordinated fashion. That has been the subject of several recommendations that we have made. I am pleased that we have gotten a response at this point to move in that direction. I think it is constructive. I think the more intelligence that we gain, the more contingency planning, the process will only get better as it goes forward.

Mr. TERRY. One last question. Now developing this next phase as you described, the FBI's involvement as being the hub here to help us organize focus, become comprehensive, where are they in the process of implementing any of these recommendations, Nunn-Lugar, Domenici? Where are they in the process?

Mr. HINTON. I think they are in the early beginnings of it.

On the Nunn-Lugar, we had a recommendation a while back, and it was picked up in the 1999 defense authorization legislation for them to develop some methodologies and assess the possibility of weapons of mass destruction threat against several cities. They were given about a year I think from when that legislation passed

to complete the task. They are not at the point of fully executing that yet. They have started working the methodologies, and I think they are going to be evolving in this area.

Mr. TERRY. Thank you.

Mr. HINTON. Yes, sir, Mr. Terry.

Mr. SHAYS [presiding]. Thank you, Mr. Hinton.

We made a decision to have this hearing public, and we invited DOD and the CIA to come and testify, but their preference is to testify in a hearing that would not be open to the public and therefore we could get at the issues that we can't get into in a public forum like this.

In the question do you believe that a nuclear or chemical or biological attack could happen in the 20 years, your answer was that it is appearing more and more likely that we will have to deal to some degree with one of those three types of weapons of mass destruction.

Mr. HINTON. Mr. Chairman, I think the keyword here is an "attempt" in the chemical and biological area and that is where I would like to have my remarks focused. On the nuclear side, I haven't done the research yet to comment on that.

Mr. SHAYS. Tell me the difference—terrorists don't play by the same rules, so tell me the difference between dealing with a rogue nation, a nation that might use one of these three weapons of mass destruction and a terrorist organization?

Mr. HINTON. Well, I think if you look at it from a state environment, you have more resources. You probably have access to expertise that you need. You might well have a sophisticated machine that can move in that direction to do those types of things. I guess it is the goals and the intent that they want to advance.

I think also that you have to look at the in objectives. And when it comes to a terrorist, the question is, do they have the same capacity that a state-sponsored organization might have? Would they have the same level of resources and the same knowledge and those types of things? Also, you have to look into the motives and the objectives which they are trying to achieve.

Mr. SHAYS. Versus the terrorists—a terrorist has to live somewhere, so there has to be some environment that enables them to exist and potentially train and so on.

What is the likelihood that—if we are dealing with foreign terrorists, that we would know the country that basically has sponsored them or has allowed them to live there?

Mr. HINTON. We are getting very close to some of the concerns that I think the CIA and others raised to you.

Mr. SHAYS. Let me put it this way. In most instances, do we believe that we would know if a terrorist was sponsored by a foreign country?

Mr. HINTON. I think that the intelligence community would probably have indications of that based on their research.

Mr. SHAYS. In determining the risks, we asked you to look at casualties of over 1,000 or more. If that number were to drop to 200 injuries, would your study be all that different?

Mr. HINTON. No, sir, I don't think it would. Probably to have casualties of that magnitude you almost need to go through the same process discussed here in terms of coming up with and overcoming

the challenges that one would have in coming up with an agent or a device to cause that magnitude of casualties.

The events that we saw in Japan not too long ago, the casualties of deaths were smaller but a large number were injuries, and that was serious. But I think also, looking at that incident there is a huge psychological impact that comes along when you see events like that.

But I think in terms of whether I would lower from 1,000 to 200, I wouldn't see much difference in terms of the technical and operational challenges.

Mr. SHAYS. When I read your report, I thought in a way—my first reaction was that it seemed to minimize the threat to me a bit. Then I thought about it more and changed my view a bit.

Let me say that there was a student before I was a Member of Congress who lived in Norwalk, CT and went to Princeton, and his assignment was to see if he could go to material in any—in some of our libraries, material that would be available and construct a nuclear weapon. And he ended up doing that. We are going back I think 18 years ago. So the thought now is that one doesn't have to go anywhere other than just turn on their computer. The ability to make—to know—to have the directions on how to make a nuclear or chemical or biological agent is pretty much available. So then the issue is do you have the technical skills to be able to make—let us just talk chemical or biological.

We have Americans and foreigners who obviously have tremendous technical skills. Am I to infer that just because it requires—I say just—am I to infer that having the technical skill makes it unlikely that a nuclear or biological agent won't occur? Or should I make an assumption that there are enough people who possess these technical skills that we need to be concerned? In other words, I want you to walk me through this chart, particularly the side corners, and have you tell me what that really means. Start with possess requisite technical skills first.

Mr. HINTON. Well, you need specialized skills in this arena. There are a lot of risks. The process gets into acquiring, handling, processing, and manufacturing. To understand those risks and to deal with them and come up an agent that can be weaponized is technically challenging, with the exception of toxic industrial chemicals such as chlorine, which is already in the commercial market.

Mr. SHAYS. One of the basic points in the report was that a chemical agent is more likely than biological because a chemical agent can be bought in an industrial setting?

Mr. HINTON. Right. Those such as chlorine and phosgene.

Mr. SHAYS. There are literally potentially not just thousands of people, but tens of thousands, even hundreds of thousands of people who possess the technical skills. We are not talking about just a few geniuses around the country.

Mr. HINTON. That is correct. You are right on that. But there is a lot of information that is not publicly available, we know, Mr. Chairman, that would be needed to successfully go through all of these processes and weaponize an agent.

Mr. SHAYS. Let's just take them one at a time.

First off, the technical skills, we have hundreds of thousands of people potentially——

Mr. HINTON. Right.

Mr. SHAYS [continuing]. With those technical skills. You realize when we put the whole package together we minimize, fortunately, the number. And I realize that in going through a process like this, it can help us find out where we need to focus our time and attention.

So I think this is—but I just want to—I don't want us to dismiss it by saying that someone needs technical skills as if we don't have to be concerned.

Mr. HINTON. No. I understand where you are going right now. It has got to be the people with certain motives. They might be individuals or groups. Not everyone who has those technical skills are going to want to participate, depending on the motives or the skill or the objectives of what the terrorist might want to do.

Mr. SHAYS. It seems what I am hearing is, in one case, you need one kind of technical skill, and then in order to get it through to the point at which it becomes a weapon, you've had a lot of different people with different skills come into play. So, in other words, one person—I guess one of the messages that I am getting is a Unabomber may be able to make a bomb, but it is less likely that they are going to be able to make a weapon of mass destruction, clearly nuclear, but also chemical or biological, there is going to be more than one person that is going to have to be involved?

Mr. HINTON. I would say that is probably the case unless they have had past experience.

Mr. SHAYS. But as I go down this chart, you start out with biological or chemical cultures. You have to acquire and synthesize, you have to process and then you have to deliver the system. They are all going to take different skills.

Mr. HINTON. Right. As my statement—in the remarks, there are different types of skills, from physicists, meteorologists, those types of people, you are going to need their technical knowledge. From the research that we have done and the people that we have spoken to, you are going to have to bring a host of those technical skills to bear in this issue.

Mr. SHAYS. Which suggests to me that, in many instances, they are going to have to have the cooperation of a country that is willing to—the more vigilant a country is, the more difficult it is going to be for someone to have this kind of activity take place in that country. The more friendly that country is to a terrorist's efforts, obviously the more likely it is going to happen. This is the challenge.

The bottom line is that we are spending over $10 billion a year trying to deal with a chemical or biological threat. One danger would be to minimize the likelihood because then that gives us a false sense of comfort. Another danger is for us to make it more dramatic than it is. But the bottom line is that you even felt this way. There are a number of us who feel that a nuclear or chemical or biological terrorist attack is—is not a question of if, it is a question of where and when and to what degree.

We want to make sure that we are maximizing all of our resources, and that is the purpose of your report, to say that we are

going to have to make choices. I am trying to get a feeling for how you begin to compartmentalize this effort and begin to know how to do that.

When you say technical skills, I am struck with the fact that is not a significant barrier. There are a lot of people with technical skills. The challenge begins when you try to synthesize this whole effort and get the people who have those skills coming together. And as soon as you get more than one person involved, then the phrase on the right side as I look at your chart ''avoid detection by authorities,'' becomes more and more difficult.

Could you speak to some personal risk where no vaccines or antidotes are available?

Mr. HINTON. Do you want to take that?

Ms. COLANTONIO. Yes. It is almost a catch-22, Mr. Chairman. If terrorists were to work with in particular a biological weapon and if they were not able to vaccinate themselves, they run the risk of hurting themselves.

But if we want to step back and go through the process of handling the biological agent, whether it be a virus or a bacteria, and they are growing it and they are processing it and working with it and they are working with specialized equipment and specialized types of ingredients that they need to use to get to a liquid or to a dry form, they run the risk of perhaps inhaling the agent themselves. If the terrorists don't have the proper vaccines or if there are not proper antidotes available, they could possibly harm themselves, infect themselves or die.

Let me give you an example. When you work with a dry biological agent and you have rubber gloves on, a dry biological agent tends to stick to your gloves. That poses a risk. That is a concrete example of a risk factor for a terrorist. So you have the biological agent on your gloves. It is sticking to your gloves. And so if you have somebody pull the gloves off for you, that individual can be infected perhaps or if you happen to inhale this because we know you—the process of inhaling any type of biological weapon and in some cases chemical weapons one can become ill.

Mr. SHAYS. Describe to me the differences between the challenges for the terrorist with a chemical versus biological?

Ms. COLANTONIO. For example, for chemical agents, there is a process where these agents are corrosive. There are nasty by-products that have to be dealt with and disposed of. You have to, for example, get the right temperatures for the materials. So you have to be careful when heating or cooling. You have to handle highly toxic gases.

With biological agents, when you are dealing with a wet agent, you are growing your media, and you have to, from your wet media, get your actual live bacteria or virus out of your growth material so you have to filter out the by-product from your growth. If you were to stop there, then you have to get this into containers or store it. So, again, there are by-products that you have to dispose of.

If you want to go from a liquid biological agent to a dry biological agent, you have to go through a drying process and you've some risks involved there in terms of just handling the material, at all stages carefully.

You also have to—for example, with biological agents have to have the right respiratory equipment, like a filter that you are breathing with, and you have to make sure that you are secure, you have a secure hood that won't let these particles into your mouth, nose, or eyes.

Mr. HINTON. To bring that back to your question about the skills: the skills that you need to weaponize, whether it be chemical or biological, are not as plentiful as we might think. I think that is important from the perspective we were discussing a little while ago about the skills. It is all the delicate parts that Deborah was bringing out to you there. As you move through that process in the various stages, the weaponization is a real critical part of this, for which the skill base may not be as plentiful.

Mr. SHAYS. The chemical weapon convention hasn't been fully adopted and defined, correct?

Mr. HINTON. That's correct. Not everybody has signed up to it.

Mr. SHAYS. How many chemical companies are subject to inspection under the CWC, the Chemical Weapons Convention?

Mr. HINTON. I don't have that, Mr. Chairman. We can get that and provide it for the record.

[The information referred to follows:]

Page 31a

Insert line 711 (After Mr. Hinton)

The Chemical Weapons Convention (CWC) will impact U.S. manufacturers in those instances where they produce a known chemical weapon agent or precursor agents which can be combined to produce a chemical weapon. Under the CWC, manufacturers are required to report specific activities that involve scheduled chemicals (divided into schedules 1, 2, and 3) when produced above certain threshold quantities. The CWC also requires large volume producers of discrete organic chemicals to report on production levels. All declared producers of scheduled chemicals or discrete organic chemicals are subject to scheduled or random inspections by CWC inspection teams.

The Chemical Manufacturers Association (CMA) estimates that

- Seven to eight pharmaceutical and defense contractors, not chemical manufacturers, will be subject to annual reporting and routine inspection due to their involvement in the production of schedule 1 chemicals.
- Approximately 30-35 facilities are involved in the production and use of schedule 2 chemicals.
- Approximately 60 producers of schedule 3 chemicals are covered by the CWC.
- Up to 1,800 producers of discrete organic chemicals may be subject to CWC declaration requirements and random inspection.

CMA notes that the Department of Commerce is preparing to publish final regulations to implement the CWC by December 1, 1999. The final regulations will enable the U.S. to fulfill its obligations to submit industry declarations on reportable activities and to allow for the inspection of declared facilities. CMA expects the Department to require initial and first annual CWC declarations from industry by February 28, 2000. Upon submission of industry declarations, CMA and the Department will learn the exact number of affected facilities.

Mr. SHAYS. If, say, 1,000 of the chemical companies who are subject to inspection, what are the chances of a sham company receiving a chemical weapon, precursor chemicals being inspected?

Mr. HINTON. I don't have a good answer. We have not looked at that issue, Mr. Chairman.

Mr. SHAYS. When we were in Geneva, that was one of the questions that we were trying to get a handle on. You have a certain group that play by the rules, but we just wonder if others can get the precursors that ultimately lead to the weapon.

In the chart that you gave us, you talk about the stages and then the obstacles. One of the obstacles I note that is not there is money. How come?

Mr. HINTON. We could add that. There is another one that is not there either, testing. Money and testing are two that are on our minds. What I was trying to do was walk you through the operational aspects.

Mr. SHAYS. To make a better chart you can add those two.

Mr. HINTON. We will.

Mr. SHAYS. Are there any others?

Mr. HINTON. Money is an issue. Also testing, and testing in the sense that once you have something, you want to make sure that it works. And the only way you can find that out beforehand is to test it, but there are risks associated with that.

The other issue, too, while I think the chart is rich in the sense of the stages and the challenges, is the time that is involved in this process, too.

Mr. SHAYS. I note that we are joined by our ranking member. I will continue to allow you an opportunity to catch up.

You mentioned in your testimony the smallpox virus is available only in the United States of America and Russia. Could it have been proliferated beyond Russia and how dangerous is smallpox compared to anthrax?

Ms. D'AGOSTINO. Based on our review throughout the entire year that——

Mr. SHAYS. Could you lower your mic a little bit?

Ms. D'AGOSTINO. Sorry.

Mr. SHAYS. That is all right.

Ms. D'AGOSTINO. Based on our reviews, there was no credible evidence available that the smallpox virus has been proliferated to other countries or individuals.

What we don't know about is the level of security specifically on the smallpox cultures in Russia. We don't have really good, sound, corroborated information about that. We also don't know whether or not terrorists really are interested in getting smallpox and using it. So we are kind of short on answers and other pertinent questions that you might want to ask before you undertake a very large program.

In terms of smallpox, I guess everybody has billed it as a low probability but high consequence attack scenario, and I think we would agree with that. But, unlike anthrax, smallpox is very contagious. And it is a severe illness with an estimated fatality rate of about 30 percent, which is very low compared to a successful inhalation anthrax attack which can lead to an 80 to 90 percent lethality rate.

The vaccinations, obviously, have not been given for smallpox for many years, partly because the disease has been eradicated. It is just not clear to us at this time that smallpox is a very attractive biological weapon for a terrorist based on what we have seen.

Mr. SHAYS. Right. Thank you.

Could you please comment on Mr. Hamre's, the Deputy Secretary of Defense, recent statement before the House Armed Services Committee that, one, North Korea has weaponized anthrax; and, two, it is easy to weaponize biological warfare agents.

Mr. HINTON. We haven't seen the evidence to support Mr. Hamre's statement that North Korea has weaponized. But it is something that we would be happy to look into for you, Mr. Chairman. Based on the evidence that we now have, we have a disconnect.

On the second issue—easy to weaponize, that, too, is different from the information that we have, and, as I have discussed through the process, it is another area that I need to inquire about so that we can understand the basis for those statements.

Mr. SHAYS. Thank you.

Let me ask Mr. Blagojevich if he has questions, and then I will just come back for a few more questions.

Mr. BLAGOJEVICH. Thank you.

Mr. Hinton, you evidently had made the point just moments ago that the threat of a nuclear or biological attack has been overstated and not nearly as threatening as some of the popular literature lately might suggest. Can you tell us what you are talking about when you say that and who is overstating that threat and how they are doing it?

Mr. HINTON. My comment, Congressman, was more to the point that, based on the information that we have received from the work that we have done through the intelligence community and all, that the data and the evidence would suggest that there might be an attempt down the road in the chemical and biological area. I have not had any review around the nuclear area at this point, but it might be an attempt somewhere down the road.

Mr. BLAGOJEVICH. Is it your conclusion that some of the discussions in the public domain regarding a threat of a chemical or biological terrorist attack has been overstated? And if that is in fact your conclusion, can you give us examples of where and who is doing it?

Mr. HINTON. Some overstatement has been made regarding how to go about acquiring, manufacturing, weaponizing an agent, and it has been made out to be easier than the evidence through our work would suggest. We have discussed the various operational and technical challenges to do this and—so it contradicts some of what has been in the press and the media about how easy it is to do.

Mr. BLAGOJEVICH. Your report states that potential terrorist attacks carried out, and I am quoting from your report, "without access to state-run laboratories or weapons programs." Now, limiting the qualifying—the discussion on potential terrorist attacks by that statement, does that arbitrarily restrict your analysis?

Ms. D'AGOSTINO. We don't think that it arbitrarily restricts our analysis. What it did was help define the parameters of our analysis, and we don't see it as necessarily a limiting factor.

The question that you raised by that scope definition is whether or not a state actor would be willing to provide a terrorist group or organization with their chemical or biological weapons. That is a question that the intelligence community has looked at, and we can't discuss their position on that matter in this forum. But it has been looked at, and they have come to conclusions and judgments about that very matter.

I think that in comment on our report, the Department of Health and Human Services raised that issue, and we did say that could be part of a risk assessment. But there are some judgments out there on the part of the community about that question. So you could factor that into the assessment.

Mr. BLAGOJEVICH. Some of the language in the report also indicates receiving chemical or biological agents or weapons from such countries, that being a statement in your report that terrorists would not be—your conclusion is predicated on the thought that terrorists would not have access to some of the material from certain countries that may have it; is that true? Is that essentially a fair statement of your report?

Mr. HINTON. Yes.

Mr. BLAGOJEVICH. OK. I am asking these questions in the context of the fluidity of the material that we are talking about and the experts that are presently leaving the former Soviet Union. Russia has acknowledged—is acknowledged as the world's largest stockpile of chemical agents, including 40,000 metric tons of chemical agents. It included various delivery systems, such as artillery aerial bombs, rockets and missiles. In 1992, Boris Yeltsin revealed that the Soviet Union conducted its biological warfare program in violation of the 1972 Biological Weapons Convention.

My question is: With all of this information, do you believe Soviet decentralization, the process going on now in the former Soviet Union with all of the talk of criminal syndicates and so forth, has this posed a significant concern with regard to the flight of Russian scientists and materials?

Ms. COLANTONIO. Congressman, I think the one thing that we have to remember is that if the chemical and biological agents are stockpiled, in order to be effective and cause the mass casualties, they have to be released effectively, be disseminated, and be weaponized.

Our work—as Mr. Hinton has discussed earlier, there are certain steps that you have to go through, and what we found in our work is that as agents sit on the shelf, they possibly could lose some of their stability and strength.

Now, in terms of rogue or errant former Soviet Union scientists passing out information, we do not—there is no credible evidence that suggests that is going on. In fact, there was a senior fellow at the University of Maryland who did some investigation on the Aum Shinrikyo group, and it was suggested that the Aum had contacted a former Soviet Union scientist to get his expertise, and it just appeared in the media as if the scientist provided the Aum the information.

Through this investigation, it was suggested that the Aum wasn't able to get any kind of technical information.

Mr. BLAGOJEVICH. The conclusions that some of you have reached in terms of the threat of terrorism, did it contemplate a terrorist organization that might purchase chemical agents or a delivery system from a former Soviet state, or was that consideration outside the parameters of your analysis and the conclusions that you ultimately reached?

Ms. COLANTONIO. Congressman, that was outside our parameters. What we wanted to look at was whether individuals, whether they are defined as terrorists or religious sects or cult groups, whether these individuals or groups of people can actually perform the stages, OK, and do the science and actually go from a growth media or a chemical to actually effectively weaponize and release.

Mr. BLAGOJEVICH. So the concentration was on producing and weaponizing the various agents, that was the concentration of your study?

Ms. D'AGOSTINO. Right, outside of the state-run laboratories where you would have a lot of resources marshalled around solving the types of problems in getting an effective biological or chemical weapon.

Mr. BLAGOJEVICH. Having said that, is it fair to assume on my part that you have excluded the possibility that this technology could be stolen by a terrorist organization from a foreign state? That is excluded from the analysis?

Ms. D'AGOSTINO. It is excluded from our analysis, but we are not ruling out the possibility. We did not weigh the likelihood or the risk of that occurring.

Ms. COLANTONIO. May I add that, even if you have the technology, you have to have the "smarts" in order to weaponize, to disseminate, OK, a biological or chemical agent.

For example, with a biological agent, the best way to cause casualties is to aerosolize the agent, and as Mr. Hinton mentioned earlier in his remarks—you have to use the proper equipment with the proper rates or speed and use of energy in order to do this.

Not only that, some of the other clouds come into play in terms of what a terrorist has to do, for example under the right weather conditions.

Mr. BLAGOJEVICH. In closing here, let me throw out one hypothetical. Iran has some money. They cultivate a Russian scientist who needs money and has expertise in chemical and biological matters. As part of a terrorist organization funded by Iran, they have this person produce weaponized various agents. They are prepared to steal products if necessary. That kind of a hypothetical was not considered in terms of the analysis that you are providing; and if in fact I am right, then doesn't this undercut your conclusion that the threat has been overstated by not considering all aspects of this threat?

Mr. HINTON. The specifics of that were not addressed as part of this. It doesn't rule it out. I don't think that it undercuts our conclusions, that to go through the entire process that we have laid out and discussed this morning, that it is highly dependent on the agent—whether it is a chemical or biological agent that is chosen. It is not easy to do. It is a challenge, and it is something that the

intelligence community looking overseas and the FBI looking domestically has got to stay focused on. And I think that process is moving right now toward assessing the various hypothetical scenarios that we are talking about.

Mr. BLAGOJEVICH. Thank you.

Mr. SHAYS. You are basically making an interesting point to me that all terrorists aren't the same, and I am stuck with the fact that we are trying to develop a rational approach, which is something that I tried to allude to in my statement, and we are dealing in many cases with irrational terrorists.

We are going to have some interesting time in our next panel going through this, but Raymond Zilinskas says, on page 12, kind of making reference to this, the last full paragraph, "This problem may be illustrated by referring to the microbiology technician Larry Wayne Harris. During an interview conducted in September, 1999, by a German reporter, Harris was asked whether he would use biological weapons. He replied, 'If God tells me to do it, I will.'" And then he goes on to say that no risk assessor would be in a position to determine if and when God gives Harris, or others of his ilk, the requisite command.

I think it is a cautionary word.

Would you describe how you envision a national threat and risk management could be conducted? That is kind of a big question. Maybe you can just kind of address it.

Mr. HINTON. Sure, Mr. Chairman, and I think our report does a pretty good job of laying that out and how we envision that working. Basically, the concept is that you would take all of the available threat assessments that have been done throughout the intelligence communities, both internationally and those that we would have domestically through the FBI, that they have agreed to do in response to our recommendation. This is a starting point for the process of doing a risk assessment. And we would think that then you would bring in a team of multidisciplinary folks, from the law enforcement community, from the science community and others, to weigh in on this, particularly terrorism experts, that get at the point that you just raised—to help sort through what are the likely threat scenarios; what agents might be involved in those threat scenarios and think through the likelihood of those events occurring, the in-severity, if they did occur—what could really happen and then begin to pose countermeasures. That would begin to lay out a process by which you could decide on the risks at hand and what you want to do to mitigate those risks.

I don't think that you are going to rule risk out totally, or completely. I think it is a process that is going to come back. You are going to have to revisit it as more data and information are brought to bear. You are going to have to go back and review those assessments that you have done.

I think the FBI and the Justice Department's response to our report furthers the process by which the government is approaching this.

The foreign-origin threats, are being handled through the intelligence community. What was missing from the picture in the threat assessment was the domestic piece. This is a step to move that process forward. Now we have got the FBI that is going to

sponsor the risk assessment to look domestically. So I think the process is evolving, and I think what we have got to see now is what comes out of the process once they go through the analysis we have recommended.

Mr. SHAYS. How will this type of assessment help us focus resources better?

Mr. HINTON. When you see the likely scenarios, and what are likely to be involved in those scenarios, it will help make resource decisions. There might be some that you will rule out immediately that you don't move forward on or invest in. For example, where smallpox might fall in the scenario development could be used to gauge whether or not we want to be making the investments in the national pharmaceutical stockpile and vaccines that HHS is moving toward. But I think it would give you an affirmation if it is or what is in line with the priority threats the Nation may face.

We know from some of our past work looking at that issue as it involved HHS is that some of the threats that were on its list were not consistent with the threats that were on the intelligence community's list.

Mr. SHAYS. Interesting.

Have you looked at the possibility of terrorists just taking over a nuclear plant, electrical generating plant and blowing it up?

Ms. D'AGOSTINO. The DOE has focused on that scenario for many, many years and has put a great deal of resources to that problem; it has used risk assessment in its process as well.

Mr. SHAYS. I am struck by the fact that when we look at risk, it is really looking at the hazard versus times the exposure. It is really the likelihood of an event.

But I also—I have a hard time separating or ignoring consequence. So even if something was not likely to occur but the consequence was so horrific, then I think that we need to put resources into it even though the likelihood is small. What becomes difficult is that I can think of a lot of very large consequences that could take place.

Mr. HINTON. I think one part of the process, Mr. Chairman, would give you as decisionmakers and policymakers the various scenarios that are at crosshairs so that those judgments can be made. Right now, we don't have that laid out before us, and I think to get that type of a process working would enable that information to come forward so that Congress, the executive branch, can make informed judgments in this area.

Mr. SHAYS. I am going to conclude. I just happen to accept the fact that you need a process, but it seems to me that process has got to be very flexible, and it constantly has to be updated and analyzed because the process could really give us a false sense of comfort when we are totally ignoring something, and it seems to me that you have to have the irrational be part of that process. What is someone who is irrational going to do? If someone is willing to die in the process—we make an assumption that as long as—they wouldn't do this because they would die; and that is not——

Mr. HINTON. We would not disagree with your view on that, Mr. Chairman. In fact, I think one aspect of this is having hearings like you are holding is to get more discussions going about this and find out what is coming out of the process that is now taking place so

that you can raise whether or not all of those types of scenarios have been considered as part of that process. I think that is a valid question.

Mr. SHAYS. Thank you very much. Your report is a helpful contributor to our—to those of us in Congress and in the administration, for those trying to sort this issue out. Thank you very much. I always appreciate the work of your people. They make you look good.

We call the next panel, Brian M. Jenkins, senior adviser to the president, RAND; John V. Parachini, senior associate, Center for Nonproliferation Studies, Monterey Institute of International Studies; Dr. Raymond Zilinskas, senior scientist in residence, Biological and Toxin Arms Control, Monterey Institute of International Studies.

[Witnesses sworn.]

Mr. SHAYS. Note for the record that all three have responded in the affirmative.

We will go right down the line starting with you, Mr. Jenkins.

STATEMENTS OF BRIAN M. JENKINS, SENIOR ADVISOR TO THE PRESIDENT, RAND; JOHN V. PARACHINI, SENIOR ASSOCIATE, CENTER FOR NONPROLIFERATION STUDIES, MONTERREY INSTITUTE OF INTERNATIONAL STUDIES; AND RAYMOND ZILINSKAS, SENIOR SCIENTIST IN RESIDENCE, BIOLOGICAL AND TOXIN ARMS CONTROL, MONTEREY INSTITUTE OF INTERNATIONAL STUDIES

Mr. JENKINS. Thank you, Mr. Chairman, and Mr. Blagojevich. Thank you very much for inviting me to participate in these important discussions.

I have been given a number of opportunities to testify before Congress on the topic of terrorism, the first time more than 25 years ago when I thought I knew a hell of a lot more than I know today.

I have submitted a written statement summarizing my views on the threat of whether a terrorist might use chemical or biological weapons. Let me just underline a few of those points. In doing so, I want to make it clear that, although I am an adviser to the president of the RAND Corp., my comments this morning are entirely my own and do not reflect those of the RAND Corp. or any of its sponsors.

The possibility that terrorists might resort to chemical or biological agents is not a new concern. People have been writing about this for several decades. That it is only a matter of time before terrorists use such weapons is a relatively new idea which has become kind of a new orthodoxy. What has brought about this change from something that was considered an exotic possibility years ago to the inevitability that we see it today?

There are several developments that give us cause for concern. The growth of organized crime and corruption in Russia raise concerns about the security of its arsenal. While we have no direct evidence that chemical or biological substances have been stolen from or sold by corrupt government officials in Russia, we have ample examples of other weapons being sold through criminal organizations of strategic materials being stolen, and even small quantities

of nuclear material being stolen. So there is some cause for concern.

Also, a number of America's foes and potential foes are conducting research on weapons of mass destruction. Several were mentioned in the earlier discussion this morning.

Another factor is that today's terrorists seem more interested in running up high body counts than in advancing political agendas. In part this is a consequence of the change in motivations of terrorists, as we move away from ideological motivated terrorism and into the realm of terrorism that is inspired by someone's vision of God.

The nerve gas attack in Tokyo subways may yet inspire repetition. Even the fact that we are having these public discussions may alter the environment somewhat. Again, there are reasons for concern.

At the same time, we cannot conclude that a catastrophic terrorist attack involving chemical or biological weapons is inevitable. The historical analysis provides no basis for forecasting such incidents. There is no inexorable progression from truck bombs to weapons of mass destruction. In the more than 4 years since the Tokyo attack, no group has attempted to do anything like it; that is significant when we look at past terrorist and criminal innovations: hijackings, political kidnappings, malicious product tampering—those were innovations that were promptly imitated.

But even if it is correct, this assessment offers no comfort because every tentative conclusion that one can offer must be followed by the necessary caveat. Indeed, predictions call for the gift of prophecy. I don't think that we can do well in the realm of predicting with any degree of confidence what certainly will or will not happen, I know that causes a certain amount of frustration on the part of those such as yourselves who have to make decisions regarding how much resources should be devoted to the issue and how to best allocate those resources. We are trying to make the uncertainty go away; it is very, very difficult to do that.

About the best we can do is an assessment of comparative likelihoods. We can say with a degree of confidence that hoaxes, which already have become a problem, will continue to be a problem. We can say that limited attacks seem more likely than large-scale attacks. We can say that crude dispersal techniques in contained environments are more likely than poisoning cities.

But I would echo the report prepared by the GAO that we do need a more comprehensive and in some cases a more rigorous analysis, not to validate the threat or dismiss the threat. The issue is not whether we can say "we don't have to worry about it," or "it is imminent" and set off national panic.

But if we are going to prepare at all, we need to have some rational basis for allocating resources. You mentioned the figure $10 billion. Somebody decided on the basis of something that $10 billion is the right amount. How should we best allocate those resources? Should we spend another $10 billion? Or is even that not enough to spend in the years that come? A high degree of uncertainty will remain. That is the reality upon which we are going to have to make these decisions. Therefore we might try to com-

pensate not only by trying to reduce the uncertainty but also by adopting a strategy that takes into account that uncertainty.

First, we want to have a comprehensive analysis. That is not a finite task. That requirement is going to continue as we gain more information, as the threat evolves, as our analysis becomes more sophisticated.

No. 2, we can't wait for the results of the analysis; we have to continue to prepare. We have to be willing to refine our efforts to prepare as we learn more and refine our analysis. We are going to have to be flexible whatever we do.

Third, we might want to look for opportunities to create capabilities that will have utility even if no terrorist attack occurs. For example, increasing our capability to respond to emergencies; improving our ability to detect, identify and treat infectious diseases; creating a more muscular public health service; improving measures to ensure food safety are some of the things that we may want to explore. Even if it is done in the context of terrorism, we nonetheless device public health benefits.

There is a final issue that we often ignore, and that is terrorism always consists of two components. One is the actual event or set of events that terrorists carry out. The second is the much broader psychological effects of those terrorist incidents.

Even if a terrorist attack involving a biological or chemical agent were to kill only a small number of people, as in Tokyo, instead of the tens of thousands predicted in one of the recently publicized fictional scenarios, nonetheless if we did not communicate well, it could provoke national hysteria. This is scary stuff.

Therefore, we need to plan our communications, educate the public in advance. We need to create a cadre of people who will provide practical advice and act as a barrier against the misinformation and rumors that will inevitably occur. That requires legislative initiatives, legislative support; and, should something happen, requires that each of you as Members of Congress act as calm, informed communicators. Thank you.

Mr. SHAYS. I was reminded while you were speaking, I represent Fairfield, and in the late 1950's the person who built my house found that it was more lucrative for him to build the shelters for a nuclear attack and so we had throughout Fairfield County people building these shelters. This was a guy who was making a good amount of money on homes, but he found it more advantageous to build shelters.

[The prepared statement of Mr. Jenkins follows:]

TESTIMONY OF BRIAN MICHAEL JENKINS
before the SUBCOMMITTEE on NATIONAL SECURITY, VETERANS AFFAIRS, and INTERNATIONAL RELATIONS,
HOUSE COMMITTEE on GOVERNMENT REFORM

October 20, 1999

I have been given numerous opportunities to testify before Congress on the topic of terrorism – the first time more than 25 years ago when I thought I knew a lot more than I do now. Different issues arose as terrorism evolved over the years. Often there were differences as to how best to combat the latest terrorist tactics but the threats were real. Extraordinary security precautions at airports were a necessary response to hundreds of hijackings and attempts to sabotage commercial airliners. Hostage situations and bombings dictated that we do more to protect American diplomats abroad. The threat of truck bombs persuaded authorities to increase security around government buildings and, eventually, to block traffic on Pennsylvania Avenue.

The question before us today is a more difficult one. It recently has become a new orthodoxy that it is only a matter of time before terrorists use chemical or biological weapons. How much should we prepare for events that, although perhaps unlikely, if they were to occur, would have grave physical and psychological consequences for the nation? The recent GAO report, *Combating Terrorism: Need for Comprehensive Threat and Risk Assessments of Chemical and Biological Attacks*, underlines the dilemma pointing out that "substantial investments are being made to counter an

uncertain threat." Does catastrophic terrorism involving chemical or biological agents constitute a clear and present danger?

Let me begin by stating that there is ample cause for concern. Deteriorating security and the growth of organized crime and corruption in Russia raise concerns that it might become a source of material and know-how for states or groups seeking weapons of mass destruction. A number of America's foes and potential foes are actively conducting research on chemical, biological, or nuclear weapons. As motives change and their self-imposed constraints erode, today's terrorists seem more interested in running up high body counts than in advancing a political agenda. The nerve gas attack in Tokyo's subways may inspire repetition. Even the fact that we are publicly devoting so much attention to the topic may awaken terrorist interest.

At the same time, we cannot conclude that catastrophic terrorist attacks involving weapons of mass destruction are imminent or inevitable. Historical analysis provides no basis for forecasting such incidents. There is no inexorable progression from truck bombs to weapons of mass destruction. With one possible exception, it is not clear that any organized terrorist group is planning to use chemical or biological weapons.

In the more than four years since the Tokyo attack, no group has attempted to do anything like it. This fact gains significance when we note that past terrorist and criminal innovations – airline hijackings, political kidnappings, malicious product

tampering – were promptly imitated. And terrorist attacks involving chemical or biological agents, if they do occur, are likely to remain rare events – they will not become the truck bomb of the next decade.

Even if it is correct, however, this assessment offers no comfort. Every tentative conclusion must be followed by a caveat. Historical analysis may not always alert us to future developments; unprecedented events do occur. We cannot be confident that intelligence efforts will detect preparations. Even when we have identified terrorist foes, we cannot always forecast and foil their attacks.

Probabilistic predictions are simply not possible. The most one can do is offer assessments of comparative likelihood. Mentions of Sarin and anthrax in the press increased twenty-fold during the 1990s and, not surprisingly, we have suffered a spate of anthrax hoaxes. Hoaxes involving the threatened or alleged use of chemical or biological substances will remain our most common problem.

Attacks involving chemical agents seem more likely than biological attacks. Readily-available substances are more likely to be used than exotic, difficult-to-manufacture substances. Attacks involving crude dispersal techniques in contained environments seem more likely than poisoning cities. Wholesale slaughter is not easy. Attacks involving ten to hundreds of fatalities are more likely than catastrophic attacks of more than a thousand deaths. But again, there are no guarantees.

Uncertainty regarding the identity, intentions and capabilities of potential terrorist adversaries – the traditional components of threat assessment – has not reduced the sense of urgency in current programs to meet the threat. The intentions of terrorists are considered a given. There is a tendency to brush aside terrorists' self-imposed constraints and the technical difficulties they face. Part of the momentum comes from the method used to assess the risk.

Today's risk assessments begin with identifying vulnerabilities, positing a foe, and creating a hypothetical scenario. While perfectly legitimate, this approach entails some analytical risks. One problem is that vulnerabilities are infinite in modern society; hypothetical foes can easily be conjured, and the scenarios are invariably worst cases. This creates another analytical problem. Since risk equals the probability of an event times its consequences, focusing on only the most horrendous events overwhelms any estimate of their likelihood. The possibility of occurrence becomes irrelevant unless the threat can be dismissed with a high degree of confidence – which, of course, it cannot.

Yet another problem arises from the tendency to reify the scenarios from "what ifs" to imminent realities, reinforced by admonitions that future generations will hold us accountable for failure to protect them when a deadly attack does occur. This kind of analysis can degenerate into a fact-free scaffold of anxieties and arguments – dramatic, emotionally powerful, but analytically feeble.

The approach indicated in the GAO report, in my view, offers a useful antidote. It can help us allocate resources, but further analysis by itself is not enough, and some would assert that it is irrelevant, that we cannot afford to wait for an attack – that we must prepare now. No one argues against preparedness. The issue is how much and how to prepare. To compensate for the inevitable uncertainty, we may want to look for opportunities to create capabilities that will have value even if no chemical or biological attack occurs: improving intelligence about terrorism in general, creating a more muscular public health service, and improving measures to ensure food safety are some possible examples.

There is a further issue that is often ignored. Terrorism comprises two components: the actual events and their psychological effects. Whether a chemical or biological attack kills no more than 12 as in Tokyo or tens of thousands as in one of the recently publicized fictitious scenarios, the psychological impact will be enormous.

Just as we must be able to respond effectively to any terrorist attack, we must also address the terror it will create. The difference between an orderly response that saves lives and national hysteria may be determined not only by how well emergency services respond to the incident but by how well we communicate during the crisis. Communications must be planned in advance. The Administration and members of Congress, local public officials, non-government authorities, and the news media must

be brought into the picture. We must look for ways to educate the general public through the Red Cross and other organizations with the objective of creating an informed cadre who will be able to offer fellow citizens practical advice and reduce the alarm caused by the inevitable misinformation and rumor.

These efforts will require legislative initiative and support, but as members of Congress, I believe you will have the additional requirement to act as reasoned voices communicating to your constituents and to the nation in a crisis situation where an ill-considered remark could have disastrous consequences. It is a crucial role which I hope each of you will prepare for with the same patriotism, energy, and skill that brought you to Congress.

Mr. SHAYS. Mr. Parachini.

Mr. PARACHINI. Thank you, Mr. Chairman, for inviting me to this hearing.

I think now is a very important time to do reevaluation of what we see as the threat of chemical and biological weapons terrorism. There were a number of events that really spun the country up to look at this very carefully, first being the World Trade Center bombing, then the bombing on the Tokyo subway, and the Oklahoma City bombing. And then there were a series of hearings in the Senate chaired by Senators Roth and Nunn in which Senator Lugar also participated that are entitled, Global Proliferation of Weapons of Mass Destruction, and these hearings drew a lot of attention to the events in those cases.

I think at this point the threat is overstated, and so now is a good time to reevaluate it, and so I commend you for doing that at this time.

The GAO's general call for a comprehensive threat assessment I think is a good thing to do, although you have to recognize that within the intelligence community and within the FBI there are different methodologies that they employ to actually do the threat assessments, so you have to figure out how to marry those different methodologies. Law enforcement functions and intelligence functions are different, so you have to figure out some way to fit those together and not take away the beauty that those different approaches also bring. But clearly an important part of the assessment has to be a multidisciplinary effort.

Most of how the threat has been evaluated in this country in the last 4 years has been on vulnerability. We are potentially an infinitely vulnerable society. There are a lot of different components. Vulnerability is certainly a part of it. Technological ease of acquiring and assembling these weapons is part of it.

That is not the only part. The part that has not been looked at adequately and has not been discussed in public hearings—and I commend you for trying to do this now—is to look at the behavioral patterns of terrorists and their motivations. What exactly has been the past cases where terrorists have done this in the few instances where this has actually occurred?

If I can call upon the first chart—I am going to put up two charts to sort of help make this point. Actually, the other one.

At the Monterey Institute of International Studies we are conducting a series of both qualitative and quantitative assessments of terrorist incidents, and we have just concluded a series of qualitative case studies where we have asked the same questions. This lists a series of cases which we looked at in the first volume that will come out in January 2000, and it is a series of cases from 1946 until 1995. We had a number of authors who were experts on these groups or in these regions of the world. They applied the same questions. We then brought back all of the data and tried to compare across the cases to see what were common patterns. This is valuable to help establish a bench line. It is not necessarily a clear guide to the future, but it does create a benchmark for what we are looking at.

At the moment, the worst-case scenarios are being spun out by people mainly who have a lot of expertise in our own weapons pro-

grams, or evaluating the weapons programs of foreign countries, not subnational groups or terrorists. That doesn't mean that their expertise is not relevant, but it means that their expertise captures one part of the problem.

The other part of the problem is you have to actually look at groups and what they have done. So that is what we tried to do using open source information, interviewing the terrorists, interviewing people who know them, interviewing arresting officials and prosecuting attorneys and reading all of the statements that the terrorists have articulated, trying to see what were the agents that they used and how did they get them and how were they apprehended.

Based on this work and another set of case studies that we will be conducting in 1999 and the year 2000, we are beginning to get some sense of a profile of what some of the groups are that will use weapons of mass destruction, principally chemical and biological weapons, and we are beginning to understand what are some of their patterns of behavior.

Some of the findings are that, in contrast to what we hear in popular discussion, that this is a very complex task. Even very smart people have difficulty doing it. And as you yourself noted, there is a lot of technical expertise in the United States. Why isn't this happening more often? We should ask ourselves that question.

One, it is not that easy. So it is a technologically complex thing. Two, it is sort of surprising how infrequent it is. Three, the people who do want to use these types of agents for their particular purposes tend to be small groups or individuals. Those are very hard for law enforcement people to penetrate—very hard.

And, finally, the people who are most motivated toward these attacks are people who we identify with the following characteristics. They have charismatic leadership. They have no outside constituencies so they are internally focused. They don't have the outside constraints that most of us have in the socialization process. They have an apocalyptic view of the world. They are often splinter—individual splinter groups or individuals. They have a sense of paranoia that tends to push them to want to use these when they feel that law enforcement people are closing down on them. And they have a sense of grandiosity. They are above the restraints that most of us feel and that they may be impervious to the effects of their action.

The beauty, fortunately, and I am not clear on how long we can rely upon this, but the beauty is these are unusual characteristics. These are not the political terrorist groups that we faced in the 1960's, 1970's and early 1980's. These tend to be splinter groups or loners. They tend to be religiously motivated groups or people who are somewhat unstable, so there are self-limiting characteristics in who these groups are. They tend to envision ways to perpetrate their attacks that are not realistic. They tend to have visions that are very difficult to carry out, so there is an upside story when you begin profile who has done this in the past.

On the next chart you can see how we have tried to compare across the various cases what some of these patterns are. The beauty of identifying these patterns is it begins to focus us on what agents are really relevant. It doesn't mean that those will be the

agents in the future, but at least we know what has been used in the past. By looking at the incidence, it gives us some sense of the magnitude of what did happen in the past, how many casualties were there. You have asked this question several times. This is not an arbitrary number. This is a number based on looking at the historical record.

One of the things that you do find is that industrial chemicals, as was mentioned, and fairly common pathogens are more likely. So are we scaling our response to deal with the more likely things or are we scaling to deal with national strikes with very unusual agents that were in foreign countries' weapons programs that are not very likely?

Let me finally comment on the report in a general sense as an observer and a regular reviewer, both of hearings that you convene and of reports that the General Accounting Office prepares.

Although I think a general call for comprehensive assessment is valuable, I was struck when reviewing the report how caveated it was in many ways. While I recognize that there is a beauty to that reiterative process between the GAO and the various agencies, at some point you have to begin to worry about when does it become a negotiated product. And I think Congress, to perform its proper oversight role, wants as crisp and as hard-edged reports as possible, even if it makes them unpopular. This issue is too important to get sort of a negotiated product. In the end, you want clear statements and judgments. People should be held accountable for their judgments.

That is why we would have tried to ground our work in the historical record, and we recognize it is a historical record and not a projection for the future. We wanted to have some benchmark for our work and how we might project into the future.

Mr. SHAYS. Thank you.

[The prepared statement of Mr. Parachini follows:]

Statement of

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Before the House Subcommittee on National Security, Veterans Affairs, and International Relations

Combating Terrorism: Assessing the Threat

October 20, 1999

Parachini

Mr. Chairman,

I want to thank you, other committee members and your staff for inviting me to share my views on the threat posed by terrorist use of chemical and biological weapons (CBW) and the General Accounting Office's (GAO) recent report on the subject. I commend you and the committee for searching for a better understanding of the terrorist chemical and biological weapons threat to the United States.

Considerable governmental funding and energy has been applied to counter the danger of terrorists using unconventional weapons materials in the United States; however, considerably less effort seems to have been made to fully understand the nature of the threat. I am concerned that much of the momentum for this government wide effort to improve our capabilities to combat the threat of CBW terrorism, and to manage the consequences should an attack ever occur, has been based on worst-case scenarios. These worst-case scenarios tend to be shaped by perceptions of vulnerabilities and the availability of know-how and materials for perpetrating a CBW attack and do not take into account other key factors. A more comprehensive approach is needed to build scenarios that more accurately reflect the nature of the threat.

Now is an appropriate historical juncture to step back and make sure that the US government is acting and spending smart and not just talking and spending big. An essential first step towards this end is a thorough threat assessment that includes more than an assessment of vulnerabilities and the ease of acquiring certain weapons critical technologies. The threat of

CBW terrorism is simply too serious to approach in any other fashion. In this regard, I praise the GAO's repeated call for the relevant law enforcement and intelligence agencies to conduct thorough national threat assessments on a periodic basis. As I will note below, re-examining previous incidents can be very important as new information becomes available with the passage of time.

Our national vulnerabilities to a terrorist CBW attack and the technical possibilities of such an attack are just some of the aspects that should be considered when formulating a judgement about this unconventional terrorist threat. By emphasizing national vulnerabilities and technology proliferation that could reach the hands of terrorists, we naturally drift towards technological remedies to the terrorist CBW threat. Techno-optimism of Americans is one of our great national qualities. However, we must guard against looking for the technological silver bullet and ignoring other non-technological options to curb the problem. The dilemma of this terrorist challenge is that while the likelihood of terrorist use of unconventional weapons material is slim, the potential consequences could be catastrophic. The government must figure out how to assess the risk and allocate finite resources to meet the demands of the risk. Simply pouring resources, no matter how plentiful, in directions policy makers believe are appropriate without undertaking a thorough, systematic review, may very likely lead us to just spend money, not spend it wisely.

From 1993 until 1996 three terrorist incidents and a series of congressional hearings significantly shaped our national perception of the terrorist threat and the prospect that terrorists

might resort to weapons of mass destruction. The World Trade Center bombing, the Oklahoma City federal building bombing and the Tokyo subway Sarin attack all signaled a new age of terrorism. Greater texture was given to all three of these events in a set of Senate hearings chaired by Senators Roth and Nunn of the Committee on Governmental Affairs.[1]

In the period since these events and these important hearings, new information and more extensive analysis suggest that some of the findings in the hearings may have been premature. Thus, the combination of these unprecedented tragic incidents and the initial conclusions from these hearings, media coverage of these events and these hearings, statements by some members of the legislative and executive branches of government and national security experts, have led to a characterization of the CBW terrorist threat that may not necessarily square with several recent analyses that benefit from temporal distance from the events in questions.[2] Given the significant departure from previous terrorist events, these incidents of the 1990s shaped our approach to the threat. Similarly, the senate hearings and the three volume report they generated were extremely valuable. However, the perception of the threat spawned by these sources has begun to outpace the facts. Once again, now is an appropriate time for the Congress, the executive branch, responsible authorities and scholars to re-examine our perceptions of the CBW terrorist threat in the United States.

Recent studies of the CBW terrorism issue by researchers at the RAND Corporation, the Chemical and Biological Arms Control Institute, the University of Maryland, Harvard University and my colleagues at the Monterey Institute, to name just a few, are helping to establish a new

and more complete understanding of the threat that should facilitate more appropriately tailored policy responses and spending patterns.[3] Common to all these efforts is a determined effort to understand the perpetrators of these criminal acts, the facts of the cases and their implications for future counter terrorism and emergency response policy. Calibrating the threat of sub-national groups and individuals who might be motivated and capable of carrying out a terrorist attack with chemical and biological weapons will help focus law enforcement and intelligence resources on the most likely threats. Similarly, understanding the motivations and behavior patterns of the perpetrators of these attacks will help law enforcement authorities cull the hoaxes from cases of genuine concern. And finally, greater familiarity with the range of terrorist behavioral patterns, preferred types of weapons and delivery methods will aide in the development of the most effective medical countermeasures and consequence management activities should the unlikely event actually occur. At the moment, I fear, many governmental efforts to address the CBW terrorist threat may not be geared to the most likely threats.

Case Studies of Terrorist Motivations and Behavioral Patterns

At the Monterey Institute of International Studies we are engaged in a multi-year effort to examine thoroughly the threat of terrorist use of unconventional weapons materials. Our research has focused on the motivations and behavioral patterns of terrorists who have actually used, threatened or tried to acquire chemical and biological weapons. The product of our first phase of research is a volume entitled *Toxic Terror* that will be published by MIT press in January. Edited by my colleague Dr. Jonathan Tucker, this volume includes 12 case studies of terrorist incidents in which chemical and biological weapons were or were alleged to have been

involved. I contributed two case studies to this volume and I am currently managing the next phase of our research that involves 15 new case studies (See attachment of two sets of case studies).

In these case studies, each of the researchers apply the same set of questions to their particular cases such that we can systematically compare the cases. We focus our research on primary source materials. When possible, the case study authors interview the terrorists, people who know them, the arresting officials, and the prosecuting authorities. Similarly, the case study authors review the terrorists' published statements, writings, records from court proceedings and any other primary sources that may give some indication about what motivated them to seek these unconventional weapons materials, the dynamics of their organizations, how they decided upon their targets, what skills they needed to procure and deliver their weapons and what foiled their plans and led to their arrest. One of the primary objectives of our research has been to establish a baseline understanding of terrorist motivations and patterns of behavior concerning the acquisition and use of chemical and biological weapons.

We recognize that the history is not a perfect guide to the future, but without any understanding of the historical record, people are merely speculating about what actions terrorists might take. We intend to continue conducting case studies to hone our qualitative understanding and build up our data set. Additionally, parallel to this qualitative case study research, my Monterey Institute colleagues Jason Pate and Diana McCauley are leading a team in building a database of terrorist incidents with unconventional weapons materials that now includes more

than 520 cases.[4] The cumulative result of this quantitative and qualitative research is a baseline understanding rooted in a thorough examination of the historical record.

Some general observations emerge from this body of research. First, several of the cases commonly cited in the scholarly literature as incidents where terrorists sought to or succeeded in employing chemical or biological weapons turned out to be apocryphal. Upon further inspection, three of the twelve cases examined, which are frequently cited in the scholarly literature, lack sufficient evidence to be considered as actual incidents of CBW terrorism. This is an important finding because an inflated and flawed data set will lead us to falsely appraise the threat and may lead to imperfect policy prescriptions for addressing it.

Second, contrary to much of the popular discussion of terrorist use of chemical and biological weapons, employing chemical and biological weapons for terrorist purposes is technically complex. Procuring the proper materials, fashioning them into a weapon, maintaining an organization that avoids infiltration or detection, and finally, delivering the weapon to a meaningful target, is far more difficult than often portrayed in many Hollywood films, the popular press and as sometimes described by elected or appointed officials.

Third, according to the historical record, attacks with chemical and biological weapons are strikingly infrequent and the number of fatalities and casualties are far lower than those caused by conventional explosives. According to an analysis of 105 US incidents featured in the Monterey Institute database from 1900 to 1998, only one fatality resulted from a CBW terrorist

attack.[5] This incident involved a 1973 assassination of an Oakland, California school superintendent by the Symbionese Liberation Army. In the Sarin gas attack on the Tokyo subway, 12 people eventually died and several hundred people suffered injuries from exposure, not the figure of 5,000 that is frequently cited. More than 5,000 people went to hospitals following the attack, but only a fraction of those people actually suffered from exposure to chemical agent.[6] In contrast, 6 people died and more than 1,000 were injured in the World Trade Center bombing.[7] One-hundred sixty-eight people died in the Oklahoma City bombing and several hundred were injured.[8] The bombings of the US embassies in Africa resulted in 252 deaths and over 5,000 injured.[9] Thus, given how vulnerable we believe we are to terrorist CBW attacks, surprisingly few incidents have actually occurred and attacks with conventional explosives have proved to be far more deadly.

Based on this initial set of case studies contained in *Toxic Terror*, we identified six common characteristics. Some of these characteristics are common to many groups, and others begin to etch a profile that law enforcement, emergency response and intelligence officials should consider carefully as they were grapple with the threat and consequences of terrorist use of chemical or biological weapons. The six characteristics we identified are: charismatic leadership, no external constituency, apocalyptic ideology, loner or splinter group, a sense of paranoia and grandiosity, and defense aggression. Of these six characteristics, the two that were present in all of the cases of actual CBW use warrant thorough examination: no outside constituency and a sense of paranoia and grandiosity.

Cults, loners and splinter groups are by their very nature often isolated from society. Lacking outside constituencies, these types of terrorist entities operate without any moderating influences. The Aum Shrinrikyo, R.I.S.E., the Rasneeshees and the Christian Identity group, the Covenant, the Sword and the Arm of the Lord (CSA), are all groups or individuals that fit this pattern. Another characteristic of these groups is their apocalytic vision. They lived in the confines of their own organization or self created world without the social constraints of society. They believed that they were superior to others who operated outside their world vision. When challenged, these groups all asserted defensive aggression. In the case of the Aum Shrinrikyo, they conducted their attack on the train lines crossing central Tokyo right near the main police station just as law enforcement authorities were closing in on them. All of these behavioral traits served to melt away the normal social restraints that keep people for employing chemical and biological weapons to get their way in the world.

In the cases examined in *Toxic Terror*, key group members exhibited a sense of paranoia and grandiosity. The sense of paranoia caused group members to act impulsively with little regard for the consequences of their actions. The sense of grandiosity allowed members to believe they could survive any adverse physical or social implications of their actions. Perceiving themselves as superior, they believed themselves above the earthly implications of causing indiscriminate mass murder of innocent people. Moreover, by inflicting mass death on others they affirmed in their minds their power and superiority. This is a very dangerous, self-reinforcing cycle. Fortunately, as noted before, the people who think this way tend to be amateur terrorists unable to harness the technical complexity of chemical and biological weapons and

maintain effective group cohesion to fulfill their twisted vision. While the rise of groups interested in using chemical and biological weapons has increased in the 1990s, they have distinctive limitations that tend to hamper their capabilities to undertake the technically daunting task of a chemical or biological weapons attack.

The groups and individuals studied reveal another notable feature of the terrorist who seeks to inflict mass casualties: they tend to be amateur terrorists whose chemical or biological weapons attacks are ill-conceived and ineffective.[10] Several of the case studies in *Toxic Terror* illustrate this point. For example, the 1970s eco-terrorist group R.I.S.E. planned to wipe out the entire planet with several different microbial pathogens and then repopulate the world with their own genes. They eventually scaled back their attack to contaminating the urban water supplies in the Chicago area. The plot was thwarted when group members informed the FBI. In another case during the mid 1980s, Covenant, the Sword and the Arms of the Lord (CSA) believed it could overthrow the US government and facilitate the return of the Messiah. They acquired 30 gallons of potassium cyanide that they planned to put into urban water supplies believing that God would direct the poison to kill only nonbelievers, minorities and non-whites living in big cities. The FBI penetrated the group before they could attempt to carry out their scheme. And finally, in the World Trade Center bombing, one of conspirators returned to the rental car company to obtain the deposit on the van used in the bombing. Turned away on his first attempt, the individual returned again, but this time under cover FBI agents arrested him. The amateurishness of these cults and lone individual actors tends to be a self-limiting factor on their capabilities. While these groups are difficult for law enforcement authorities to penetrate, the

historical record also suggests that their practices limit their ability to conduct the type of attack we most fear.

All of these characteristics distinguished the terrorist groups inclined to employ unconventional weapons materials from the traditional terrorist groups of the past. Traditional ethno-nationalist/separatist and ideological terrorist groups eschewed unconventional weapons, because as Brian Jenkins insightfully noted a decade ago, terrorists "find it unnecessary to kill many, as long as killing a few suffices for their purposes."[11] Moreover, traditional terrorist groups targeted symbolic targets, killed specific persons they blamed for exploitation and oppression, and modulated their activities to garner attention without sapping the support they sought from current or potential followers. In some cases, terrorist operatives viewed themselves as governments in exile. They could not afford or did not wish to completely alienate domestic constituents or international benefactors. In the case of cults and lone individuals, however, the restraints imposed by external constituencies do not exist.

Thus, based on our examination of the historical record, only a small number of groups or individuals were actually motivated to employ chemical or biological weapons, and most of them were unable to surmount the formidable technical hurdles to be produce a mass casualty event. Truly determined individuals or groups will turn to conventional high explosives when their efforts to employ chemical or biological weapons stall. Those groups or individuals who continue to pursue unconventional weapons materials because of a particular fascination with poisons or diseases, fortunately, may be limited by their capabilities. Hoaxes and small scale

attacks with chemical and biological weapons are much more manageable for these groups and therefore are much more likely. This finding is important for appropriately calibrating emergency response efforts and guiding our attention to search for indicators that help distinguish hoaxes from threats that require serious attention.

Assessment of Chemical and Biological Terrorist Threat to the United States Homeland

Several themes currently guide much of our thinking on the CBW terrorist threat to the United States. In the 1990s we have learned that the former Soviet Union, Iraq and South Africa operated clandestine programs to develop unconventional weapons capabilities that turned out to be much larger than commonly known. Based on this pattern, it is reasonable to speculate whether we understand the magnitude of unconventional weapons programs of states like North Korea, Syria, or Libya, to name but a few countries of concern. Thus, by inferences some policy makers and analysts worry about individuals who defect from former or current state CBW programs to aide terrorist organizations.

In the cases of the former Soviet Union, particularly Russia, and South Africa, there is acute concern that either materials or know-how from these former programs could be illicitly transferred to sub-national terrorist groups. Senator Richard G. Lugar, co-author of the Nunn-Lugar legislation recently argued that "As a consequence of the collapse of the Soviet totalitarian command and control society, a vast supermarket of weapons and materials of mass destruction has become accessible."[12] The implication of Senator Lugar's statement is that one should worry that potential proliferant states or terrorists might exploit this "supermarket." This problem is all

the more dangerous if it is also combined with the trafficking of unconventional weapons know-how. For example, there have been reports of Iranians trying to recruit former Soviet BW scientists.[13] Similarly, there are reports that the former head of the clandestine South African chemical and biological program, Walter Basson, traveled to Libya and may have also offered his services to other countries such as Iraq and Syria.[14] Fortunately, there is no open source evidence to date indicating that unconventional weapon materials or know-how has reached the hands of sub-national groups. There are a few reports of people in these programs having contact with officials in other countries that could contribute to the development of unconventional weapons capabilities, but even in these few instances, the publicly available evidence is slim. There is no question that the potential proliferation of weapons materials and know-how from the former Soviet weapons complex presents a serious proliferation challenge. Yet, there is no open source evidence indicating that terrorists have exploited the turmoil in Russia or other former Soviet republics to obtain chemical or biological weapons and their means of delivery.

Several factors mitigate against the dangers defectors from former and current state CBW programs might present for terrorist acquisition of CBW capabilities. In the case of the biological weapons scientists of the former Soviet Union, those who have emigrated from Russia have gone to the United States, Great Britain, Israel and Germany to seek jobs in the commercial economies of these countries. For the most part, there is no open source information indicating that they have not gone to Iraq, Libya, Syria or North Korea to sell their weapons expertise. The adverse economic conditions that might lead us to imagine former Soviet BW scientists selling

themselves to states or groups have led these individuals to countries with vibrant commercial sectors. Another factor weighing against these former scientists selling their expertise to potential adversaries is the deeply ingrained security culture in which they operated for many years. Weapons scientists entrusted with developing weapons to defend their country do not immediately shed many years of training to offer such valued secrets to the highest bidder. Additionally, US and international programs to address the problem of brain drain from former weapons laboratories may also stem the immigration of scientists to nations of proliferation or terrorism concern. And finally, many of these scientists have family and cultural ties that make living in Russia more desirable than Damascus, Pyongyang and Tripoli. While the potential of "brain drain"exists, the few troubling cases that have occurred involved individuals in contact with state officials, not terrorists. Thus, while the clandestine programs of a few countries, particularly Russia, present clear proliferation dangers, the problem has thus far not been as acute as many have feared. There is no evidence indicating that terrorists have successfully taken advantage of the so-called supermarket of materials and human talents presumed to be available in the republics of the former Soviet Union. Hence, we should re-evaluate how important possible proliferation from the former Soviet Union might be for the terrorist threat of CBW use here in the United States. This is not to suggest that there is no CBW terrorist threat in the United States, but rather that we should not assume that aspects of CBW proliferation from the former Soviet Union show up as components in the threat of CBW terrorist in the United States. The historical record indicates that the CBW terrorist threat in the United States is driven by its own forces with its own unique set of characteristics. If we gauge our American counter terrorism and emergency response efforts according to what we fear may be leaking from the

former Soviet Union, we may be miss casting the nature of the terrorist threat here in the United States.

A second theme of concern about terrorism in the 1990s that raises our concern about the possible use of CBW by terrorists is the emergence of terrorist groups with access to vast resources. The Aum Shinrikyo and Osama bin Laden's al Qaida organization are the main examples of entities fitting this concern.[15] The Aum Shinrikyo operated a number of front companies, possessed assets running from the hundreds of millions to as much as one billion dollars, purchased helicopters from Russia, trained pilots in the United States, and sought to procure unconventional weapons materials from Russia, Australia, Sri Lanka, Zaire and North Korea.[16] The organization had considerable scientific talent among its members. Japanese police eventually discovered that the Cult amassed a number of chemical agents. Similarly, Osmaa Bin Laden provides his al Qaida organization with support from his fortune estimated in the hundreds of millions of dollars, commands what some believe to be the most effective fighting brigade in the Taliban's struggle to control the territory of Afghanistan, and as the bombings of American embassies in Africa proved, has a transnational reach that can inflict significant casualties and effect tremendous physical damage throughout a large theater of operations. Despite these tremendous resources at their disposal, it is worth noting the difficulty each group had in acquiring and/or conducting CBW attacks. The Aum Shinrikyo repeatedly tried to develop a biological weapons capability, but failed. Their chemical weapons attack on the Tokyo subway crossed a threshold for use of unconventional weapons use, but it inflicted far fewer casualties than the World Trade Center bombing, the Oklahoma City bombing and the US embassy

bombings in Africa. Similarly, according to US official statements, bin Laden made various attempts to acquire a chemical weapons capability.[17] To date, however, there is no open source evidence that he has succeeded in his quest. Thus, while the advent of groups inclined to perpetrate terrorist attacks using CBW is a trend worth monitoring closely, the threat should not be overdrawn. Both cases reveal significant barriers that even groups with vast resources have trouble surmounting and as the bombing of US embassies in Africa indicate, other deadly alternatives are readily available to meet their objectives.

The third threat theme that warrants mention actually falls outside the scope of what this committee directed the GAO to consider in its report, namely a state-sponsored terrorist attack. In an era when the United States is the pre-eminent global power, considering asymmetrical attacks against the US homeland and forces abroad by state-sponsored operatives is important. While state-sponsored terrorist attacks would greatly reduce the technical hurdles terrorists might face in perpetrating a chemical and biological weapons attack against the United States homeland, a number of factors mitigate against the likelihood of such attack. First, there is no evidence in recent years of state-sponsored attacks on the United States homeland with chemical or biological weapons. State-sponsored terrorist attacks of chemical and biological weapons have been very rare and have usually engaged special-operations forces, not sub-national terrorist groups. When engaged in high risk, clandestine attacks, states do not want to lose control of the operation, which might be a danger when employing free lance terrorists. Additionally, states rightly fear the potential severe retaliation they might suffer if their activities where ever discovered. Retaliation against a state that sponsored a terrorist use of chemical and biological

weapons would likely be treated as an attack perpetrated by the sponsoring state. Risking retaliation undoubtedly would make even the most rebellious national leadership reluctant to cross the threshold from conventional high explosives to unconventional weapons materials. Thus, even if the GAO were directed to consider the possibility of state-sponsored terrorist attacks against the United States, my assessment is that while the consequences of such an attack are potentially significant, the probability of such an attack is extremely low.

The CBW terrorist threat to the United States needs to be reconsidered. Current counter terrorism and emergency response activities should be recast according to a new assessment of the CBW terrorist threat to the United States that is not unduly influenced by assessments of the threat that were prevalent when a number of the current programs were initiated. This is not to suggest that these programs were miscast in the first place or that the United States does not need to undertake a variety of new activities to counter this emerging threat and prepare to respond to its consequences should it occur. Rather, now is a good time in the evolution of a national effort to augment national, state and local capabilities to address the CBW terrorist threat to take a fresh look at the threat. Special effort should be made to avoid simply affirming old notions of the terrorist threat to the American homeland. The Aum Shinrikyo incident provides a poignant example of how old notions of threats can restrict our scope of vision causing us to miss important new threats. On numerous occasions the Aum Shinrikyo publicly threatened to kill the US president, threatened to use Sarin gas and threaten to attack major international meetings in the pacific region. The former head of the Central Intelligence Agency's Nonproliferation Center said in open congressional testimony that the Aum Shinrikyo did not register as a terrorist entity

of concern.[18] At that time the CIA focused its energies on terrorism on different parts of the world and failed to see a religious group in an allied state moving to cross the threshold of terrorist behavior. Admittedly, anticipating the Aum Shinrikyo was not easy. But the CIA was not helped by its outdated perception of the threat. We must position our intellectual capabilities such that we constantly re-evaluate our terms of reference when assessing the threat of WMD terrorism against the American homeland.

Comments on GAO Report on Combating Terrorism

The main thrust of the GAO's report "Combating Terrorism: Need for Comprehensive Threat and Risk Assessments of Chemical and Biological Attacks" is on balance a constructive contribution to improving the US government's evaluation of the terrorist threat to use CBW in the United States. A comprehensive threat and risk assessment can establish a benchmark for evaluating counter terrorism and emergency response spending decisions across the full range of federal government programs. Making decisions without any commonly agreed upon threat and risk assessment curries the chance that important resource allocation decisions will be based on current beliefs and not on a well grounded understanding of the problem at hand. The apparent over reliance on worst-case scenarios shaped primarily by vulnerability assessment rather than an assessment that factors in the technical complexities, motivations of terrorists and their patterns of behavior seems to be precisely the sort of approach we should avoid.

Different government agencies use different methodologies to evaluate the missions they perform. Calling for a comprehensive national threat and risk assessment can be valuable as a

common reference point for law enforcement and intelligence agencies. However, within a comprehensive assessment there must be some appreciation for how different agencies with different missions perform mission assessments in different ways. Law enforcement and intelligence collection and analysis are very different government functions. Thus, a common threat and risk assessment, including both foreign and domestic components, that the entire federal government takes as a baseline understanding to guide all departments and agencies would be extremely valuable. This comprehensive threat and risk assessment should encompass the assessments performed by different departments and agencies. Forcing all the relevant government players to follow one approach is a prescription for error. Forging a common assessment while allowing a plurality of approaches to continue throughout the government will provide a better threat and risk assessment product.

While the GAO report appropriately points to the importance of a comprehensive threat and risk assessment for guiding government funds to address the threat of terrorist use of chemical and biological weapons, the report suffers from too narrow a consideration of the factors that should compose such an assessment. While a thorough examination of the technical ease of terrorist to conduct an attack with chemical or biological weapons is an essential part of a comprehensive assessment, a better understanding of the motivations and behavioral patterns of terrorists disposed to use unconventional weapons materials must also be a component of such an assessment.

Drawing on a wider set of talents than just weapons specialists and scientists might also

have improved the GAO's analysis. Engaging psychologists, criminologists, and political scientists to thoroughly examine the historical record of CBW terrorist incidents in the United States may provide some insight into more accurate incident casualty rates and the types of agents and delivery methods that terrorists have used in the past. By merely looking at the scientific aspects of the problem, GAO and the Congress denies its self a richer appreciation of the threat.

And finally, while I recognize that the GAO and the departments and agencies engage in considerable interchange during the process of these reports. This interchange undoubtedly improves the product that the Congress receives. However, there is the danger that at some point the Congress receives a negotiated product that is not necessarily as sharp and sharp-edged as it may desire. While I do not have any suggestions on how to avoid this problem, I would like to note that I sense that this particular product is the result of considerable GAO and executive branch dialogue.

1.U.S. Congress, Senate, Committee on Governmental Affairs, Permanent Subcommittee on Investigations, Global Proliferation of Weapons of Mass Destruction, Parts I, II, III, (Washington, DC: US Government Printing Office, 1996).

2.For discussions of new evidence on the allegations of chemical and biological weapons use in World Trade Center bombing and Tokyo subway Sarin attack see: John Parachini, AWorld Trade Center Bombing,@ in Jonathan B. Tucker (ed.), Toxic Terror: Assessing Terrorist Use of Chemical and Biological Weapons, (Cambridge, Massachusetts: MIT Press, 2000); and Testimony by Milton Leitenberg entitled AAn Assessment of the Biological Weapons Threat to the United States,@ before the Committee on Government Reform, US House of Representatives, Washington, DC, October 12, 1999; and Milton Leitenberg, AThe Experience of the Japanese Aum Shinrikyo Group and Biological Agents, ATerrorism and Political Violence,@ forthcoming in Vol. 11, No. 4, Winter, 1999.

3. The following is a list of recent work by the institutions or individuals working at these institutions that characterizes serious new scholarship on this topic: Brad Roberts, (ed.) Terrorism with Chemical and Biological Weapons: Calibrating Risks and Responses, (Alexandria, Virginia: The Chemical and Biological Arms Control Institute, 1997); Richard A. Falkenrath, Robert D. Newman, and Bradley A. Thayer, America=s Achilles Heel: Nuclear Biological, and Chemical Terrorism and Covert Attack, (Cambridge, Massachusetts: MIT Press, 1998); Jessica Stern, The Ultimate Terrorists, (Cambridge, Massachusetts: Harvard University Press, 1999); Bruce Hoffman, ATerrorism and Weapons of Mass Destruction: An Analysis of Trends and Motivations,@ (Washington, DC: RAND Corporation, 1999); Jonathan B. Tucker, Toxic Terror: Assessing Terrorist Use of Chemical and Biological Weapons, (Cambridge, Massachusetts: MIT Press, 2000).

4. For a summary of the Monterey database information see Jonathan B. Tucker, AHistorical Trends Related to Bioterrorism: An Empirical Analysis,@ Emerging Infectious Diseases, Centers for Diseases Control and Prevention, July/August 1999, (http://www.cdc.gov/ncidod/eid/vol5no4/tucker.htm)(October 18, 1999). See also, Jonathan B. Tucker and Amy Sands, AAn Unlikely Threat,@ The Bulletin of the Atomic Scientists, Vol. 55, No. 4, July/August 1999.

5. Jonathan B. Tucker and Amy Sands, AAn Unlikely Threat,@ The Bulletin of the Atomic Scientists, Vol. 55, No. 4, July/August 1999.

6. Milton Leitenberg, AThe Experience of the Japanese Aum Shinrikyo Group and Biological Agents, ATerrorism and Political Violence,@ forthcoming in Vol. 11, No. 4, Winter, 1999.

7. U.S. Senate, Committee on Judiciary, Subcommittee on Technology, Terrorism, and Government Information, Statement by J. Gilmore Childers, Esq. and Henry J. DePippo, Esq., Foreign Terrorists in America: Five Years After the World Trade Center, February 25, 1998, (http://www.senate.gov/~judiciary/childers.htm) (April 7, 1998).

8. The Oklahoma Department of Civil Emergency Management, AAfter Action Report Alfred P. Murrah Federal Building Bombing,@ April 19, 1995, (http://www.onenet.net/~odcem/aar-final_5.htm)(October 18, 1999).

9. Report of the Accountability Review Boards, ABombings of the US Embassies in Nairobi, Kenya and Dar es Salaam, Tanzania,@ August 7, 1999,

(http://www.state.gov/www/regions/africa/accountability_report.html)(October 18, 1999).

10. Bruce Hoffman, ATerrorism and Weapons of Mass Destruction: An Analysis of Trends and Motivations,@(Washington, DC: The RAND Corporation, 1999) pp. 34-44.

11. Brian Michael Jenkins, The Likelihood of Nuclear Terrorism, (Santa Monica, CA: RAND, P-7119, July 1985), p. 6.

12. Richard G. Lugar, The Threat of Weapons of Mass Destruction: A US Response,@ The Nonproliferation Review, Vol. 6, No. 3, Spring-Summer 1999, p. 51.

13. Judith Miller and William J. Broad, AThe Germ Warriors: A Special Report; Iranians, Bioweapons in Mind, Lure Needy Ex-Soviet Scientists, The New York Times, December 8, 1998, p. 1.

14.Peta Thornycroft, APoison gas secrets were sold to Libya,@ Weekly Mail & Guardian, (http://wn.apc.org/wmail/issues/970207/NEWS1.html) (August 13, 1998); and, Stephane Bothma, ABasson had plans to open hospital in Libya, Business Day Online, March 7, 1997, (http://www.bday.co.za/97/03037/news/n20.htm) (September 14, 1998).

15. For an excellent comparison of these two entities see Gavin Cameron, A Multi-track Micro-proliferation: Lessons From Aum Shinrikyo & Al Qaida,@ Studies In Conflict & Terrorism, forthcoming in Vol. 22/4, December 1999.

16. See David E. Kaplan, AAum Shinrikyo (1995),@ in Jonathan B. Tucker (ed.), Toxic Terror: Assessing Terrorist Use of Chemical and Biological Weapons, (Cambridge, Massachusetts: MIT Press, 2000). See also, David E. Kaplan & Andrew Marshall, The Cult At The End Of The World, (Crown Publishers, Inc.: New York), 1996.

17. Sandy Berger, APress Briefing By The National Security Advisor, The White House, Office of the Press Secretary, September 21, 1998,@ (http://www.pub.whitehouse.gov/uri-res/I2R?urn:pdi://oma.eop.gov.us/1998/9/23/21.text.1) (October 18, 1999). See also, United States of America v. Usama Bin Laden, United States District Country , Southern District of New York, 98 Cr., (Indictment), pp. 1-7.

18. U.S. Congress, Senate, Committee on Governmental Affairs, Permanent Subcommittee on Investigations, Global Proliferation of Weapons of Mass Destruction, Part I, (Washington, DC: US Government Printing Office, 1996) pp. 27-284.

Profiles

CASES	Charismatic Leadership	No Outside Constituency	Apocalyptic Ideology	Loner or Splinter Group	Sense of Paranoia and Grandiosity	Defensive Aggression
Avenging Israel's Blood	X	X			X	X
R.I.S.E.	X	X		X	X	X
Alphabet Bomber		X		X	X	
Rajneeshee Cult	X	X		X	X	X
CSA	X	X	X	X	X	X
Minnesota Patriots Council	X	X	X	X	X	X
Aum Shinrikyo	X	X	X		X	X
Larry Wayne Harris		X	X	X	X	X
Apparently Apolitical Cases						
Weather Under-ground	X				X	
Baader-Meinhof Gang	X				X	
Red Army Faction	X				X	
World Trade Center Bombers	X			X	X	

TOXIC TERROR CASE STUDIES

1998-1999

- 1946 Avenging Israel's Blood (Ehud Sprinzak and Idith Zertal, Hebrew University)
- 1970 The Weather Underground (John Parachini, Monterey Institute)
- 1972 R.I.S.E. (Seth Carus, National Defense University)
- 1974 Alphabet Bomber (Jeffrey Simon, Political Risk Assessment)
- 1975 Baader-Meinhof (David Claridge, St. Andrews University)
- 1980 Red Army Faction (Terence Taylor, International Institute of Strategic Studies)
- 1984 The Rajneeshee cult (Seth Carus, National Defense University)
- 1986 Sword & Arm of the Lord (Jessica Stern, Council on Foreign Relations).
- 1992 Minnesota Patriots Council (Jonathan Tucker and Jason Pate, Monterey Institute)
- 1993 World Trade Center bombing (John Parachini, Monterey Institute)
- 1995 Aum Shinrikyo (David Kaplan, *U.S. News & World Report*)
- 1995 Larry Wayne Harris (Jessica Stern, Council on Foreign Relations)

1999-2000 CASE STUDIES

- **Kach —Why not CBW use?—Gavin Cameron, Monterey Institute**
- **Hamas and Muslim Brotherhood—Why not CBW use?—Magnus Ranstorp, St. Andrews University**
- **Israeli oranges poisoning—Ehud Sprinzak, Hebrew University**
- **Chilean grapes and The Breeders agricultural cases—Jonathan Ban, Chemical and Biological Arms Control Institute**
- **Osama Bin Laden—Michael Moodie, Chemical and Biological Arms Control Institute**
- **Armed Islamic Group of Algeria—Gavin Cameron, Monterey Institute**
- **Kashmiri separatists—Alex Evans, Centre for Defense Studies, King's College, London**
- **Poisoning in Japan-Masaaki Sugishima, Asahi University**
- **Anthrax hoaxes in the United States—Jason Pate, Monterey Institute**
- **Tamil Tigers-Bruce Hoffman, RAND Corporation**
- **PKK-Michael Radu, Foreign Policy Research Institute**
- **Chechen radiological material in Moscow—Diana McCauley, Monterey Institute, and PIR Center in Moscow**
- **BW threats against U.S. officials by members of the Republic of Texas —Seth Carus, National Defense University**
- **James Dalton Bell-Jessica Stern, Harvard University, and Darcy Bender, Monterey Institute**

Mr. SHAYS. Mr. Zilinskas, it is wonderful to have you here.

Mr. ZILINSKAS. Thank you, Mr. Chairman. This is a thoroughly enjoyable opportunity.

My written presentation has four parts. I will skip over my background. I will go directly into the preliminary findings of a project that I am doing with the National Defense University, then I will talk a bit about the GAO report, and I will conclude with some thoughts on what might be done as far as meeting the biological threat that faces us all.

As to the project that I am doing in collaboration with National Defense University, we are trying to assess how the advanced biotechnologies might be fed into projects to develop biological weapons; our timeframe is the next 5 years. This is a pretty unique project because nobody else has tried to objectively assess what genetic engineering can do for weaponization of agents.

Our approach is to assemble 16 of some of the foremost scientists in the United States. They include virologists, microbiologists, geneticists, and others. We have met for 2 days as a focus group. The report of this focus group meeting and the analysis of the conclusions will be published at the beginning of the year 2000, but I can tell you a bit about the findings with the caveat that they are my interpretations on what has happened so far. To reiterate the report is not finished, and it will contain the official word of the focus group proceedings.

In the main, we find that the advanced biotechnologies are not likely to be used, and there are two reasons for that. First, there is something called pleomorphic effects when you genetically engineer an organism. These are effects that manifest themselves as undesirable characteristics. So, for example, if you genetically engineer a bacterium to become antibiotic resistant, it might also show other effects that will make it less useful a weapon agent.

So what happens, and this has happened many times in industry, is that the developer is able to successfully do what he wants to do, but then ends up with an organism that is less virulent or less resistant to environmental factors. So then the developer has to go through another cycle of research and development, and then he might end up with something else that is undesirable.

So our feeling is that the only kind of programs that could undertake this kind of activity are well-supported national programs that are in it for the long-term. That is the first.

The second is simply a lack of basic information about natural phenomenon such as host-parasite interrelationships, the infectious processes, pathogenesis and so on.

There is a lot of information that is being generated in these areas right now, but it is not to the point where it really can be applied for weaponization.

We recognize fully well that the Soviet Union's scientists did use genetic engineering in research to produce some very, very frightening or theoretically frightening, hybrids; for example, a combination of the Ebola and the smallpox virus, but it does not make it a weapon. It only means that they were working on it. It might have taken them 5 or 10 years to succeed or then might fail entirely to make this kind of an organism into a real, useful weaponized agent.

In the course of focus group discussions, we came up with some incidental findings. They include that the most likely scenario in the next 5 years for a biological attack is that a common food-borne or beverage-borne agent will be used to deliberately sabotage food or beverages, and this certainly has the capability of injuring hundreds of people, but not thousands. An example occurreed in 1984 when there was an attack by the Rajneeshee group in Oregon of 10 salad bars that affected 751 persons; it is a harbinger for the future.

Second, it is much less likely that an attack using an airborne organism will take place, and that has to do with the technical difficulties of formulating the agents for an airborne attack. The problems, as was shown by the Aum Shinrikyo experience are two. First, they used the wrong strain but second the technical part was that they were not able to disperse the agent as an aerosol because it clogged the nozzles. To overcome this kind of problem is rather difficult. It takes a lot of time and a lot of experimentation.

So moving on to the second part, remarks on the GAO report, I am not going to go into the good parts of it, but I will tell you about the two problem areas that I had with it.

The first one, as a scientist, I had real problems with some of the terminology, which I found——

Mr. SHAYS. For the record, we will note that someone from the GAO smiled when you said that you were not going to go over the good parts. Were there more good parts than bad parts?

Mr. ZILINSKAS. There were more bad parts, unfortunately.

They used terms like "valid" and "sound", which sound pretty good when you read it, but are meaningless when you really look at them. Are you going to use valid data versus—what—invalid data? Are you going to use sound information or do a sound assessment versus—what—an unsound assessment? I found this very irritating, and I guess it hindered me to some point to—well, maybe not.

And then the second part is that the heart of this report is that it recommends risk assessments to be done, but doesn't provide ideas on methods.

I listened to the GAO talking about methodology. They were not talking about methodology whatsoever. They were saying that they should put together an interdisciplinary team, they should get information from national intelligence estimates, whatever that is. Is that a bunch of guesses or are they hard facts? I don't know. And so on.

But there is no set methodology, and I give an example in my report of a scientific way of doing scientific assessment done by the EPA when it considers the introduction of genetic engineered organisms into the environment.

I also give an example of how I used this protocol, the EPA protocol, to do a risk assessment involving the introduction of genetically engineered marine organisms into the open environment, and found out that I could not do a risk assessment. Hey, there is nothing wrong with saying we can't do the risk assessment because the necessary information is not available. And I find that the necessary information as far as terrorist organizations is not there, and it mainly has to do with capabilities. There is no way that you

can know what the capabilities are unless you look at each organization individually and then somehow find out if they have access to it, microbiologists, chemists, doctors. And, furthermore, whether or not these people are willing to lend their skills for illicit purposes.

The second bigger problem has to do with intent. There is no way that anyone can read the mind of a terrorist. For example, my experience with Iraq, people often ask why did they acquire biological weapons? We don't know why they acquired them because the only one who has that knowledge in his brain in Saddam Hussein, and no one can read that brain.

In conclusion, my feeling is that you cannot do a risk assessment under the terms that is discussed in the report. What do we do then?

Well, my feeling is that you take a common sense approach, and the common sense approach, as far as I am concerned, is to try to figure out what is the large biological threat facing the United States. It is really natural disease outbreaks; specifically emerging diseases, reemerging infectious diseases and transported infectious diseases in other words, diseases coming from somewhere else.

And if we can do something that meets this threat, the overwhelming threat of natural infectious diseases, then we have gone a long ways toward at least also being able to alleviate the aftereffects of biological attacks by terrorists.

There is another part of that which I don't go into that much, which is how do you prevent terrorist attacks. The only way that you can prevent them is by having good intelligence. That is something that I don't know anything about because it is mostly classified. How do you set up a good intelligence-gathering system through the intelligence agencies and the police forces?

I say, first of all, deal with the public health and the medical aspects, and then we are in a good place to deal with the terrorist aftereffects. Thank you.

[The prepared statement of Mr. Zilinskas follows:]

ASSESSING THE THREAT OF BIOTERRORISM

by
Raymond A. Zilinskas
Monterey Institute of International Studies
October 20, 1999

1. Introduction

I thank the Subcommittee on National Security, Veterans Affairs, and International Relations for having been given the opportunity to testify on the subject of meeting the threat of terrorism armed with biological weapons. The specter of terrorists enhancing their already formidable arsenals by acquiring these weapons of mass destruction is truly a horrendous one, one that we all must do our best to prevent. So, how may prevention best be accomplished? A good start is to try to understand the threat of bioterrorism, use that understanding to craft appropriate barriers, and, should barriers be breached, craft effective means for alleviating ill effects resulting from an attack and the apprehending of the perpetrators. I hope that my testimony will further our collective ability to understand the technical aspects of bioterrorism and biocriminality.

To accomplish this objective, my presentation has four parts. The first provides a brief background of myself and my work in arms control. Second, findings from an ongoing project to assess applications of advanced biotechnologies for terrorist and criminal purposes are presented. Third, I comment on the recently issued report *Combating Terrorism: Need for Comprehensive Threat and Risk Assessments of Chemical and Biological Attacks* by the United States General Accounting Office (GAO). Fourth, thoughts on what the major biological threats to our society are and what might be done to meet them are presented.

2. Background

After having graduated from California State University at Northridge with a BA in Biology (1962), and from University of Stockholm with a Filosofie Kandidat in Organic Chemistry (1963), I worked as a clinical microbiologist for 16 years before commencing graduate studies at the University of Southern California. Shortly after having earned a Ph.D. in 1981, I went to work for the Office of Technology Assessment (1981 - 1982). My subsequent jobs have been at the United Nations Industrial Development Organization (1982 - 1986) and the Center for Public Issues in Biotechnology, University of Maryland Biotechnology Institute (1987-1998). Since September 1998, I have worked as a Senior Scientist in Residence for the Center for Nonproliferation Research at the Monterey Institute of International Studies (MIIS). I also am an Adjunct Associate Professor at the School of Hygiene and Public Health, Johns Hopkins University where I teach courses on emerging issues in international health.

In October 1993, I was named William Foster Fellow at the Bureau of Intelligence, Verification and Information Support, U.S. Arms Control and Disarmament Agency (ACDA). In April 1994, ACDA seconded me to the United Nations Special Commission (UNSCOM) (see below). After the Foster fellowship ended on December 31, 1994, I returned to the Center for Public Issues in Biotechnology.

2

I began to think about biotechnology's possible negative effects in 1980, when performing research to complete my doctoral dissertation. At that time I was the supervisor of the clinical microbiology section of an acute care hospital's laboratory. Most of my responsibilities related to recovering and identifying pathogens, performing antibiotic testing on bacteria, and so on. I also served on the hospital's infection control committee, attempting to prevent and eliminate nosocomial infections. My work gave me opportunity to reflect on what I call the "pestilence triangle," which encompasses the complex interrelationships and balances between host, parasite (or pathogen) and the environment. Much of the activities in the medical sciences are focussed on trying to affect the components of this triangle for the benefit of the host. Thus, from the aspect of the host, some research seeks to devise methods whereby microbial invasions can be prevented or the host's ability to resist infection may be augmented. As to the parasite, the prevention of infectious diseases is sought through vaccine and anti-toxin R&D, while therapeutics, such as antibiotics, germicides, and other agents, weaken or kill the pathogen. Perhaps most important, the characteristics of the "natural" environmental that support the growth of pathogens past a certain critical threshold, or favor the dissemination or transmission of pathogens, may be affected by public health measures, such as proper waste disposal, water treatment, and air filtration. I came to realize that biological weapons, either when being developed in the laboratory or when actually used in the field, have the potential to upset the intricate balances that exist within the pestilence triangle by either altering the environment or upsetting parasite-host interactions. In either case, the host will suffer damage or death.

The objective of my dissertation was to analyze policy issues generated by recombinant DNA research, including the applicability of genetic engineering techniques to the weaponization of pathogens and toxins. Eventually, the part addressing BW was to take up fully one-third of the dissertation (Zilinskas, 1981). My thoughts on this subject were previously been developed in an article published in 1978, which included a discussion of terrorism and biological weapons (Zilinskas, 1978). I analyzed the Sverdlovsk anthrax epidemic in an article published in 1983 (Zilinskas, 1983). In 1986, I edited a book that contained an article in which the possible applications of biotechnology for BW were analyzed (Zilinskas, 1986a; Zilinskas and Zimmerman, 1986). I examined the difficulties pertaining to verifying the 1972 Biological and Toxin Weapons Convention (BWC) in a book chapter (Zilinskas, 1986b) published by the Stockholm International Peace Research Institute (SIPRI) (Geissler, 1986). In 1990, I wrote an article that investigated whether terrorists were likely to acquire biological weapons and concluded that they would do so within a fairly short time (Zilinskas, 1990a). That same year, I discussed biological weapons and the Third World and concluded that their allure to leaders of these nations was high (Zilinskas, 1990b). Also in 1990, I co-authored a United Nations report on the applications of biotechnology for arms control (Geissler and Zilinskas, 1990). In 1991, I co-authored a book chapter with a renowned Swedish scientist that argued for the activation of Article X of the BWC and the involvement of bioscientists in arms control activities (Zilinskas and Hedén, 1991); this chapter is found in a book published by SIPRI (Lundin, 1991). Also in 1991, I organized a conference called "The Microbiologist and Biological Defense Research: Ethics, Politics and International Security," which was held at the University of Maryland;

its proceedings were published by the New York Academy of Sciences (Zilinskas, 1992a). My contribution to this book focussed on the need to establish an early warning system for suspicious and unusual disease outbreaks that might have been deliberately induced (Zilinskas, 1992b). In 1993, I was part of an interdisciplinary study group that considered the threat of biological events and analyzed whether local and state emergency personnel were trained and otherwise prepared to meat this threat (Bradford et al., 1993, 1994). Our conclusion was that they were not.

As noted above, I was a Foster Fellow at ACDA during late 1993 and all of 1994. However, the agency seconded me to UNSCOM, where I worked during April – November 1994. Here I was responsible for setting up a database containing data about key dual-use biological equipment in Iraq and developing the first draft of the protocol that was to guide UNSCOM's on-going monitoring and verification program in the biological field. I was also UNSCOM's representative on two biological weapons-related inspections in Iraq (June and October 1994) encompassing 61 biological research and production facilities. Drawing on my experience at UNSCOM, I have written four articles or chapters that bear on international arms control (Zilinskas, 1995ab, 1996a; 1997).

After returning to the Center for Public Issues in Biotechnology in January 1995, I wrote an article that discussed whether the attacks carried out by the Aum Shinrikyo was a paradigm for future terrorist operations (Zilinskas, 1996b). In addition to fulfilling academic responsibilities, I worked for ACDA on an ad hoc basis as a long-term consultant. At ACDA I have performed a costing analysis of the future BWC compliance regime (Zilinskas, 1995c), analyzed the utility of lists for the protocol now under development to strengthen the BWC (Zilinskas, 1995d), and assessed problems related to the conductance of challenge inspections (Zilinskas, 1995e). Most recently, ACDA asked me to investigated Cuban allegations of the U.S. having waged BW against its human, animal, and plant populations; the results of that study were published in September 1999 (Zilinskas, 1999a).

At MIIS my research is mostly focused on effective biological arms control, the proliferation potential of the former Soviet Union's BW program, and meeting the threat of bioterrorism and biocriminality. One of the first tasks I undertook was to revisit the problems pertaining to verifying the BWC and analyze how the protocol now under development might make this task more effective (Zilinskas, 1998a). In early October 1999, the book *Biological Warfare: Modern Offense and Defense,* edited by myself, was published (Zilinskas, 1999b); it includes a chapter that I co-authored on the ethics of BW-related research and the role of bioscientists in preventing illicit research and development (R&D); i.e., R&D for offensive military, terrorist, and criminal purposes (Colwell and Zilinskas, 1999).

Beginning in February 1999, I have been working with faculty at the Center for Counterproliferation Research at the National Defense University (NDU) on a project that aims to assess the applicability of modern biotechnology techniques for terrorists and criminals (this project is discussed below). We expect that its findings will be published in two reports. The first will address terrorism or criminality directed against humans; this will be published in early 2000. The second report, to be issued in the

middle of next year, will analyze the possibilities of BW against, animals, plants, and materials.

3. Advanced Biotechnologies and Their Possible Applications for Terrorism and Criminality

The NDU/MIIS terrorism project aims to assess the impact of recent and anticipated advances in biotechnology on R&D undertaken for the purpose of perfecting biological weapons. In general, it is exceedingly difficult to forecast developments that can be expected in the future from rapidly evolving and growing scientific fields. Because of its proven value for identifying areas of consensus or disagreement on issues presented to the involved experts, the focus group approach was selected for forecasting (Morgan, 1993). Accordingly, the principal investigators established a focus group constituted by 16 natural and social scientists who possess a wide variety of expertises. The scientific disciplines represented in the focus group include aerobiology, biotechnology, bioprocessing, human medicine, meteorology, microbiology, molecular biology, phytology, toxincology, veterinary medicine, and virology. Specialists in criminality, industrial practices, and terrorism also participated.

The focus group was asked to analyze a number of newly developed and emerging biotechnology techniques in terms of their utility in R&D that aims to produce microorganisms of enhanced military or terrorist utility. However, lessons from the history of the pre-1969 U.S. BW program and the Soviet BW program (this program supposedly was terminated in 1992, but some analysts believe it continues in some form in present-day Russia) indicate that research, development, and production to weaponize pathogens and toxins is only a small part of the total process of acquiring biological weapons. The most important parts of the acquisition process are developing "formulations," merging formulations and munitions to produce an efficient weapon system, and designing and producing a mechanism for dispersing pathogens or toxins over a target. This being so, the NDU/MIIS focus group was also asked to examine whether advanced biotechnologies may be used to enhance the ability of agents to withstand stress brought about by storage, dispersal, and physical and chemical environmental factors. This, in turn, necessitated giving thought to how agents may be used and for what purposes. The focus group was asked to limit its consideration to the next five years; i.e., up to and including 2005. The focus group was not to consider "classical" microbiology except to provide background or for the sake of comparison.

Much of what follows in Section 2 is derived from my analysis of initial focus group deliberations. However, as the NDU/MIIS project is still underway, its findings are yet to be finalized. This being the case, the descriptions, opinions, thinking, and conclusions set forth below are mine and do not necessarily represent those of either the NDU or any of the members of the focus group.

Biological weapons can be designed and used to injure and kill not only humans, but also animals and plants. Some security analysts believe that the greatest biological threat facing the U.S. is, in fact, the possible use of biological weapons by terrorists or criminals to wage economic warfare by destroying animal and/or plant populations important in agriculture (Rogers et al., 1999). However, the expertise of the present NDU/MIIS focus group is such that it is best capable of analyzing scientific/technical

advances pertinent to BW as waged against humans, so the possible uses of biological weapons by criminals and terrorists against animals, plants, and materials will be the subject of a subsequent NDU/MIIS study.

My analysis of focus group proceedings, as well as of information derived from other sources, leads me to draw certain conclusions about the types of biological attacks terrorists can mount, the most likely scenarios for biological attacks in the immediate future, less likely but still possible scenarios for biological attacks in the immediate future, the possible applications of advanced biotechnologies for terrorist or criminal purposes in the next five years, and the possibilities that advanced biotechnologies offer to terrorists and criminals in the more distant future.

A. Types of Biological Attacks by Terrorists and Criminals

In general, terrorists or criminals can carry out three types of biological attacks. First, the pathogen or toxin may be injected. This method is best used when the terrorist or criminal wishes to assassinate an individual. Since individual assassinations are not likely to stress our emergency response and health delivery systems, they are not considered further in this paper. Second, a quantity of pathogens or toxins may be used to contaminate or poison foods, beverages, or fomites (such as food supplements and medicines taken by mouth). If done skillfully, this method could cause hundreds of casualties. Third, pathogens or toxins may be suspended in a wet or dry formulation (see below) and dispersed over a target area as aerosolized particles. This type of attack could produce thousands of casualties, if three conditions were met: (1) the formulation was well designed for aerosol dispersal; (2) the aerosol particles produced by the dispersal mechanism were of optimal size and could withstand environmental stresses; and (3) meteorological conditions were just right for blanketing the target area with aerosol particles.

B. Scenario of Likely Biological Attacks

It is highly probable that biological attacks by terrorists or criminals utilizing foodborne and waterborne pathogens or toxic chemicals will occur in the next five years. Much like what has taken place in the past, these attacks are likely to cause casualties ranging in number from a few to hundreds. Examples of past attacks include the contamination of 10 salad bars by members of the Rajneeshee cult in Oregon in 1984, which caused 751 casualties (Török et al., 1997), and intentional food contamination in Texas in 1996, which harmed approximately 15 persons (Kolavic et al., 1997). Events such as these likely will take place with increasing frequency in the years ahead for two main reasons; unprotected, unmonitored salad bars and other food displays have become ubiquitous throughout the U.S. and the number of persons with at least a modicum of training in microbiology is ever increasing (although the population constituted by microbiologists probably is no more or less dishonest or unethical than other populations of professionals, a small proportion of it should be assumed to be willing to lend or sell its skills for terrorist or criminal purposes [see below]). There is nothing original about making this near certain prediction; it is done here mainly for the purpose of developing recommendations stated in the Conclusion.

C. Scenario of Low Probability Biological Attack

The probability that terrorists or criminals will carry out airborne attacks with pathogens in the next five years is low. The reasons are that it is technically difficult to formulate pathogens and toxins for airborne dispersal, to operate dispersal mechanisms successfully, and to ensure proper meteorological conditions for effective aerosol dispersal. For these reasons, this type of attack is too difficult for most terrorist and criminal groups to attempt. The example of the Japanese sect Aum Shinrikyo is illuminative in regard to both pathogens and toxic chemicals (Kaplan and Marshall, 1996; Tucker, 1996). In the biological field, despite having evil intent, a membership that included highly trained bioscientists and chemists, ample funding, and ample time to carry out appropriate R&D, the sect failed utterly to produce effective biological and toxin weapons. It appears that there are two explanations for this failure. First, the sect used an avirulent strain of *Bacillus anthracis* (the causative agent of the disease anthrax) in their weapons and, second, they used a formulation of pathogens and substrate that clogged up the nozzles of their sprayers.

The problem of formulation, especially formulations for airborne attacks, is a difficult one to overcome. Briefly, after they have been produced, pathogens and toxins must be suspended in formulations in preparation for storage or attack. Possibly the major remaining secret of both the pre-1969 U.S. and pre-1992 Soviet BW programs pertains to the formulation of BW agents. After much empirical experimentation, both programs were able to develop methodologies for suspending or dissolving optimal quantities of weaponized pathogens and toxins in special solutions containing preservatives, adjuvants, and anti-static chemicals. The final emulsion or mixture is what is commonly called formulation. A specific formulation is required for every weaponized pathogen and toxin. Without properly constituted formulation, pathogens or toxins in storage or being transported are likely to loose their virulence or toxicity after a relatively short time (days to weeks); during spraying, solutions containing pathogens or toxins might foul nozzles so that no aerosol is emitted; after being emitted through the spray nozzle, electrostatic attraction between particles made up of pathogens or toxins can cause them to clump (bacteria as colloidal particles have electric charges), after which the clumps will fall ineffectually to the ground; and/or environmental stresses, such as UV light and desiccation, will kill or inactivate the aerosolized pathogens or toxins.

D. Possible Applications of Advanced Biotechnologies for Terrorism and Criminality in the Next Five Years

After having examined the panoply of advanced biotechnologies, two of them appear to hold the most promise for applications by scientists and technicians intent on weaponizing pathogens and toxins -- DNA technologies and genetic and protein engineering.

There is a precedent. Scientists who worked for the Soviet Union's BW program are alleged to have used recombinant DNA to combine certain features of the smallpox and Ebola viruses (Alibek, 1999). The result might have been a new type of virus, one that combined the virulence of the Ebola virus with the hardiness and contagiousness via aerosol of the smallpox virus. Soviet scientists also worked at recovering the

influenza virus from the corpses of persons who died of influenza in 1918 - 1919 and were buried in permafrost ground. If they were successful, they might have been able to insert this material in influenza viruses circulating in our time, to produce a new variant useful for BW. Site-directed mutagenesis may be employed in order to change the structure of proteins constituting a bacterium's cell wall so that the modified organism is more difficult to identify or will no longer be recognized by an immune system primed to defend against the parent organism.

Protein engineering might be used by a scientist to stabilize toxin molecules so they better resist the action of, for example, chlorine, do not dissociate if placed in water, or resist heat. Further, as many toxins consist of two subunits (one subunit that ferries the toxin molecule to the cell and/or anchors the molecule to the cell membrane and a second subunit that kills the host cell), the possibility exists that protein engineering could be applied to alter a toxin's chemical structure for the purpose of increasing the efficiency of one or both subunits.

The foregoing are examples of what could be done, but I believe it is highly unlikely that any of them will be utilized in laboratories operated by, or working on the behest of, domestic terrorist groups or criminals to weaponize pathogens or operate production systems in the next five years. There are two reasons for this conclusion.

First, complex research undertaken to weaponize pathogens is risky because it is more likely to fail than achieve its objectives. The problem of pleomorphic effects is particularly daunting. Pleomorphic effects are manifested as undesirable characteristics that appear in a genetically engineered organism simultaneously to sought-after positive characteristics. Thus, even if a laboratory succeeded in genetically engineering a pathogen so it exhibited a new or enhanced characteristic desirable for weapons use, such as antibiotic resistance or added toxin production, the newly developed organism might simultaneously present a weakness to environmental stresses and/or decreased virulence. If so, a new cycle of research, development, and field-testing would have to be done to remove the pleomorphic effects while retaining the sought-after characteristics. If the researcher was unskilled and/or unlucky, he or she might have to undertake several subsequent research, development, and testing cycles before being able to field a strain of pathogen that had improved weapons capabilities over the parent strain. As a consequence of potential difficulties with pleomorphic effects, it is likely that in the next five years or more only well supported, long-term national BW programs would attempt genetic engineering projects for the purpose of weaponizing pathogens.

Second, science's understanding of many natural phenomena, such as infectivity, pathogenesis, host-parasite relationships, and others, is rudimentary. Lack of fundamental information about these phenomena prevents the undertaking of much applied research to, for example, enhance the ability of organisms to infect target hosts, cause severe damage to host systems, and be more specific as to preferred hosts. Further, some important phenomena, such as virulence factors and the ability of a pathogen to penetrate the host's skin or intestinal wall, are controlled by several or many genes; however, the present level of scientific capability allows bioscientists to transfer or modify only single genes. It therefore is impossible to modify phenomena

controlled by multiple genes, thus severely circumscribing approaches to weaponizing pathogens.

E. Possible Applications of Advanced Biotechnologies for Terrorism and Criminality in the More Distant Future

As a corollary to the preceding finding, the likelihood of advanced biotechnologies being applied successfully for terrorist or criminal purposes will increase substantially during the time 2006 – 2010. The reason is that much basic research is currently being undertaken pertaining to mechanisms of pathogenesis, including pathogenicity islands; histocompatability complexes; retroviral control and ecology; and bacterial genomics. Information generated by this research will fill many of the gaps discussed in Section A, thereby providing markedly increased opportunities for research to weaponize pathogens. Further, the Human Genome Project will be completed in or shortly after 2003; when this occurs, the human genome constituted by 80,000 – 100,000 genes will have been mapped. As the human genome is being mapped, a new field called functional genomics is growing; functional genomics aims to clarify the functions of identified genes. It is probable that some of the findings generated by functional genomics could be applied for such purposes as disrupting or destroying physiological functions by designing pathogens, toxins, and naked DNA that will target genes controlling these functions.

It has been suggested that functional genomics some day will generate data that may be used to identify genetic markers peculiar to specific human populations. If this was done, pathogens and toxins might be developed that mainly affect persons of populations possessing specified genetic markers (Larson, 1970; Hammerschlag, 1974; Lancet editorial staff and International Advisory Board, 1996; British Medical Association, 1999). This type of weapons has been called "ethnic" weapons; i.e., weapons that preferentially harm or kill designated national or ethnic populations. While stories about ethnic weapons make for exciting reading, the research required to develop an ethnic weapon would be extremely difficult, have a high probability of failing, take a long time to carry out, and be expensive. Realistically, the probability of such research being undertaken at all is low; and even if it were to be done by, for example, a well-supported national program, it would probably take more than 25 years to realize findings meaningful for biological weapons development.

To conclude this section, there are six reasons why biological and toxin weapons are likely to become ever more attractive to criminals and terrorists as we move into the 21st century. First, as the biotechnology, pharmacology, environmental, and health delivery industries grow, the number of persons possessing expertise in microbiology and the biosciences will increase greatly. It is reasonable to expect that a small proportion of this population will be willing for reasons of greed, ideology, or fear to apply techniques in these disciplines for criminal or terrorist purposes. Second, information on how to produce and disseminate pathogens and toxins is readily available in open sources. Someone with a modicum of education and training in the microbiological and biotechnological sciences can easily access this information and probably would be able to adapt it for the purpose of weaponizing agents. Third, a tiny

quantity of a pathogens or toxin delivered effectively can cause many persons to become ill and die. Fourth, tactical weapons utilizing pathogens or toxins can be designed so that they are easily hidden. Therefore, it would be unlikely that a terrorist or criminal transporting and using a biological weapon would be discovered by either police or nearby citizens. Fifth, the delivery and use of pathogens and toxins do not necessarily require sophisticated methods. In particular, it is not technically difficult to contaminate food or beverages, which could cause hundreds of casualties. Due to significant technical difficulties, it is unlikely that terrorists or criminals will be able to deliver pathogens by aerosol, so a biological attack utilizing the airborne method is unlikely to occur in the next five years. Sixth, there are no defensive technologies available that are, or could be, deployed at civilian facilities to detect and identify deliberately disseminated pathogens or toxins in real or near real time. The fact that a biological attack has occurred would therefore not become known until some time later, when the pathogen's incubation period has passed and many individuals become ill nearly at once.

4. Comments on the Report Combating Terrorism: Need for Comprehensive Threat and Risk Assessment of Chemical and Biological Attacks

In view of limited time and space, I will concentrate on what I believe to be the report's main problem, namely, the performance a "sound" risk assessment. Specifically, although much is made of the need to perform a risk assessment of domestic terrorists deploying biological and chemical weapons, there is nothing said about how such a risk assessment should be performed.

To begin, the Report states:

> "To perform a sound risk assessment, a multidisciplinary team of experts would use valid, current, documented threat information, including NIEs [National Intelligence Estimates], to develop valid threat scenarios, rank the likelihood of a successful attack, and assure that program countermeasures are not based solely on worst-case scenarios." (p. 3)

At first glance, this reads fairly well. However, when examined, the statement raises several questions in the reader's mind. The authors do not define key words, such as "valid" and "sound." The do not explain NIEs and how they are derived. Without this information, the statement becomes at best unclear and at worst meaningless.

More information on risk assessment appears to be provided in a paragraph that begins on the bottom of page 5. Unfortunately, its contents are hopelessly muddled, jumping from risk assessment to threat assessment, then to risk management, and back to risk assessment. Regard the following sentence: "A threat analysis – the first step in determining risk – identifies and evaluates each threat on the basis of various factors such as its capability and intent to attack an asset and the likelihood and the severity of the consequences of a successful attack." Can a "threat" have capability and intent? Can it attack? Do the authors equate "threat" with a terrorist group? Or a biological or

chemical weapon? What in civilian-speak is an "asset"? Are populations, individuals, police, and/or cows assets?

A bit more information of risk assessment is provided on page 19. After assuring the reader for the third time that "Risk assessments are widely recognized as valid decision-making support tools to establish and prioritize program requirements" (there is that word "valid" again; would anyone use "invalid" tools for decision-making?), the authors suggest the use of a multidisciplinary team of experts to: "(1) generate valid attack scenarios; (2) assess and rank the risks (likelihood and severity of consequences) of attack scenarios; and (3) decide on actions and programs focused on reducing or otherwise dealing with risks as assessed." Continuing, the authors state "Risk assessment should include sound inputs and information, such as the best available intelligence and law enforcement information and analysis, including NIEs and Intelligence Community Assessments. Soundly established requirements could help ensure that specific programs and initiatives and related expenditures are justified and targeted, given the threat and risk of validated terrorist attack scenarios." (p. 20)

As can be realized, the authors of the GAO report argue for the performing of a "sound" risk assessment (versus an "unsound" risk assessment?) of possible future terrorist events that would generate more than 1,000 casualties using "valid" information from various trustworthy sources they name. However, nowhere in the report do they offer suggestions or advice on how such a risk assessment ought to be done. The authors write of interviewing what reads like a large number of experts in every sector of our society. It would seem that some of these experts could have provided concrete guidance on how to conduct the type of risk assessment recommended in the report, but that is not done.

Could it be that a "sound" risk assessment as recommended in the report would be extremely difficult or impossible to perform? I now take the opportunity to explore difficulties inherent to performing risk assessments.

During 1996 – 1998, I was involved in a multidisciplinary project that aimed to determine risks that would attend the introduction of genetically engineered macroorganisms (such as fish and shellfish) and microorganisms (mainly bacteria) into the open marine environment. The results of that project were published in September 1998 (Zilinskas and Balint, 1998). My main task was to consider genetically engineered marine microorganisms and the possible risks they would pose to human health and environment were they to be released into the oceans (Zilinskas, 1998b). As a result of this work, I learned something about performing scientific risk assessment.

In science, the formula for estimating risk is as follows:

RISK = HAZARD x EXPOSURE

(Risk is the magnitude and likelihood of adverse effect.
Hazard is the harm the agent will cause.
Exposure relates to what population will be exposed to the agent,
at what concentration, and for how long.)

Some risk assessments are relatively straightforward. For example, the estimating of risk associated with adding lead to gasoline would not be difficult for a trained, experienced risk assessor. Hazard can determined because the harm done by various concentrations of lead on humans is known and the amount of lead emitted in exhaust gases of automobiles can be measured. Similarly, exposure can be determined by counting the number of automobiles traversing a locale of interest during a measured time, the half-time of lead in the environment is known, historic meteorological data may be consulted to determine dispersal patterns of gases over the local of interest, and demographic data may be mined for information on the population of the local of interest.

Estimating possible risks attendant to the introduction of a genetically engineered microorganism into the open terrestrial environment was at one time very difficult to do. When the first such introduction was proposed, the U.S. Department of Agriculture (USDA) and the U.S. Environmental Protection Agency (EPA) had great difficulty developing a protocol for appropriate risk assessment that should be done before a decision could be made whether the proposed introduction would be forbidden or allowed to proceed. Eventually, the EPA was given the authority to regulate proposed introduction of genetically engineered microorganisms into the environment, while the USDA has authority over proposed introductions of genetically engineered plants. Both agencies developed risk assessment protocols for proposed introductions that have been followed by researchers and industrialists for over 10 years. As this is written, over 3,000 genetically introductions of genetically engineered plants and microorganisms have taken place in the U.S., with no apparent harm (hundreds of introductions have also taken place in many other countries of the world). Thus, it would appear as if the risk assessment protocols developed and used by the EPA and USDA has done what they were supposed to do, namely, they protect human health and the environment while allowing possibly risky but economically beneficial activities to proceed under specified conditions.

In 1990, the EPA developed "21 Points to Consider" (United States Environmental Protection Agency, 1990), which lays the basis for risk assessment. It is unnecessary here to provide a detailed listing of these points; it is sufficient to say that a developer of a genetically engineered microorganism must provide information that satisfy five criteria – familiarity with the organism donating genetic material, familiarity with the organism receiving genetic material, familiarity with the environment of the site onto which the proposed introduction will take place, ability to contain the introduced organism to the designated site and, should containment fail, knowledge of the damage that the escaped organism would cause to human health and/or the environment. If information can be provided that satisfies these familiarity and containment criteria, the EPA is able to perform an adequate and appropriate risk assessment of the proposed action.

When I attempted to determine the risks that might attend or result from the introduction of genetically engineered marine microorganisms into the open marine environment, I found that EPA's 21 Points to Consider could not be satisfied. The main reasons had to do with lack of familiarity with the marine environment; the inability to contain microorganisms to the site of application because of currents, eddies, and other

natural forces; and the lack of knowledge about possible damaging actions by escaped microorganisms. In other words, although the EPA's 21 Points to Consider appear to provide a satisfactory basis for risk assessment in the marine environment, the lack of fundamental scientific information about marine organisms and the marine environment precludes the performing of an adequate risk assessment of a proposed action involving an application of genetically engineered microorganisms in oceans.

The point of the foregoing is that it is not possible to perform a meaningful or adequate risk assessment in all cases because the information to do so is not available. If solid information is lacking, the tendency might be to substitute assumptions for information. The more assumptions that are made while performing a risk assessment, the less rigorous will be the analysis.

For illustrative purposes, it is worthwhile considering how one might go about trying to assess whether a domestic terrorist group is likely to use biological weapons capable of causing more than 1,000 casualties. The first question that would be answered is, which terrorist groups in the U.S. possess the necessary expertise to acquire and deploy biological weapons that depend on aerosol dispersion of pathogens for effect? I do not know how many terrorist groups exist in the U.S., but it may be a sizeable number. Perhaps the FBI and/or local police have information on each of these groups' membership, including whether microbiologists, biotechnologists, or other technical people belong to them. However, since relevant expertise is the key ingredient to any endeavor in applied microbiology, be it peaceful or ill willed, without this basic information, one cannot perform a risk assessment of terrorist capabilities in applied microbiology.

To get around this stumbling block, let us assume that a certain proportion, say a conservative 0.1%, of any population of workers will consist of bad persons; i.e., individuals who would be willing to use their skills for nefarious purposes. The population of scientists and technicians trained in microbiology probably numbers approximately 100,000; based on the foregoing assumption about 100 of them would be willing to apply microbiology for terrorist or criminal purposes. We do not know how many of these individuals belong to terrorist or criminal groups and how many of them would prefer to be lone operators. Let us make another assumption; fifty belong to groups that might wish to mount biological attacks and 50 are potential microbiology equivalents to the Unabomber.

Assuming even distribution of ill-willed microbiologists, then 50 groups in the U.S. each has one microbiologist and thereby possesses the requisite capability to acquire biological weapons. This brings up the next difficult problem to the risk assessor; which of these groups have leaders that intend to deploy biological weapons? This problem may be illustrated by referring to the microbiology technician Larry Wayne Harris. During an interview conducted in September 1999 by a German reporter, Harris was asked whether he would use biological weapons. He replied "If God tells me to do it, I will." No risk assessor would be in a position to determine if and when God gives Harris, or others of his ilk, the requisite command.

The intentions of others have proven equally difficult to ascertain. For instance, no outsider, as far as is known, was able to divine the intent of the Aum Shinrikyo to use biological and chemical weapons before it actually deployed a chemical weapon in 1993

in Tokyo. No one outside Iraq knows why Saddam Hussein, who possessed sizeable BW and CW programs, decided not to arm saboteurs or terrorists with biological and chemical weapons before and during Desert Shield and Desert Storm. Might he decide to do so in the future? Might Fidel Castro attempt to strike back at the U.S. with biological weapons in retribution for the many biological attacks he perceives Cuba has experienced? A risk assessor cannot know the answer to questions such as these.

Whatever the weapons system, the question whether or not it will be used depends on the intent of the leader or leadership controlling it. No risk assessor will be in a position to know the intent of the leadership of microbiologically capable domestic terrorist groups. Therefore, more assumptions have to be made when assessing the risk these groups pose to our society. The easiest would be to say that if a group has the capability, it should be assumed that it will acquire biological weapons. It follows that if a group possesses biological weapons, it should be assumed that it will use them.

It can be seen from the discussion presented above that fundamental information about capabilities and intent of domestic terrorist groups is lacking and probably cannot be obtained. This being the case, the analyst would have to make a series of assumptions if he or she wished to perform a threat or risk assessment of any one group. The product of such a threat or risk assessment would, to my mind, be worthless. If our government cannot use results from risk assessment to guide decision-making, what might it do to meet the so far theoretical threat of bioterrorism?

4. Conclusion

The major biological threat facing U.S. society are infectious diseases of natural origin, in particular, emerging infectious diseases, reemerging infectious diseases, and transported infectious diseases (Lederberg et al., 1992). An example of the first was AIDS in the early 1980s and the Hantavirus outbreak in Four Corners in 1993. These types of diseases typically seem to appear out of nowhere and may cause tremendous damage and untold suffering among a susceptible population. Examples of the second type include the reemergence of cholera in South America after an absence in that continent since the early 1900s. There could be many reasons why diseases that have not been seen for a long time reemerge. In the case of cholera, a combination of factors probably was responsible, including an unusual El Niño condition and a breakdown in sanitary systems (Colwell, 1996). An outbreak of Marburg hemorrhagic virus disease outbreak in Germany earlier this year and the just concluded outbreak of West Nile fever in the New York area are examples of the third type. In these cases, the causative infectious agents are transported from an area where they are endemic to a new site where they have never been detected previously. As with emerging infectious diseases, transported infectious diseases are likely to come into contact with a population that is immunologically naïve, and therefore eminently susceptible.

In comparison to the real and enormous threat of emerging, reemerging, and transported infectious diseases, the problem of deliberately caused disease is almost insignificant. From a public policy perspective, it would make sense to pay much more attention to the larger problem while not neglecting the smaller one. However, that is not the situation at present in the U.S.; the overwhelming attention of executive agencies, the legislative branch, and the concerned public is affixed on the theoretical

problem of bioterrorism and not on natural infectious diseases. Fortunately, this is not necessarily a bad development.

When a disease outbreak is first detected, no one is in a position to know if it has a natural or laboratory etiology. Thus, the initial public health and medical response to a disease outbreak will be the same whatever its etiology. Public health practitioners get busy trying to determine the etiology of the disease of concern by applying classical and molecular epidemiological techniques, while health providers treat those who have taken ill and try to prevent secondary spread of disease.

Our society's response to a natural versus deliberately caused disease outbreak would differ only after there are clear signs that the disease of concern might be the result of a terrorist or criminal attack. An explosive outbreak of a disease striking hundreds or thousands of persons and whose etiological agent normally is spread by aerosol would be one such sign. Another, more subtle sign, would be a cluster of cases where the causative agent is a foodborne or waterborne pathogen and a specific food or beverage source seems to be its likely source. Once the suspicion arises among public health and/or health delivery personnel that the disease of concern was deliberately caused, then law enforcement officials will also become involved, gathering evidence that might lead to the arrest and prosecution of the perpetrators.

Since the initial response by the public health and health delivery systems would be the same to an outbreak of disease whatever its origin, it follows that if the ability of these systems to respond effectively and appropriately to any medical disaster were enhanced, our society's ability to cope with both natural disease outbreaks and the aftermath of terrorist attacks would increase. If the following three steps were taken, I believe a significant increase in the ability of public health and health delivery systems to respond to disease outbreaks would result.

First, there seems to be a general agreement among emergency responders that no municipality in the U.S. is prepared to deal with the aftermath of a massive outbreak of disease; i.e., one that generates thousands of casualties within a few days. I suggest that assessments be made by each major city and state to determine what it would take for the city or state in question to prepare for dealing with the aftermath of such a health disaster. The assessment might be conducted in phases. Thus the first phase, or the generic phase, might determine what is needed to process, treat, and house a thousand casualties whatever the cause of their illness. A second phase might do the same, but would consider 10,000 casualties. A third phase might consider the special conditions that would have to be taken into account if a contagious disease agent caused the 1,000 or 10,000 cases of illness. After that, the special situations brought about by individual diseases might be clarified.

Second, each municipality should perform a study that includes assessing its ability to respond to disease outbreaks of lesser magnitude than what is discussed in the preceding paragraph and clarify possibilities for receiving assistance should its response ability be surpassed. The purpose of each assessment would be to determine the maximum numbers of casualties that the municipality in question could handle without outside assistance, make known the assistance that it could count on to receive from the state should the maximum be exceeded and, should a massive disaster strike, set up procedures for requesting federal assistance, including necessary military forces.

The federal government might consider providing funding and expert assistance to those municipalities who need them in order to conduct these studies.

Third, the reporting system in the U.S. for infectious diseases needs to be significantly improved. During the last three years, significant improvements have been made to this system as a result of the current bioterrorism threat. However, this is still not a high priority item; out of the approximately $ 10 billion being spent annually on countering the threat of terrorism, less than $ 200 million is earmarked for public health surveillance and reporting. The reporting system should be sufficiently build up so that it would generate information that could be quickly analyzed for indications of emerging, reemerging, transported, and deliberately caused infectious diseases. To do this, more intensive training on how to detect and report unusual disease outbreaks must be given to local public health personnel and emergency medical personnel. Further, a certain proportion of law enforcement people should be given training in public health to the extent that they could spot indications of deliberately caused diseases and know what evidence they need to collect to verify the cause of these diseased and to track down and apprehend perpetrators. The possibility of establishing a detection system for automatically and continually surveying the entire Internet for information indicative of suspicious and unusual disease outbreaks should be considered. The Canadian government has set up an Internet-based surveillance system to track influenza on a worldwide basis; this experience should prove useful when setting up the surveillance system proposed here.

To conclude, it is not likely that rigorous risk assessments can be done of threats posed by terrorists or criminals armed with biological and chemical weapons. This being the case, risk management of the terrorist threat has to be undertaken on an empirical basis. Some steps to this end are suggested in this paper, such as improving the ability of federal, state, and local police to analyze information indicative of illicit biological activity, improving the ability of public health and health delivery personnel to deal with the aftermath of disease outbreaks, and improving the national system for detecting, surveying, and monitoring disease outbreaks. What is not so obvious and what I try to make clear in this paper is that there is need for placing the threat of bioterrorism in perspective – the greater biological threat facing the U.S. is not terrorists armed with biological weapons, it is, as it always has been, diseases of natural origin. If we can successfully meet and defeat the real threat of emerging, reemerging, and transported infectious diseases, then we have also gone a long way towards being able to handle whatever manifestation of bioterrorism that will occur.

Reference List

Alibek, K. (1999), *Biohazard*, New York: Random House.

Bradford, J.K., Hatcher, C., Zilinskas, R.A., Wiener, S., Van Zandt, C.R., Bahnsen, P.F. and Medigovich, W.M. (1993), *Biological Hazards and Emergency Management (Working Paper #82)*, Boulder, CO: Natural Hazards Research and Applications Information Center, Institute of Behavioral Science, University of Colorado.

Bradford, J.K., Hatcher, C., Zilinskas, R.A., Wiener, S., Van Zandt, C.R., Bahnsen, P.F., and Medigovich, W.M. (1994), Biological hazards and emergency management. *Journal of Contingencies and Crisis Management* 2(1), 39-47.

British Medical Association (1999), *Biotechnology, Weapons and Humanity*, New York: Harwood Academic Publishers.

Colwell, R.R. (1996), Global climate and infectious disease: The cholera paradigm. *Science* **274**, 2025-2031.

Colwell, R.R. and Zilinskas, R.A. (1999), Bioethics and the prevention of biological warfare. In: Zilinskas, R.A., (ed.) *Biological Warfare: Modern Offense and Defense*, pp. 225-245. Boulder, CO: Lynne Rienner Publishers.

Geissler, E. (ed.) (1986), *Biological and Toxin Weapons Today*, New York: Oxford University Press.

Geissler, E. and Zilinskas, R.A. (1990), Technology trends in selected areas -- biotechnology. In: United Nations General Assembly (ed.) *Scientific and Technological Developments and Their Impact on International Security. Report of the Secretary-General.* UN Document A/45/568.

Hammerschlag, R. (1974), Ethnic weapons. In: *Chemical Weapons and U.S. Public Policy: A Report of the Committee on Chemistry and Public Affairs*, pp. 19-24. Washington D.C.: American Chemical Society.

Kaplan, D.E. and A. Marshall, A. (1996), *The Cult at the End of the World*, New York: Crown Publishers, Inc.

Kolavic, S.A., Kimura, A., Simons, S.L., Slutsker, L., Barth, S. and Haley, C.E. (1997), An outbreak of *Shigella dysenteriae* Type 2 among laboratory workers due to intentional food contamination. *Journal of the American Medical Association* **278**, 396-398.

Lancet editorial staff and International Advisory Board (1996) Gene warfare -- unless we keep our guard up. *Lancet* **348.** Electronic citation: www.thelancet.com.

Larson, C.A. (1970), Ethnic weapons. *Military Review* **50**, 3-11.

Lederberg, J., Shope, R.E. and Oaks, S.C., Jr. (eds.) (1992), *Emerging Infections: Microbial Threats to Health in the United States*, Washington D.C.: National Academy Press.

Lundin, S.J. (ed.) (1991), *Views on Possible Verification Measures for the Biological Weapons Convention*, Oxford: Oxford University Press for Stockholm International Peace Research Institute.

Morgan, D.L. (ed.) (1993), *Successful Focus Groups: Advancing the State of the Art*, Newbury Park: Sage Publications.

Rogers, P., Whitby, S. and Dando, M. (1999), Biological warfare against crops. *Scientific American* **280**, 70-75.

Török, T.J., Tauxe, R.V., Wise, R.P., Livengood, J.R., Sokolow, R., Mauvais, S., Birkness, K.A., Skeels, M.R., Horan, J.M. and Foster, L.R. (1997), A large community outbreak of Salmonellosis caused by intentional contamination of restaurant salad bars. *Journal of the American Medical Association* **278**, 389-395.

Tucker, J.B. (1996), Chemical/biological terrorism: coping with a new threat. *Politics and the Life Sciences* **15**, 167-184.

United States Environmental Protection Agency (1990), *Points to Consider in the Preparation and Submission of TSCA Premanufacture Notices for Microorganisms*, Washington D.C.: U.S. Environment Protection Agency.

Zilinskas, R.A. (1978), Recombinant DNA and the International System. *Southern California Law Review* **51**, 1483-1504.

Zilinskas, R.A. (1981), *Managing the International Consequences of Recombinant DNA Research* (Doctoral Dissertation), Los Angeles, CA: University of Southern California.

Zilinskas, R.A. (1983), Anthrax in Sverdlovsk? *Bulletin of the Atomic Scientists* **39**, 24-27.

Zilinskas, R.A. (1986a), Recombinant DNA research and biological warfare. In: Zilinskas, R.A. and Zimmerman, B.K. (eds.) *The Gene-Splicing Wars: Reflections on the Recombinant DNA Controversy*, pp. 167-203. New York: Macmillan Publishers.

Zilinskas, R.A. (1986b), Verification of the Biological Weapons Convention. In: Geissler, E. (ed.) *Biological and Toxin Weapons Today*, pp. 82-107. New York: Oxford University Press.

Zilinskas, R.A. (1990a), Terrorism and biological weapons: Inevitable alliance? *Perspectives in Biology and Medicine* **34(1)**, 44-72.

Zilinskas, R.A. (1990b), Biological warfare and the Third World. *Politics and the Life Sciences* **9(1)**, 59-76.

Zilinskas, R.A. (ed.) (1992a), *The Microbiologist and Biological Defense Research: Ethics, Politics and International Security. Annals of the New York Academy of Sciences* Vol. 666:1-249.

Zilinskas, R.A. (1992b), Confronting biological threats to international security: A biological hazards early warning program. In: Zilinskas, R.A. (ed.) *The Microbiologist and Biological Defense Research: Ethics, Politics and International Security*, *Annals of the New York Academy of Sciences*, Vol. 666, pp. 146-176.

Zilinskas, R.A. (1995a), UNSCOM and the UNSCOM Experience in Iraq. *Politics and the Life Sciences* **14**, 230-235.

Zilinskas, R.A. (1995b), Detecting and deterring biological weapons in Iraq: The role of aerial surveillance. *Politics and the Life Sciences* **14**, 255-258.

Zilinskas, R.A. (1995c), The future BWC transparency regime: A costing analysis. Unpublished ACDA report.

Zilinskas, R.A. (1995d), Assessing the utility of lists for the BWC protocol. Unpublished ACDA report.

Zilinskas, R.A. (1995e), Issues pertaining to challenge inspections. Unpublished ACDA report.

Zilinskas, R.A. (1996a), Detecting and deterring biological weapons: Lessons from United Nations Special Commission (UNSCOM) operations in Iraq. In: Brown, J. (ed.) *Arms Control in a Multi-Polar World*, pp. 193-210. Amsterdam: VU University Press.

Zilinskas, R.A. (1996b), Aum Shinrikyo's chemical/biological terrorism as a paradigm? *Politics and the Life Sciences* **15**, 237-239.

Zilinskas, R.A. (1997), Iraq's biological weapons: The past as future? *Journal of the American Medical Association* **278**, 418-424.

Zilinskas, R.A. (1998a), Verifying compliance to the Biological and Toxin Weapons Convention. *Critical Reviews in Microbiology* **24**, 195-218.

Zilinskas, R.A. (1998b), Analysis of the ecological risks associated with genetically engineered marine microorganisms. In: Zilinskas, R.A. and Balint, P.J. (eds.)

Genetically Engineered Marine Organisms: Assessing the Environmental and Economic Risks and Benefits, pp. 95-138. New York: Kluwer Academic Publishers.

Zilinskas, R.A. (1999a), Cuban allegations of biological warfare by the United States: Assessing the evidence. *Critical Reviews in Microbiology* **25**, 173-227.

Zilinskas, R.A. (ed.) (1999b), *Biological Warfare: Modern Offense and Defense*, Boulder, CO: Lynne Rienner Publishers.

Zilinskas, R.A. and P.J. Balint (eds.) (1998), *Genetically Engineered Marine Organisms: Assessing the Environmental and Economic Risks and Benefits*, New York: Kluwer Academic Publishers.

Zilinskas, R.A. and C.G. Hedén, C.G. (1991), The Biological Weapons Convention: A vehicle for international co-operation. In: Lundin, S.J. (ed.) *Views on Possible Verification Measures for the Biological Weapons Convention*, pp. 71-97. New York: Oxford University Press.

Zilinskas, R.A. and Burke K. Zimmerman (eds.) (1986), *The Gene Splicing Wars: Reflections on the Recombinant DNA Controversy*, New York: Macmillan Publishers.

Mr. SHAYS. I am going to call on my colleague, but I am struck by the fact that your statement was that it is hard to make common sense out of terrorists. So it is interesting how we would use a common sense approach.

Mr. ZILINSKAS. The common sense approach is to say that the greater threat is natural infectious diseases. What can we do about them? Meeting this threat has to do with surveillance, monitoring, and, improving emergency response to outbreaks.

You have to remember when there is a disease outbreak you don't know at its beginning whether it is a natural outbreak or it is a deliberately caused outbreak. Therefore, the response of public health responders and medical people will be the same regardless of what it is. It is only after 2, 3, or 5 days that you can determine this. This could have been a terrorist or biological attack. At that time, the police enters into it, and there is a whole—then you try to get evidence.

Mr. SHAYS. It is interesting because we had an example of encephalitis in my District and in New York City, and the New Yorker or New York magazine had some unnamed source who talked about the possibly that this might be a terrorist attack, and then we got a lot of calls. And it was interesting how just even the inference got people very excited.

Mr. ZILINSKAS. I got a lot of calls from reporters on that incident, and it happens each time there is an unusual disease outbreak. For example, the hantavirus outbreak in 1993 was like that. I was getting calls from Albuquerque, Denver, asking, could that have been a biological attack? I said, no.

Mr. SHAYS. We are going to try to finish before we leave—we have like 10 minutes.

Mr. BLAGOJEVICH. Thank you.

Dr. Zilinskas, if I can just followup, you are suggesting that the enhancement of the ability of public health and health delivery systems to respond to these disease outbreaks is essential. Can you give us some more suggestions on how you would enhance the public health sector so they can respond properly?

Mr. ZILINSKAS. What happens when you have a disease outbreak of any type, you suddenly have a lot of people who become sick. First of all, you have to treat these people in an adequate way. The problem of treating a large number of people might overwhelm local systems. Therefore, we have to do an assessment of what local systems can do. And then, if they are in a situation where they can't handle a large outbreak, what kind of assistance can be immediately available at the State level and eventually, the Federal level, and that includes military forces.

I would imagine that a large disease outbreak there would create a lot of logistical problems, and maybe, problems having to do with deciding who has authority and so on. All of that has to be solved. That is the treatment part.

The second part is the investigation to find out what the etiology of the disease was, and that involves using trained people in epidemiology, both molecular and classic epidemiology, and having them immediately available for this kind of work.

So I think that is important, to increase our capabilities at the local and at the State levels especially to immediately investigate disease outbreaks.

Mr. BLAGOJEVICH. Thank you, Dr. Zilinskas.

Mr. Jenkins, you also suggest that, rather than focusing on probability predictions and infinite vulnerabilities, we instead work toward creating capabilities that will help us with or without chemical or biological attack. You mention enhancing intelligence and improving food safety. What do you think should be done to help prepare the public infrastructure with regard to that?

Mr. JENKINS. I think some of the comments just made would address that particular issue. My point is to find areas where we can devote resources, since we are spending this money, that we will get permanent benefit out of it.

If we go back in our own history in this country, we have had experience with large-scale outbreaks of infectious diseases. We at one time had a very powerful U.S. Public Health Service with extraordinary authority granted to it to deal with outbreaks of typhoid, yellow fever, Spanish flu and things of this sort.

As we have become a somewhat safer society, we have lost some of that capability. Now that we are faced again with the reappearance of some of these diseases as a result of increased global travel, global food supplies, some of these issues have reemerged, and we have to go back and develop some of these capabilities.

Mr. BLAGOJEVICH. Thank you.

Mr. SHAYS. Mr. Parachini, I was struck by the fact that you wanted to look at the events that have already taken place and try to analyze the behavior, and I was just struck by the fact that I didn't feel that they were as relevant because I don't think they are a precursor of what is going to happen in the future.

Now, I guess I would have no likely basis for making that, but it seems some of it was domestically focused. In other words, in many instances they were domestic terrorism. I am struck with the information that I have seen that our biggest concern is not domestic.

Mr. PARACHINI. Most of the cases now that the FBI is looking into, about 85 percent are domestic threats. The variety of threats we face now, we previously had always thought of foreign threats. We did not think that this would happen here in the United States, but Oklahoma City should be the clear signal that there are threats here that are domestic.

If indeed it is right that there are all of these capabilities here in this country to procure materials, many of them commercially available, there are plenty—this is a large country with a lot of people with different agendas. It seems to me no accident that the FBI is mainly following domestic cases and not foreign cases.

Mr. SHAYS. Right. But when we were overseas—I was struck by the fact that in one country they were trying to explain to us that the United States can bully every nation—and I don't mean that in a pejorative sense. We have incredible military powers, so we force our adversaries to look at other ways to deal with the United States.

Mr. PARACHINI. So they may be looking at asymmetrical attacks, and I want to draw a distinction on asymmetrical attacks on our

forces abroad and asymmetrical attacks here within the United States. I think it is harder—the closer you get into the United States, it is harder to do. And we have within our own borders many people who have strong grievances against the Federal Government or against other people who are willing to do that.

Mr. SHAYS. I guess what I am going to say is that I think your analysis is more valuable as it relates to how we would respond to a domestic attack. It would probably be a little easier for us to take that information and then translate it into something useful. But I think we are facing a whole new potential level of activity that we can't draw on the past.

Let me ask the other two to respond to that in any way that you want.

Mr. JENKINS. Could I add a comment to that? I think there is some relevance in the historical analysis that has been done here.

First of all, there are incidents drawn from various parts of the world. There is Aum Shrinrikyo. There are other things that have happened outside of the United States.

During the same period of time, if we take those incidents that have happened since 1970, discarding the first one on the top of that list, there were 11 incidents; 11 incidents out of what are more than 10,000 international terrorists incidents. If we indeed add domestic terrorists incidents around the world, we are talking about a universe of tens of thousands.

The fact that there have been very few. It doesn't give us an actuarial chart, it doesn't give us the scientific confidence that we would want to have, but, nonetheless, it does permit an inference that this is a pretty rare event.

Mr. SHAYS. Let me respond to that, because you really triggered something. I was here in 1968 as an intern for what I think was the first hijacking of an airliner to Cuba. The first became—we lost track of the number. So I am struck by the fact that if we use that kind of analysis, we never would have thought that there would be a hijacking of a plane and then wouldn't have been able to deal with the plethora of attacks that followed.

Mr. JENKINS. I agree with the fact that history does not suggest that things cannot occur. There are always going to be unprecedented events.

However, a number of groups have looked at this, a number of groups have certainly contemplated this, and some attempts have been made. What is striking is the lack of imitation, to go back to your own analogy. The first politically motivated hijacking took place in 1968. Within the following 4 years, we were dealing with hundreds of hijackings that forced us to take extraordinary security measures. In the 4 years since Tokyo, we haven't seen anything.

Mr. SHAYS. You have made that point.

Let me tell you the challenge. We have a series of votes. We have your statements in the record, and they are all valuable and helpful. We are just scratching the surface.

I am going to adjourn the hearing because we will be tied up for a bit, and I do not want to hold you. Thank you very much.

[Whereupon, at 12:20 p.m., the subcommittee was adjourned.]

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