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Recommendations for a Notional National Emergency Response Architecture

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Recommendations for a Notional National Emergency Response Architecture

A Report from the Visiting Scientist Program

Conducted by the Defense Threat Reduction Agency

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Abstract Follows

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ABSTRACT

This document details the results of a collaborative effort by the Defense Threat Reduction Agency Advanced Systems and Concepts Office (DTRA-ASCO) and the Sandia National Laboratories Advanced Concept Group (SNL-ACG) to support development of requirements for a National Emergency Response Architecture (NERA). A DTRA Visiting Scientist Program (VSP) was established to elicit concepts to be used as the basis for a NERA. The interdisciplinary study team met three times in 2001, using a bioterrorism scenario to facilitate the concept-development process. The resulting concepts and social context developed for a NERA, are documented in this volume and will serve as a foundation for future NERA work.

Acknowledgments

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The NERA study was managed for ASCO by Dr. Peter Merkle, who authored the study plan and wrote the scenario used as a focus for the meeting deliberations. Mr. Terry Sandin and Mr. Michael Hinds, of Northrop Grumman Information Technology provided administrative and logistic support for the meetings. Michael Hinds created the final draft of the report from the NERA group draft. Mr. Fred Leiner, also with Northrop Grumman Information Technology, served as a subject matter expert on C4ISR systems. Ms. Deborah Serna, of SNL, developed and maintained the web site that was used for communication among the group.

Funding provided by DTRA is gratefully acknowledged. DTRA-ASCO supplied funds for the VSP participants and provided most of the resources to develop the program, assemble the team, perform the study, and document the results. Colonel Timothy Lampe, USAF, was the DTRA sponsor, and Dr. Peter Merkle functioned as the Program Manager. Additional funding was supplied by SNL-ACG.

Table of Contents

Executive Summary	5
Introduction	7
Study Categories and Concepts.....	9
<i>The Social Context for a NERA in Response to a Biological Terrorist Attack</i>	9
<i>Categories and Concepts</i>	10
Category I: Public Education and Communication	11
<i>Improve Public Response through Education.....</i>	12
<i>Orient Education to Encourage Individuals to Take Action for the Betterment of Society....</i>	13
Category II: Planning and Resources.....	14
<i>Classify Event-Defining Characteristics and Ability to Detect Anomalies.....</i>	14
<i>Couple Responses of Many Agencies and Levels of Government</i>	15
<i>Plan for Treating Affected and Concerned Populations</i>	16
<i>Provide Special Attention to Isolated Populations</i>	17
<i>Address Response on Multiple Fronts Given International Spread.....</i>	17
<i>Institute Red-Team Plans Using Models, Panels, and Ad Hoc Teams</i>	18
Category III: Operational Communications.....	18
<i>Define and Implement Common Operating Picture and Language.....</i>	19
<i>Assemble Disparate Information.....</i>	21
<i>Implement National Real-Time, Secure Reporting of Critical Data</i>	23
<i>Implement National Real-Time Pattern Recognition and Anomaly Detection</i>	25
Category IV: Public Information and Communication	27
<i>Define and Implement a National Authority</i>	27
Category V: Operational Decision-Making	29
<i>Institute a Protective Action Decision Support System.....</i>	29
Category VI: Critical Infrastructure Management.....	31
<i>Arrange for Delivery of Critical Goods and Services</i>	31
<i>Supplement and Protect Communication Systems</i>	31
Category VII: Recovery and Rehabilitation.....	32
<i>Conduct Post-Event Review and Lessons Learned</i>	32
<i>Manage Mental Health Needs</i>	32

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Conclusions	34
Bibliography	37
Appendix A: Scenario	43
Appendix B: Program Participants	49

Acronyms and Abbreviations

ACG	Advanced Concepts Group
ASCO	Advanced Systems and Concepts Office
C4ISR	command, control, communications, computing, and intelligence, surveillance and reconnaissance
COP	common operating picture
CTSP	collaborative time stepping portal
DTRA	Defense Threat Reduction Agency
EHF	Ebola hemorrhagic fever
ER	emergency room
FEMA	Federal Emergency Management Agency
NAF	National Authority Figure
NERA	National Emergency Response Architecture
PADSS	protective action decision support system
POTUS	President of the United States
SNL	Sandia National Laboratories
VSP	Visiting Scientist Program
WHMO	Western Hospitality Management Organization
WMD	weapons of mass destruction

Executive Summary

Initial concepts for a notional National Emergency Response Architecture (NERA) were researched through a cooperative effort between the Defense Threat Reduction Agency Advanced Systems Concepts Office (DTRA-ASCO) and the Sandia National Laboratories Advanced Concepts Group (SNL-ACG) using the DTRA Visiting Scientist Program (VSP). DTRA gathered together a wide-range of experts from outside the federal government to search for potential solutions to difficult problems associated with emergency response. The NERA VSP study team was comprised of experts in consequence management, emergency response, societal behavior, medicine, and communication. The study team developed concepts which provided a framework for an architecture (NERA) to improve the mitigation of the effects resulting from a weapon of mass destruction (WMD) event.

The VSP study team was provided a stressing scenario describing the intentional release of a highly contagious, lethal, nontreatable biological agent. The scenario provided the nucleus for group discussion and deliberation. The results of the study team's deliberations are described in this report as a series of concepts and implementation measures grouped into seven categories then mapped onto Command, Control, Communication, Computing, Intelligence, Surveillance, and Reconnaissance (C4ISR) functions to create the beginnings of an architecture for a NERA.

The seven categories and corresponding concepts developed by the VSP study team are as follows:

- Public Education and Communication
 - Improve Public Response through Education
 - Orient Education to Encourage Individuals to Take Action for the Betterment of Society
- Planning and Resources
 - Classify Event-Defining Characteristics and Ability to Detect Anomalies
 - Couple Responses of Multiple Agencies and Levels of Government
 - Plan for Treating Affected and Concerned Populations
 - Provide Special Attention to Isolated Populations
 - Address Response on Multiple Fronts Given International Spread
 - Institute Red-Team Plans using Modules, Panels, and Ad-Hoc Teams
- Operational Communications
 - Define and Implement Common Operating Picture and Language

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- Assemble Disparate Information
- Implement National Real-Time Secure Reporting of Critical Data
- Implement National Real-Time Pattern Recognition and Anomaly Detection
- Public Information and Communication
 - Define and Implement a National Authority
- Operational Decision-Making
 - Institute a Protective Action Decision Support System
- Critical Infrastructure Management
 - Arrange for Delivery of Critical Goods and Services
 - Supplement and Protect Communication Systems
- Recovery and Rehabilitation
 - Post Event Review and Lessons Learned
 - Manage Mental Health Needs

The seven categories represent, in the study team's opinion, gaps or areas which need improvement in the nation's strategies for mitigating WMD events. Even without the construction of a NERA, addressing these concepts would be useful in improving the nation's ability to cope with a WMD event.

The VSP meetings were held prior to the September 11, 2001, terrorist attacks on the U.S. and the release of anthrax by mail during September and October of 2001. Those events have shown these concepts to be relevant. In-depth analysis of these notional NERA concepts in light of these attacks would be good subject matter for future studies.

Introduction

Terrorist actions that were once considered by the U.S. public as a vague possibility have become a terrible reality. These events have focused public and government attention, action, and resources on prevention and improved mitigation of subsequent attacks. New agencies have been created and massive funding increases have been allocated, but what, specifically, should be done? What are the underlying problems with the current strategies? How may emergency response be improved at all levels (local, state, and federal)?

The current federal policy controlling all aspects of response to the use of Weapons of Mass Destruction (WMD) and coordination of that response with state and local entities is described in the Federal Response Plan (FRP). The FRP was signed into law (Public Law 93-288) in April 1992. It was developed and endorsed by 27 federal departments and agencies plus the American Red Cross. The FRP provides the mechanism for coordinating the federal assistance and delivery of resources in the event of a major disaster or emergency and includes functional annexes outlining the responsibilities and procedures for each of twelve functional groups of response activities, as well as annexes covering acts of terrorism, financial management, public information, and Congressional relations.¹

The original intent of the FRP was to facilitate delivery of federal assistance to states to help them deal with the consequences of major disasters, including protection of lives, public health and safety, and property. The plan provides for assistance to all 50 states and includes Washington DC, Puerto Rico, Virgin Islands, Guam, American Samoa, and U.S. protectorates in the Pacific Islands Trust, Marianas, Micronesia, and the Marshall Islands. The FRP has been used dozens of times to assist states, protectorates, cities, and communities to recover from hurricanes, floods, earthquakes, and other natural disasters. The inclusion of mitigation responsibilities under the FRP for terrorism was added in 1997 in response to Presidential Decision Directive (PDD) 39.

While the FRP is effective, exercises and actual events have shown areas which need improvement or redesign.

A cooperative effort between the Defense Threat Reduction Agency Advanced Systems Concepts Office (DTRA-ASCO) and the Sandia National Laboratories Advanced Concepts Group (SNL-ACG) led to the creation of the Visiting Scientist Program (VSP). The VSP would gather together experts from outside the Federal Government to find potential solutions to difficult problems. The goal was to create a sustainable program for the generation and development of advanced

¹ Leiner, F. The Federal Response Plan: A Synopsis, with Potential Implications for the Defense Threat Reduction Agency. 1998.

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concepts for threat reduction. The first VSP study team was comprised of experts in consequence management, emergency response, societal behavior, medicine, and communication (see Appendix B). The VSP study task was to examine the current response structure to WMD events and develop concepts to satisfy the following objectives: 1) mitigate potential adverse social response during WMD events, 2) bolster work effectiveness and improve decision making during WMD events, and 3) devise these concepts to provide a framework for a notional National Emergency Response Architecture (NERA). An ideal NERA would integrate local, state, federal, and public communication and response. The goal of this integrated framework is to minimize the impact of an event, assist in restoration after an event, and maintain the ability of the U.S. to continue functioning. The NERA concept is about improving knowledge accessibility, communication at all levels, and decision-making in the chaos created by a strategic WMD attack on the U.S.

This paper, which is the final report of the VSP study team, describes seven categories and their corresponding concepts that were developed through a series of three meetings of the study team held between May and August 2001. These concepts were developed by exploring a stressing scenario describing the intentional release of a highly contagious, lethal, nontreatable biological agent (see Appendix A). Vigorous discussion between panel members generated a series of talking points which were organized by the study team into categories and concepts. The concepts were then mapped onto Command, Control, Communication, Computing, Intelligence, Surveillance, and Reconnaissance (C4ISR) functions to create the beginnings of an architecture for a NERA.

Study Categories and Concepts

This section presents the seven categories and their associated concepts developed by the VSP study team for a NERA.

The Social Context for a NERA in Response to a Biological Terrorist Attack

The social context requires suppositions regarding the response of the public. The first assumed response to such an attack is social panic, or fear-based behaviors. Social psychologists note that expectations of panic during a large-scale catastrophe or disaster are a common misunderstanding of how the public will actually respond. More likely, people will band together for the common good, knowing that the welfare of the individuals is furthered through group effort and mutual support. We have recently witnessed these prosocial behaviors during and after the terrorist attacks on New York and Washington, D.C.

The contagious nature of the scenario posed in this study has very different implications for social response. In coping with a contagious disease, the public is likely to realize that every person they contact is a potential hazard for infection. The study team believed it unlikely people will seek out crowds or congregations of people, especially after they have been educated not to do so. Individuals may interact with others only if it is perceived to enhance their likelihood of survival. Thus, resources now dedicated to militia for crowd control would be better directed to supporting critical infrastructure and providing food, water, and supplies.

The notion of avoidance of fellow citizens has positive aspects. The approach to controlling a contagious agent with no known cure is through isolation. Individuals, fearing for their lives and the lives of their loved ones, will undoubtedly feel distraught and potentially overcome with anxiety. They will express this fear by seeking to communicate with others and seeking to gain information.

Ideally, this need for communication can be accomplished using the telephone, the Internet, radio, and television rather than in person. Attention to keeping the communications infrastructure working may be an important means of minimizing the spread of disease.

A plausible response to the scenario is the transition of our country into a self-imposed quarantine in safe havens. These havens will primarily be homes, but may include churches or other shelters. Minimizing the spread of disease will depend on (1) getting supplies to havens (e.g., individual homes) so that people will not feel compelled to seek out supplies and information and (2) sustaining the operation of key infrastructure by getting critical people to work. The workers at the power plants, phone companies, retail stores, airports, gas stations, etc., will not want to be exposed to anyone and therefore will stay home. Media, First Responders, emergency medical personnel, and some essential

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government employees may be needed to assist with maintaining the critical infrastructure.

The greatest damage may be the enduring consequences for our society. We may lose trust for meeting and working with fellow citizens. The culture may evolve to one of separatism rather than teamwork. This effect may be the most damaging. It may make our country very easy to destroy and overtake in later years. The same spirit of voluntary teamwork that promoted our success in World War I and World War II, allowed us to send a man to the moon, win the Cold War, and got us through the terrorist events against the U.S. in 2001 will be degraded.

The situation that evolves to overcome this challenge includes relevant concepts for public education, planning and resource allocation, operational communications, public information and communications, operational decision-making, critical infrastructure management, and recovery and rehabilitation. Concepts are presented in each of these areas in the following section.

Categories and Concepts

The categories and their corresponding concepts developed through the VSP activities are shown in Table 1. For the purposes of this architecture, a category is a broad action that needs to be addressed as part of preparing for dealing with major events. Associated with the categories are concepts that specify activities or capabilities deemed critically important for the development of any NERA by the VSP study team.

Table 1. NERA Categories and Concepts

Public Education and Communication
Improve Public Response through Education Orient Education to Encourage Individuals to Take Action for the Betterment of Society
Planning and Resources
Classify Event-Defining Characteristics and Ability to Detect Anomalies Couple Responses of Many Agencies and Levels of Government Plan for Treating Affected and Concerned Populations Provide Special Attention to Isolated Populations Address Response on Multiple Fronts Given International Spread Institute Red-Team Plans Using Models, Panels, and Ad Hoc Teams

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Operational Communications
Define and Implement Common Operating Picture and Language Assemble Disparate Information Implement National Real-Time Secure Reporting of Critical Data Implement National Real-Time Pattern Recognition and Anomaly Detection
Public Information and Communication
Define and Implement a National Authority
Operational Decision-Making
Institute a Protective Action Decision Support System
Critical Infrastructure Management
Arrange for Delivery of Critical Goods and Services Supplement and Protect Communication Systems
Recovery and Rehabilitation
Conduct Post-Event Review and Lessons Learned Manage Mental Health Needs

Category I: Public Education and Communication²

One of the key NERA themes is self-responsibility and self-help by citizens—that is, self-awareness, self-protection, and self-treatment. Public preparation via education and awareness is the key factor. In the 1950s, the nation was collectively educated about nuclear attack. Even though projected property destruction and casualties were shocking, the information was nevertheless distributed to the public at large and was followed by protection, sheltering, and recovery training. The focus of the information was preparation for the massive destruction and contamination.

With the recognition of WMD terrorism threats, federal funding of multiple and divergent programs generated an enormous effort in a relatively short time that focused on establishing a national response and recovery protocol. Cities were identified for first responder training, and personal protective gear and detection and communications equipment were provided for use by first responders to WMD-suspected events. A variety of training programs rapidly evolved for public safety, public health, and medical personnel. Public officials were invited to attend briefings to better understand the consequences involved with WMD event decision-making.

² Contributed by Mr. Marcus Aurelius.

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What was missing from the efforts of the Federal Civil Defense Administration then, and remains missing today, is an effective public education and training component.

Improve Public Response through Education

It almost goes without saying that improved education can greatly improve public response. With diligence, the public can be prepared to know how to recognize an attack, be informed about what will be done to support stabilization and recovery, and understand plans that minimize the effects and promote survival.

Improvement in public response through education will save lives, assist government actions and response, and likely increase national cohesiveness. While medical and public health organizations will be the source of definitive diagnostic results, significant reduction in the spread of infective products can be achieved when applied at the source by the informed public.

Before the formal, organized public emergency response arrives at the scene of a catastrophic event, the public has frequently already voluntarily engaged in self-help rescue and stabilization efforts. An effective program of public education must be delivered to improve the effectiveness of the public response and to alert the public to the unique threats of exposure to biological or chemical products. Threat source and character information is essential to understanding the self-help concept (e.g., isolation strategies associated with biological agents).

Public education about terrorism, in particular bioterrorism, must happen immediately and cannot wait any longer. Once the nation is confronted with an ill-fated response from lack of preparedness, the public trust will be permanently degraded. Although the threat in the 1950s and the national culture were very different, lessons learned from civil defense are still clearly relevant.

Implementation:

- **Assess present awareness.** The public's level of threat awareness and response must be determined prior to the dissemination of new information. Because the threat potential is extensive and involves different forms, there may be public confusion about self-help practices. Empirical research that establishes a baseline measure of public perception of the saliency of communication messages during a terrorist event is sorely needed. Even if the terrorist event is not the release of a biological agent, a baseline measure will aid in the prediction of public expectations of credible and trustworthy communicators best suited to inform or educate the public.
- **Communicate the nature of the WMD agents and methods of delivery.** This information needs to be communicated by the public health system honestly and early in the event. The need for rapid

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discovery from a population sample requires an effective and timely diagnostic system, recognition by the public health system, and dissemination of understandable information to the contaminated, exposed, and at-risk population. Such information should reveal the potential for mass casualties and discuss the very limited capability of the public health and medical community to treat certain biological agents successfully. Information should address the measures necessary to isolate the “well” from the infected and exposed population. In other words, the federal government must trust the American people to “do the right thing.” The federal government must communicate information honestly, completely, and in a timely manner.

Orient Education to Encourage Individuals to Take Action for the Betterment of Society

This concept goes beyond general education to a very specific notion. The approach to educating the public about bioterrorism must do more than educate the public on the threat; the education is challenged with communicating strategies for “acting for the good of the group” as opposed to acting for what may initially appear to be for the “good of oneself.” Prosocial public behaviors are needed in response to the reality that in a triage situation, not all will be treated and many will die. This concept is counter to the current cultural orientation toward respecting life and may pose an insurmountable challenge. In addition, given the diversity of American culture, we propose that each subculture may have a different orientation toward life and death—therefore, communications will need to be tailored to address the perspectives of each subculture that comprises our nation.

The character of most WMD threats is such that the healthiest and most mobile will likely die first. This healthy, mobile population is the same group that typically produces heroes in single-impact disasters and attacks. This group, because of training and doctrine, will likely exhibit helping behaviors that put their lives at risk. If isolation is required, these people must have the presence of mind to voluntarily separate themselves from society and may even need to avoid seeking medical attention at conventional facilities.

In the case of a bioterrorism attack with a contagious pathogen, self-isolation is the best solution to stop the spread of the disease, conserve resources (human), and save lives. It is simply not possible, nor is it desirable, to control the population by force. A population’s protection may be improved when individuals make the hard choices not to engage with others if they are exposed.

Short- and long-term time scales for both individuals and populations must be considered. Actions that may appear to be counter to the near-term interests of individuals, such as isolation from family and sustenance with minimal provisions, will be difficult but necessary to encourage through education for the long-term health and survival of the nation.

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Implementation:

- **Promote public voluntary compliance with strategies for society-based triage and patriotism.** A different approach is needed. Consider the difference between public education messages for civil defense (community response) vs. AIDS/TB awareness (individual). The education messages are very different. Ideally, the public would engage in “self-triage.”
- **Provide a repetitious, very clear message before and during the event.** There will always be issues within voluntary compliance. The message needs to be established with the public by a variety of methods to show a clear cause-and-effect relationship.

Category II: Planning and Resources

Possible bioterrorist events are difficult challenges for which to plan appropriate responses as well as to determine the exact mix of resources required. It is crucial to determine the nature of the attack, involve the right people and organizations, and decide on what assistance can be given and how best to deliver it to what populations. Red teams, modeling, and exercises can help to define planning needs.

Classify Event-Defining Characteristics and Ability to Detect Anomalies

The concept of classification of WMD events is to create the taxonomy of key evidence and indicators (i.e., relevant cues) for different events. One method for diagramming the relationships could be through the use of associative networks. Once the associative networks of relevant cues are described, the appropriate goals and courses of actions can be determined. A taxonomy for relevant cues or indicators for each class of WMD scenario should be prepared so that the public is able to recognize potentially dangerous situations. This information should be disseminated to the public as soon as possible.

Implementation:

- **Central data collection and analysis.** Today, the responsibility for determining if an unconventional WMD attack is under way and determining the cause is in the hands of a few centrally situated decision-makers—although the information flow is distributed throughout a loose hierarchy. Many of the relevant cues necessary to diagnose the situation could already be known, but may not be collected or used because the cues are so widely distributed. Knowing what information to collect at the level at which patterns may not be distinguishable requires providing the broad sets of cues that indicate a biological attack in an understandable format. A taxonomy of cues, goals, and courses of action for the range of scenarios or attack situations would improve timely and accurate

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decisions and treatment. In addition, the goals for mitigation, prevention, maintaining order, and returning to normalcy are more easily identified.

- **Define the characteristics for different disease and attack scenarios into evidence that can be reduced to reportable observations.** Examples include dead birds, dead people, people with specific symptoms, etc. The set of networks collectively defines a broad spectrum of potential attack scenarios.
- **Develop an architecture for diagramming the taxonomy associated with the potential classes of WMD.** The network of cues would include the following:
 - What to look for.
 - Who should be looking.
 - What it could mean.
 - When to report it and how.
- **Convene working groups to develop the taxonomy for each WMD scenario (although this may be most relevant for biological attack).** Members would represent the broad range of key actors in the data gathering and decision- making structure for determining if an attack is under way. The two key sets of cues are disease cues (e.g., symptoms, victim, vectors) and attack cues (e.g., methods of release or transmission).
- **Distribute the information for discussion and incorporation in table top exercises.**
- **Distribute the information to first responders as cards that they can carry for review.**

Couple Responses of Many Agencies and Levels of Government

The VSP study team noted that many studies have concluded that a contagious biological agent release is a very different threat from what we have historically been prepared to address. The need for multi-agency collaboration is therefore not new. Accordingly, little detail is provided on this concept except to state its importance and a few main features and requirements that may comprise new thoughts.

Implementation:

- **Carefully consider the importance of communication among different levels of response entities and include these interactions in planning.** Coupled responses must cross-cut every communication, planning, and operational aspect of a NERA. One metric of any

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implementation is an evaluation of the value to the spectrum of entities involved.

- **Develop plans for a structure that supports a hybrid of lateral (between organizations at same level) and vertical (hierarchical) decision-making to ensure the appropriate involvement and to expedite the process.** The decision-making within the different agencies of the response community should be studied to devise a decision structure that facilitates lateral and hierarchical communication flows within and among local, state, and federal agencies.

Plan for Treating Affected and Concerned Populations

In much the same way there is a need for education to direct the public (individual) to take action for the benefit of society, our response planning must recognize that the ill must be treated in the best manner possible even if there is minimal hope for recovery. The potentially exposed (including what some call the “worried well”) must be treated even if they are not affected. However, a logistical issue rapidly arises. Many reports have noted the current shortage of hospital beds and personnel. Often, local and regional plans include provisions for temporary medical care (by whoever is available) in places such as schools, convention centers, and other large public facilities. In addition, a hard reality must be faced: many afflicted individuals will not be treated in time. Our current triage capability will not save everyone.

Implementation:

- **Isolate the public and send messages to the public during the response effort encouraging individuals to isolate themselves.** If the exposed have come in contact with others, the objective will be to slow or stop the personal interactions that spread the disease. It will not be possible for Americans to immediately suspend interactions. Limited interactions, however, must be maintained for the amount of time determined by the incubation period of the agent to preserve public health.
- **Plan to treat the exposed and potentially exposed as well as is possible.** Although this activity may become fruitless, depending on the fatality rate of the agent, there is merit from the public perspective to treating the visibly ill. This approach serves to isolate those that are highly contagious from the public and provides a conduit for obtaining knowledge that may in turn be used for future treatment or vaccines. The potential pitfall is that the public will gain an unrealistic expectation that they can be cured and hence abandon the benefit of self-isolation. It will therefore be necessary to engage in moderate over- vs. under-reacting. Key to this process again is information for the public.

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Provide Special Attention to Isolated Populations

The healthiest and most mobile Americans will perish first. Those most capable of providing assistance and those who first come into contact with the afflicted will regrettably be the first affected. Our first responders put themselves in grave danger every time they answer a 911 call. Conversely, populations who are isolated from the biological agent release will survive. Therefore, survivors may include representatives of groups traditionally thought of as burdensome (frail elderly) or undesirable (reclusive or prisoners). Our ability to overcome additional conflicts may be greatly compromised if the healthier, more mobile populations are significantly reduced.

Implementation:

- **Large numbers of people, all with different needs and interaction levels, must be served by a NERA.** Currently, local and regional preparedness teams are tasked with knowing and addressing their own populations, including mobile and isolated populations.
- **Perform vulnerability analyses to define the best approach given the demographics of an area.** These analyses must be compiled at a federal level to ensure national preparedness and support integrated planning.
- **Employ modeling and simulation to evaluate the impact on populations.** Even with recognition of the wide variation in populations, the overall trends inherent in exploratory studies can serve to define improved planning and assist in evaluating the effect of an attack on the future of the country.

Address Response on Multiple Fronts Given International Spread

The scenario explored in the study included rapid transmission of the biological agent and subsequent contamination outside the country via air travel. A plausible response scenario includes the notion that the international community sees this contamination as the fault of the United States. Developing strong international relations will be key to successfully responding as a nation to a contagious biological agent release. We must be as careful in dealing with the international communities as we are with our own public. Our allies will need to come to our aid, and we will need to come to theirs. We will have to foster the international coalition begun by President George W. Bush after the September 11 attacks. Foreign soil may be a positive place to isolate a healthy population—our military stationed abroad.

Implementation:

- **Increase foreign relations.** A massive foreign-relations effort will be required to calm international fears and to provide assurance that the agent is not a U.S. military error or an act of war.

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- **Address economic impact.** If isolation is induced and sustained, economic impact to the country and the world will be immense. Strategies for stimulating the economy may be required after the event.
- **Institute protective measures for our military and citizens abroad.** The military actions may suddenly take a turn in the mission. Early notice and an understanding of the potential impact must be included in planning.

Institute Red-Team Plans Using Models, Panels, and Ad Hoc Teams

Our readiness will require a commitment to fully understanding the ramifications of a complex biological-agent-release scenario never before encountered by the U.S. on a national level. Teams must be assembled to examine the response of the nation under different threats. The complication arises from the tightly coupled nonlinear character of the threat and response. Comprehensive red teaming for such an activity requires knowledge and ability to simulate the response of the nation for each action taken by the red team. The results of this planning can provide hope for a positive outcome that in turn can be delivered to the nation.

Implementation:

- **Planning should avoid incorrect actions/surprises that cost lives.** Teams can build and revise system and mental models to explore responses.
- **Conduct no-notice exercises in which federal authorities test local and state systems.**
- **Develop and implement advanced models.** Expert elicitation is likely the best near-term approach. The development of advanced models will be required to explore the response for various actions for the purpose of developing improved plans. Since the governing relationships are not known, model development can be used primarily to stimulate the thought processes.
- **Continually address the threat through vulnerability studies.** New ideas are critical to identifying invalid assumptions and exploring counterintuitive issues. Engaging the government, the media, and to some extent the public improves the breadth and hence increases the probability of identifying gaps and needs.

Category III: Operational Communications

The thrust of concepts grouped under Operational Communications is to address a national event at the local and regional level. It is important that data be

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available and analyzed such that patterns can be recognized. Also of importance is that organizations speak intelligibly and share a common picture of the event.

Define and Implement Common Operating Picture and Language³

The response speed and effectiveness of any operational communication system with widely diverse and variable participants will require a common operating picture (COP) for early, wise decisions.

This concept interfaces heavily with the education stage, since educating the people involved will be central to the operating picture. However, the concept also points to a system with hardware and software that may be used by a spectrum of users. This hardware would integrate the overwhelming amount of materials available on the multitude of web sites, publications, and presentations made by various entities with useful information, responsibility, and interest. In summary, this system would help coordinate information, avoid misunderstandings, and promote horizontal decision-making.

Optimally, a COP is a compilation of all available information, in electronic graphical form, pertaining to emergency situations, including origin, casualties (current and forecasted), encumbered and available personnel, equipment, supplies, and facilities, etc. The information must be presented in an organized and filtered manner to meet the diverse needs of first responders, planners, officials, media, and the public in supporting their respective decision-making and information distribution duties. Unified information to support COP at all levels within the emergency response system depends on a high level of horizontal and vertical interoperability and requires a common language or standards.

At the first-responder level, COP capabilities can be derived from information available from the dispatch facility. Whether manual or automated, the dispatch center actively monitors the volume and types of calls for service, and personnel and equipment availability. For large-scale or mass-casualty events, local agencies establish an on-site command and control center and implement the incident command system structure for resource management, planning, and surveillance. Typically, on-site command posts rely on manual systems and have limited interoperability with dispatch or higher-level support systems.

When multi-agency response capabilities are required, the city or county activates its emergency operations centers, which provide support to the local incident commander. This support may be provided by both private and public sector agencies (public utilities, health department, etc.). The state's office of emergency management may also activate its emergency operations center to provide additional support to local agencies involved in the incident, and request

³ Contributed by Mr. John McIntire.

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assistance from federal agencies, if necessary. Levels of automated and real-time interoperability (horizontal and vertical) vary greatly from jurisdiction to jurisdiction. The most accurate, reliable, and timely information regarding the incident is typically available only on the scene.

Effectively deploying a national COP is less a technology challenge than one of business function and priority. Trust and cooperation between participating public and private agencies are essential to establishing a “battlefield view” of a terrorist incident. Business functions and priorities include a commitment to a common language (standards) at each level in the hierarchy to promote horizontal and vertical interoperability. For example, there are no standards for dispatch center E911 call types. The business decision to adopt a national standard for defining call types would greatly assist early detection of bioterrorism incidents and improve the fidelity of a national COP.

Implementation:

- **Develop a national system with state and local access.** It is important to recognize state autonomy, while promoting national awareness and strategizing. Although significant differences are inherent in different locations, many of the lessons learned will transcend these boundaries and must be made available. Each federal agency also has its own COP support systems derived from information sources within its organizational infrastructure. The challenge of vertical and horizontal interoperability is characteristic of the threat addressed in this study that requires a COP. Additionally, the federal COP view is highly dependent on information sources embedded within the local and state hierarchy. However, as is the case with other federal agencies, these systems must be interoperable with local and state agencies to provide the fidelity necessary to support an event similar to the scenario addressed in this study.
- **Provide access to common information within the bounds of security.** The development of a true COP initiative requires that all participants (local, state, and federal) have access to critical need-to-know information. From a technology perspective, a national COP environment is a filtered, hierarchical system where true information sharing may be difficult because ownership of the system will remain at the top level. Reluctance to share information from the top with lower tier emergency responders is evident from the “Harbor Incident” that occurred in April 1995 where a terrorist threat was made against the Disneyland complex in Anaheim, California. While federal authorities were aware of the threat for five days, it was not until the day of the intended attack that local agencies were notified. The local fire authority assumed incident command duties and was given less than 16 hours to prepare an incident management plan to prepare to treat 30,000–40,000 potential victims.

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- **Reduce and translate jargon.** Operational participants in the VSP study team cited this requirement as among the most important for making significant advances in response effectiveness.
- **Share technologies with partners in the emergency response architecture and focus on interoperability.** An additional technology infrastructure will increase costs and delay implementation of an effective national COP environment. Enhancement of the existing infrastructure will also benefit local and state agencies in their efforts to provide day-to-day emergency response.
- **Provide training to engender trust.** As the elements of a national COP are enabled, it is essential that full-scale training exercises be incorporated both to test the technology and the business rules (filtering capability and access controls), and to engender trust among the various agencies involved.

Assemble Disparate Information

As has been stated often, early recognition is clearly critical to risk mitigation—early recognition saves lives, reduces number of victims, and maintains state capacity for governance. Examples of the multiple and dispersed data mentioned by the group include animal illnesses, reported symptoms and medical diagnoses, agricultural data, pharmaceutical data, travel data, movement of material, hospital and clinic admissions, work and school attendance records, death records, police records, surveillance observations at public facilities and events, media reporting, and general public observations. Embedded in these data are the relevant cues that will indicate a disease and that the disease was intentionally transmitted. Identification of these cues is addressed in Operational Communications.

Infectious-disease case information is routed to the public health system through a variety of sources, including but not limited to, private clinicians, laboratories, environmental health staff, public health nurses, and local police officers. Nevertheless, action will not be taken until state/local laboratory personnel receive information that suggests a possible infectious-disease outbreak.

There are two critical challenges that a NERA should address: 1) the coordination of early retrieval of information from unobvious sources such as 911 dispatch, local pharmacies, and grocery stores and 2) early coordination with hospitals, emergency room physicians, laboratories, veterinary hospitals, and local/state, federal responders at the national and perhaps international level. Because WMD agents have different characteristics and create different demands, the system can be expected to contain three direct means of detection. The first lies with police and fire dispatchers who may receive a call pre-identified as WMD or who may determine based on call screening that a WMD event is involved in a given call. Another route for alert is fire and police

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personnel who respond to an apparently routine call but notice “signs and symptoms” that indicate a WMD incident. Another route lies with the epidemiological-type screening done by hospitals and state and county health departments. A less direct indication of an assault may be the immediate presentation of sick people at the exposure site or a delayed post-exposure arrival to medical facilities and the rapid escalation of absentees from the school and work place.

Currently, both formal and informal information-processing channels exist at state and local responder levels, with public health, law enforcement, and many other involved parties. A serious, national effort to collect and analyze data from unobvious, disparate sources in real time would improve the ability to manage a WMD event. In particular, attention should be devoted to correlating quantitative data in order better to make qualitative hunches or to direct decisions that are meaningful. The VSP recognized that although studies on detection cite the need for new technology to obtain additional data, use of existing data is also needed.

Many of these activities are already under way or are positioned for implementation. National access to reporting systems such as the Sandia National Laboratories RSVP and the new health care reporting system in San Diego would be conducive to initiating such a system. Incorporating or linking queries to data available from sources such as Computer Aided Dispatch Services would allow additional details on the specific calls.

The tracking of purchases is another example. Included in this concept are new technologies that will allow rapid detection. The VSP study team did not dwell on these issues because they are highlighted in many other studies. The management and exchange of this information will be addressed as part of the next concept.

Implementation:

- **National mechanism for defining thresholds of terrorist event hazards.** At the local level, these thresholds may currently be specifically mandated in plans, or at the discretion of the responsible authority.
- **Tracking and vectoring (and perhaps model) transmission of exposed and affected, including movement of exposed from the source once identified.** Monitoring the spread of disease will allow improved containment and treatment and the development of spatially correlated epidemiological plots and histories.
- **Diagnosis of single/multiple attacks.**
- **Management of hoaxes.**
- **Ability to prosecute perpetrators.**

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- **Collect information via a two-way system.** The current National Alert System is a one-way program. It is anticipated that volunteer, privately owned radio systems would be widely used were an event to take place today.
- **Integrate multiple lines or groups of emergency management organizations (city, county, state) and health care (including veterinarians) providers that may depend on population.** The use of the COP will therefore be implicit in the success of this concept.
- **Assemble data in context with verification and best-possible validation.** The applicability of the data depends on the source. Sources will need to be verified, and when possible, the situation presented by the data should be validated.
- **Balance speed with verification and validation.** This becomes a decision-making issue, but the connection with information assembly should be noted.
- **Design and connect, with filters, to information yielded by new technology.** Pathogen detection technologies which are rapid and selective and epidemiological patient data collection systems in hospital emergency rooms are just two sources which may provide critical data about an event. A system must be defined that will collect and manage this data without information overload or the involvement of inappropriately educated individuals.
- **Include parallel data transmission.** Avoiding chains will improve throughput and reliability.
- **Large-scale computing is needed.** The tracking and data management of these sources will involve massive amounts of data. Computational platforms make a large fraction of this currently possible. Future growth in computational capability will further promote the implementation of this concept.

Implement National Real-Time, Secure Reporting of Critical Data

This concept provides the capability for real-time rapid reporting to enhance early detection and allow the country to step through an event in time. Despite the rapid dissemination of the agent, there will be time lags associated with air travel, contact, exposure, and incubation. Collaboratively time stepping through the event of a contagious biological agent release takes advantage of these time lags and exploits them to improve response.

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A system that provides the opportunity for “collaboratively time stepping” through the event may involve a secure, collaborative time stepping portal (CTSP) that provides rapid decentralized access to information needed before, during, and after a bioterrorist attack. For example, each emergency management office, hospital, law enforcement, fire, veterinary clinic, and medical laboratory could be equipped with secure intranet access to a portal that provides each viewer with analysis of trends, tracking of symptoms, activity in emergency rooms, and more. A CTSP is important not only because it could provide valuable information adaptable to each agency’s decision-making and planning process, but also because it could signal when each agency needs to become involved, and how.

Implementation:

- **Time stepping through the event.** In the context of rapid reporting and early warning, this will save lives in areas outside the primary target of the contagious biological agent release, as well as offer predictive tools to improve future responses to similar events.
- **Enhance response community’s decision-making and planning.** An intelligent rapid-reporting system can manage data from medical records, epidemiological trends by region or city or state, and over-the-counter purchases made in pharmacies or grocery stores.
- **Be national in scope.** An Internet-based environment that allows real-time rapid reporting and incorporates early warning detection may produce the desired environment. This system may be part of a collaborative virtual C4ISR system with decentralized flow of personalized and validated information.
- **Provide a balance between open source information and strict security levels.** A real-time rapid reporting system that mimicked dysfunctional communication processes (formal and informal) among organizations would be futile. What is needed is a reporting system that facilitates lateral decision-making or at least “information viewing” at all levels, especially local and state. By providing necessary information (albeit visible from different viewpoints) in a timely manner to all concerned, decision-making and trust between entities will be greatly enhanced.
- **Provide the highest access and alerts to first responders.** Critical personnel such as first responders should have access to a robust, rapid real-time identification of the contagious biological agent in question. This access should include local and national information. Alerting first responders and other officials in different parts of the nation to be on the lookout for and to prepare for elevated cases of ordinary “flu-like” symptoms in their local areas is one example.

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- **Include a component to enlist the media.** The media will have a critical role in the dissemination of accurate information and will rely extensively on “official government” resources for material. Because the WMD incident is significantly different from a nature-caused catastrophic event and is composed of deliberate acts against the community that are complex to explain, careful production of the message to be heard is essential. Because of the limited public presentation time, “average sound bite is 6.2 seconds,” there will be little time to address a complicated topic.
- **Provide a rapidly deployable secure mobile communications capability.** Essential to enhanced decision-making is the two-way flow of information. That is, feedback and communication are integral to promoting wise decisions.
- **Pass information to the nation and world.** Simulations of trend (forecasting trends in each city or location) or decision-making strategies could assist in passing information to different national and international interests. Additionally, lessons learned, or feedback platforms may prove very useful for enhancing decision-making during a bioterrorist attack.

Implement National Real-Time Pattern Recognition and Anomaly Detection

In addition to making information available in real-time, an essential component for effective and timely determination of a medical/public-health crisis is pattern recognition. Since recognizing patterns in the data yields cues to adverse events, this concept has been emphasized heavily as a key to mitigating the effects of an attack. Rapid discovery of onset and patterns is essential to interruption of the contamination process. Requisite to this concept is the collection and analysis of specific samples and dissemination of findings through an organized network as mentioned in the previous two concepts.

Having the defining characteristics of a biological attack in the hands of a broad spectrum of people who might be able to see some of the relevant cues is important for maximizing the potential for early identification and response. There are two kinds of relevant and related cues: those that indicate an important public health event and those that indicate an attack. Both sets of cues are important and may be necessary to identify that a biological attack is under way.

Recognizing the relevant cues and associating the correct cues with likely biological attack scenarios are likely to occur only if the cues are collected and reported, and if the appropriate decision-makers recognize the pattern of relevant cues. The concept addresses knowing what cues to collect at the level at which patterns may not be distinguishable. Implementing the concept can only start if the broad sets of cues that indicate a biological attack are identified and communicated in an understandable format. Real-time pattern recognition and anomaly detection would be an integral part of a NERA. The data mining and data fusion implicit in this concept can be included in the CTSP.

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Implementation:

- **Promote positive public response.** The immediate diagnosis and ability to identify those who have been exposed but are not yet exhibiting signs and symptoms will be critical for rapid medical response and possible identification of the criminal actors. The significant differences between the chemical and biological effects and the different response protocols to different forms of biological agents will promote confusion and public unrest as the psychological impact of the terrorist act evolves.
- **Accommodate different courses of action.** Syndromes caused by different biological agents may often begin with the same vague symptoms, yet different courses of action may be required (e.g. treatment versus quarantine). The biological or chemical assault upon an unsuspecting population will occur without warning in an area most advantageous to the terrorist agenda.
- **Gather data and recognize cues.** To collect information from physical samples as well as observations, the public will need to be properly and effectively informed about the event, including what to look for, what to do, who to give the information to, and where to give the information.
- **Use intelligent agents that explore and investigate data sources for information from medical data, trends of symptoms in certain locations, and historical data provided on open source Internet sites.** The agents behind the CTSP could send out appropriate alerts to all or specific agencies when abnormalities are noted. These intelligent agents could mine many data sources available from the Internet, television, 911 transcripts, local pharmacies, etc. The CTSP is to “sense” when abnormal activity in certain areas begins to “swell” as a result of correlating valuable information from various data sources.
- **Provide ability to detect natural infections and bio-engineered agents within time constraints and with minimal or no preparation.**
- **Provide rapid detection in the body or clinical samples, in real time and in the absence of recognizable signs and symptoms when the pathogen numbers are still low, of the presence of infection by any pathogen.**
- **Control exposure of first responder to the threat.** Exposure of staff and equipment is likely, and may be planned for by the terrorist, necessitating strategies to limit this exposure while maintaining adequate response.

Category IV: Public Information and Communication⁴

Public information and clear communication with the public are crucial to the effective mitigation of a WMD event. Information given to the public must be accurate and credible in its presentation, and it must be delivered by trusted and respected individuals. These National Authority Figures (NAFs) would be recruited and trained for this purpose.

Define and Implement a National Authority

During the unfolding of the events of a biological attack, levels of discomfort will be experienced by most of the public. This unrest and discomfort will increase dramatically if people do not understand the actions being taken or do not understand what is happening to them. Encouraging the public to take the appropriate courses of action will depend on their understanding of the goals and necessary courses of action. Most people will assume the worst, which could lead to an adverse social response. While prior education is desirable, it will also be necessary to do some real-time educating. The message will include informing and directing, appealing for national unity, conveying the need for protecting people, and conveying the need for protecting the constitution. It is possible that an attack with biological agents will require actions that are unappealing and controversial. For example, it may be necessary to encourage isolation or even to impose limited quarantine. Another example is that people may not be allowed to have the bodies of deceased relatives.

It is likely that few in the community will have the necessary understanding of these actions in advance. Many elected officials are also political figures and thus could use the help of some apolitical figures to help people make the right choices. In a time of crisis, when there is likely to be an overload of information (from many news media, for example), the public will need someone to trust. A key factor in communicating with the public is that during the time of crisis, public officials and trained emergency response directors will likely have different knowledge, language, cultural beliefs, fears and expectations than the public. The NAFs would be counted on to better relate to the mental models of the public.

Many of the most knowledgeable people will be unknown to the public, and it is likely that media sources will have their own experts. This creates the possibility for conflicting messages and uncertainty in the general public about the credibility of experts and which source should be followed. Many of the people most known to the public will be ill informed, have motives that are not in the best interest of the nation during time of trauma, or communicate different messages from each other. Incident response decisions will be made at the local and state levels,

⁴ Contributed by Dr. James H. Flynn.

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many by volunteers. The social and political decisions are higher-level decisions and the communication of these will need public support.

On a local level, it is essential that appropriate government experts, police, fire, medical, and public health, be identified and properly scripted to present to the public, through the media, an account of what has happened and what they can do to initiate self-protection and treatment. (Otherwise, the media may develop their own expert resources and without reference to credibility or political motivation, use them to speak on the event).

The concept for NAFs is to have recognizable public figures that have the necessary credibility to get people to listen. The NAFs could be focused on particular constituencies and would have to be known as honest, trustworthy, and competent about the issues identified by their constituency. As a group, they would need to communicate a consistent message. The NAFs would need to have and demonstrate access to the latest information. Messages communicated by the NAFs would support decision-makers at all levels in carrying out the necessary actions.

Implementation:

- **Communication of critical data to the public:**
 - What is happening.
 - What the relevant cues, goals, and courses of action are.
 - How people can help themselves and their communities.
 - They would need to calm people and call for unity.
- **NAF characteristics:**
 - Honest and trustworthy, in fact and in reputation.
 - Multilingual.
 - Not associated with a political agenda and they must have the ability to appeal to their constituency.
 - Competent as demonstrated by providing explanation of events consistent with people's observations and knowledge, or they must be able to explain why things are not consistent with the people's observations.
 - Excellent communication skills.
 - Recognized loyalty to the nation and to their constituents.
- **Appropriate branch of the federal government should own the NAF program.** In the event of a biological agent release, is it more appropriate

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for the NAF to be the Director of Homeland Security or the Surgeon General?

- **Detailed specification of qualifications of individuals and process needs to be developed.** Included in the process description would be the selection, training, and accreditation, method of service, and method of induction to national service before and during an emergency. States may want to create a similar position. A NAF may mean the reinstatement of a prominent Surgeon General or public health person. Additionally, this national figure will need to intimately understand the roles and responsibilities and processes of the first responder and may have a first responder background.

Category V: Operational Decision-Making⁵

Knowing what to do and when do it may difficult in a crisis situation, and responses may be different for decision-makers from different backgrounds. Multiple decision-makers can be supported with a Protective Action Decision Support System to direct them towards more effective decisions.

Institute a Protective Action Decision Support System

Among lessons learned from table top exercises is that conflict between authorities from different constituencies of national, state, and local government and from different domains (e.g., public health, emergency response, law enforcement, military, and public policy) impedes decision-making. Frequently, the issues overlap jurisdictions, or there are ambiguous jurisdictions or authority; different roles, goals, or purposes; access to different tools; or simply different perspectives and experience.

During the early stages of an attack, similar cues could suggest different goals and courses of action. For example, if the disease is contagious, prevention of spread and isolation are required to minimize the impact. On the other hand, for acute symptoms from a noninfectious pathogen, emergency medical care may be needed, and it may be appropriate to transport the sick person to a critical care facility. The different goals and courses of actions are compounded by different responsibilities for different agencies. For example, a hazardous material responder may want to evacuate people, while a public health doctor may want to impose quarantine measures.

Highly trained decision-makers in stressful situations (e.g., high consequence, high risk, incomplete information, ambiguous, high anxiety, sleep deprived) would look for critical cues, and once these cues are recognized, appropriate goals are

⁵ Contributed by Prof. Michael K. Lindell.

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understood and courses of action are quickly undertaken. As described above, in a WMD attack on the U.S. homeland, many different decision-makers will be coming together. It is likely that they each will have their own expertise, and the collective decision-making group will have to communicate and agree on goals and courses of action. This would be necessary particularly in the early stages, before a command authority becomes involved. Those early times are likely to be important for minimizing the consequences, and it is during those times that a support system would be desirable.

The concept for a protective action decision support system (PADSS) is to help the multiple decision-makers with congruent and quick decisions based on critical key factors in the early stages of an incident when protective actions may reduce the consequences. The most pronounced impact may be outside the primary target zone (e.g., clinics from which an ill person may seek some medical advice).

The system would integrate the perspectives of the various constituencies and various domains into one that supports making quick decisions. The key functions would be emergency assessment, population protection, and incident management.

Implementation:

- **The PADSS must support lateral decision-making.** The population protection module could be based on the *Emergency Response Guidebook* disseminated by the Department of Transportation to local emergency responders throughout the country.
- **The PADSS should group threats by the similarity of the crisis management and consequence management procedures involved.** The threats should be categorized into the basic categories of explosives, toxic chemicals, radiological materials, and biological agents. Subcategories of threats might be based upon, for example, the degree of infectiousness of biological agents or the toxicity and volatility of chemical agents.
- **Entry into the PADSS should be symptom-based rather than diagnosis-based.** Local emergency managers would be able to initiate protective actions without having to await the arrival of national expertise.
- **The PADSS should provide threshold levels for initiating protective action.**
- **The PADSS system should include:**
 - Web-based or standalone electronic story framing device.
 - Integration between the interrelated decision nodes.

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- Communication between key decision nodes.
- Access to Federal Emergency Management Agency (FEMA) situation reports.

Category VI: Critical Infrastructure Management

Successful management of a scenario similar to that addressed in this study will require widespread, if not national-scale, public isolation. Isolation will place the burden on emergency response to provide for the public as described by the two concepts below.

Arrange for Delivery of Critical Goods and Services

Goods and services must be delivered immediately to maintain public trust. The delivery must happen almost simultaneously with announcements encouraging isolation. People will trust the officials if they act promptly and as promised. People will also do what they feel is necessary for survival. If goods and services are not delivered, the public will take the necessary actions to protect themselves. Looting and civil disruption are likely outcomes. This concept places extensive requirements on government. The current “expectation” of public safety prevalent in society is consistent with this concept.

Implementation:

- **Design and institute a system to deliver critical goods and services for credible periods of isolation.** This system should include access to the goods and services and the preparation of necessary protected personnel.

Supplement and Protect Communication Systems

The communications requirements of officials and the communications needs of the public during a scenario similar to that addressed in this study will rapidly overwhelm current capabilities. Isolation will require enhanced communications to request needed goods and services. Our society has grown used to the comfort of mobile communications via cell phones. Adverse, fear-based behavior will be promoted by the loss of communications. Alternatively, working communications will provide comfort and confidence in government. Although low-technology devices such as HAM or CB radio may be used, the public will greatly benefit from using the same means of communication to which they are accustomed.

Implementation:

- **Expand communications capability.** Current commercial communication systems can become overloaded during holidays, peak hours, etc. Additional capabilities will be needed.

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- **Protect from attackers.** The Internet has been shown to be vulnerable to hackers and may be compromised.
- **Provide greater protection for critical system components for operational communication.**

Category VII: Recovery and Rehabilitation

The VSP study team recognized that many previous reports have highlighted the need for remains and property management. These activities are required for overall public health and for control of transmission and potential future outbreaks. Additional social implications, such as the long-term move towards a less coherent society and public fear, should also be considered as high priority, since these items are key factors in ensuring the long-term sustainability of the nation. Concepts below are post-event ties to previously presented concepts and requirements.

Conduct Post-Event Review and Lessons Learned

Following the event, an evaluation of lessons learned is required to derive recommendations and implement improvements. The natural tendency during an event is to focus on dealing with the near-term issues. After a serious event, hoaxes may become more prevalent and have greater impact on the public and first responders. Lessons learned can help alleviate such enduring consequences.

Implementation:

- **Collect and store data during the event for future analysis.** Because of the stress of the event, planning must ensure that this requirement does not distract emergency operations personnel.

Manage Mental Health Needs

The time scales involved in the event will give people more time to ponder the situation and their fate. The emotional stress associated with isolation and the loss of loved ones will pose enormous challenges to the general mental health of society. The scope of these challenges can be estimated by analogy to the entire country being in need of the same support provided to veterans of conflict in Vietnam or Korea.

In the event of a contagious disease where people consider their fellow human beings to be potential hazards, there will be challenges in restoring the people's trust and sense of well being. A NERA that includes the previously presented concepts can support these needs by providing services and estimates of affected populations. The main responsibility will be on mental health personnel who will ultimately have to provide the necessary counseling. Among the most

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severe cases may be the young, mobile population that is not used to dealing with crises, but that will be heavily exposed to the event.

Implementation:

- **Characterize affected areas.** By exploring data collected before and during the event, estimates of affected areas can be obtained and resources focused accordingly.
- **Employ remote communication.** Data links and web portals can be used for counseling large groups of people.
- **Use information to reduce the effects of stigma.** Some geographical variations will surely occur; and data collected during the event may help overcome the stigma associated with people from a specific location or region.

Conclusions

The VSP study team recognized that building a NERA without using elements of existing emergency response procedures was not cost effective or efficient. By using the fundamental C4ISR architecture the study team was able to construct a NERA on an already established emergency response framework. Accordingly, The categories and their corresponding concepts developed by the study team in this report have been mapped onto the C4ISR functional areas (see Table 2). This mapping provides the initial starting point for further design of a NERA.

The seven categories represent, in the study team's opinion, gaps or areas that need improvement in the nation's strategies for mitigating WMD events. The corresponding implementation measures described are the first steps toward strengthening the response mechanisms at both the state and national level. The reader is reminded that the NERA is not intended to replace the Federal Response Plan but to augment and improve the existing C4ISR architecture imbedded in that plan. This VSP report and the recommended implementation measures improve the synergies the FRP and its annexes have sought to establish (see Figure 1).

It should be noted, as the scenario was explored by the study team, it became immediately apparent local and state responses would be quickly overwhelmed and the federal response would be severely hampered by a lack of effective communication to first responders and the public. Reactions to the attack by the international community would have caused a shutdown in international transportation to and from the U.S. as well as an international economic crisis stemming from a subsequent shutdown of the lines of communication and trade. The expected international reaction caused the study team to consider the reactions of not only the U.S. public audience but a global audience as well. The architecture described in this report addresses these global consequences in the category of public education, although in the notional NERA described, the consideration of local, state and national responses would have first priority.

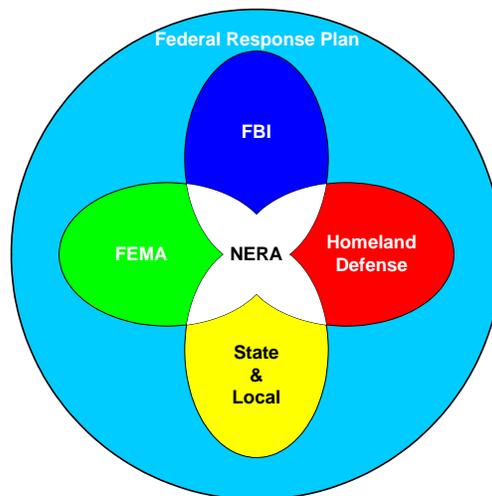


Figure 1 NERA Relationship to Emergency Response

Lastly, although the VSP meetings were held prior to the September 11, 2001, terrorist attacks on the U.S. and the release of anthrax by mail during September and October of 2001, those events have shown the concepts presented in this report to be relevant. In light of the recent terrorist attacks and because of the

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rapidly changing threat environment, further in-depth analysis of the notional NERA is recommended as subject matter for future studies.

Table 2. Concepts Mapped Against Functional Areas

	C4ISR Functions									
	Educating	Planning	Training	Sense	Process	Evaluate	Decide	Execute	Informing	Resourcing
PUBLIC EDUCATION AND COMMUNICATION										
Improve Public Response through Education	[Redacted]									
Orient Education to Encourage Individuals to Take Action for the Betterment of Society	[Redacted]									
PLANNING AND RESOURCES										
Classify Event-Defining Characteristics and Ability to Detect Anomalies	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]
Couple Responses of Multiple Agencies and Levels of Government	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]
Plan for Treating Affected and Concerned Populations	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]
Provide Special Attention to Isolated Populations	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]
Address Response on Multiple Fronts Given International Spread	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]
Institute Red-Team Plans Using Models, Panels, and Ad Hoc Teams	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]
OPERATIONAL COMMUNICATIONS										
Define and Implement Common Operating Picture and Language	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]
Assemble Disparate Information	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]
Implement National Real-Time, Secure Reporting of Critical Data	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]
Implement National Real Time Pattern Recognition and Anomaly Detection	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]
PUBLIC INFORMATION AND COMMUNICATION										
Define and Implement a National Authority	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]
OPERATIONAL DECISION-MAKING										
Institute a Protective Action Decision Support System	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]
CRITICAL INFRASTRUCTURE MAINTENANCE										
Arrange for Delivery of Critical Goods and Services	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]
Supplement and Protect Communication Systems	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]
RECOVERY AND REHABILITATION										
Post Event Review and Lessons Learned	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]
Manage Mental Health Needs	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]

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Appendix A: Scenario

"Welcome to the *Hotel Albuquerque*"

Scenario for the National Emergency Response Architecture Study (NERA)
of the DTRA Visiting Scientist Program

Peter B. Merkle, Ph.D.

DTRA Advanced Systems and Concepts Office

This is a work of fiction, set in the not too distant future.

An autumn Monday dawns in Albuquerque. Crisp, clear, and calm...it's another beautiful day. Perfect Balloon Fiesta weather, if it holds. There is a new addition to the skyline: the *Hotel Albuquerque*, nicknamed "The Duke." It is an innovative mix of new construction and urban renewal. The multi-block structure includes an expanded convention center, a 1200-room hotel, and upscale shops and bistros. The light rail station in the underground plaza makes downtown truly convenient for tourists and locals. Several blocks have become a pedestrian mall, with shade and cooling fountains. Café life is thriving. Downtown businesses have been booming since The Duke's grand opening last spring.

This week, the Western Hospitality Management Organization (WHMO) gathers at The Duke. Long overshadowed by the Santa Fe brand, a revitalized Albuquerque is now marketed by the U.S. hospitality industry as a preferred business and leisure travel destination. East Asia and the EU are becoming leading markets for the new Southwest travel experience. Over three thousand travel agents, meeting planners, and resort hotel executives arrive today for a week of networking, training, and exhibits. Local business leaders and industry groups are keenly interested. The "Bon Voyage Ball" awards banquet is the social highlight, and everyone will be there Friday in Zia Hall. Senator Chang will speak, and on Saturday, he will lead the NM congressional delegation on a trade promotion mission to South America. The WHMO has organized twelve "fact-finding" tours in the following week, with overnight visits to several Northern New Mexico sites. About five hundred people will enjoy luxury bus tours before returning for the closing weekend of the Balloon Fiesta.

In many ways, the new millennium has been very good to Albuquerque. Since 2000, economic growth has been brisk. *Business Week* describes the booming entrepreneurial culture as "The 21st Century's Silicon Valley." Advanced technology "start-ups" in photonics, microsystems, and IT industries are now "grown-ups," more than doubling the 1990s wage base. A European technology conglomerate has moved its U.S. headquarters here. Resort gaming, tourism, and a revitalized DoD budget are now just icing on the cake. The renaissance

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and growth of local Native American communities is spectacular, fueled by careful investments of gaming proceeds in development programs. The words "recession-proof" are heard around City Hall. A new class of IPO philanthropists is making its own pragmatic investments in charter schools, public health, and environmental quality of life projects. These privately funded civic improvements are long overdue, as the rapid pace of growth has exceeded all regional planning forecasts. To the south, the resurgence of Mexico's economy under political reforms has been unprecedented.

The city's physical infrastructure is in transition, with both progress and neglect apparent. A light rail system connects Downtown and Uptown with stops at West Mesa, Northeast Heights, East Mountains, Kirtland AFB, Tech Park, and UNM. Fast rail links the city with Santa Fe and Socorro. During rush hours, highways and major surface roads are near gridlock. Part-time telecommuting on the city's cutting-edge IT network is routine for most workers. Schools are crowded, and new housing is too expensive for the "working poor." No new hospitals have been built since 2005. The New Mexico public health and disease surveillance program is world-renowned, and for good reason. Suburbs have expanded into natural areas. More frequent and closer wildlife contacts result in infrequent but worrisome cases of plague and Hantaan virus. Water is more plentiful and more expensive than ever, thanks to the new Prairie Pipeline.

Barely invisible lines of economic and educational opportunity, race, and culture divide the human geography of Albuquerque. An effective community policing and foot patrol program has cleaned up chronic downtown crime problems. For some less fortunate neighborhoods, conditions are perhaps worse than ever: violent crime, drug traffic, bad schools, and family disintegration are harsh daily realities. The gulf between haves and have-nots has widened. The murky side of Las Vegas-style gaming has frayed the unique multicultural social contract once vital to the city's well being. Burglary, gang violence and prostitution are on the increase. The homeless population is growing, and shelters are at capacity. Fortunate law-abiding citizens have little direct experience of crime, apart from sensational media coverage. The growth of "enclaves" is evidence of growing anxiety about personal security: every new residential development in the last four years has been a gated community. Police, fire, and emergency services are coping but are stressed, and begging for personnel and equipment.

Through Tijeras Pass, the East Mountain area has fought tenaciously to retain its rural character. Most residents travel to the city every day to work or shop. About 20% of all workers in Albuquerque commute more than 50 miles daily. Kirtland AFB has expanded its roles in nuclear deterrence and national security missions, with new and critical operational support activities added to traditional roles. Its robust nuclear weapons engineering program is rivaled in scope by other mission areas such as IT defense, miniaturization, precision weapons, robotics, and laser research. The adjacent Tech Park is the focus of intense real estate development, and a satellite "downtown" is taking shape.

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TIMELINE (all hrs, Mountain Time)

- Monday (D-4) 0900:**WHMO conventioners and early Balloon Fiesta crews arrive today at The Duke, the Fiesta Host Hotel.
- Friday (D0) 2200:**Attack on "Bon Voyage Ball" in Zia Hall
- Saturday (D1) 0600:**Balloon Fiesta begins, start of cross-country race. Routine receptions and banquets continue daily in Zia Hall.
- Sunday (D+2) 1200:**Half of the WHMO have left NM to return home. WHMO bus tours of Northern New Mexico begin. Albuquerque ER traffic increasing during the Fiesta.
- Monday (D+3) 2200:**Some D0 cases feel fairly ill and worse overnight.
- Tuesday (D+4) 1200:**About 10% of all D0 cases have developed initial symptoms by now. Some are reporting to medical facilities. Some of these are admitted for observation and further testing. Symptom severity varies.
- Wednesday (D+5) 0700:**In many states, a noticeable number of D0 cases are reporting to medical facilities with initial symptoms. ProMed reports possible Hantaan fever cluster in Four Corners tourists. In New Mexico, the "Syndrome Net" alerts public health. Some local epidemiological investigations begin across the U.S. Informal communications intensify in BW defense community.
- 1400:**First clinical cases present severe febrile illness with evidence of vascular involvement: Albuquerque, Dallas, Phoenix, Denver, and Las Vegas. Viral hemorrhagic fever of unknown origin is now suspected, and is formally reported to public health authorities as such. Local media reports begin. ERs getting busy.
- 1530:**POTUS briefed. Response teams alerted. Japan, Germany, UK, and Mexico ProMed reports. Media special bulletins begin to appear. Radio talk shows, chat rooms, rumor mill pick up the story.

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Thursday (D+6)

0230:There is definitive diagnosis of Ebola hemorrhagic fever (EHF) by virologic techniques. Intense reconnaissance by special units continues in New Mexico. About 40% of D0 Cases are now feeling fairly ill. Clinical reports accelerated overnight in multiple cities. Public awakes to 24 hour news blitz, with graphic footage of ER scenes from New Mexico.

1000:News conference: U.S. Surgeon General

1400:EHF confirmed in Japan, Germany, UK, and Mexico. Situation in Albuquerque and Northern New Mexico is considerably worse. ERs overwhelmed.

1500:"The Duke" identified as ground zero outbreak of *Ebola-Duke*, possibly a new filovirus. Consequence model predictions are reviewed by NSC. POTUS is informed by the DCI that a BW attack is confirmed. The U.S. is in the early stages of a multi-state outbreak.

1600:The NCA activates NERA. Your secure pager is beeping.

1630:NERA technical response group briefing (via secure WebCon)

1800:Scheduled POTUS address nation on all networks.

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Location	Population	Est. Cases
Albuquerque, NM	855,286	1500
Las Vegas, NV–AZ	1,875,938	191
Chama, NM	1,374	129
Phoenix–Mesa, AZ	3,902,251	122
Four Corners, NM	68,514	121
Santa Fe, NM	177,162	119
Reno, NV	407,383	88
Acoma Pueblo, NM	< 1000	84
Salt Lake City–Ogden, UT	1,600,697	76
San Antonio, TX	1,910,860	65
Colorado Springs, CO	620,315	64
Zuni Pueblo, NM		61
San Diego, CA	3,376,600	55
Taos, NM	4,872	50
Santa Rosa, NM	2,632	50
Seattle–Tacoma–Bremerton, WA	4,265,712	45
Dallas–Fort Worth, TX CMSA	6,266,161	44
Denver–Boulder–Greeley, CO	3,097,807	43
Los Alamos, NM		42
Pojoaque, NM		41
Austin–San Marcos, TX	1,499,716	38
Kansas City, MO–KS	2,131,274	28
Los Angeles–Riverside–Orange County, CA	19,648,374	27
San Francisco–Oakland–San Jose, CA	8,447,234	26
Flagstaff, AZ–UT	146,839	24
New Orleans, LA	1,605,271	23
Tucson, AZ	1,012,495	22
Washington–Baltimore, DC–MD–VA–WV	9,129,684	21
New York–Northern New Jersey–Long Island, NY–NJ–CT–PA	25,439,838	18
Boise City, ID	518,814	18
Oklahoma City, OK	1,300,015	17
Provo–Orem, UT	442,243	16
El Paso, TX	815,546	14
Santa Barbara–Santa Maria–Lompoc, CA	479,216	14
Fresno, CA	1,107,019	12
Omaha, NE–IA	860,398	10
Pocatello, ID	90,678	10
Spokane, WA	501,527	9
Las Cruces, NM	209,618	8
Atlanta, GA	4,934,638	7
Portland–Salem, OR–WA	2,718,268	7
Great Falls, MT	96,428	7

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Chicago–Gary–Kenosha, IL–IN–WI	10,989,048	6
Nashville, TN	1,477,573	6
Honolulu, HI	1,051,387	6
San Luis Obispo–Atascadero–Paso Robles, CA	296,017	5
Grand Junction, CO	139,506	5
Cheyenne, WY	97,928	5
Fort Collins–Loveland, CO	301,793	4
Casper, WY	79,840	4
St. Louis, MO–IL	3,124,328	3
Little Rock–North Little Rock, AR	700,614	2
Amarillo, TX	261,430	2
Pueblo, CO	169,766	2
Bangor, ME	109,037	2
Rapid City, SD	106,278	2
Corvallis, OR	93,784	2
Salinas, CA	482,114	1
OCONUS		77
	Total	3500
	Cases	

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Appendix B: Program Participants

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