The Emergency Manager of the Future: Summary of a Workshop -- June 13, 2003, Washington, DC

A Summary to the Disasters Roundtable by Monique C. Hite, National Research Council

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THE NATIONAL ACADEMIES

THE EMERGENCY MANAGER OF THE FUTURE

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JUNE 13, 2003
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A SUMMARY TO THE
DISASTERS ROUNDTABLE

BY
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FOREWORD

The Disasters Roundtable (DR) seeks to facilitate and enhance communication and the exchange of ideas among scientists, practitioners, and policymakers concerned with urgent and important issues related to the understanding and mitigation of natural, technological, and other disasters. Roundtable workshops are held three times a year in Washington, D.C. Each meeting is focused on a specific topic or issue and is free and open to the public. The Disasters Roundtable Steering Committee identifies topics, creates agendas, and recruits expert speakers for Roundtable events. For upcoming meetings, please visit http://national-academies.org/disasters.

The Disasters Roundtable Steering Committee is composed of seven appointed members (two-year terms) and sponsoring ex-officio members. The appointed members are William H. Hooke, chair, American Meteorological Society; David Applegate, American Geological Institute; Ross B. Corotis, University of Colorado, Boulder; Ann-Margaret Esnard, Cornell University; Susan K. Tubbesing, Earthquake Engineering Research Institute; Ellis M. Stanley, Sr., Emergency Preparedness Department of the City of Los Angeles; and Richard T. Sylves, University of Delaware. The ex-officio members are Lloyd Cluff, Pacific Gas & Electric; Dennis Wenger, National Science Foundation; Timothy Cohn, US Geological Survey; Stephen Ambrose, National Aeronautics and Space Administration; Margaret Lawless, Federal Emergency Management Agency; Deborah Dietrich, US Environmental Protection Agency; James Russell, Institute for Business and Home Safety; and Helen Wood, National Oceanic and Atmospheric Administration. The DR staff includes William Anderson, director, Patricia Jones Kershaw, staff associate, Kemi Yai, project assistant, and Monique Hite, Science and Technology Policy Intern (Summer 2003).

This document presents the rapporteur's summary of the workshop discussions and does not necessarily reflect the views of the roundtable members or other participants. Thanks to Professor Richard Sylves of the University of Delaware for providing his notes from the workshop.

For more information on the Roundtable visit our website: http://national-academies.org/disasters or contact us at the address below.

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This summary has been reviewed in draft form by individuals chosen for their diverse perspectives and technical expertise, in accordance with procedures approved by the NRC's Report Review Committee. The purpose of this independent review is to provide candid and critical comments that will assist the institution in making its published summary as sound as possible and to ensure that the summary meets institutional standards for objectivity, evidence, and responsiveness to the study charge. The review comments and draft manuscript remain confidential to protect the integrity of the deliberative process. We wish to thank the following individuals for their review of this summary:

Leanna Falkiner, Institute for Catastrophic Risk Reduction, Toronto, Canada

Henry W. Fischer, III, Millersville University of Pennsylvania

Responsibility for the final content of this summary rests entirely with the authoring committee and the institution.

DISASTERS ROUNDTABLE

THE EMERGENCY MANAGER OF THE FUTURE

ABSTRACT

From hurricanes to terrorism to chemical spills, natural, technological, and other disasters can have potentially life-threatening effects. Emergency managers of the future will need to contend with these events in addition to other global changes in demographics, climate, and geography to further useful mitigation/prevention, preparedness, and response and recovery efforts to disasters. To address these issues, the Disasters Roundtable held its eighth public workshop to identify and discuss the role and responsibility of emergency managers of the future and the resources needed to meet forthcoming challenges. Some challenges discussed included the need for emergency managers to maintain an "all-hazards" approach, despite the recent focus on homeland security, and the need to enhance interoperability among key stakeholders especially in terms of training, communications, and organization. The opportunities of higher education and research, in addition to the role of technology, were noted to play vital roles in the advancement of emergency management. Presented in this summary are several other observations made on the emergency manager of the future as a result of the exchange of perspectives shared at this workshop.

INTRODUCTION

The Disasters Roundtable[1] (DR) held its eighth public forum on June 13, 2003 at the Keck Center of the National Academies in Washington, D.C. This one-day workshop served as a clearinghouse for practitioners, decision makers, researchers, and other stakeholders to discuss and exchange perspectives on the challenges and opportunities that face future emergency managers, based on current knowledge and experience. The anticipated challenges and opportunities for the emergency manager of the future have evolved since the concept of emergency management first emerged following the detonation of the Soviet's first nuclear device in 1949 and the beginning of the Korean Conflict (1950). As a consequence of those events and thus the beginning of the 'Cold War', President Truman established the Federal Civil Defense

[1] The National Research Council (NRC) defines a "roundtable" as a type of convening activity of the National Academies that provides a means for representatives of government, industry, and academia to gather periodically for the identification and discussion of issues of mutual concern. In contrast to NRC study committees and other committees of the National Academies, roundtables are intended solely to enable dialogue and discussion among key leaders and representatives on a particular issue. They provide a valuable forum for exchanging information and for the presentation of individual views. However, because roundtables are not subject to institutional requirements concerning conflicts of interest, composition, and balance that apply to NRC committees, roundtables are prohibited by the National Academies from providing any advice or recommendation. This paper presents the rapporteur's summary of the workshop discussions and does not necessarily reflect the views of the roundtable members or other participants.

Administration in 1949; the Federal Civil Defense Act (FCDA) of 1950 provided the statutory authority for the Federal Civil Defense Administration and included authority for planning, sheltering, and evacuation and support to states and localities with planning, technical guidance and assistance, training, and fifty-fifty matching grants for equipment.[2]. Civil defense was elevated to a national perspective during the Kennedy Era[3], and was expanded to include natural disasters in the 1970s. The Federal Emergency Management Agency (FEMA) was formed by President Carter in 1978 to assist in responding to both natural and human-made disasters. The1980s brought the notion of the Integrated Emergency Management System (IEMS), an all-hazards approach (including natural and man-made disasters).[4]

Today's "all-hazards" approach to emergency management extends far beyond the focus of the 1950s and 1960s "civil defense" to address epidemic risks, terrorism, and other societal threats.[5] This National Research Council (NRC) workshop provided the medium for addressing the role and responsibility of emergency managers and the resources needed to meet future challenges. The workshop also addressed the opportunities for higher education and research to support the emergency manager of the future, in addition to exploring the role of technology in furthering the effectiveness of emergency management. The Disasters Roundtable Steering Committee selected a diverse group of speakers and panelists extending from the practice of emergency management, to academia, and policy makers (See Appendix A for agenda). The first six sessions of the workshop involved both individual and panel presentations with a moderated discussion. After each session, the speakers entertained questions from the audience. In the final session, all attendees were encouraged to participate in an open discussion related to the emergency manager of the future. Approximately 115 people attended the workshop (See Appendix B for attendees list and Appendix C for speaker bios). This document is a summary of the workshop presentations and discussions.

PERSPECTIVES OF THE EMERGENCY MANAGER OF THE FUTURE

The workshop began with opening remarks by the DR Chair, **William H. Hooke**, Senior Fellow and Director of the Atmospheric Policy Program of the **American Meteorological Society**. **Ellis M. Stanley**, **Sr.**, Certified Emergency Manager (CEM), DR Steering Committee Member, and General Manager

[2] Green, W. G., III, ed. 2003. Civil Defense: The Truman Administration (entry 0113) *in* The Electronic Encyclopedia of Civil Defense and Emergency Management. Online: <http://www.richmond.edu/~wgreen/Ecdtruman.htm>. Accessed: August 2003.

[3] Green, W.G., III, ed. 2003. Civil Defense: The Kennedy Administration (entry 0110) *in* The Electronic Encyclopedia of Civil Defense and Emergency Management. Online: <http://www.richmond.edu/~wgreen/Ecdkennedy.htm>. Accessed: August 2003.

[4] Green, W.G., III, ed. 2003. Civil Defense: The Reagan Administration (entry 0112) *in* The Electronic Encyclopedia of Civil Defense and Emergency Management. Online: <http://www.richmond.edu/~wgreen/Ecdreagan.htm>. Accessed: August 2003.

[5] National Emergency Management Association (NEMA). 2003. A Governor's Primer on All-Hazards Emergency Management. Online: <http://www.nemaweb.org/docs/Gov_Primer.pdf>. Accessed: July 2003.

of the **City of Los Angeles Emergency Preparedness Department** provided an overview of the workshop objectives. Mr. Stanley also challenged the audience to learn the name of their local emergency manager, especially since every state, in addition to Washington D.C., Puerto Rico, and the U.S. Virgin Islands, has an emergency manager. As evidenced in past tragic events, Mr. Stanley emphatically reminded the audience of the civic responsibility of local citizens, who are often the unofficial "first responders" before the professional first responders arrive on the scene.

Thomas E. Drabek, Professor of Sociology at the **University of Denver**, addressed global issues of the future in emergency management based on his experience conducting forty years of research in this area. U.S. population trends, such as steady growth and an aging population, place increased demands on emergency management, including the need to care for more potential victims. Additionally, emerging trends indicate that emergency managers will also need to take into account matters of cultural, ethnic, racial, and gender diversity when addressing the needs of disaster victims. A framework for emergency managers to follow in assessing major trends can be based on a sociological model called "POET"[6]—population, organization, environment, and technology. Emergency managers of the future will need to also consider how regional conflicts, ethnic strife, or religious and cultural militancy abroad may trigger terrorist activity against Americans at home. Dr. Drabek challenged the emergency manager of the future to "grasp the big picture" but not be controlled by it.

VIEWS OF PRACTITIONERS AND DECISION MAKERS

This session of the workshop, moderated by Ellis M. Stanley, Sr., involved discussions from the perspective of emergency experts and decision makers concerning challenges that future emergency mangers will face. These challenges are based on the anticipated vulnerability of the nation to particular types of risks, such as natural, technological, and human-induced hazards.

J.R. Thomas, CEM, Director of **Franklin County, Ohio Emergency Management Agency** and President of the **International Association of Emergency Managers** discussed various aspects of the emergency management profession. He noted that increased disaster threats demand increased emphasis on emergency management capabilities. Emergency managers of the future will need to have a multi-disciplinary education and be well-versed in elements of criminal justice, seismology, meteorology, chemistry, public administration, public health, public budgeting and community planning. Emergency managers could be

[6] Duncan, Otis Dudley and Leo Schnore. 1959. "Cultural, Behavioral, and Ecological Explanations of Social Organization." *American Journal of Sociology*. 65:132-153.

more proactive in warning the public of unsafe development by being knowledgeable in matters such as environmental clean up, building code formulation and enforcement, and building location (e.g., zoning). To prepare for the future, Thomas suggested that emergency management should be integrated or co-located with intelligent transportation centers[7] to provide video images from various transportation routes, allowing for better and safer transportation, especially for first responders when navigating emergency routes.

Figure 1: Intelligent Transportation System control facility.
Source: Presentation by J. R. Thomas, June 13, 2003.

Thomas continued by stating that emergency managers should also work towards regionalization to better integrate individual community emergency plans into a multi-jurisdictional response that would affect a more cohesive and seamless approach to a large scale event. He concluded by expressing the need for emergency managers of the future to have shared visions, where multi-discipline administration and organization, and interoperability (e.g., training, communications, language, and culture) are paramount.

Eric Tolbert, Director, Response Division, Federal Emergency Management Agency (FEMA)**, Department of Homeland Security**, provided his "10 Steps" on how the profession of emergency management can survive and prosper in a multi-hazard prone environment:

1) Collaborate with other agencies, organizations, governments, and the private sector to establish a shared vision and commitment.
2) Learn to compromise, adapt and standardize for the greater good.

[7] Intelligent transportation centers use real-time video images to better manage traffic on well-traveled roads to reduce congestion. Traffic management technologies are designed to communicate real-time information on traffic and road conditions for drivers, transit users, and the general public through navigational systems, variable message signs, television, internet, radio or fiber optical communications.

3) Strategic planning skills are critical in the development of tangible, appropriate and measurable capacity building. Higher education institutions should support the development of these critical skills.
4) Look beyond your own geo-political boundaries to coordinate the development of new capabilities that are appropriate and sustainable. Regional cooperation, not duplication, will be the key to our success in building and maintaining adequate emergency response capabilities.
5) Academic institutions aid the identification of, and exploitation of new and emerging emergency response technologies.
6) Retain an "all-hazards" approach to contingency planning and capacity development.
7) Advertise your successes to promote continued support.
8) Retain a "passion" for the emergency management profession, which has just begun to evolve.
9) Retain "compassion" for the victims, whom we are all here to serve.
10) Be patient with the changing environment and ambiguities.

Mr. Tolbert stated that more collaboration is needed to end "bureaucratic" turf battles. He described the national initiatives aimed at adapting and standardizing the National Response Plan (NRP) and the National Incident Management System (NIMS), as required by Homeland Security Presidential Directive 5 (HSPD-5) – "a comprehensive revision of all previously published directives and executive orders related to the transition of Office of Homeland Security to the new Department, and applies to all agencies/departments with equities in the Department of Homeland Security."[8] Along the lines of having a well-written strategic plan, Tolbert expressed the need for academia to place more emphasis on emergency planning, including hazard, risk and vulnerability assessments. Emergency managers should look beyond their boundaries to regionalize, exploit technology, and retain an "all-hazards" focus. Lastly, Tolbert implored emergency managers to focus on the needs of past, present and future disaster victims as the customer, and to formulate policies and resource allocations based on their ultimate benefit.

In the open discussion that followed, particular challenges and concerns were noted. One of the greatest challenges to emergency managers, is that they cannot plan for every event. Thus they must have the ability to improvise, encourage educational sharing between academics and practitioners, and effectively interact and communicate with stakeholders. Other comments focused on the status and sustainability of federal disaster funding for emergency management, and funding for related science and technology contributions. In fiscal year 2003, FEMA will provide grant funds to states and territories to be used to

[8]International Association of Emergency Management. 2003. Background Paper on Homeland Security Presidential Directive 5 (HSPD-5). Online: <http://www.iaem.com/HomelandSecurityPresidentialDirective51.doc>. Accessed: July 2003.

expand the Community Emergency Response Team (CERT)[9] program. The CERT program provides training for community emergency preparedness. CERT members learn to aid first responders, assist victims, and organize volunteers at a disaster site. The grant funds are allocated for state-offered train-the-trainer courses as well as to help communities start CERT programs and expand existing teams. The grant money for fiscal year 2003 is in addition to funds distributed through the fiscal year 2002 supplemental appropriation. Furthermore, the U.S. Department of Homeland Security (DHS) has announced awards to ten states for enhancing the response and preparedness capabilities for first responders and state and local governments.[10] Also, in terms of science and technology, DHS has implemented a Science & Technology Directorate, which is "tasked with researching and organizing the scientific, engineering and technological resources of the United States and leveraging these existing resources into technological tools to help protect the homeland."[11]

HIGHER EDUCATION NEEDS OF THE EMERGENCY MANAGER OF THE FUTURE

This panel discussed emergency management, and how university-based programs can best meet the needs of future emergency managers and decision makers given the challenges they will face this century. **Lacy Suiter**, Naval Postgraduate School and former Assistant Director of FEMA, moderated this panel.

John R. Harrald, Director, Institute for Crisis, Disaster, and Risk Management (ICDRM), **George Washington University,** opened with a brief description of his program, the ICDRM, which was chartered in 1994 to improve the disaster, emergency, and crisis management plans, actions, and decisions of government, private, and not for profit organizations. His program confers master's and doctoral degrees and graduate certificates in crisis, emergency, and risk management within the Department of Engineering Management and Systems Engineering. Harrald stressed the importance that graduate education becomes a critical component of the emergency management profession. He also indicated that emergency management involves a relationship between two streams, domain expertise and the application of theory. As such, academics need to integrate these streams into a professional degree program given the high interest in emergency management since the September 11, 2001 terrorist attacks. Professor Harrald's program benefits from funded research projects from the National Science Foundation (NSF), the U.S. Army Corps of

[9] The CERT program was developed and implemented by the Los Angeles City Fire Department in 1985 and FEMA made this training available nationally in 1993. Since this time, CERT programs have been established in more than 340 communities in 45 states.

[10] For more information on "Funding Report: Helping Our Nation's First Responders," see: http://www.dhs.gov/dhspublic/display?theme=63.

[11] For more information on DHS Science and Technology Directorate, see: http://www.dhs.gov/dhspublic/theme_home5.jsp.

Engineers, and the American Red Cross, to name a few. In addition to his research, Dr. Harrald is also in the process of launching a new electronic journal, *Journal of Homeland Security and Emergency Management*, which will respond to the need for more rapid interchange between practitioners and researchers in the field.

B. Wayne Blanchard, Higher Education Project Manager, Emergency Management Institute, **Federal Emergency Management Agency** (FEMA), tracks the growth and diffusion of higher education emergency management programs across the United States, noting that today there are 47 states that have at least one emergency management collegiate program. Dr. Blanchard estimated that the number of emergency management collegiate programs is growing at an average rate of about one and a half a month, yielding a net increase of 18 new programs.

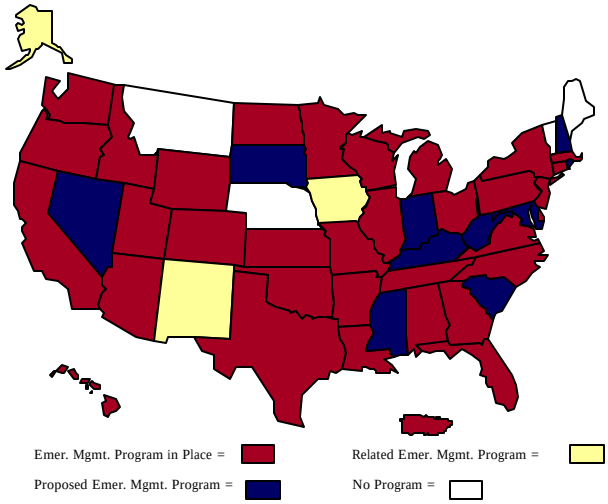

Figure 2: Map Showing Emergency Management College Programs by State. Source: Presentation by B. Wayne Blanchard, June 13, 2003.

Dr. Blanchard disclosed that emergency management doctoral, master's, bachelor's, associate, and certificate programs have mushroomed in number since September 11, 2001. In fact, approximately 15 institutions sponsor homeland security degree programs and many more have developed terrorism focused degrees and curricula. The Higher Education Project has subsidized and supervised professor-developed instructor guides made freely available via the Internet to academics interested in, or seeking help to develop, their own emergency management-related courses. These guides cover a range of disciplines, specialties, and sub-fields. Blanchard noted that among the goals of the Higher Education Project is helping emergency managers to learn management principles and skills, master tools of their trade, draw from experts studying the legal, political, economic, social, ethical, planning, geographical, and administrative aspects of emergency management, and advance their own ability to pursue research in their field.

Brenda Phillips, Professor, Institute for Emergency Preparedness (IEP), **Jacksonville State University**, Alabama, stated that universities function to prepare the next generation, in this case, emergency managers well versed in sound research and best practices. Traditionally, universities function to produce students with degrees and/or certificates. However, because universities serve multiple functions they must also become involved in creating and disseminating new knowledge. Particular needs include textbooks, anthologies, articles, web sites and course syllabi sets pertinent to emergency management. Faculty must also be engaged in identifying, elaborating, and critiquing theories, perspective, methods and models useful to the field of emergency management. University programs will need to meet the unique needs of emergency management students who are often unable to leave jobs and families. Distance learning technologies can help meet those needs, including internet based learning, college by cassettes, web casts, video and satellite courses. Because of a significant lack of qualified faculty, universities must educate not only emergency managers, but the future professoriate as well.

Some of the discussion comments for this session pertained to several key issues in developing higher education programs in emergency management such as the lack of teaching materials, appropriate education and training, and increasing the number of doctoral graduates. The lack of teaching materials has presented a challenge in terms of resources used for training and education. Although core competencies for 21st century emergency managers include the development of both interpersonal skills and management skills and principles, there is a need for research findings to be converted to more practical "how-to" formats. More collaboration among researchers, educators, practitioners, and student feedback will help to contribute to the development of core curriculum for higher education programs in emergency management. Some discussion participants pointed out that to increase the number of doctoral graduates, funding is needed to support doctoral programs. Hiring practitioners as adjunct faculty also enhances the number of educators who can contribute to the development of training and educational programs for emergency managers of the future.

RESEARCH NEEDED TO SUPPORT THE EMERGENCY MANAGER OF THE FUTURE

This session was comprised of representatives from research and emergency management related practice communities to discuss prominent research that is needed to help advance the field of emergency management and how to transfer the knowledge to end users once the research results have been obtained. Ann-Margaret Esnard, DR Steering Committee Member and Associate Professor at Cornell University, moderated this panel discussion.

Dennis Wenger, Program Director, Infrastructure Management and Hazard Response, National Science Foundation (NSF), highlighted the significant and rapid changes that have been occurring in the field of emergency management over the past decade. Recent events have challenged some of the earlier directions taken by the field, and fundamental research is still needed in a variety of areas such as interdisciplinary work, applied research on hazards and disasters, and program evaluation. NSF's Division of Civil and Mechanical Systems joined with NSF's Division of Social, Behavioral and Economic Sciences to sponsor a program solicitation that paired social scientists with engineers, encouraged multi-disciplinary research, and addressed emergency management for critical infrastructure and related systems. NSF anticipates granting approximately seven awards from this program, and plans to hold another round of competition next year. Dr. Wenger deemed this effort to be a forerunner of how hazards research will progress in the future. He also felt that the Integrated Emergency Management System, the Incident Command System and Project Impact all deserved much more research and analysis in terms of program evaluation than each has garnered thus far, and that an all-hazards approach to emergency management deserves more theory-based research to determine its advantages and practical limitations. The Earthquake Engineering Research Institute (EERI) has already extended their concern to an all-hazards approach. Wenger advocated research that helps to optimize local emergency management. To improve upon the current "loosely coupled" local emergency management system, Wenger calls for work that addresses the strengths, weaknesses, and "goodness of fit" between current models and local emergency management effectiveness. Some focal points include urban planning and local law enforcement that are better linked to local emergency management. Dr. Wenger also emphasized the importance of continuing research on warning and risk communication and the effectiveness of community-wide preparedness and response efforts. Few have examined the effectiveness of community-wide preparedness and response organizations, such as Local Emergency Planning Committees (LEPC) and Community Emergency Response Teams (CERT). The emergency management community has embraced the Incident Command System, which manifests many command and control features. However, Wenger observed that research suggests that in contrast emergency managers usually work in a decentralized, flexible environment that values consensual, brokering behavior. Thus, the Incident Command approach deserves significant evaluation by researchers for its effectiveness. According to Wenger, multidisciplinary research is also needed on the efficacy of evacuation, in-place sheltering, mass inoculation and mass quarantine efforts. Wenger stated the appropriateness and limitations of these measures for a wide variety of natural, biological, chemical, and nuclear hazards must be examined.

Michael Lindell, Director, Hazard Reduction and Recovery Center, **Texas A&M University**, explained how his staffing analysis of emergency management led him to conclude that there is not much

research on what the job of an emergency manager is really like. Lindell posed a question to the audience—"Where are the applicant pools for emergency management positions?" He disclosed that many emergency managers are volunteers or part-time workers who may not even have adequate resources. Many emergency managers have police, fire service, or emergency medical backgrounds while others emerge from university or college programs. Today, emergency managers are being asked to devise scenarios of emergency response to weapons of mass disaster events while they must simultaneously address more common and probable types of disasters and emergencies. Lindell, like J. R. Thomas, maintained that emergency managers need to be familiar with basic public administration and public budgeting. In terms of the appraisal of emergency management work performance, Lindell was disappointed to discover in his research that authorities sometimes do not evaluate this kind of work at all. Furthermore, matters of compensation, tangible and intangible rewards, and tenure on the job are seldom systematically analyzed. Dr. Lindell posed the question of how much emergency management software contributes to emergency management work and information needs for hazard vulnerability analysis (HVA). He also asked what knowledge, skills, and material resources do local emergency managers need to perform HVAs? In particular, he discussed the utilization of HAZUS (Hazards U.S.), a version of emergency management software that employs geographic information systems (GIS) for hazard mitigation. HAZUS is a natural hazard loss estimation methodology developed by FEMA under contract with the National Institute of Building Sciences.[12] HAZUS loss simulation models contribute to emergency management by making credible hazard vulnerability analysis possible in order to further more precise disaster impact projections. Lindell concluded by asking what new measurement tools are needed for guiding and monitoring disaster recovery, especially managing "unmet needs"?

John Pine, Professor in the Department of Environmental Studies at **Louisiana State University**, works as director of the Disaster Science and Management Program. Dr. Pine presented some of the developments for emergency management, such as remote sensing of environmental data, new sources of land elevation data using LIDAR (Light Detection And Ranging), digital flood maps, and impact analysis for flooding and air dispersion modeling, to name a few. Pine also discussed the opportunities provided by HAZUS, by which science and technology have become more specialized and various technologies have become essential tools of academic work. HAZUS-MH (Multi Hazard), applying standardized methodology in a software program that contains models for estimating potential losses from earthquakes, floods, and hurricanes, is to be released in August 2003. It promises to characterize events at a very detailed level, and to facilitate use in real time to support response and recovery following natural disasters.

[12] HAZUS: Natural Hazard Loss Estimation Methodology. 2003. Online: <http://www.fema.gov/hazus/hz_index.shtm>. Accessed: July 2003.

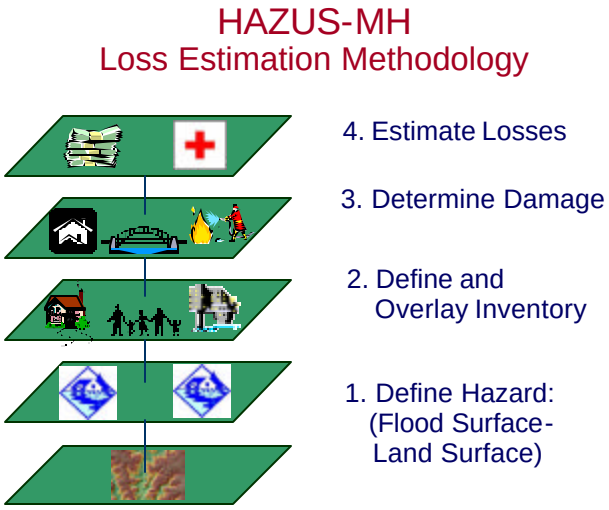

Figure 3. HAZUS-MH Loss Estimation Model. Source: Presentation by John C. Pine, June 13, 2003.

Programs such as HAZUS serve education and training needs on several levels and help emergency management practitioners to better understand physical phenomenon. Dr. Pine concluded with a system focus of future research needs: 1) clarify the role of the emergency manager, 2) facilitate realistic expectations, 3) integrate technology into the system, 4) access and integrate data in a timely fashion, and 5) examine human and system factors.

In discussing the research needed for the emergency manager of the future, emphasis was given to interdisciplinary and multidisciplinary research. This was seen as especially important when analyzing the effectiveness of alternative models for managing emergency preparedness and response activities. It was noted that it would be advantageous for research initiatives to integrate applied research, case studies, and field experiments. The need for the development of more effective technologies, warning systems, and decision support systems was also discussed as well as the need to apply existing technology and knowledge in the emergency management enterprise.

THE ROLE OF TECHNOLOGY IN FURTHERING THE EFFECTIVENESS OF EMERGENCY MANAGEMENT

This moderated discussion consisted of experts familiar with modern technological tools, such as GIS, that can help meet today and tomorrow's emergency management challenges. The use and deployment of such tools for emergency management planning, response, communication, and other relevant activities were discussed. William "Al" Wallace, Professor, Rensselaer Polytechnic Institute, New York moderated this panel discussion.

John Young, Director, **Enterprise Solutions, ESRI,** stated that geographic information systems (GIS) "are more than maps." He said that GIS aids in management, is a tool for information sharing, provides an integrating framework for people working on widely different dimensions of the same problem, and offers decision support in times of crisis or emergency. Young added that ESRI GIS products compile prodigious quantities of geospatial data that researchers or managers may link to other sources of data and subsequently analyze. He emphasized that fixed sensor detection systems linked to GIS information bases may make it possible for emergency managers at an emergency operations center to know more about the spatial dimensions or characteristics of disasters or emergencies as they occur. Young provided a scenario of a hazardous chemical release and how GIS technologies can further emergency management. He noted that plume modeling over GIS mapped terrain and demographic areas serve a vital role in evacuation management and modeling around nuclear or chemical facilities.

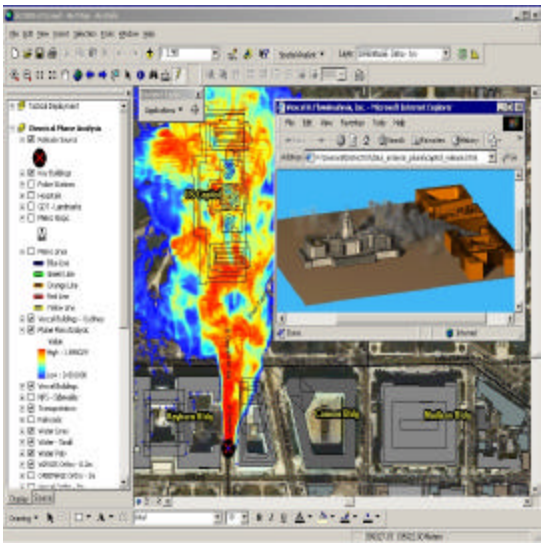

Figure 4. GIS Analysis of chemical plume spreading over Washington, DC. Source: Presentation by John Pine, June 13, 2003.

GIS and Global Positioning System (GPS) technology might make it easier for emergency managers to identify who among their personnel is in an unsafe location. Tablet personal computers and hand held palm-top computer devices operated in wireless mode might help revolutionize future emergency responses. Young indicated that GIS serves recovery operations via monitoring contamination in spatial terms, marshals data, and even provides a means of managing and documenting workflow in emergency management. GIS helps present a common operational picture such that the enterprise of emergency management is both data and network centric.

Matt Walton, President, **E-Team, Inc.,** was responsible for the transition of E-Team's software from military to commercial use through a public/private partnership with the City of Los Angeles, and its

widespread adoption among leading government and corporate organizations. E Team, Inc. provides collaborative software to public agencies and corporations for use in emergency response management, facility and event security, disaster preparedness and recovery, and business continuity. Mr. Walton predicted that a new challenge is to prepare emergency managers to work in a wireless fashion. He anticipates that more emergency managers will be prepared for regional deployment and will get "pull downs" of city specific information and broad national overviews (e.g., displaying the location of various emergency resources or specialists). Walton presented five key sets of emergency management players: 1) software vendors, 2) system integrators, 3) corporations (i.e., Microsoft, Oracle, etc.), 4) government agencies, and 5) non-profit organizations. He stated that another challenge will be establishing an Emergency Management (EM)-XML consortium able to produce verified and validated XML conventions and compliance standards. XML, or Extensible Markup Language, can be used to store any kind of structured information, and to enclose or encapsulate information in order to pass it between different computing systems which would otherwise be unable to communicate[13]. Walton serves as Chairman of the EM-XML Consortium, a public/private effort that is working closely with the Department of Homeland Security to develop effective interoperability standards for emergency response using Internet services. Mr. Walton favors allowing emergency managers to practice and beta test E-Team system products. He expects his firm and others to build partnerships with academics and their institutions, sharing data as they proceed. Walton expressed the view that the tools now available are "knowledge discovery" tools, but he warned that these tools cannot be the decision maker.

This session revealed how technology enhances interoperability, allowing for multi-agency deployment, which can further the effectiveness of emergency management. One attendee noted that the problem with interoperability relates more to human behavior not technology. Recognizing this challenge, it was stated that technology tools are available across the spectrum and can be chosen to fit behavioral models that reflect emergency management exercises and meet the ability of the users. It was stated that software assists in the decision making process, where the humanistic components are heuristic based on situation awareness, identification needs, available resources, and accountability, to name a few. Decision-making software tools are designed to facilitate accountability and liability, in addition to providing information for people to make informed decisions.

[13] Flynn, Peter. 2003. The XML Faq. Online: <http://www.ucc.ie:8080/cocoon/xmlfaq#acro>. Accessed: July 2003.

This session was a moderated panel discussion with emergency management researchers and practitioners at the beginning of their careers. Each of the speakers provided their perspectives regarding tomorrow's challenges and opportunities for research and practice in the emergency management field.

James Kendra, Research Coordinator, Disaster Research Center, **University of Delaware**, and Assistant Professor in the Department of Public Administration at **University of North Texas,** identified various challenges facing emergency managers, from earthquakes, tornadoes, and chemical spills to threats of terrorist attacks and weapons of mass destruction. Dr. Kendra suggested that future emergencies might be characterized by ambiguity about when they begin or end, and might occur in sequences that are difficult to understand. Emergency management is shifting so that even familiar hazards and emergency management needs will be viewed differently. Kendra also conveyed the need for research to be translated into practice. As such, close collaboration between researchers and practitioners is an urgent matter.

Ethan Beckcom, Student, **Arkansas Tech University**, discussed his experience at a Disaster Resistant University (DRU) and its benefits to everyone, including entire communities, current emergency managers/public officials, and future emergency managers. Mr. Beckcom explained how DRU is much like Project Impact[14], except on a campus level instead of a community level. Within a DRU, students get to work on an Emergency Operations Plan (EOP) or Emergency Action Plan (EAP) as a part of making their university disaster resistant. To make Arkansas Tech University a disaster resistant university, some students are currently working on the logistics, using a four phase approach consisting of 1) organizing their resources, 2) hazard identification and risk assessment, 3) developing the mitigation plan, and 4) adoption and implementation. DRU, a program created by FEMA, has components of research developed and funded by the University of California, Berkeley. DRUs were established to not only promote disaster mitigation in the nation's universities, but also to reduce the impact of any hazard that a specific university may face. FEMA intends to award grant assistance to various universities to reduce and manage their vulnerability to hazards. This initiative facilitates the development of loss reduction measures to avoid damages that may kill or injure students, faculty and staff, cost millions to repair, interrupt teaching and harm research activities. The University benefits as a participant by receiving national recognition for being considered disaster resistant.

[14] Project Impact communities initiate mentoring relationships, private and public partnerships, public outreach and disaster mitigation projects to reduce damage from potentially devastating disasters. Previous community projects have included creating disaster resistance strategies, revising local building and land use codes, and passing bond issues to construct prevention measures that will impact the entire community.

Chris Wright, Manager, Emergency Operations, **Amgen Inc**., is responsible for the Emergency Planning, Mitigation, and Training Programs and for the operation of the Corporate Emergency Operations Center (EOC). He stated how the next generation will likely be comprised of more corporate practitioners because of boardroom recognition of need, insurance constraints, increased monetary loss due to incidents, smarter emergency managers, and public sector budget constraints. Some reasons for more corporate practitioners as emergency managers may be attributed to e-businesses, global business environment, 24/7 operations, and insurance coverage limits and expenses. To better address these exposure losses, Wright emphasizes better preparedness and the need for an "all-hazards" approach. Better mitigation should include nonstructural elements as well as structural mitigation. According to Mr. Wright, some needs for the future include more research specific to the private sector, partnerships, and educational programs. Mr. Wright also encouraged the research community to reach out to the corporate sector and ask boldly for assistance with programs.

From this final session, the discussion covered the evolution of emergency management and trends for the next generation of managers. A participant predicted that in the future corporate enterprises may lean more towards emergency management, whereas non-corporate enterprises may focus on risk management. It was noted that because society is rapidly and constantly changing the responsibilities and tasks of future emergency managers may look quite different than they do today. Thus a question was posed as to whether or not emergency managers may become obsolete. However, the panelists did not feel that this would occur. One panelist mentioned that some of the trends may change to involve risk management as a part of emergency management, and that there will be many opportunities for emergency managers to pursue in order to ward off obsolescence. Some of the panelists also commented on the need for proactive approaches in terms of more research, training, and outreach to the private sector.

WRAP-UP: WHERE HAVE WE COME FROM AND WHERE ARE WE GOING?

This workshop unveiled and addressed some of the challenges and opportunities that the emergency manager of the future will have to face in a society that is constantly changing. Some of the key observations from the workshop are summarized as follows:

- The emergency manager of the future will need to assess major trends in society related to such aspects as population, organization, environment, and technology.

- Ideally, the emergency manager of the future will have some understanding of matters related to a broad range of issues, including criminal justice, seismology, public administration, and community planning, to name a few.
- There is a need to maintain an "all-hazards" approach for effective mitigation/prevention, preparedness, and response and recovery efforts.
- Better relationship building and collaboration, especially between researchers and practitioners, are important for the advancement of emergency management.
- Technology and research should also play a vital role in the advancement of emergency management.

The workshop concluded with final remarks from the audience and Mr. Stanley, who adjourned the workshop.

APPENDIX A

June 13, 2003
Washington, DC

AGENDA

8:30 AM **Welcome and Introductions**
William H. Hooke, DR Chair, American Meteorological Society

8:35 AM **Emergency Management Overview and Forum Objectives**

Ellis M. Stanley, Sr., CEM, DR Steering Committee, General Manager, City of Los Angeles Emergency Preparedness Department

8:45 AM **Facing New Challenges**
"A World in Flux: Emergency Management Challenges and Opportunities"

Thomas Drabek, Professor of Sociology, University of Denver
Dr. Drabek will address the future from the perspective of his forty years of conducting research on emergency management.

9:15 AM **Today and Tomorrow's Challenges: Views of Practitioners and Decision Makers**

Moderator: *Ellis M. Stanley, Sr.*, CEM, DR Steering Committee, General Manager, City of Los Angeles Emergency Preparedness Department

Moderated discussion with emergency management experts and decision makers to discuss challenges that future emergency managers will face based on the anticipated vulnerability of the nation to particular types of risks, such as natural, technological and human-induced hazards. The challenges they consider will include resource and institutional problems, and the need for all-hazards planning and interoperability. Possible solutions to such challenges will be discussed in later sessions.

Eric Tolbert, Director, Response Division, FEMA, Department of Homeland Security

J.R. Thomas, CEM, Director, Franklin Co. Emergency Management Agency, and President, the International Association of Emergency Managers

10:00 AM Questions and Discussion

10:30 AM Break

10:45 AM **Higher Education Needs of the Emergency Manager of the Future**

Moderator: ***Lacy Suiter,*** **Navy Post Graduate School**

Moderated discussion with experts involved in emergency management studies programs. They will offer their views on how university-based programs can best meet the needs of future emergency managers and decision makers given the challenges they will face this century.

John R. Harrald, Director, Institute for Crisis, Disaster and Risk Management, George Washington University

B. Wayne Blanchard, Higher Education Project Manager, Emergency Management Institute, Federal Emergency Management Agency

Brenda Phillips, Professor, Institute for Emergency Preparedness, Jacksonville State University, Alabama

11:30 AM Questions and Discussion

12:00 noon Lunch break (cafeteria available)

1:10 PM **Research Needed to Support the Emergency Manager of the Future**

Moderator: *Ann-Margaret Esnard*, DR Member, Cornell University

Moderated discussion with representatives from the research and practice communities to discuss major research that is needed to help advance the field of emergency management and how to transfer the knowledge to end-users once the research results have been obtained.

Dennis Wenger, Program Director, National Science Foundation

Michael Lindell, Director, Hazard Reduction And Recovery Center, Texas A&M University

John Pine, Professor, Louisiana State University

1:55 PM Questions and Discussion

2:15 PM **The Role of Technology in Furthering the Effectiveness of Emergency Management**

Moderator: *Al Wallace*, Rensselaer Polytechnic Institute, New York

Moderated discussion with experts familiar with modern technological tools, such as GIS, that can help meet today and tomorrow's emergency management challenges. They will discuss the place of such tools for emergency management planning, response and communication and other relevant activities.

Matt Walton, President, E-Team, Inc.

John Young, Director, Enterprise Solutions, ESRI

3:00 PM Questions and Discussion

3:20 PM Break

3:55 PM **The Next Generation**

Moderator: *David Applegate,* DR Steering Committee Member, Director, Government Affairs, American Geological Institute

Moderated discussion with emerging experts at the beginning of their careers. They will provide their perspectives regarding tomorrow's challenges and opportunities for research and practice in the emergency management field.

James Kendra, Research Coordinator, Disaster Research Center, University of Delaware and Assistant Professor, University of North Texas

Ethan Beckcom, Student, Arkansas Tech University

Chris Wright, Manager, Emergency Operations, Amgen Inc.

4:20 PM Questions and Discussion

4:40 PM **Wrap Up: Where have we come from and where are we going?**

Moderators: *William Hooke,* DR Steering Committee Chair, American Meteorological Society and *Ellis Stanley, Sr*., CEM, DR Member, General Manager, City of Los Angeles Emergency Preparedness Department

All participants should be thinking about key research questions and lessons learned from the day. This will be an open discussion to sum up what we learned, what we still need to learn, and how we may go about doing this. Audience members are the key participants in this discussion.

5:30 PM Adjourn

APPENDIX B

LIST OF ATTENDEES

Beverly Allen, ALCOSYS, Inc.
Stephen Ambrose, National Aeronautics and Space Administration
William Anderson, National Research Council
Kasse Andrews-Weller, U.S. Air Force
David Applegate, American Geological Institute
Michael Armstrong, ICF Consulting
Sandy Baer, Nextel
Ethan Beckcom, Arkansas Tech University
Stephen Bender, Organization of American States
B. Wayne Blanchard, Federal Emergency Management Agency
Andrew Bruzewicz, U.S. Army Corps of Engineers
Jane Bullock, Bullock and Haddow, LLC
Keith Bushey, George Mason University
Burnice Cain, ComCare Alliance
Arthur Candenquist, Amtrak
Damon Cappola, George Washington University
Peter Casals, International Association of Emergency Managers
Robert L. Chartrand, Center for Strategic and International Studies
William Choate, BCS, Inc.
Ross Corotis, University of Colorado
William R. Cumming, Vacation Lane Group
Dale Dague, U.S. Forest Service
Tom Donaldson, National Weather Service
Thomas Drabek, University of Denver
Robert J. Dumont, National Oceanic and Atmospheric Administration
Douglas A. Ehrhardt, Uniform Services University of Health Services
Erdem Ergin, George Washington University
Ann-Margaret Esnard, Cornell University
Derek Estes, Washington, DC Emergency Management Agency
Leanna Falkiner, Institute for Catastrophic Loss Reduction
Lee Finewood, National Research Council
Don Geis, Geis Design-Research Associates
Jeffrey Glick, Federal Emergency Management Agency
Daniel Glucksman, International Safety Equipment Association
Paula Gordon, George Washington University
Valerie Gregg, National Science Foundation
George Haddow, Bullock and Haddow, LLC
Jack Harrald, George Washington University
Tom Hassler, VEMA
Monique Hite, National Research Council

William Hooke, American Meteorological Society
Patricia Jones Kershaw, National Research Council
James Kendra, University of Delaware
Mila Kennett, Federal Emergency Management Agency
Karitha KIailasam, ARC
Butch Kinerney, U.S. Geological Survey
Richard Kuchnicki, International Code Council
Quon Kwan, Federal Transit Administration
Matthew Ladd, ARC
Buck Latapie, U.S. Forest Service
Ray Lehr, Northgro Grumman
Elizabeth Lemersal, Federal Emergency Management Agency
Marc Levitan, Louisiana State University
Michael Lindell, Texas A&M University
Nicholas Lum, U.S. Department of Transportation
Kevin Lynott, National Oceanic and Atmospheric Administration
Harold M. Baker, Virgin Islands Territorial Emergency Management Agency
Steve Maguire, U.S. Department of Transportation
Margaret McCalla, National Oceanic and Atmospheric Administration
Christine McCoy, Rural Community Assistance Program
Carolyn McMahon, American Meteorological Society
Dave McMillion, National Emergency Management Association
Jim McPheeters, McManis & Monsalve Associates
Susan Mockler, The Research Group
Ugo Morelli
Richard Murname, Risk Prediction Initiative
Jim Murphy, Michael Baker, Inc.
Joanne Nigg, University of Delaware
Robert O'Connor, National Science Foundation
Brenda Phillips, Jacksonville State University
Brenda Phillips, University of Massachusetts
John Pine, Louisiana State University
Lewis Podolske, Homeland Security Council
Carla Prater, Texas A&M University
Thomas Roston, U.S. Department of Transportation
Clair B. Rubin, George Washington University
Mary Kate Rubin, GRS
Emily Scott, American Geological Institute
Monica Severson, SRA International
Porter Shellhammer, Sarasota County Fire Department
Mark Siegel, University of the District of Columbia
Roylando A. Smith, Sr., Virgin Islands Territorial Emergency Management Agency
Daryl Spiewak, International Association of Emergency Managers
Eugene Stallings, National Hydrologic Warning Council
Ellis M. Stanley, City of Los Angeles
Laura Steinberg, Tulane University
Charles M. Stahl
Joe Steller, National Institute of Building Sciences
Lacy Suiter, Naval Postgraduate School
Richard Sylves, University of Delaware
K. Thirumalai, U.S. Department of Transportation

Greg Thomas, CSOSA
J. R. Thomas, International Association of Emergency Managers
Eric Tolbert, Federal Emergency Management Agency
Susan Tubbesing, Earthquake Engineering Research Institute
Maria J. Vorel, Federal Emergency Management Agency
Daniel Wako, ARC
William (Al) Wallace, Rensselaer Polytechnic Institute
Matt Walton, E-Team, Inc.
Maria Weir, ARC
Dennis Wenger, National Science Foundation
Joel Widder, CalTech
Don Winter, DW Consulting Services
Chris Wright, Amgen, Inc.
Kemi Yai, National Research Council
John Young, ESRI
William Yurcik, National Center for Supercomputing Applications

APPENDIX C

SPEAKERS BIOS

Applegate, David- Dr. Applegate is the American Geological Institute's Director of Government Affairs and Editor of Geotimes, AGI's newsmagazine of the earth sciences. He also teaches in the Environmental Sciences and Policy master's degree program at The Johns Hopkins University. Before arriving at AGI in 1995, he served with the Senate Committee on Energy and Natural Resources as the American Geophysical Union's Congressional Science Fellow and as a professional staff member for the minority. Born and raised in Chambersburg, Pennsylvania, he holds a B.S. in geology from Yale University and a Ph.D. in geology from the Massachusetts Institute of Technology.

Beckcom, Ethan- Mr. Beckcom is a senior at Arkansas Tech University majoring in Emergency Administration and Management. He is the first student to sit on the board of directors and represent the students for the International Association of Emergency Managers (IAEM). Mr. Beckcom is currently doing an internship for the Brazos River Authority.

Blanchard, B. Wayne- Dr. Blanchard works with the Emergency Management Institute of the Federal Emergency Management Agency (FEMA) as a Higher Education Project Manager. He also serves as FEMA's Commissioner to the International Association of Emergency Manager's Certified Emergency Manager. Dr. Blanchard's disaster experience includes Hurricane Andrew, Mid-West Floods of '93, Northridge Earthquake. He received a Ph.D. in Government and Foreign Affairs from the University of Virginia, B.A. in Political Science from University of North Carolina at Charlotte, and Minor in Philosophy, Mount St. Mary's College. He has conducted graduate work in Theology at Mount St. Mary's Seminar. Dr. Blanchard has served as adjunct instructor at the Shenandoah University in Winchester, Virginia and Florida Atlantic University in Boca Raton.

Drabek, Thomas- Dr. Drabek is the John Evans Professor in the Department of Sociology and Criminology at the University of Denver. He joined the University of Denver faculty in 1965 after completion of graduate studies at The Ohio State University where he was employed by the Disaster Research Center. He has published nearly 100 journal articles and 25 books including *Human System Response to Disaster* (1986), *The Professional Emergency Manager* (1987), *Emergency Management: Strategies for Maintaining Organizational Integrity* (1990), *Disaster Evacuation and the Tourist Industry* (1994), *Disaster-Induced Employee Evacuation* (1999), and *Strategies for Coordinating Disaster Responses* (2003). He was senior editor (with G. Hoetmer) of *Emergency Management: Principles and Application for Local Government* published by the International City Management Association (1991) and has prepared three *Instructor Guides* for courses sponsored by FEMA's Higher Education Project, e.g., *Sociology of Disaster* (1996). Currently, he is revising the first of these, which is entitled *Social Dimensions of Disasters.*

Esnard, Ann-Margaret- Dr. Esnard is Assistant Professor and Director of GEDDeS GIS Computer Lab in the Department of City and Regional Planning at Cornell University (1997-present). Prior to her appointment at Cornell she was a Research Associate/Instructor at the Institute of Transportation Research and Education at North Carolina State University (1997). Her teaching and research interests lie in land use and environmental planning, natural and environmental hazard assessment and mitigation, environmental justice, spatial analysis, and Geographic Information Systems. Her many honors and awards include the 2001 American Institute of Certified Planners (AICP) President's Award and the Cornell Outstanding Educator

Award. Esnard holds a Ph.D. in regional planning from the University of Massachusetts, Amherst, an M.S. in agronomy and soils from the University of Puerto Rico, Mayaguez, and a B.S. in agricultural engineering from the University of the West Indies, Trinidad.

Harrald, John (Jack)- Dr. Harrald is the Director of The George Washington University Institute for Crisis, Disaster, and Risk Management and a Professor of Engineering Management in the GWU School of Engineering and Applied Science. He is a founding member, Director, and Immediate Past President of The International Emergency Management Society (TIEMS) and is a former Director of the Disaster Recovery Institute (DRI). He is Executive Editor of the electronic *Journal of Homeland Security and Emergency Management* and Associate Editor of the *International Journal of Emergency Management*. He served as the Associate Director of the National Ports and Waterways Institute for ten years. Dr. Harrald has been actively engaged in the fields of emergency, consequence and crisis management and maritime safety and port security and as a researcher in his academic career and as a practitioner during his 22-year career as a U.S. Coast Guard officer, retiring in the grade of Captain. He writes, publishes, and consults in the fields of crisis management, emergency management, risk and vulnerability analysis, and transportation safety and security. Dr. Harrald received his B.S. in Engineering from the U.S. Coast Guard Academy, a M.A.L.S. from Wesleyan University, a M.S. from the Massachusetts Institute of Technology where he was an Alfred P. Sloan Fellow, and an M.B.A. and Ph.D. from Rensselaer Polytechnic Institute.

Hooke, William H.- Dr. Hooke is a senior policy fellow and the director of the Atmospheric Policy Program at the American Meteorological Society. Prior to this, he worked for the National Oceanic and Atmospheric Administration (NOAA) and antecedent agencies for 33 years. After six years of research with NOAA he moved into a series of management positions including chief of the Wave Propagation Laboratory Atmospheric Studies Branch, director of NOAA's Environmental Science Group (now the Forecast Systems Lab), deputy chief scientist, acting chief scientist of NOAA. Between 1993 and 2000, he was also director of the U.S. Weather Research Program Office, and chair of the Interagency Committee on Environment and Natural Resources. Prior to NOAA, he was a faculty at the University of Colorado from 1969 to 1987. Dr. Hooke holds a B.S. in physics (with honors) from Swarthmore College, an S. M. and a Ph.D. from the University of Chicago.

Kendra, James- Dr. Kendra is the Research Coordinator at the University of Delaware Disaster Research Center and an assistant professor in the Department of Public Administration at the University of North Texas. His research interests include organizational resilience and crisis management. Dr. Kendra is currently devoting most of his attention to a study of the emergency response to the World Trade Center attack. Beginning within two days of the attack, Dr. Kendra and other DRC researchers observed various aspects of the multi-agency coordination of resources and information, including the reestablishment of the Emergency Operations Center after the destruction of the primary facility. They also visited other sites that were significant in the emergency response, including incident command posts located close to Ground Zero, respite facilities, and other emergency management operations throughout the city. A licensed unlimited tonnage master mariner, Dr. Kendra maintains considerable interest in maritime hazards.

Lindell, Michael K- Dr. Lindell has 30 years of experience in the field of emergency management, conducting research on community adjustment to floods, hurricanes, earthquakes, volcanic eruptions, and releases of radiological and toxic materials. He recently completed the development of a hurricane contingency planning guide for the Texas Division of Emergency Management and is just beginning two projects. One of these is a National Science Foundation funded study to develop a hurricane evacuation management decision support system and the other is a Federal Emergency Management Agency funded project to write an introductory textbook on emergency management. Professor Lindell worked for many years as an emergency preparedness contractor to the U.S. Nuclear Regulatory Commission and trained as a Hazardous Materials Specialist at the Michigan Hazardous Materials Training Center. He has served as a consultant on chemical and nuclear emergency planning to numerous private companies and government

agencies, including the International Atomic Energy Agency. He has made 120 presentations before scientific societies and emergency planners in this country and abroad and is the author of over 120 technical reports and journal articles, and 5 books.

Phillips, Brenda- Dr. Phillips is Professor of Emergency Management at Jacksonville State University. Dr. Phillips directs the Emergency Preparedness Applied Research Center. She teaches Introduction to Emergency Management, Disaster Recovery, Emergency Management Leadership and Populations at Risk. Her research projects include long-term recovery of low-income and minority groups and disaster warnings to the Deaf and hard-of-hearing. Dr. Phillips participates in community-based threat assessment and emergency response planning with a particular focus on school safety. She leads the JSU technical secretariat to support the Hemispheric Eduplan at the Organization of American States Natural Hazards Project (http://www.oas.org/nhp). She is also Secretary-Treasurer for the International Research Committee on Disasters which publishes the International Journal of Mass Emergencies and Disasters and participates in the Gender and Disaster Network (http://online.northumbria.ac.uk/geography_research/gdn).

Pine, John- Dr. Pine is a professor in the Department of Environmental Studies and an adjunct professor in the Department of Management at Louisiana State University. Dr. Pine also serves as the Director of Disaster Science and Management Program. He received his Ph.D. in Higher Education & Public Administration from the University of Georgia, M.Ed. in Adult Education & Counseling from the University of Georgia, and B.A. in History from Rhodes College. Prior to his current position, Dr. Pine worked as a public service associate for the Institute of Georgia at the University of Georgia from 1972 to 1980 and as a public management associate governmental services institute at the Louisiana State University from 1988 to 1992. Dr. Pine has sponsored several research efforts and has published his work in scholarly journals.

Stanley, Ellis M., Sr.- Mr. Stanley is the general manager of the Emergency Preparedness Department for the City of Los Angeles, California. Prior to this position, he served as director of the Atlanta-Fulton County Emergency Management Agency, where he had been an emergency manager since 1975. He is an adjunct instructor at the Emergency Management Institute and has served on the Board of Visitors of the National Emergency Training Centers, Emergency Management Institute. He is a past president of the National Coordinating Council on Emergency Management and currently chairs its International Development Committee and its Certification Commission. He is president-elect of the American Society of Professional Emergency Planners. He serves on the advisory board of the National Institute for Urban Search and Rescue, the National Weather Services' Modernization Committee, and other organizations. He is a Certified Emergency Manager (CEM).

Suiter, Lacy E.- Mr. Suiter is Mobile Education Team Coordinator for the Naval Postgraduate School. He was appointed Executive Associate Director for Response and Recovery by FEMA Director James Lee Witt in October 1996, after spending two years as the agency's head of the Office of Policy and Assessment. In his current position, Lacy is responsible for the planning and execution of the federal government's response to major disasters and emergencies. He is also responsible for the multi-billion dollar Individual and Public Assistance Grant Programs authorized by the Robert T. Stafford Disaster Relief and Emergency Assistance Act. Lacy also serves as special advisor to the Director Witt, and served as the Federal Coordinating Officer for the federal response to Hurricane Fran, in North Carolina. His posts have included the National Academy of Science's board on natural disasters, the advisory board of the University of Colorado's Natural Hazards Center, the peer review committee of the Yucca Mountain high-level radioactive disposal project, and the Latin American Partnership. Lacy also chaired the Central United States Earthquake Consortium from 1983 to 1994 and was president of the National Emergency Management Association from 1984 to 1985. A native of Tennessee, Lacy earned a B.S. in general business from the Middle Tennessee State University.

Thomas, J.R.- Mr. Thomas is the current President of the International Association of Emergency Managers and Director of the Franklin County Emergency Management Agency in Columbus, Ohio. Mr. Thomas has been with the agency since 1984 and Director since January 1992. He has a Bachelor's degree in Secondary Education and a Master of Arts degree with an emphasis in Political Science from the Ohio State University. J. R. has also received his Certification in Emergency Management from the International Association of Emergency Managers and completed the Federal Emergency Management Agency's Professional Develop Series.

Tolbert, Eric- Mr. Tolbert is Director of the Response Division for the Department of Homeland Security – Emergency Preparedness and Response Directorate. Mr. Tolbert started with the Federal Emergency Management Agency (now part of DHS) in March 2002 as the Deputy Director of the Office of National Preparedness, coordinating federal efforts to assist state and local emergency management and emergency response organizations. Immediately prior to that he was director of the North Carolina Division of Emergency Management, where he developed and managed the state's comprehensive emergency management system. He began his emergency management career in 1976 on the front line in North Carolina as a Paramedic, and later became emergency services director for Caldwell County. He then was named emergency management area coordinator, and later Assistant Director for the state of North Carolina. Mr. Tolbert then moved to the Florida Division of Emergency Management, where he was preparedness and response bureau chief for four years before returning to North Carolina as state director of emergency management. He is the immediate past president of the National Emergency Management Association (NEMA). He has served as chairman of the North Carolina Emergency Response Commission, as a member of the Federal Emergency Management Agency's Urban Search and Rescue Advisory Committee and the Emergency Management Institute's Board of Visitors.

Wallace, William (Al)- Dr. Wallace is a Professor in the Decision Sciences and Engineering Systems, Civil Engineering, and Cognitive Science Departments at Rensselaer Polytechnic Institute, and is presently Research Director of Rensselaer's Center for Infrastructure and Transportation Studies. He has held many appointments and positions abroad, including Visiting Professor, Systems Engineering and Policy Analysis, Delft University of Technology, Visiting Professor, Polyproject: Risk and Safety of Technical Systems, Swiss Federal Institute of Technology, Zurich, and a U.S. faculty member at the Dalian Institute of Technology, Dalian, China. He was a research scientist at the International Institute of Environment and Society, Science Center, Berlin, Germany. In addition, he has been a visiting professor at the University at Albany and Carnegie-Mellon University. Wallace has completed assignments as Consultant, Board on Infrastructure and the Constructed Environment, National Research Council, and Expert, Civil and Mechanical Systems Division, National Science Foundation. He received the International Emergency Management and Engineering Conference Award for Outstanding Long-Term Dedication to the Field of Emergency Management and The Institute of Electrical and Electronics Engineers (IEEE) Third Millennium Medal, and is a Fellow of the IEEE. Professor Wallace received his bachelor's in chemical engineering from the Illinois Institute of Technology, and his M.S. and Ph.D. in management science from Rensselaer, and is a Navy veteran.

Walton, Matt S. – As Vice Chairman and Founder, Matt Walton possesses more than 20 years of management experience and is actively involved in company evangelism and business development. Mr. Walton was responsible for the transition of E Team's software from military to commercial use through a Public/Private partnership with the city of Los Angeles, and its widespread adoption among leading government and corporate organizations, including the City of New York, where it was used for the city's response to the September 11, and the 2002 Winter Olympics. Mr. Walton also serves as Chairman of the EM-XML Consortium, a public/private effort which is working closely with the Department of Homeland Security to develop effective interoperability standards for emergency response using Web services. Prior to founding E Team, Mr. Walton served as Executive Vice President of Marketing and Strategy at Illusion, Inc. an engineering company that specialized in the development of networked interactive systems for clients as diverse as the Defense Advanced Research Projects Agency and the Sahara Hotel in Las Vegas. For 12 years,

Mr. Walton was Managing Principal and Director of the Sales Management Practice of Sibson Company Inc., a leading management consulting firm that focuses on organizational planning and effectiveness. During this time, he served more than 100 clients in the high-tech and entertainment sectors. He was also a consultant at Towers, Perrin in the areas of marketing, strategy and organizational design. Mr. Walton has a B.A. from Brown University and an M.B.A. from Yale University School of Management.

Wenger, Dennis- Dr. Wenger has been engaged in research on hazards and disasters for over 35 years. In addition to currently serving as a program director at the National Science Foundation, he is also the founding director and senior scholar at the Hazard Reduction & Recovery Center at Texas A&M University where he is also professor of urban and regional planning and adjunct professor of sociology. Prior to coming to Texas A&M, Dr. Wenger was the co-director of the Disaster Research Center at the University of Delaware. Dr. Wenger's research has focused upon the social aspects of natural, technological, and human-induced disasters. Specifically, he has studied such topics as local emergency management capabilities and response, police and fire planning and response to disasters, search and rescue and the delivery of emergency medical services, mass media coverage of disasters, warning systems and public response, factors related to local community recovery success, and disaster beliefs and emergency planning. He undertook the only empirical study of the evacuation of the World Trade Center towers after the first terrorist attack in 1993 and served as the principal investigator for the first project to "Enable the Future Generation of Hazard Researchers." He is the author of numerous books, research monographs, articles and papers.

Wright, Chris- Mr. Wright is responsible for the Emergency Planning, Mitigation and Training Programs as the Manager of Emergency Operations for Amgen Inc., located in Thousand Oaks, California. He is also responsible for the operation of the Corporate Emergency Operations Center (EOC). He previously developed comprehensive emergency response programs for Warner Bros. Studios, Gibraltar Savings and First Interstate Bankcard. Chris is on the Business and Industry Council for Emergency Planning and Preparedness (BICEPP) Board of Directors and currently serves as Vice-President of this organization. He has coordinated several BICEPP projects including the Staying Open for Business after Disasters small business workshop and the Mortality Management Workshop. Chris also has served as the President and Vice President of the Los Angeles Chapter of Association of Contingency Planners (ACP). Chris also served a 2-year term on the National Board of ACP.

Young, John P.- Mr. Young is Director, Enterprise Solutions, for the Environmental Systems Research Institute (ESRI). He oversees ESRI provision of Geographic Information System (GIS) solutions for military and intelligence community customers. He manages Defense operations in ESRI's Washington, D.C. office; coordinates Defense-related sales, service, and software engineering initiatives across the United States; and works with an extensive network of ESRI Defense business partners. Prior to joining ESRI, Mr. Young served for 22 years in the U.S. National Security Community. He managed components responsible for assessing defense capabilities, as well as components providing information technology support to operations. In his final assignment he served as Chief Information Officer in an Intelligence Agency. Mr. Young is a graduate of the Universities of Washington and Wisconsin, and of the U.S. National War College.