From Forest Fires to Hurricane Katrina: Case Studies of Incident Command Systems

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IBM Center for
**The Business
of Government**

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On behalf of the IBM Center for The Business of Government, we are pleased to present this report, "From Forest Fires to Hurricane Katrina: Case Studies of Incident Command Systems," by Donald P. Moynihan.

Conventional wisdom pits hierarchical organization models against network-based organization models. This report describes how the two approaches can be successfully blended in special circumstances: responding to emergencies.

The success of the Incident Command System (ICS) as a hierarchical-network organizational model in emergencies such as forest fires led to its being designated by the federal government as the preferred approach for responding to emergencies. However, it seemingly failed in the response to Hurricane Katrina. Professor Moynihan examines the Katrina case, as well as others, and identifies the conditions under which the ICS approach can be successful.

Moynihan offers a series of recommendations for managing in hierarchical networks like the ICS. These include pre-crisis actions—for example, training responders in the ICS approach—and actions during a crisis—for example, creating access for unanticipated, emergent network members such as church volunteers. Moynihan concludes that while the ICS was not used successfully in Katrina, none of the subsequent after-action reviews questioned the basic wisdom of the ICS approach. He notes: "The model continues to remain the central plank in crisis management policy."

We hope that the lessons from the case studies in this report, and the resulting recommendations, help public managers across all levels of government expand the use of hierarchical networks like the ICS in crisis incidents to a range of other policy areas as well.

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E X E C U T I V E   S U M M A R Y

Hierarchies tend to be viewed as rigid and based on formal controls. Networks tend to be seen as fluid and based on relationships. These two organizational approaches seem to be antithetical to each other. Yet, there is a blended "hierarchical network" model between these two organizational approaches that has shown remarkable success over the past three decades, when used appropriately.

In fact, in 2004 the Department of Homeland Security (DHS) asked emergency responders at all levels of government to use a hierarchical network model to organize crisis response efforts. This model, the Incident Command System (ICS), was developed in California in the 1970s by firefighters struggling to overcome an organizational paradox that most crises create. Crises require a mix of skills and capacities that are beyond a single hierarchy and therefore require a network of responders. At the same time, crises require coordination, rapid decision making, and decisive, coordinated action, characteristics associated with hierarchies. The ICS sought to solve this paradox by using aspects of both networks and hierarchies in a manner consistent with the needs of crisis situations.

What is a hierarchical network? It is a form of social coordination that uses hierarchical control, in the form of unified and centralized command, to help manage a network of organizations pursuing a shared goal. An ICS is neither a pure network nor a pure hierarchy, but it combines elements of both. The ICS model organizes incident responses around a central command. An incident commander sits atop the hierarchy, overseeing a variety of functional units—usually planning, operations, logistics, and administration/finance. In terms of an organization chart, the ICS model looks like a

hierarchy, but relies on the efforts of multiple organizations that enjoy some measure of autonomy. To recognize that such a mixture of social forms exists is remarkable, because much of the study of networks is devoted to explaining how they are different from hierarchies.

Recognizing an ICS as a hierarchical network is important because it helps us to consider what management factors will lead to successful crisis response. Treating an ICS solely as a hierarchy or solely as a network would lead to a misdiagnosis of management issues. This report also begins to identify the management factors that were important for incident command systems in a variety of settings, including responses to two major wildland-urban fires, the Oklahoma City bombing in 1995, the terrorist attack on the Pentagon in 2001, and Hurricane Katrina in 2005.

The cases suggest a number of crucial questions that help us to begin to identify the qualities of effective hierarchical networks:

1. **What is the nature of the incident?** Some crises are more complex than others. In comparing responses across crises, it is important to control for how the nature of the crisis impacts the ability of an ICS to function. From this very broad question, a number of more specific questions emerge:

    a. *What are the time constraints?* ICSs take some time to construct and put in place, and will struggle in crises that are changing rapidly and/or where the major consequences of the event occur very quickly.

    b. *What is the size and scope of the crisis?* Crises that are smaller, more familiar, and

simpler are easier to manage. Large crises create a large demand for services; reduce capacity among local responders, who may become victims of the crisis; and reduce coordination by destroying communication mechanisms. Tried and tested routines may not exist for unfamiliar crises.

c.   *How large is the network?* Crisis networks expand as they incorporate members who can provide specific skills and expertise. Large and complex crises demand large networks of responders. The study of social networks shows that larger and more diverse networks are more difficult to coordinate than smaller and more homogeneous networks.

2.   **Who is in charge?** The cases show that hierarchical networks struggle when it is unclear who is in charge. Identifying an ICS leader of leaders is often a negotiated process among the actors involved. Furthermore, establishing certainty and clarity about the chain of command reinforces the basic purpose of the ICS model.

3.   **What is the capacity of the network?** An ICS provides a model for coordinating action, but like any model it depends on the quality of the actors responsible for implementation. Capacity problems, especially among hub actors, can undermine the response of the entire network.

4.   **Do responders have positive working relationships?** While hierarchical networks depend on authority as a basis for coordination, they also rely on the basic ingredients of successful networks: positive working relationships and trust. In the cases studied, trust facilitates coordination and the assignment of responsibility, reduces conflict and blame shifting, and speeds decision making.

Answering these questions results in a series of findings, summarized in the accompanying box, "The Nature of Hierarchical Networks in Crises," and detailed in the body of this report.

The Nature of Hierarchical Networks in Crises

1.   The ICS model incorporates elements of both hierarchy and network.

2.   Rapidly changing crises limit the efficacy of a centralized command.

3.   Networks grow as crises grow, incorporating new members and becoming more difficult to coordinate.

4.   Conflict about who is in charge is likely for large or complex crises, undermining network coordination.

5.   The potential consequences and time constraints of crisis situations make it critical that ICS hub organizations have high capacity.

6.   Even with command and control systems, ICSs depend on network values such as trust and norms of reciprocity to succeed.

Incident Command Systems as Hierarchical Networks

This section presents the concept of hierarchical networks as represented by the Incident Command System, or ICS. The ICS provides a hierarchical structure intended to coordinate a network of responders. This report seeks to explain the conditions and factors that foster effective ICS outcomes by examining a variety of crises employing this approach.

The study of organizations largely continues to treat networks and hierarchies as distinct social forms of coordination (e.g., Milward and Provan 2006, 22–23). But organizing multiple responder organizations under a temporary hierarchical authority has been a matter of practice for at least 30 years in fighting forest fires. The ICS model has also gradually seen acceptance in other crisis management areas.

The ICS arose from an outbreak of wildfires in California, killing 16 people and destroying 885 homes. In 1970, as fires crossed jurisdictions, it became clear that coordination was a major problem. Responders did not have a common language, management concepts, or communication systems, and often worked at cross-purposes. California's firefighting agencies met to decide how they could better prepare for coordination problems during future outbreaks. They designed a system that tried to clarify who was in charge. In cases of jurisdictional and/or functional clarity, a single incident commander

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Key Aspects of Crisis Management Policy

National Incident Management System (NIMS)
The National Incident Management System is a policy document that introduces a shared national standard for how public actors deal with emergencies. NIMS is intended to be an overall framework for understanding and reacting to emergencies rather than an operational framework: "The NIMS represents a core set of doctrine, principles, terminology, and organizational processes to enable effective, efficient, and collaborative incident management at all levels" (DHS 2004a, ix).

National Response Plan (NRP)
The National Response Plan is the successor to the Federal Response Plan, and builds on NIMS. It aims to be a national approach to domestic incident management designed to integrate the efforts and resources of federal, state, local, tribal, private-sector, and non-governmental organizations. The NRP includes planning assumptions, roles and responsibilities, concept of operations, incident management actions, and plan maintenance instructions (DHS 2004b, xi). The NRP also assigns crisis responsibilities to specific federal agencies.

Incident of National Significance (INS)
Incidents of National Significance are a designation for a major crisis. Such incidents require the secretary of homeland security to coordinate the federal response. The National Response Plan defines Incidents of National Significance as "those high-impact events that require a coordinated and effective response by an appropriate combination of federal, state, local, tribal, private-sector, and nongovernmental entities in order to save lives, minimize damage, and provide the basis for long-term community recovery and mitigation activities" (DHS 2004b, 3). All presidentially declared disasters and emergencies are Incidents of National Significance.
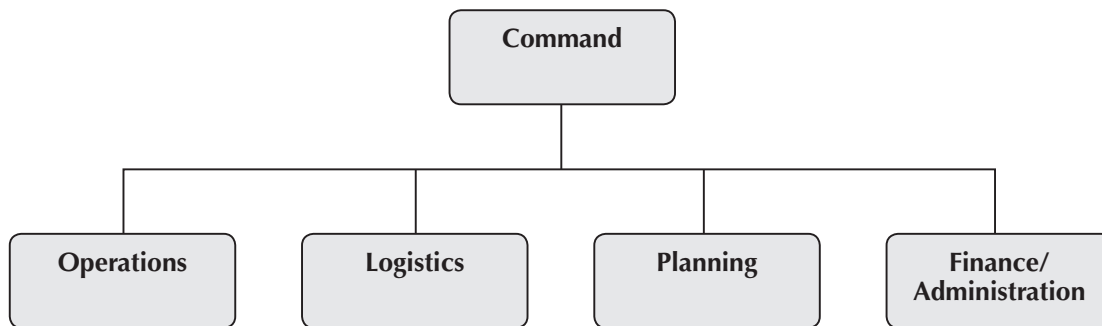
What Is the Incident Command System?

The Incident Command System has been designated the primary structure for organizing crisis response according to the Department of Homeland Security. The ICS is an organizational structure intended to coordinate multiple response organizations. The ICS structure overlays a simple hierarchy on the response organizations, and typically divides responsibilities between the crisis functions of operations, logistics, planning, and finance/administration.

The ICS is headed by a single incident commander. If multiple organizations have significant response responsibilities, it may be appropriate to create a unified command with multiple incident commanders operating jointly. If the geographical spread of a crisis becomes large enough, multiple ICSs will be created, reporting to a single area command.

Some of the basic principles of the ICS are its use of common terminology, the ability to expand the ICS to fit the size of the incident, management by objectives, a manageable span of control, a unified command, and a clear chain of command. ICS response is also characterized by daily meetings and daily incident action plans that communicate goals and tasks for the coming 24 hours (although the frequency of meetings and planning will vary with how rapidly the crisis is changing). The ICS is intended to be flexible and widely applicable to emergencies of different lengths and involving different disciplines, although it may need to be modified for unusual emergencies (DHS 2004a, 7).

The ICS STructure of Responsibility

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was appropriate. Where multiple jurisdictions were involved or where multiple agencies addressed different tasks, a unified command was appropriate. More detail on the characteristics of the ICS can be found in Moynihan (2005).

Much was learned from the 1970 California fires, illustrated by a general absence of the above problems in two California wildfires that occurred in 1993 and 2003, which are discussed in this report. According to the California incident commanders who have the greatest experience with the ICS, its most prominent strengths are:

1. Predefined hierarchy, including chain-of-command and delineated responsibilities for every position

2. Uniform terminology for identifying resources and organizational functions

3. Modular organizational structure that is expanded and contracted as needed

4. Incident Action Plans that are updated for each operational period

5. Manageable span of control (Cole 2000)

These major strengths emphasize the hierarchical aspects of the ICS. This hierarchical approach is required in order to solve the fundamental network problem of how to coordinate the efforts of independent entities with shared goals. One of the weaker aspects of the ICS, according to incident commanders, is its ability to integrate non-firefighting public officials and non-governmental actors, especially when these actors are unfamiliar with the ICS model.

In 2004, the ICS model became a matter of national policy when the Department of Homeland Security

(DHS) released two closely related policy statements intended to shape the response to a wide range of domestic emergencies large enough to be considered "incidents of national significance." The National Incident Management System (NIMS) and the National Response Plan (NRP) represent profoundly significant changes in national crisis management policy (see the accompanying box on page 8, "Key Aspects of Crisis Management Policy"). The documents identify a blueprint for how crises should be managed, acknowledging that a network of private, nonprofit, federal, state, and local responders will cooperate in any major crisis. However, DHS has proposed that such networks require central direction and a command and control system in the form of an ICS. All federal responders and all state and local responders receiving federal emergency funding must adopt the ICS approach to crisis response.

By mandating the use of the ICS, DHS assumes it is generally applicable to all forms of crises. In truth, we lack strong empirical evidence as to whether this assumption is accurate. While there is little contention that the ICS model has worked well for forest fires (Cole 2000), there is less evidence regarding the use of the ICS in other settings and, more broadly, about the contingencies that shape ICS success: "As new disciplines adopt the ICS approach, how do we know what adaptations need to be made to make ICS a truly universal system for emergency management? Is such a universal system even practical?... The Incident Command System cannot afford to 'fly blind' into a new century of emergency management" (Cole 2000, 225).

Firefighters have extensive experience in the use of the ICS, albeit within the function of firefighting, and other emergency responders at all levels of government are just beginning to catch up, even as they consider how the ICS might be applied in different situations. Responders have scant careful analysis upon which to base such training. An after-action review of the Pentagon attack on 9/11 highlights the need for research to "incorporate real world experiences drawn from such events as Oklahoma City, the World Trade Center, and the Pentagon. Hypothetical case studies have a continuing role, but reality is a critical test of capability and usually a much more compelling experience for participants" (Titan Systems 2002, A-77).

Acronyms and Abbreviations

ACFD	Arlington County Fire Department
DHS	Department of Homeland Security
DoD	Department of Defense
EOC	Emergency Operations Center
FBI	Federal Bureau of Investigation
FCO	Federal Coordinating Officer
FEMA	Federal Emergency Management Agency
ICS	Incident Command System
JOC	Joint Operations Center
LBFD	Laguna Beach Fire Department
LOHSEP	Louisiana Office of Homeland Security and Emergency Preparedness
MIPT	Oklahoma City National Memorial Institute for the Prevention of Terrorism
NIMS	National Incident Management System
NRP	National Response Plan
ODCEM	Oklahoma Department of Civil Emergency Management
PFO	Principal Federal Official
SDFD	San Diego Fire Department
WMD	Weapons of Mass Destruction

This report informs an ongoing debate about how homeland security is managed. The NIMS and NRP represent the first round of that debate in the post-9/11 era, but the response to Katrina has subjected these policies to scrutiny. Regardless of which policy changes emerge in the post-Katrina era, the next national incident will still require a network of responders as well as a need to coordinate that network. The more we know about how the ICS has worked in the past, the better prepared we will be for the future.

To understand how to foster the success of the ICS, this report examines case studies of responses to wildland-urban fires, the Oklahoma City bombing, the 9/11 attack on the Pentagon, and Hurricane Katrina. The analysis of each case is based on a significant documentary trail comprising after-action reports, interviews, and testimony. These reports were analyzed using qualitative software that allows for systematic coding of relevant

variables and comparison of these variables across cases. These cases offer a look at the use of the ICS in its original context, firefighting, but also at the application of the ICS in terrorist incidents and major natural disasters. If the ICS approach succeeds in all of these cases, it suggests the wide applicability of the concept.

The next section provides a basic description of the nature of the crisis in each case. The following sections will continue to provide case detail, but in a more analytical context, as four crucial management questions are addressed with respect to each incident command: What is the nature of the task? Who is in charge? What is the capacity of the network? Do responders have positive working relationships? In the conclusion, the author considers lessons that arise from the cases.

Overview of Four Case Studies in the Use of Incident Command Systems

Following are summaries of each case that provide a basic description of what happened. They serve as the primary sources for the subsequent analysis.

Wildland-Urban Fires: 1993 Laguna Fire and 2003 Cedar Fire

The Laguna fire burned from October 26 to November 4, 1993, affecting the cities of Laguna Beach, Irvine, and Newport Beach, the community of Emerald Bay, and the surrounding unincorporated area. In total, 441 homes were destroyed, 14,337 acres burned, and $528 million in damage was caused. While more than 26,000 people were evacuated and many were injured, no deaths resulted from the fire.

Part of what made the Laguna fire a challenging crisis is that it occurred while two other major fires were already burning in the area. A unified command between the Orange County Fire Department and the Laguna Beach Fire Department was established with the goal of containing the fire. But resource limitations meant that responders were unable to establish successful fire lines to stop the fire until the morning of October 28.

A decade after the Laguna fire, the Cedar fire also burned a significant portion of Southern California, damaging 335 structures, burning 193,646 acres, and causing $204 million in damage. Shortly before 6 p.m. on October 25, 2003, the fire originated from the Cleveland National Forest, near Julian, California. The U.S. Forest Service established the initial command, but as the fire moved beyond its federal jurisdiction, the California Department of Forestry engaged one of its Incident Management Teams to oversee the fire. The fire threatened and

eventually entered the city of San Diego by the morning of October 26, thereby involving the San Diego Fire Department (SDFD). The fire came under control by the 27th and was declared contained by the 28th. The Cedar fire was one of a number of large fires that occurred during the same two-week period in October and November of 2003. Together these fires burned 750,000 acres, causing billions of dollars in damage, destroying 4,000 homes and killing 22 people.

Wildland-urban fires are atypical relative to traditional wildland fires, thus posing a challenge to the ICS model. They are larger than traditional forest fires and are a significant and increasingly frequent threat. The fact that they had spread into an urban setting indicates that early efforts to control the fires failed, and in both cases the fires moved rapidly. Because of the urban setting, they have greater destructive capacity and responders have to work within the more complex context of urban geography. Rather than letting a fire burn out, responders must protect structures and have less discretion in their capacity to direct the fire. The urban setting also adds a human dimension. More lives are at risk, evacuation and shelters may be required, and a wider network of responders will become involved.

In the Laguna fire, responders also struggled to respond without adequate resources, which were diverted to two other fires occurring in the same area. In the Cedar fire, response was weakened because of the limited resources and capacity of the SDFD. The cases represent extreme examples of the challenges forest and urban firefighters face, putting the ICS model in the most difficult scenario possible while remaining within the category of firefighting: "These events put people in new territory. The enormity of

the situation pushed people into positions that the system and the rules were simply not prepared to handle and forced significant mental shifts in the thinking of those involved" (MCS 2003, 1).

The primary basis for analyzing the Laguna fire is through Rohde's (2002) study, which relied on after-action reports and other documentation, interviews with responders, and a comparison of the Laguna fire with five other major wildland-urban fires that took place between 1985 and 2001. An after-action report by the SDFD (2004) provides the primary basis for analysis of the Cedar fire response. The U.S. Forest Service commissioned a review of the Southern California fires that happened in the same period as the Cedar fire from Mission Centered Solutions (MCS 2003), while a similar report from the Guidance Group (2004) provides an analysis of lessons learned from after-action reports by Incident Management Teams in 2003. Both reports provide a complement to the analysis of the Cedar fire.

The 1995 Oklahoma City Bombing

At 9:02 a.m., April 19, 1995, a rented Ryder truck containing 4,800 pounds of explosives detonated beside the Alfred P. Murrah Federal Building in Oklahoma City. The massive explosion destroyed about one third of a building containing some 600 workers and 250 visitors. The attack killed 168 people, and 426 were treated for injuries in local hospitals. Of those, 82 were admitted to hospital.

The response began immediately. Members of the Red Cross were on site within seven minutes of the blast, and had more volunteers than they could handle within a half hour. A Federal Bureau of Investigation (FBI) agency representative was on site within a half hour. The State Emergency Operation Center was fully operational by 9:25 a.m. The incident was reported to Federal Emergency Management Agency (FEMA) regional headquarters, located in Denton, Texas, by 9:30 a.m. FEMA activated search and rescue teams by 10:55 a.m. Governor Frank Keating declared a state of emergency by 9:45 a.m., and President Clinton issued a federal declaration of emergency by 4 p.m.

Members of the Oklahoma City Fire Department were the first responders on the scene and established the incident command. Shortly thereafter, the local fire chief, police chief, mayor, and senior FBI official met

and resolved the basic roles. Fire Chief Gary Marrs was the primary incident commander, in charge of search and rescue and body recovery; Police Chief Sam Gonzales was in charge of security and perimeter control; FBI Special Agent Bob Ricks was in charge of the crime scene; and Mayor Ron Norick provided public information. The efforts of these and other responders were commended in an after-action report that argued that "[t]he Oklahoma City bombing should be viewed as ultimate proof that the Incident Command System works" (ODCEM n.d., 36).

The primary sources for the analysis of the bombing response come from a report by the Oklahoma City National Memorial Institute for the Prevention of Terrorism (MIPT 2002) and an after-action report by the Oklahoma Department of Civil Emergency Management (ODCEM n.d.).

The 2001 Attack on the Pentagon

At 9:38 a.m. on September 11, 2001, American Airlines Flight 77 crashed into the Pentagon, killing the crew of six, 58 passengers, and 125 occupants of the Pentagon. Responders quickly arrived on the site, contained the fire, rescued surviving occupants, and provided immediate medical treatment without the loss of any response personnel. The Pentagon was able to continue operations during a time when the nation was under attack. James Schwartz, the assistant chief for operations at the Arlington County Fire Department (ACFD), was the incident commander. He gradually expanded the command into a unified command by including other agencies.

The response to this event has been described as a success by the 9/11 Commission, which recommended the widespread use of the ICS (9/11 Commission 2004, 314). An after-action report summarized the response as follows:

> The primary response participants understood the ICS, implemented it effectively, and complied with its provisions. The ACFD, an experienced ICS practitioner, established its command presence literally within minutes of the attack. Other supporting jurisdictions and agencies, with few exceptions, operated seamlessly within the ICS framework. For those organizations and individuals unfamiliar with the ICS and Unified Command, particularly the military,

which has its own clearly defined command and control mechanisms, the Incident Commander provided explicit information and guidance early during the response and elicited their full cooperation (Titan Systems 2002, Introduction-11).

The primary source used to analyze the Pentagon response was an after-action report commissioned by Arlington County and performed by Titan Systems Corporation (2002) and a case study by the Kennedy School of Government (Varley 2003).

Hurricane Katrina 2005

Hurricane Katrina was the first major crisis after the adoption of the new incident management policies proposed by DHS in 2004. By almost any measure, the response was a failure. Over 1,500 people died and tens of thousands were left without basic supplies. While the disaster unfolded on television broadcasts across the world, the situation became gradually worse, and government responders seemed unable to provide basic protection from the ravages of nature. In contrast, following 9/11, the nation was buoyed by the heroic efforts of responders, and trust in government soared. During Katrina, the opposite seemed to happen. A Senate committee report argued that Katrina led to "an undermining of confidence in our governments' ability to plan, prepare for, and respond to national catastrophes" (Senate Report 2006, 2).

Responders were warned about the potential effects of Katrina for days before landfall. A tropical depression was observed on Tuesday, August 23, 2005, becoming a tropical storm by Thursday. By Friday, this depression had become serious enough that the governors of Mississippi and Louisiana declared states of emergency. During the course of the day, National Weather Service forecasts changed predictions but ultimately concluded that New Orleans would be hit. On Saturday, voluntary evacuations began in Louisiana while President Bush declared a state of emergency, and FEMA and state emergency responders began 24-hour operations. By 7 p.m. on Saturday, the National Weather Service warned that levees could be topped in New Orleans, causing catastrophic flooding.

The mayor of New Orleans, Ray Nagin, ordered a mandatory evacuation by 9:30 a.m. on Sunday, and the Superdome was opened as a refuge of last

resort. Katrina made landfall by 6:10 a.m. on Monday, and later that morning levees began to overtop and breach, causing catastrophic flooding (although DHS and the White House would not learn of this until early Tuesday morning). Search and rescue operations began by Monday afternoon, but communications also began to fail around this time. Michael Brown, director of FEMA, promised Louisiana Governor Kathleen Blanco that 500 buses for additional evacuation would arrive within hours. On Tuesday, Mayor Nagin opened the Morial Convention Center as an additional shelter of last resort, although federal officials did not become aware of this until later in the week. Joint Task Force Katrina, which directed Department of Defense (DoD) resources, was formed on Tuesday, the same day that DHS Secretary Michael Chertoff declared an Incident of National Significance. On Thursday, buses finally arrived to begin evacuations from the Superdome, although evacuations from both the Superdome and Convention Center were not completed until Saturday, and some remained stranded on highways until Monday.

The response to Katrina featured neither an effective network nor an effective hierarchy. It lacked a clear command and positive working relationships among key actors. The capacity of the network was also weakened, in large part due to the capacity weaknesses of its hubs, especially FEMA.

The primary sources for analyzing the response to Hurricane Katrina come from separate reports from the White House (2006), a specially formed House committee (House Report 2006), the Senate Committee on Homeland Security and Governmental Affairs (Senate Report 2006), and transcripts of participants who testified before these committees.

Lessons About the Nature of the Incident

This section examines the variable nature of crisis incidents, focusing on the size and scope of the network, the time constraints that crises create, and the size of the network that emerges.

Crises are defined, in part, by decisional urgency (Rosenthal, 't Hart, and Charles 1989, 18), and a little time can make a big difference in response effectiveness (Comfort 1988, 9). Time aids the building of trust because trust generally increases over multiple interactions, through the communication of intentions and ideas as well as the establishment of norms and reputations (Gulati 1995). A study of an exotic animal disease outbreak that lasted over a year underlined how adequate time allowed responders to recover and learn from initial disorganization, improve capacity, and resolve coordination problems (Moynihan 2005). Both the wildland-urban fires and Katrina illustrate the implications of limited time:

- Minor delays have dramatic consequences.

- The pace of events outstrips the ability to establish a centralized command and maintain knowledge of events, creating pressures for multiple commands and decentralized authority.

- Limited time inhibits the ability of responders to process information and learn from trial and error.

The size and scope of the disaster is also significant. While each case examined was unusual and challenging, the scope of the crisis was ultimately manageable in all of the cases except Katrina. The Katrina case illustrates how the size of a crisis interacts with the ability to respond by creating the following outcomes:

- Unprecedented demand for actions and services: These included food, water, evacuation, search and rescue, and shelters.

- A dramatic reduction of response capacity: Local responders lost resources, and many became victims or evacuated; federal responders were often too far away to be effective; and transportation was largely unusable.

- A dramatic reduction of coordination: Communication loss limited the ability of network members to establish situational awareness, share information, and coordinate action.

- A paucity-of-experience problem: Responders had little experience in dealing with a Katrina-size disaster.

- Network size and diversity: The size of the task demanded a response that could be provided only by a very large and diverse network, which made coordination more difficult.

Network theory and crisis management literature both suggest that large, diverse networks have difficulty resolving basic issues of coordination compared to smaller and more homogeneous networks (Provan and Milward 2001, 418). Participants bring to the network the perspective of their home agency and their profession or training, which may clash with the perspectives of other network members. This creates a form of uncertainty about how members will behave and interact with one another (Koppenjan and Klijn, 2004). Bigley and Roberts (2001, 1290) note the difficulty of building shared mental models among members from different geographic and social locations who have experienced "different stimuli, learning idiosyncratic 'facts' as they construct situational meanings and mental models."

While only in the Katrina case did the size of the network expand beyond the control of the central command, network diversity also poses a problem in other crises. The greatest difficulties occur when a network seeks to incorporate agencies with distinct backgrounds and cultures that do not align with the culture of the network or its dominant members. The intent of the ICS was to help to overcome such integration problems by offering a standard framework and common culture with which all participating agencies would be familiar. But the cases illustrate that many state and local entities were unfamiliar with the ICS model at the time of the crisis, and this lack of knowledge was even more pronounced among nonprofit or private members of the network.

One key lesson is that once a crisis begins, there is limited capacity to incorporate additional network actors. This problem appears to be especially pronounced for potential network actors who are unknown to current network actors. Crises inspire unsolicited offers of help from private and nonprofit actors. Incident commanders may not know or trust such actors, and often lack the time to learn what capacities they can offer.

Lessons Learned from Wildland-Urban Fires

The Laguna fire provides a sense of the time constraints that rapidly moving fires impose on responders. At one point the fire was consuming 100 acres per minute, with flame lengths nearly 100 feet long. Over the first six hours, it consumed an average of 45 acres per minute and moved at 6 miles per hour. One 28-year veteran who observed the "head" of the fire stated that it was the fastest moving fire he had seen in his career. Such rapidly moving fires meant that resources that could not arrive for hours were of little benefit in the short term.

The pace of the fire meant that efforts to coordinate and organize failed to keep up with events. In the Southern California fires of 2003 "[m]any times the situation was developing too fast for unified command to keep up" (MCS 2003, 15), and plans "rarely remained valid beyond six hours" (MCS 2003, 24). In the Cedar fire "[t]he standard processes of developing a command structure were not quick enough to keep pace with the incident. Plans became obsolete before the command structure

could be established to implement strategic objectives and gain control. This chaotic situation repeated itself several times over the course of many hours until adequate command level personnel were in place" (SDFD 2004, 13).

In the Cedar fire, the inability of the central command to keep pace with the fire led to additional commands being established. In the Laguna fire, it led to decentralized authority. In both fires, the scope of the fire initially exceeded available resources. The cases provide little evidence on the importance of network size, but suggest that coordination difficulties followed when responders incorporated unfamiliar agencies, especially those with limited or no background in the ICS.

The central lesson from the fires is that a rapidly expanding emergency outstripped the ability to maintain central direction or overall coordination over the fires, even among responders familiar with the ICS model.

Lessons Learned from the Oklahoma City Bombing

At the time, the bombing disaster was the most deadly terror attack on American soil. But beyond the 20-block security perimeter, the impact of the disaster was limited. It did not affect a residential area, and the search and rescue area was relatively small. A geographically contained disaster allows responders to access the area and to focus all of their efforts on that area, making coordination easier.

Relative to a Katrina-size disaster, there were a limited number of tasks in the immediate aftermath of the blast. On-site responders focused on search and rescue, recovering the dead and conducting a crime scene investigation. Off-site responders were focused on assisting families. In contrast, Katrina responders had to engage in search and rescue and the recovery of the dead in much more arduous conditions over a wider area, involving many more victims. The Katrina network also had more tasks such as providing food, clothes, water, housing, and medical services to thousands, as well as repairing levees and restoring security.

Relative to Katrina, the demand for services from victims was limited. As with the other cases, the number of victims directly affected was in the

hundreds rather than the tens of thousands. Many needed medical treatment, and mortuary services were required. But local hospitals and funeral directors were able to cope with that demand. Families needed support, and a Family Assistance Center dealt with almost 1,400 family members.

The network had some trouble incorporating the contributions and help of non-governmental actors who were not an established part of the response network. It was noted by Police Chief Gonzales that "no one was prepared to handle so many volunteers" (MIPT 2002, 36). Concerned about the security of the crime scene, the FBI provided identification to responders who had been given access to the site. Over 28,000 badges were provided (MIPT 2002, 11).

There were no standard procedures to store, track, and manage materials such as donated rescue materials, food, supplies, clothing, and financial donations. By the afternoon of the attack, commercial tractor trailers and smaller vehicles began to arrive at the scene with largely unsolicited materials. According to Debby Hampton, local volunteer coordinator of the American Red Cross, "[t]he Red Cross was overwhelmed by the numbers of spontaneous volunteers" (MIPT 2002, 90). Thousands of volunteers, inspired by media reports, offered their help. Because of delays in processing, some left or were turned away. Some medical volunteers attempted to set up their own triage area.

When responders had strong relationships with non-profit agencies or private actors, or when these actors could self-organize and offer a single point of contact and significant resources, it was easier to incorporate them into the network. For example, the Bell Southwestern external affairs officer knew the incident commander and contacted him to see what services her company could offer. Construction contractors also offered critical services in hauling debris, providing cranes and heavy equipment, and shoring and site construction. These private companies self-organized so that they came to the network with one point of contact, rather than having multiple actors descend on the scene.

In the Oklahoma City bombing, the size and scope of the disaster was not overwhelming, allowing responders to focus on a limited set of tasks in a specific area. However, the incident command struggled to incorporate and direct the extended network that developed as volunteers arrived and large amounts of resources were offered. Personal relationships between third parties and the ICS, or self-organization into a coherent offer of services on the part of third parties, greatly improved the ability to incorporate emergent aspects of the network.

Lessons Learned from the Attack on the Pentagon

The impact of the attack on the Pentagon was great, and in some ways so was the size and scope of the response. The Pentagon is an enormous building to oversee, and thousands of responders were on site by the early afternoon of September 11. On the other hand, the scope of the crisis was manageable and resources were rapidly available. As with Oklahoma, once the disaster occurred, there was little that could be done for most victims, who had died immediately. Of those that survived, only 42 that were treated on site needed to be transported to hospitals, with about 100 more treated for minor injuries (Titan Systems 2002, 1–14).

Like Oklahoma, the scope of the response could focus on a specific and accessible site, and the task in many respects resembled a large-scale fire, allowing the incident commanders to draw from previous experiences. The 9/11 Commission (2004) notes that unlike responders at the World Trade Center, responders at the Pentagon were dealing with a single incident and had clear access to the site, the structural damage did not extend beyond the Pentagon, the site was easy to secure, and the incident was not 1,000 feet above ground, as it was in the World Trade Center. The concentric design of the Pentagon and its limited height made it difficult to inflict severe damage on the entire structure, and made a structural collapse unlikely. Responders were also lucky. The plane struck a part of the Pentagon that had just been renovated, and most employees had not yet returned. This section held 850 workers at the time of the crash, but with full occupancy would hold about 5,000 workers. Had the plane struck another part of the building, or at another time, hundreds and possibly thousands more would have died.

Varley provides a sense of the network size: "30 local, state, and federal law enforcement agencies;

four 62-member FEMA Urban Search and Rescue teams from across the country, with their own 20-member support organization; 20 health, safety, and environmental groups concerned about contaminants released into the air, water, and debris; and an assortment of other government agencies, voluntary organizations, and businesses bringing supplies and expertise to the response effort, and food, equipment, services, and transportation to the emergency workers" (Varley 2003, 2).

The help provided by public and nonprofit agencies was important. Volunteer organizations such as Home Depot provided much needed materials. Telephone organizations made it easier for responders to reach home. The Red Cross provided its usual support. Individual volunteers offered help, food, blankets, and other forms of support. As with Oklahoma, the scope of voluntary efforts was somewhat overwhelming for responders, and managing donated resources became a challenge.

As with the Oklahoma City bombing, the Pentagon ICS sometimes struggled to incorporate voluntary aspects of the network. Overall, however, the limited geographical scale of the attack, the accessibility of the site, and the limited number of tasks eased the challenge that the ICS faced.

Lessons Learned from Hurricane Katrina

The unfolding Katrina disaster was accompanied by images and reports of governmental failure and, in some cases, incompetence. Certainly, there were areas where improved capacity and coordination could have saved lives and reduced suffering. But any consideration of Katrina must begin with the realization that the impact of Katrina was great not primarily because of human failures, but because of the size and scope of the task. Good management might modify natural disasters, but cannot eliminate them. Katrina affected 92,000 square miles, significantly damaging a major city. It was the largest natural disaster in the United States in living memory.

The critical period of preparation and response for Hurricane Katrina lasted just over a week, from the point when it became clear that Katrina might not be just another hurricane to the point where almost all the evacuees were accounted for. Given limited

time, any delay in making the correct decision had dramatic consequences. Examples include Mayor Nagin and Governor Blanco waiting until Sunday to issue a mandatory evacuation order, delays by federal officials in gaining situational awareness about levee breaches and flooding, the dire situation of the shelters of last resort, and delays in providing buses to evacuate these shelters.

A response already stretched thin was less able to respond quickly and was unable to focus on all of the relevant tasks that needed to be undertaken. For example, the days immediately following landfall were focused on saving lives through search and rescue efforts, which "while necessary under the circumstances, distracted emergency managers and diverted key assets from other critical missions" (House Report 2006, 117).

With limited time, the Katrina network largely failed to coordinate itself, or to improve response until after terrible suffering occurred. Time is an essential ingredient in learning. Learning occurred during Katrina—for example, the replacement of Michael Brown and the more active federal response to Hurricane Rita, which followed shortly after Katrina (House Report 2006, 12). However, even this relatively rapid learning did not occur rapidly enough to dramatically impact the Katrina response.

A catastrophe so large requires more of everything, especially resources and responders. Even as responders worked with degraded capacities, the size of Katrina also increased the number of requests for support to unprecedented levels, beyond what was immediately available.

Unprecedented Response Efforts Did Not Match Demand for Services

The scope of the disaster made even extraordinary efforts insufficient. Again and again, for evacuation, medical response, search and rescue, and temporary shelters, government efforts were impressive, perhaps even unprecedented. But they were not comprehensive or rapid enough given the scope of the Katrina crisis. The evacuation of New Orleans may have been the largest evacuation of a U.S. city in such a short period. Over 1 million people, 90 percent of the affected parishes, were estimated to have evacuated in a 40-hour period. Efforts to shelter the homeless were also extraordinary. In the days after

Katrina, 563 Red Cross or state emergency shelters in Louisiana housed 146,292 people who lacked adequate food, water, medical services, and toilet facilities (House Report 2006, 312).

FEMA undertook a logistics response that moved 11,000 trucks of water, ice, and meals into the region after Katrina, more than three times as many truckloads as were used during all of the hurricanes that occurred in 2004 (House Report 2006, 322). The DoD produced the largest domestic military deployment since the Civil War, and the National Guard deployment of 50,000 troops was the largest in U.S. history. The Red Cross led a $2 billion, 220,000-person operation, 20 times larger than any previous mission, providing services to 3.7 million victims (House Report 2006, 315). But these efforts fell short of needs, often dramatically. The House Report commented (House Report 2006, 151): "in some respects, FEMA's response was greater than it has ever been, suggesting the truly catastrophic nature of Hurricane Katrina overwhelmed a federal response capability that under less catastrophic circumstances would have succeeded."

The Scope of the Emergency Severely Limited Response Capacity and Coordination

The scope of the disaster dramatically reduced the capacity to use transportation to deliver food, water, and medical supplies, and limited the ability of responders to reach affected areas or evacuate people. In New Orleans, for example, city buses were flooded, even though they were staged in areas that had not seen flooding during previous storms. In any case, most potential drivers had already evacuated. Many police vehicles were flooded and rendered unusable, and parish sheriffs in New Orleans lost jails and booking offices to flooding, thereby limiting the ability of police to curtail lawlessness. Federal response operations were located far from New Orleans to avoid the impact of the storm, and then had trouble reaching those in need after landfall.

The size of the disaster also eliminated response capacity. Those who were counted on to offer immediate local response were themselves victims. Communication systems were destroyed, limiting the ability of responders to gain situational awareness or to communicate operational plans. Over 3 million telephone landlines were lost in the three affected states, including many 911 call centers. Wireless phones were also affected, with approximately

2,000 cell sites out of service and few places to charge the phones because of widespread power loss. The physical locations of Emergency Operations Centers (EOCs) were rendered unusable due to flooding or other damage, eliminating a base for command operations and resulting in poor coordination and wasted time as responders looked for new locations. "Thus, in New Orleans, for at least some period of time, emergency managers, the police, and the military lost command and control over their own personnel and lost unity of command with the other local, state, and federal agencies that needed to be involved in the relief efforts" (House Report 2006, 185). What operational sites remained were insufficient. The Louisiana EOC was vastly overcrowded, with hundreds of people trying to cram into a 50-person meeting room.

The impact of Katrina on coordination is illustrated by the fact that prior to landfall, the Louisiana EOC had organized conference calls with local parishes, federal officials, and the Red Cross to the point that "it appeared that pre-landfall decisions and issues were fully vetted among the participants" (House Report 2006, 188). However, in the aftermath of Katrina, such communications became impossible for many local parishes.

A Quickly Expanding Network Became Impossible to Fully Coordinate

As a crisis takes on a larger scale, more responders are needed, and as the crisis creates more tasks, a greater variety of capacities are required. The Katrina network was so diverse that there was a failure to fully comprehend which actors were actually part of the network (partly because of a large voluntary component), what skills they offered, and how to use these capacities (House Report 2006, 302). Comfort has counted over 500 organizations in the Katrina network (Comfort 2006).

The sheer diversity of Katrina tasks led to the creation of many task-specific networks within the broader Katrina network dealing with specific goals such as evacuating people; delivering materials (food, water, ice, and medicine); recovering bodies and providing mortuary services; providing medical services; restoring public safety; restoring communications and power; performing search and rescue; and providing temporary shelter.

Lessons About Command and Control

A basic prerequisite for the success of an ICS is that a clear and functioning central command, in fact, exists. This can be in the form of one incident command under a single commander, a single command under a unified team, or multiple incidents under an area command. The key factor is that it is clear who is in charge, and that that person or organization speaks with a unified voice. Confusion undermines central authority and can lead to solo rather than coordinated action.

In the cases that follow, we see responders sometimes struggling with the issue of clarity of command. The cases illustrate that the existence of the ICS model does not automatically resolve this issue, since the model itself only calls for loyalty to the command structure, but does not specify who will be in charge. The cases illustrate that this crucial decision can be a contested one and subject to disagreement among responders.

Lessons Learned from Wildland-Urban Fires

Among firefighters, the concept of a command system is widely accepted and consistent with their paramilitary culture. However, the wildland-urban fires studied saw responders engage in solo action. But responders distinguish between "independent action" necessitated by a non-functional central command versus "freelancing" in violation of the central command: "Independent action is empowered and focused effort that furthered the accomplishment of leader's intent. Freelancing is unguided effort that is possibly counterproductive or even dangerous. All respondents acknowledged that at no time should any firefighters unilaterally ignore orders or independently reassign themselves when

effective command and control is in place. However, in this case, firefighters described responding to multiple, emerging catastrophes. Effective command and control and common communications were unavailable. The values at risk were so great that firefighters felt disengagement was not a viable option" (MCS 2003, 21).

The cases suggest that in the most difficult fires it can take an extensive amount of time to establish a functioning central command, and that during these periods, independent action that was consistent with overall goals was often essential (MCS 2003, 59–60). Even as incident commanders accept that independent action may be sometimes inevitable, they worry about its implications. They worry about a loss of accountability, and uncoordinated tactical response that focuses on initial attack rather than a more coordinated strategic effort. Incident commanders also suggest that independent action can damage the credibility of the central command. Once actors have engaged in solo action, they may be reluctant to reintegrate with a command that they perceived to have failed them (Rohde 2002, 208).

Another barrier to establishing a clear and unified command was the tendency of higher levels of government to fail to incorporate local responders because of disagreements about jurisdiction and the perceived lack of capacity of local governments (MCS 2003, Guidance Group 2004). Longtime users of the ICS suggest that the ability to establish a clear command is hampered by lack of knowledge of the ICS by prospective users (Cole 2000). In the Cedar fire, the SDFD lacked officers with ICS training or experience. The MCS (2003, 11) report on the Southern California fires notes that "agencies that provided ICS training down to the tactical level

were decidedly more effective prior to the establishment of unified command, as well as after it had been established."

The cases suggest that even in the function that gave rise to the ICS, there are instances when central command struggles to assert itself, leading to poor coordination and solo action. Such solo actions tend to occur in chaotic circumstances, when there are limited resources and weak or non-existent central command, and when responders feel as if they must act independently.

Lessons Learned from the Oklahoma City Bombing

In the Oklahoma case, there was remarkably little contention about who was in charge. At the site of the incident, Fire Chief Marrs, Mayor Norick, Police Chief Gonzales, and FBI Special Agent Bob Ricks agreed that Marrs would be the incident commander.

In both the Oklahoma and Pentagon incidents, there was a legitimate argument for federal control of the incident. The Stafford Act of 1988, which seeks to provide a basic set of principles for federal crisis response, allows for federal control over an emergency in the case of foreign attack or if the attack occurs on federal property. At Oklahoma, FEMA initially wanted to take control of the ICS, but local responders did not want to cede control. Attorney General Janet Reno ordered FEMA to take an assistance role, allowing the basic structure of local control to remain in place. The FBI could have been more aggressive in seeking to control the crime scene, but understood that the criminal investigation was secondary to the immediate task of search and rescue and the recovery of the dead. Special Agent Bob Ricks had been in Waco and had seen the breakdown of relationships between FBI and local law enforcement officials during that event, and was determined to avoid the same problems in Oklahoma. Weldon Kennedy, who soon replaced Ricks as the senior FBI officer on the scene, also made it clear that he was willing to defer to the incident commander. In return, Fire Chief Marrs reassured the FBI that his firefighters would be aware of the need to maintain materials for a criminal investigation.

The situation effectively created two commands, with Fire Chief Marrs in charge of search and rescue and body recovery and the FBI in charge of

the crime scene component. This worked because of the agreement that one command took precedence over the other, but that both sets of priorities were important. The existence of a crime scene created an additional complication to the traditional ICS approach, but one which was well managed. In this case, as with the Pentagon, local command was not neutralized by the disaster. Local responders arrived first, established clear command, and demonstrated enough capacity that there was no strong case for removing local control. The case provides the lesson that in a crisis that incorporates both a criminal investigation and an emergency response, it is possible to have two functioning commands as long as each command cooperates with the other.

Lessons Learned from the Attack on the Pentagon

Similar to Oklahoma, the Pentagon ICS functioned with a clear understanding and general acceptance of who was in charge. Edward Plaugher, chief of the Arlington County Fire Department, arrived at the site shortly after his assistant chief, James Schwartz, had set up command. Plaugher decided not to relieve Schwartz of command, judging that Schwartz had more recent experience in managing incidents and that Plaugher could help most by working outside the ICS command. Schwartz assembled his ICS teams in the hours that followed, utilizing officers from the ACFD and from other fire departments.

As with Oklahoma, it is perhaps surprising that there was not more contention about who was in charge, and that federal officials were willing to allow the response to be headed by the assistant chief of a relatively small county fire department. Also like Oklahoma, the ability of local responders to be in place quickly appears to be critical in terms of taking and holding on to command. Schwartz suggests that without the quick and decisive response of the ACFD, federal responders would have taken over. "I do fully believe that had there been a gap in that command presence, FEMA, and perhaps other federal agencies, would have driven a truck through it" (Varley 2003, 6).

Schwartz recognized that the nature of the situation demanded a unified command where multiple organizations had an input into decisions rather than a single incident commander. However, he felt that the

rapid pace of events meant that the situation would be better served by a single incident commander in its initial hours. He called a meeting of the principal organizations at 6 p.m. on September 11, during which he explained the basic concept of the ICS, the basis for his authority as incident commander, and the process of switching to a unified command.

The NIMS model provides some basic principles for how ICS should be run, and training and experience provides some basic conventions for how the ICS has been run in the past. But, in practice, ICS commanders have a good deal of flexibility, and Schwartz used this flexibility to make some choices that were not typical. First, he selected officials from other fire and rescue departments to take up key positions. Incident commanders typically staff key command positions with familiar officers from their own organization, but Schwartz was willing to draw from other organizations where he saw the right fit.

A second adjustment to the ICS was to invite FEMA into the unified command. There have been tensions between local incident commanders and FEMA officials because of a perception that "FEMA officials sometimes had, in fact, rolled into town and muscled them aside" (Varley 2003, 18). This has led to local responders being protective of their command, as we saw in the Oklahoma case, where FEMA was not given a strong input into the incident command. Schwartz reasoned: "On our incident, I knew I wanted to know where FEMA was all the time, and I figured the best way to do that, as well as get their expertise, was to have them up there with me in the command post. I was just looking for practical solutions. I didn't want something that some book said you shouldn't do getting in the way of what I thought was the best way to deal with this" (Varley 2003, 19). The Pentagon case therefore illustrates how incident commanders can adapt the basic ICS model to best serve the response.

Lessons Learned from Hurricane Katrina

A fundamental problem with the Katrina response was the failure to establish unified command. No single individual took charge in the early stages of the disaster, as neither the mayor of New Orleans, the governor of Louisiana, nor the head of FEMA or DHS exerted anything other than partial control of the response. Efforts to foster clear and unified command faltered because much of the state and local emergency infrastructure was destroyed, and because "overwhelmed organizations cannot achieve unity of command" (House Report 2006, 184–185, 189). This failure to establish a unified command led to multiple, duplicative, and uncoordinated efforts (House Report 2006, 194–195).

Unity of command was also prevented by ambiguity about who was in charge. Many state, federal, and local officials "were 'freelancing,' or just showing up without coordinating with the appropriate authorities at FEMA or the state. They would bypass the command structure" (House Report 2006, 189). There were at least three major operational commands in the field during Katrina (House Report 2006, 189):

- **The Joint Field Office and Federal Coordinating Officer (FCO):** The National Response Plan makes the FCO (William Lokey, an experienced crisis responder from FEMA) the federal response commander. The FCO forms a unified command with the state coordinating officer, who is responsible for coordinating state and local needs and actions with federal actions.

- **The Principal Federal Official (PFO):** The role of the PFO, according to the NRP, is to act as the eyes and ears of DHS on the ground, but not to make operational decisions. Michael Brown, the initial PFO, largely rejected this role and sought to bypass his boss, DHS Secretary Chertoff, and work directly with the White House. The PFO that succeeded Brown, Admiral Thad Allen, established a separate command and made operational decisions without working through the Joint Field Office. In practical terms, this tension was finally resolved when Allen also replaced all three state FCOs.

- **Joint Task Force Katrina:** This command directed the Department of Defense active duty forces. Lieutenant General Russel L. Honoré was designated to lead the Joint Task Force on Tuesday, August 30, two days after landfall. The task force took local government requests and pursued actions without coordinating with the Joint Field Office. The DoD views that it cannot be put under any civilian command other than the

president and the secretary of the DoD, and that any assignments it provides to other agencies are voluntary responses to requests rather than orders from a higher command.

The failure to establish unified command was also partly due to confusion with new policies outlined in the NRP and NIMS, and a failure to train responders on these new policies, especially the principles of an ICS. New policies laid out the rules for how responders were supposed to coordinate. Not surprisingly, confusion about these rules led to coordination failures.

Louisiana officials brought in consultants after Katrina made landfall to train them how to run an ICS. In testimony before the Senate, Deputy Louisiana FCO Scott Wells expressed his frustration: "There was no unified command under the National Response Plan. They didn't understand it. They had no idea.... The states agreed to use NIMS. They agreed to ICS. What does it tell you when two days into a catastrophic disaster, a state gets somebody in to explain ICS to them?" (Senate Report 2006, 27-15). He also said: "If people don't understand ICS, we can't do ICS. And if we can't do ICS, we cannot manage disasters" (House Report 2006, 193).

Confusion about new policies was not limited to state and local responders. DHS undertook one large-scale exercise of the new policies before Katrina. The TOPOFF 3 exercise took place April 4–8, 2005, and simulated a large-scale terrorist attack involving bio-logical and chemical weapons. The exercise revealed "a fundamental lack of understanding for the princi-ples and protocols set forth in the NRP and NIMS" at all levels of government (Senate Report 2006, 12-10), and specifically identified confusion about the respective roles of the PFO and FCO.

Katrina was the first major disaster managed under the new policies, and responders lacked experience and training with the new policies to render them an effective mechanism for coordination. At the time of Katrina, the new policies had not been translated into effective operational guides. For the predecessor to the NRP, the Federal Response Plan, FEMA had developed response plans for specific regions, which included a hurricane plan for Louisiana. There was no evidence of an equivalent planning mechanism under the NRP, or that the old plans had been updated (Senate Report 2006, 27-5).

Lessons About Network Capacity

The overall capacity of a network depends upon the capacity of its individual members, including their knowledge, skills, relationships, and experience. Network capacity is also tied to the adequacy of resources. An ideal response sees high-capacity network members with adequate resources to do their jobs. In the short term, capable responders can try to overcome immediate resource weaknesses. In the long run, as we see with FEMA, under-resourced response organizations also see a decline in their human capacity, as talented individuals leave and their replacements lack adequate training.

If a network lacks the collective capacity to solve a task, it can expand to include new members who can provide surge capacity and skills not available in the original network. This is certainly consistent with longstanding crisis management policy, where the network of responders involved becomes larger as local and state resources become exhausted. From this perspective, network members with inadequate capacity can be supplemented or replaced by new network members. However, there are two limitations to such transitions of network members during crises. First, reconstructing a network during a crisis can be costly. Once a crisis begins, learning about member weaknesses and identifying and integrating new network members involves mission failures and a loss of time that can have dramatic consequences. Second, some network members are more important than others, and cannot be replaced easily because of statutory responsibilities. If these network hubs demonstrate inadequate capacity, this will dramatically weaken the overall network response. This problem is most clearly demonstrated in the Katrina network.

Lessons Learned from Wildland-Urban Fires

In some ways, the responders in the wildland-urban fire cases had some natural advantages in terms of capacity. By and large, responders were well trained and experienced with the ICS. In addition, they benefited from planning and training made under somewhat realistic circumstances. The fires were abnormal and unpredictable, but planning exercises were helpful to the extent that they prepared for predictable needs, including staging areas, resource needs, helicopter loading points, backfiring locations, and evacuation plans. One fire chief suggested that such planning meant that he could focus his "mental energy" on the more dynamic aspects of the fire, and that such plans foster a sense of confidence within the ICS, reducing the feeling of being overwhelmed (Cole 2000). Plans also reduce the number of potential "surprises," establish benchmarks for success, and identify organizational features that can be planned ahead of time.

However, responders also struggled with capacity issues. One clear issue was lack of resources. Relative to the nature of the task, resources (in terms of firefighters and equipment) were not adequate. Because of multiple incidents occurring at the same time, mutual aid was slow to arrive at both the Laguna fire and the Southern California fires in 2003: "The shortage of resources impacted the effectiveness of pre-incident plans because adequate resources were not always available to implement them" (MCS 2003, 32).

A long-term lack of resources (in terms of training and staff) also affected the hub of one of the fire response networks. The Cedar fire was one of the most destructive in California history, and the SDFD faced it as one

of the lowest funded per capita fire departments in the country, revealing shortcomings in training and equipment levels that became clear during the response. "The Cedar fire validated that the SDFD is underfunded, under-staffed, and inadequately trained to respond effectively to complex incidents for extended operational periods" (SDFD 2004, 88).

Lessons Learned from the Oklahoma City Bombing

In Oklahoma, responders had not cultivated a capacity specific to terrorist attack, but were able to easily adapt existing capacity for fighting natural disasters among firefighters, police, and other first responders to the challenge they faced. One of the reasons the response worked so well, according to the Oklahoma Department of Civil Emergency Management, is because "[t]he disaster occurred in a jurisdiction which possesses an abundance of emergency resources." The Oklahoma City Police Department had created a crisis response team and purchased a mobile command unit. A disaster exercise was held among local responders the year before in Emmitsburg, Maryland. One responder called this simulation "a godsend ... the training in Emmitsburg galvanized the roles everyone took. Everyone knew what to do and most did so without the mandate from a supervisor simply because there was no way to communicate with supervisors" (MIPT 2002, 102).

This local capacity was soon supplemented by state and federal capacity. FEMA provided communications capacity and one capability lacking among responders—trained urban search and rescue capacity. During the response, there was no evidence of responders being concerned with economizing because of resource constraints. President Clinton's federal disaster declaration at 4 p.m. removed any concern that the state or local level would be required to overspend on resources.

Lessons Learned from the Attack on the Pentagon

As with Oklahoma, the capacity of responders was not overwhelmed by the disaster. There was no shortage of willing responders, and by the afternoon of the attack, thousands of firefighters were in place. Despite being a relatively small department, the

Arlington County Fire Department was a strong hub for the network. It had been considering the potential for a terrorist attack for many years, building such assumptions into its planning. The Titan Systems report (2002) notes that one of the cultural attributes of the ACFD is to accept and deal with change. The Insurance Services Agency rated the ACFD as among the top three fire departments in the state. The ACFD also had been used to manage emergencies using the ICS and therefore had experienced leaders on hand.

In testimony before the 9/11 Commission, Chief Plaugher said that one of the capabilities that others should emulate was the use of and familiarity with the ICS, and the Titan Systems report also pointed to familiarity with the ICS model as a reason for response effectiveness (Titan Systems 2002, Introduction-11). The ACFD had used the ICS approach for years for smaller emergencies. The comments of Schwartz illustrate the belief that the ACFD had in the system: "As long as we've been doing Incident Command, we've done it with the recognition that if we didn't do it every day on everything we go to, we would never do it for the big one. Or we'd never do it well for the big one" (Varley 2003, 39).

The ICS model had been adopted shortly before 9/11 by Washington area governments as a regional model. Responders understood the system and their responsibilities under it (although in some cases, such as the Washington, D.C. Fire Department, they did not always follow standard procedures). Familiarity with the ICS also helped Schwartz as he reached out to members of other fire departments to take up leadership positions in the ICS.

Lessons Learned from Hurricane Katrina

The size of Katrina made it impossible for any network, no matter how diligent, to prevent a disaster. But capacity problems did make the response less effective than it could have been, and such failures were most obvious and most critical among key members. As previously mentioned, lack of familiarity with new crisis management policies weakened network capacity (House Report, 2006, 193; 229; Senate Report, 2006, 12-10, 27-15). This section identifies additional capacity problems among

critical hubs. FEMA had become critically weak under the Bush administration. DHS struggled to implement new policies it had devised. Weak state and local capacity in Louisiana and in New Orleans was further degraded by the size of Katrina.

The Decline of FEMA

FEMA is the hub of any natural disaster response network that involves a federal response and accordingly was the lead federal agency in Katrina. FEMA was involved with most of the major coordination failures that occurred during Katrina. The Senate report (2006, 12-14) charged FEMA with: "(1) multiple failures involving deployment of personnel; (2) not taking sufficient measures to deploy communications assets; (3) insufficient planning to be prepared to respond to catastrophic events; (4) not pre-staging enough commodities; (5) failures associated with deployment of disaster medical assistance teams and search and rescue teams; (6) failures involving evacuation; (7) failure to establish a joint field office quickly enough; and (8) failure to take measures prior to landfall to ensure proper security for emergency response teams."

While FEMA was created to facilitate disaster response, for most of its history it has been run by political appointees with limited experience in natural disasters and a stronger interest in national security issues. The exception came under the Clinton presidency, when in the aftermath of FEMA's dismal response to Hurricane Andrew, Clinton appointed James Lee Witt to head the agency. Witt is widely credited with a remarkable bureaucratic turnaround. But the FEMA that responded to Katrina looked a good deal like the one that mishandled Hurricane Andrew. Under the Bush administration, FEMA lost political influence, resources, and key functions as "decisions made by DHS leadership weakened FEMA and impeded its ability to respond to disasters" (Senate Report, 14-16). It was led by political appointees who had little discernible emergency experience. Experienced staff left, and specific functions were understaffed. All of this had a direct relationship to FEMA's failures during Katrina.

Why did this happen? One obvious reason is DHS's post-9/11 shift to terrorism at the expense of natural disaster preparedness. But even earlier, the Bush administration had begun to redefine FEMA in a way that left it a weaker agency. Witt's successor,

Joe Allbaugh, took the perspective that FEMA had become an "oversized entitlement program" that created unrealistic expectations about federal support (Senate Report 2006, 14-2).

After 9/11, FEMA found itself swallowed up by the new Department of Homeland Security, whose most pressing concern was dealing with terrorist activities. FEMA lost direct access to the White House and some key responsibilities. The Homeland Security Act gave FEMA responsibility to consolidate emergency response plans into a single coordinated plan, but this role was reassigned elsewhere. This role was crucial, since the result was the National Response Plan, which offered new crisis management concepts such as the designation of Incidents of National Significance, the Principal Federal Official, and the Catastrophic Incident Annex. These were marked departures from previous policy "which ultimately proved problematic or experienced difficulties achieving their intended purposes during the response to Hurricane Katrina" (House Report 2006, 156).

The creation of DHS also saw the loss of financial resources for FEMA. DHS officials and former FEMA Director Michael Brown disagreed about the exact number, but FEMA lost somewhere between $25 million and $78 million in discretionary spending between FY03 and FY05. FEMA responded to budget shortfalls with an old administrative trick: They failed to fill vacancies. The resulting agency-wide vacancy rate of 15 to 20 percent, and more in some areas, led to the following consequences:

- In the area of procurement, FEMA was authorized to have 55 full-time employees, but had only 36 at the time of Katrina, while a DHS study argued that 95–125 employees were required (Senate Report 2006, 14-11). Lack of procurement capacity was one of the reasons that there were not more standing contracts with private providers prior to Katrina, and why in the aftermath of Katrina FEMA relied on large and non-competitive contracts with a handful of companies.

- FEMA relied increasingly on temporary employees. Such employees were supposed to provide surge capacity during disasters, but became de facto permanent staff. Since they lacked benefits and job security, this created a workforce with reduced morale and little sense of shared

culture (Senate Report 2006, 14-7). Actual surge hires that took place for Katrina were too few, and they lacked the training and experience to be effective (Senate Report 2006, 14-8).

- The readiness and strength of FEMA's National Emergency Response Teams had "declined dramatically since 9/11 and at the time of Katrina were inadequately trained, exercised, and equipped" (Senate Report 2006, 14-9). After 2004 there was no money for training the two teams (the NRP actually called for four teams). The size of the teams declined from 125–175 post-9/11 to about 25 at the time of Katrina. One FEMA official referred to response team capacity as "theoretical." FEMA sought $80 million for improving national response teams in 2005, but the request was denied by DHS.

- FEMA's other emergency response teams declined in number, quality, and training. The NRP calls on FEMA to have a First Incident Response Team to deploy to incidents of national significance, but such a team did not exist at the time of Katrina. Disaster Medical Assistance Teams are supposed to deploy to provide medical services in an emergency. FEMA judged only 27 of the 52 teams to be operational at the time of Katrina, and lacked resources or plans to train or equip these teams. In the area of search and rescue, FEMA's Urban Search and Rescue Teams "lacked the plans, funds, personnel, and equipment to respond to a catastrophe. According to Eric Tolbert, FEMA director of response until February of 2005, funding for search and rescue is "grossly inadequate and the teams are held together on a shoestring budget'" (Senate Report 2006, 14-11).

- FEMA did not have enough personnel for operational tasks during Katrina. Wells, deputy FCO for Louisiana, said, "We had enough staff for our advance team to do maybe half of what we needed to do for a day shift…. We did not have the people. We did not have the expertise. We did not have the operational training folks that we needed to do our mission" (House Report 2006, 157).

As FEMA prospered under Witt's leadership, the political dangers of hiring inexperienced senior managers receded from memory. The Senate Report (2006,

14-4) notes that "Brown and most of his front office staff had little or no emergency-management experience prior to joining FEMA." Instead, many FEMA leaders had significant political campaign experience, leading long-term FEMA staff to perceive that political appointees were excessively concerned about the politics of emergency management at the expense of agency capacity. Tolbert said: "The impact of having political [appointees] in the high ranks of FEMA ... that's what killed us, was that in the senior ranks of FEMA there was nobody that even knew FEMA's history, much less understood the profession and the dynamics and the roles and responsibilities of the states and local governments" (Senate Report 2006, 14-5). Other senior executives made similar criticisms of the political nature of leadership to a consulting firm brought in to analyze FEMA's problems in early 2005 (Senate Report 2006, 14-5).

As FEMA declined, senior managers left, taking with them years of experience and long-term relationships with state responders. Since 2005, the directors of the preparedness, response, and recovery divisions had all left. The operational impact of the decline in leadership was exemplified by Brown during Katrina. While much more space could be given to Brown's limitations as a manager, the Senate Report (2006, 14-4) summarizes some key failings: "the leadership at the time of Katrina also lacked basic management experience and the leadership ability required to coordinate the entire federal government's response to a catastrophic event. Brown advocated to DHS and the White House to address FEMA's needs, but he was generally unsuccessful. He presided over the agency as morale plummeted. He refused to operate within the chain of command in which FEMA resided. He failed to work collaboratively with state officials in Louisiana during Hurricane Katrina, the most significant disaster during his tenure."

What is perhaps most tragic about the decline of FEMA is that it was both predictable, given the history of the agency, and predicted by those who understood that history. Problems were identified by experienced FEMA staff; the first responder community; reports by FEMA, DHS, and third parties; FEMA budget requests to the Office of Management and Budget and DHS; and even by Brown himself. Had they been rectified, the central hub of the Katrina response network would have been more effective.

DHS Failed to Comprehend the Dangers of Katrina or Use New Powers Promptly

The creation of DHS and new federal crisis management policies reflected the increased political salience of terrorism. The focus on terror was clearly central to the thinking of DHS leadership. This had consequences for Katrina. It contributed not only to the decline of FEMA and the marginalization of natural disasters in federal grants, but it also caused DHS to fail to give Katrina the level of response it would have given to a terrorist action.

The standard approach to disasters is to rely on a bottom-up "pull" approach, in which local responders turn to the state when they need help and, in turn, states turn to the federal level when their resources are exhausted. However, disasters such as Katrina immediately overwhelm state and local resources, limiting their ability to provide their own resources or define what support they need. In such a situation, a more proactive "push" approach on the part of the federal government is needed. This basic policy logic was in place prior to 9/11, but took new prominence in the NRP and NIMS, which provided detailed plans for a "push" response and created additional mechanisms for triggering such a response.

The post-9/11 focus on the "push" approach would seem to set the stage for a rapid response to Katrina, since the federal government had adequate warning and could predict that state and local responders would be overwhelmed. Instead, DHS leadership provided a sluggish response because Katrina, as a natural disaster, did not match their image of the type of incident these new policies were designed for, i.e., a terrorist incident. During crises, responders need to be able to engage in sense making, adapting their knowledge to the circumstances they face (Weick 1995). However, responders also tend to look to the past to guide their decisions and, for this reason, are often unable to adapt their thinking to unexpected circumstances (Brändström, Bynander and 't Hart 2004). DHS leaders had designed new policies because of 9/11, and expected that the full activation of these policies would involve another terrorist incident. This mind-set limited their ability to make sense of Katrina as an incident of national significance. What evidence do we have of DHS inertia and confusion?

- In most respects, DHS failed to move to a "push" mode until Tuesday, August 30. Given the warnings of the National Weather Service as early as Friday, and more definitively on Saturday, the House Report argues that DHS reasonably could have been expected to have moved into "push" mode on Saturday.

- DHS declared an Incident of National Significance on Tuesday. This statement was actually redundant, since the declaration of emergency made by President Bush on Saturday qualified Katrina as an Incident of National Significance under the Stafford Act. DHS leadership appeared to have been unaware of this, indicating confusion about its powers.

- DHS never used the NRP Catastrophic Incident Annex. DHS officials would explain that this was because the Annex was relevant only for "no-notice events" (i.e., terrorist attacks). However, the Catastrophic Incident Supplement states that the Catastrophic Index Annex is also for "short notice" events, explicitly identifying hurricanes.

The perceived association between new response policies and terrorism also slowed the response of others. Weapons of Mass Destruction (WMD) Civil Support Teams made up of National Guard greatly helped during Katrina. These teams had hazard response skills in medical support, logistics, administration, communication, air liaison, and security (House Report 2006, 229). However, some states delayed sending these resources because they believed that such teams, by law, could be used only in WMD situations.

Human Resource Problems Weakened State and Local Capacity

Responders from the state of Louisiana and from the city of New Orleans also suffered from capacity problems, although the relevance of these problems is less pressing when we consider that any state and locality would have been overwhelmed by Katrina. For example, the New Orleans Police Department has a reputation for being underpaid and less professional than other police forces, and was heavily criticized for its failure to maintain law and order. In the aftermath of Katrina, 133 police officers were dismissed or resigned amid accusations of dereliction of duty (House Report 2006, 246). However, many officers were trapped by floodwaters, and

those that stayed often had no weapons or ammunition, uniforms, or even food.

In Louisiana, the capacity problems of state- and local-level emergency organizations mirror the problems of FEMA. Clearly, inadequate resources and number of personnel hampered planning, training, and actual operations during the response. The Louisiana Office of Homeland Security and Emergency Preparedness (LOHSEP) had a staff of between 43 and 45 people, which an internal staff study found was only about 60 percent of the staffing capacity of peer organizations in other states. Only about 15 of those on staff had emergency management experience. However, proposals for staff increases were not funded by the state legislature (Senate Report 2006, 6-5). As with FEMA, lack of resources and staff shortages had direct consequences:

- Low pay stymied recruitment and encouraged turnover.

- The New Orleans medical director tried to establish a pre-evacuation agreement with Amtrak in the months before Katrina, but LOHSEP lacked the staff necessary to finalize the plan (Senate Report 2006 6-5).

- The agency failed to update state emergency plans (Senate Report 2006, 14).

- After landfall, LOHSEP had primary responsibility for establishing an Emergency Operations Center to channel the state and federal response. However, LOHSEP could provide the EOC only 40 full-time trained staff, or 20 per 12-hour shift. To supplement this staff, LOHSEP relied on National Guard personnel to staff the EOC, many of whom were inadequately trained for the task (House Report 2006, 192).

Local parishes also shortchanged emergency planning. Once the federal government stopped funding satellite phones for localities, many parishes declined to retain what might have offered their only means of communication during the disaster. The New Orleans Office of Emergency Preparedness had a staff of only three and chronic turnover problems including five different directors since 1993 (Senate Report 2006, 6-10). Its fire and police departments had a combined total of five boats, and requests for additional boats were refused by the city in 2004 (Senate Report 2006, 14). Given the widely known threat to the city from flooding (emergency responders widely referred to it as the "New Orleans scenario"), the lack of administrative attention to emergency planning is all the more striking. Parishes around New Orleans typically have no more than two to three emergency staff (Senate Report 2006, 6-12-13).

Lessons About Creating Working Relationships and Trust

In a perfect hierarchy, trust should not be necessary, as authority is the basis for all coordination. But even in hierarchies, actors have some measure of discretion in how they behave and specifically how they coordinate their actions with others. Within the ICS, despite the command and control system, the zone of such discretion is large because the ICS is composed of different organizations under a temporary unified command rather than members of the same, permanent hierarchy. In each of the cases, bar Katrina, we see clear evidence that trust was an important mechanism in facilitating ICS effectiveness among responders. Where working relationships and trust were lacking, we see coordination problems and a weak network.

Trust can act as a low-cost alternative to formal control mechanisms by inspiring confidence. In the cases that follow we see trust fostering:

- Cooperation and problem solving among agencies, reducing conflict over authority and policy

- The assignment of responsibilities, as trusted actors are provided with authority, resulting in quicker decisions and actions

- Personnel choices, as known actors who enjoy high levels of trust are selected

- Greater information sharing between incident commanders and other actors

- Credibility with other responders, as trusted incident staff are more likely to win resources where working relationships exist

- The incorporation of new actors into the network

- A reduced potential for blame shifting and solo action

Lessons Learned from Wildland-Urban Fires

The ICS, with its focus on central command, emerged from fighting forest fires. But no less than in other crises, fire responders repeatedly discuss the need for interpersonal trust. Rohde (2002, 224–225) offers a compelling overview of the importance of trust from his study of six fires.

> A recurring finding in many aspects of the command and organization of wildland-urban fire command was the "absolute" importance that positive relationships play in credibility, assessing needs and resource allocation, and commitment to action at all levels. Trust was a factor that was many times observed to be relationship driven; had the relationship not been created prior to the fire occurrence, the demands of the fire left little time for relationship building concurrent with firefighting. Relationships were found to be important at all levels of the incident management interface. During the Laguna fire, the Orange County Fire Department duty officer relied on relationships to place added emphasis for critical resource orders through personal telephone contacts. He was significantly more successful in acquiring mutual aid than his counterparts in other studied fires, and he attributed these contacts and prior established relationships to his success.... Incident command system position assignments were often made by study respondents based on the personal knowledge and trust between themselves and the available pool of command officers. Often, the most important

responsibilities were assigned to individuals with whom the Incident Commander shared the highest degree of trust…. Most respondents felt that the importance of relationships could not be overstated.

The study of the 2003 Southern California fires is no less adamant regarding the importance of trust:

> Nearly universally, respondents reported the importance of trust, developed through established personal and professional relationships with peers and cooperators. During the initial chaos of these incidents and at the times when dispatch and incident command systems were overwhelmed, these relationships became the primary means by which things got done, until the system could be brought online. These networks, enabled by these relationships, were frequently the primary force behind successful operations. Respondents also reported that networks of personal relationships minimized unproductive conflict. In situations where conflict did occur—sometimes under incredibly stressful conditions—it was often resolved by leaders who sought out their counterparts for face-to-face meetings (MCS 2003, 12).

Lessons Learned from the Oklahoma City Bombing

Oklahoma is another case in which working relationships and trust facilitated cooperation. Basic responsibilities were assigned while the potential for conflict was averted partly because of the strong personal relationships among the principal actors on the ground. Additionally, trust facilitated problem solving. Assistant City Manager JoeVan Bullard "personally knew many of the players. He was able to call them at home or reach them on a direct line, which saved critical time. When there was conflict, the players were forced to sit down and work it out until compromise was achieved."

The importance of personal relationships is also clear among voluntary components of the network. Fire Chief Gary Marrs referred to the "long-standing relationship, which proved to be a high benefit to our efforts" between the Fire Department and the

local Red Cross. The Red Cross asked Marrs how it could help, and Marrs asked them to set up the Family Assistance Center. Southwestern Bell worked successfully with the incident command post because its director of external affairs knew Fire Chief Marrs and other members of the incident command. She quickly contacted the incident commander to see what help her company could offer. This proved to be significant, as Southwestern Bell provided a location for the incident command post, provided 1,500 cell phones to responders, set up mobile cell phone units to manage call traffic, and installed 20 phone lines to the Family Assistance Center.

A crucial first meeting between the mayor, the police chief, the fire chief, and the senior FBI agent to assign leadership positions was a meeting of people who knew one another personally. Three of the four were regular golfing partners. At a local level, responders can draw from existing social capital and trust to facilitate working relationships. FBI Special Agent Ricks notes that the practice of bringing in outsiders to supersede the role of locals disrupts pre-established relationships among locals. "It is important to allow local federal representatives to run the operation. The FBI typically brings in someone from the outside. This can cause major problems because the local representative has already established the essential relationships" (MIPT 2002, 130). This case particularly illustrates the benefits of personal relationships that local responders have with each other. Of course, the existence of positive working relationships should not depend solely on personal ties, and with any large-scale emergency will require responders from beyond the local level. Systematically building strong working relationships across levels of government should therefore be a central part of any emergency preparation strategy.

Lessons Learned from the Attack on the Pentagon

The Pentagon case further underlines the importance of personal trust and previous working relationships to facilitating a command response. The Titan Systems report (2002, A-31) argued that "it is difficult to overstate the value of personal relationships formed and nurtured among key participants long before the Pentagon attack."

One piece of evidence in particular is compelling, providing something akin to a natural experiment on the importance of working relationships. Fire Departments in Virginia and Washington, D.C., were both familiar with the ICS. On 9/11 they both received calls asking for support and instructing them to establish themselves at a set-up point by the Pentagon. Both responded quickly. However, the Virginia firefighters followed instructions and integrated themselves with the ICS, while the D.C. Fire Department essentially formed its own command, failing to stop at the set-up location or report to the ICS. The most obvious explanation for this is that Virginia firefighters had strong working relationships with the Arlington County Fire Department, while the D.C. Fire Department did not.

Trust facilitated inter-agency coordination in a variety of ways. Trust fostered compromises between the DoD and the ACFD in allowing Pentagon workers to continue to work in the site (Varley 2003). Trust of actors in other organizations gave Schwartz, the incident commander, the confidence to include them in the ICS. The Titan Systems report (2002, A-50) refers to the "close ties developed prior to this incident" between the FBI and other agencies in juggling the multiple tasks of the site, i.e., search and rescue with crime scene investigation. This trust was also supported by the use of Special Agent Chris Combs as the FBI liaison to the ICS. Combs had worked with local fire departments for the previous three years and was personally known to Schwartz. This put him in a strong position to act as a conduit of information between organizations.

Trust also reduced the potential for network members to act in ways that would undermine the network such as blame shifting between members. Arlington County Police Chief Flynn says: "You are exposed in these situations. You're not going to make the perfect decision every single time. So you need colleagues who will say, 'I'm willing to do that, but if we do that, this will happen'—as opposed to just doing it and then saying, 'I told you so' to a reporter someday. You need to know and trust each other so you can talk to each other frankly in a crisis without worrying about having to repair relations later" (Varley 2003, 41).

Lessons Learned from Hurricane Katrina

During the Clinton presidency, James Lee Witt, who worked in emergency management at the state level, brought to FEMA a desire to establish strong working relationships with state and local responders through improved mitigation and preparation tactics. One outcome of FEMA's decline was the weakening of these relationships.

After it was moved into DHS, FEMA lost a key function: preparedness. The basic design of crisis management systems—mitigation, preparedness, response, and recovery—assumes a consistent, integrated approach across these functions. The loss of the preparedness function limited FEMA's ability to influence state preparation and weakened relationships with state responders. Preparedness grants became the responsibility of the Office of Domestic Preparedness, housed in the Office of State and Local Government Coordination and Preparedness, described as "a law enforcement, terrorism prevention-focused organization formally part of DOJ [Department of Justice]" (Senate Report 2006, 14-13). This office has limited experience or interest in natural disasters, and has required that federal grants to state and local responders for equipment, training, and exercises have a clear relevance to terrorist attacks and WMD. As a result, requests by New Orleans to purchase flat-bottomed aluminum boats to aid during flooding stood a low chance of funding (White House Report 2006, 153).

Reduced resources also directly impacted FEMA's ability to build relationships through planning efforts. FEMA sought $100 million for catastrophic planning in FY04, and requested $20 million for a catastrophic housing plan in 2005. Both requests were denied by DHS. At a more specific level, FEMA struggled to fund the Hurricane Pam simulation for five years. Even then, the exercise was not funded sufficiently to cover such issues as pre-landfall evacuation, and a follow-on workshop was delayed until shortly before Katrina occurred because FEMA could not find $15,000 to pay travel expenses (Senate Report 2006, 8-6).

It is instructive to look at the most striking example of large-scale positive coordination during Katrina: the massive support given by other states to

Louisiana, Mississippi, and Alabama. Almost 50,000 National Guard and almost 20,000 civilians were activated through a pre-established reciprocity agreement, called the Emergency Management Action Compact. States provide support in the expectation that the receiving state will cover the costs of this support, and that similar help will be provided to the giving state if it faces its own emergency. The support is therefore governed by norms of reciprocity.

By contrast, the intergovernmental relationship in crisis response does not involve reciprocity—the federal level helps states and localities because it is a political responsibility, rather than out of the expectation that they will gain something in return. The same logic applies to coordination between federal agencies, most of whom have little to gain in helping FEMA and DHS, but must do so by legal and political imperatives. Political leaders and agency heads may sometimes judge that political blame will be minimized by blame shifting and solo actions rather than engaging in coordinated action.

There are numerous examples of what appear to be calculated solo actions and blame shifting emerging from Katrina:

- Michael Brown referred to the response of the state of Louisiana as dysfunctional.

- The Department of Health and Human Services (HHS) and FEMA disagreed about their respective roles in allocating medical services.

- General Honoré made little effort to coordinate with the Joint Field Office.

- Senior Coast Guard officers "refused to meet and conduct joint search and rescue operations with FEMA and state agencies" (House Report 2006, 190).

- Governor Blanco, other state officials, and local parishes often bypassed the Joint Field Office by directing requests directly to General Honoré and Joint Task Force Katrina.

- DoD took over victim identification and mortuary services when they perceived HHS as not fulfilling its role of coordinating this task.

- Governor Blanco blamed FEMA for delays in body recovery and the provision of buses for

evacuation. The state later signed a contract with a private operator to collect bodies and had started to commandeer buses at about the time FEMA buses started to arrive.

Political blame shifting and solo actions may serve the needs of individual network members to avoid political blame, while still having a deleterious effect on the overall network goal and the long-term sense of trust among different levels of government. For instance, in the aftermath of Katrina, federal efforts to establish authority during Hurricane Wilma in Florida were rebuffed by state officials concerned about the federal performance in Katrina. Florida officials named their governor as incident commander to ensure a federal official did not try to take this role, and refused to agree to the appointment of a PFO (Block and Schatz, 2005).

Recommendations for the Future

The box below, "Conditions for ICS Success," summarizes the conditions under which incident command systems work well based on the four cases examined. The cases make clear that responders cannot control perhaps the most important influence on the success of an ICS: the nature of the crisis faced. The Katrina case also demonstrates, however, that even in an extraordinarily difficult situation, responders could have performed better and increased preparation would have helped. We should be realistic about the limits of preparing for large-scale disasters and terrorist attacks while understanding that such preparations, when done correctly, can at least mitigate the effects of these disasters.

What recommendations should we draw from the cases? There have been many analyses of what went wrong in Katrina, and hundreds of recommendations.

Conditions for ICS Success

In the cases examined, incident command systems were more successful under the following conditions:

- Responders faced a limited number of manageable tasks.

- Crises were geographically limited.

- Responders did not face intense time constraints.

- The network size was manageable.

- Responders were experienced with the ICS model.

- Hub agencies had high capacity and adequate resources.

- Responders had strong positive working relationships with one another.

The recommendations presented here are different because they arise from an analysis of a range of cases, and because the author has characterized the ICS model as a hierarchical network. It is the network aspects of the ICS that have been most frequently overlooked, and for that reason the bulk of the author's recommendations are devoted to the issue of building network norms of trust and reciprocity. The box on page 35, "Recommendations for Managing Hierarchical Networks," summarizes them.

Recommendations: Preparing for Emergencies

Crisis response networks exist during both non-crisis periods and when crises actually occur. Before a crisis occurs, the network is relatively small, comprising primarily the hub members whose primary task is to prepare for a variety of emergencies. During the crisis, the network grows, incorporating new members whose primary task and training is usually in a functional area outside of emergency response. Before a crisis occurs, emergency responders should concentrate on building both the hierarchical and network components of the ICS.

Strengthen hierarchies by clarifying command relationships: The cases illustrated how the issue of who is in charge can be ambiguous once a response begins. Jurisdictional authority comes under question depending on the size and nature of the emergency and the ability of local responders to resist efforts to move command authority to a higher level of government. In an incident like Katrina, where authority needed to be quickly asserted at the federal level, there were overlapping commands. DHS clearly needs to clarify the relationship between the Principal Federal Officer and Federal Coordinating

Recommendations for Managing Hierarchical Networks

Pre-crisis:

- Strengthen hierarchies by clarifying command relationships.

- Strengthen hierarchies by training responders in the ICS.

- Build network relationships through simulated experiences such as joint planning, training, and table-top exercises.

- Maintain network relationships by limiting turnover.

- Build network relationships through preferential hiring of network members and network exchange programs.

- Build network relationships by reconnecting preparation and response functions.

- Integrate as much of the network as possible into preparations.

During crisis:

- Coordinate network access for emergent network members.

- Strengthen network relationships by communicating shared challenge and purpose.

- Strengthen network relationships by highlighting the contributions of different network members.

- Exert hierarchy to direct network capacity.

Official positions during a crisis. It also remains unclear as to whether the military is part of the unified command system in emergency response. As much as possible, these questions should be resolved beforehand and consistently understood by all participants.

Strengthen hierarchies by training responders in the ICS: Greater understanding of the ICS model reduces the potential for responders to question authority and engage in solo action during a crisis. The National Incident Management System requires such training, but Katrina revealed that many responders at all levels were unclear about the ICS and other aspects of new crisis management policies.

Build network relationships through simulated experiences: In pre-crisis stages, the network aspects of the ICS—the most important of which is trust—can be fostered in a number of ways. The cases suggest a variety of ways that allow agency personnel to get to know one another, learn about the capacity of each other, and develop reciprocity norms.

Simulated experiences in the form of joint planning, training, or table-top exercises give network members a chance to interact with one another. Such processes are beneficial in building social capital even if the plan or simulation does not mirror

actual crises (Moynihan 2005). In Oklahoma, a number of responders pointed to a disaster exercise in Emmitsburg, Maryland, the year before. Police Chief Gonzales said, "This drill not only provided practice for key personnel, but it allowed them an opportunity to build trust and relationships with key players prior to the incident" (MIPT 2002, 81). The director of Oklahoma's Department of Civil Emergency Management said, "This allowed most of the players to work together, establish relationships, and build a trust factor. Because many of the players had practiced together in drills, the steps and actions taken in April became second nature, and most knew their counterparts were taking care of their part so they could focus on other issues at hand" (MIPT 2002, 54). Oklahoma responders point out that the exercise would have been even more effective if it had included federal counterparts.

In the case of the Pentagon attack "[r]egular and frequent participation in exercises and other activities with neighboring jurisdictions had produced sound working relationships that were evident during the Pentagon response" (Titan Systems 2002, A-74). After the 1995 sarin nerve gas attack on the Tokyo subway, the Arlington County Fire Department helped to develop the first locally based terrorist response team with the U.S. public health services and other agencies. Incident Commander Schwartz reported

that the planning built relationships that served the Pentagon response well even if it did not produce a plan to match the event. "What we set out to build is not what we built. We were building a network, we were building a system, we were building friendships. When the plane flew into the side of the Pentagon—it was not chemical, it was not biological—it wasn't any of those things we had prepared for. It ended up being a building collapse and a building fire. But what managed the Pentagon was those relationships—was a system we didn't even know we were growing" (Varley 2003, 42).

Maintain network relationships by limiting turnover: Working relationships are aided by time and shared experience. It is therefore important that crisis responders across organizations deal with the same agency representatives. The Katrina case demonstrates how such relationships can be disrupted through turnover. The decline of FEMA saw an exodus of experienced managers, while state and local response agencies in Louisiana also suffered from turnover problems. Turnover not only weakens the capacity of the employee's organization, but it also weakens relationships across the network. Some element of turnover is inevitable, but agencies should make a conscious effort to limit turnover among those who act as boundary spanners to other organizations in the crisis response network.

Build network relationships through preferential hiring of network members and network exchange programs: As actors move from one organization to another, they can maintain their social capital in the first organization. Crisis response networks should find ways to encourage mobility between organizations as a way of creating boundary spanners.

In the case of the Pentagon, many senior managers had worked in neighboring fire departments and were familiar with one another, and the FBI liaison to the incident command had previously been assigned to work with local fire departments. Such mobility is most likely among response agencies that share functions and are geographically proximate to one another.

Mobility within networks could be fostered through personnel policies. Network members could organize worker exchange programs or facilitate temporary assignment of their employees to another network member. Exchange programs would allow these employees to develop ties that they can rely on when they return to their old position. Job candidates from network organizations could be encouraged to apply for and given preferential treatment when other network members are hiring. To exploit the social capital that these actors bring with them and to maintain relationships over time, they should be assigned as liaisons to their old organizations.

Build network relationships by reconnecting preparation and response functions: After DHS was created, FEMA lost its preparation function, thereby losing contact with state and local responders, as well as influence on spending and preparation for crises. However, FEMA was still expected to act as the primary federal agency that would lead response initiatives, working with people it had lost contact with and in a response phase for which it had not prepared. The Katrina case suggests the need to have the same set of actors responsible for preparation and response.

Integrate as much of the network as possible into preparations: It is difficult to build working relationships with network members if they are not a formal part of the network. A consistent difficulty across all of the cases was the integration of emergent components of the network. Most governmental actors involved in the network have a formal responsibility to provide certain services, responsibilities which are made known to them before the crisis. By contrast, emergent members are typically nonprofit and private actors who are largely unknown to planners ahead of time, but when the crisis occurs they join the network by voluntarily offering resources or being solicited to help by the incident command. In either case, such actors are typically not familiar with the ICS model.

Many of these emergent network actors could be better incorporated into planning and training exercises. Organizations that can provide food, water, shelter, and other resources can be identified ahead of time and have liaisons included in simulated experiences. Once a crisis actually starts, existing relationships allow the incident command to more easily solicit their help and to provide these actors with information about how to contribute. Of course, this expands the size of the network involved, but does so in a controlled manner prior to the crisis rather

than during it. In addition, such network expansion can be limited by using liaisons to represent multiple organizations. For example, in the Oklahoma City bombing, we saw one liaison represent multiple firms in the construction industry.

Recommendations: Managing an ICS During Emergencies

An ideal scenario for emergency management is that every incident is met with an ICS that has prepared so that it has a clear command, well-trained responders, and strong working relationships. In reality, this ideal will almost never be met. During a crisis, ICS managers should focus on using hierarchical authority to provide prompt response. But they still need to maintain and nurture network aspects of the ICS, partly because new network members will emerge and partly because bonds of trust need to be strengthened in the dynamic context of an unfolding emergency.

Coordinate network access for emergent network members: When a crisis occurs, many private and nonprofit actors will seek to help in any way that they can, offering services and goods. Voluntary contributions can pose coordination problems because responders may not always need the resources offered or have standard procedures to collect them, and volunteers may not understand how to direct their efforts.

It is impossible to integrate all of these actors into the network beforehand, because one cannot predict all of the groups who will be involved in an incident, and many will be reluctant to devote resources to a crisis network before an actual crisis occurs. During a crisis, the ICS can facilitate their involvement by providing one central access point, such as a toll-free hotline number where volunteers can find out how to help. Developing standard procedures to incorporate volunteer services and materials would also help.

An annex to the National Response Plan offered some guidance on how volunteer and donations management should work, but these broad principles did not help much during Hurricane Katrina. This task needs to be better integrated within the ICS. When we look at the traditional ICS functions (operations, logistics, planning, finance/administration), it is not

immediately clear where the coordination of emergent network members falls, but given that the focus of the logistics function is to facilitate the flow of resources, this appears to be the most likely candidate.

Strengthen network relationships by communicating shared challenge and purpose: Crises can create a sense of common challenge and mutual trust, which in turn can foster a sense of esprit de corps (Moynihan, 2005). As responders perceive that they are working together to overcome the same challenge, they perceive the ICS less as a collection of organizations and more as a single team. For example, with the Pentagon attack, the nature of the task created "camaraderie and a shared sense of purpose" (Titan Systems 2002, D-7).

Crisis managers should not wait until an actual crisis to start building relationships with other actors. However, once a crisis begins, ICS managers should communicate to their staff the shared nature of the challenges they face, the difficulties they may encounter, and the goals they are pursuing.

Strengthen network relationships by highlighting the contributions of different network members: As responders come to appreciate the skills of other network members and observe these members fulfilling their commitments, they develop trust in them. Such trust forms a virtuous circle of reciprocity and coordination. But vicious circles can form if a response is faltering. As network members perceive other members as incompetent or failing to meet their responsibilities, they are less likely to rely on them and more likely to favor unilateral action rather than coordinate their resources. We saw such patterns of behavior emerge in the Katrina case. ICS managers can overcome this by communicating to their staff and to the media the positive contributions that network members have provided, establishing the credibility and competence of ICS members and thereby building a basis for intra-network trust.

Exert hierarchy to direct network capacity: Even as incident commanders attend to network aspects of the ICS, their primary task during an emergency will be to exert hierarchy to direct network capacity. During a crisis, responders need to effectively coordinate the resources they have, availing themselves of the command and control system of the ICS.

Illustrating this point, Cole (2000) quotes Peter Drucker's justification for hierarchical approaches to management: "In a situation of common peril—and every institution is likely to encounter it sooner or later—survival of all depends on clear command. If the ship goes down, the captain does not call a meeting, the captain gives an order. And if the ship is to be saved, everyone must obey the order, must know exactly where to go and what to do.... 'Hierarchy,' and the unquestioning acceptance of it by everyone in the organization, is the only hope in a crisis" (Drucker 1999, 11).

The cases studied point to some qualifications to this recommendation. The first is that events may be moving so rapidly that a central command cannot keep up and therefore needs to be willing to allow independent action, as we saw in the wildland-urban fires. Another contingency is that if a network is not working or lacks capacity, incident commanders may seek to exert authority but find little response among subordinates. A final contingency is that incident commanders should be willing to opportunistically expand the network to include unanticipated members who offer resources that the existing network lacks.

Conclusion: The Future of Crisis Management

Prior to the attacks of 9/11, the crisis management field had changed incrementally. Over the course of three decades, the ICS model had become an increasingly popular method for organizing crisis response, migrating from its original setting of fighting forest fires to a variety of other emergency situations. The adoption of the ICS was based on its perceived suitability and advantages over other forms of crisis coordination. However, post-9/11 policy changes have elevated the ICS to a mandatory national approach to managing all crises. It is, for better or worse, the future of crisis management. Some critics might wonder if any method of coordination can fit all types of emergencies and point to the failures in response to Hurricane Katrina. Defenders of the ICS point to its successes and argue, with some merit, that Katrina failures had less to do with problems with the ICS than a failure to implement it properly.

This report has offered some thoughts about the future of crisis management by looking to the past. The case studies provide us with some insights about how to operate an ICS. One point relevant to Katrina is that the nature of the task is a major influence on success, and it is therefore open to question whether any form of social coordination could achieve what we might consider a successful response. But in some ways, this is beside the point. In the thousands of pages of frequently scathing criticism that Senate, House, and White House reports directed toward the Katrina response, none of them questioned the basic wisdom of applying the ICS model. The model continues to remain the central plank in crisis management policy. The task for those who care about emergency response is to understand what makes the ICS succeed and under what circumstances. This report has offered some preliminary suggestions, based on treating the ICS as a hierarchical network, but much work remains to be done.

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