QUICK RESPONSE REPORT

Large-Scale Rooftop Search and Rescue: the Experience of Hurricane Katrina

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Abstract

This paper examines issues that arose during large-scale rooftop search and rescue operations following Hurricane Katrina. Few events in the U.S. disaster experience have provided background or a means of preparing for the scale of the airlift required following Katrina. Researchers from the Center of Hazards Research and Policy Development at the University of Louisville conducted on-site visits and interviews in Mississippi and Louisiana approximately six weeks after Katrina made landfall. Unique characteristics of this event created new challenges and agencies operated with little coordination. Additional recommendations regarding communications and similar means of dealing with large-scale events are described.

Introduction and Issues

Emergencies are circumstances for which every unit of government makes preparations. Automobile accidents, fires, and hazardous material spills are events for which procedures are rehearsed and response is practiced. Depending on one's definition, however, larger-scale emergencies (disasters and catastrophes) are special circumstances that cannot be dealt with by ordinary measures (Dynes, 1983). Large floods are special occurrences that fall into this category, since they have a wide range of unique factors that create a demanding technical rescue operation (Glassey, 2006). Preparedness for disasters is a complex process and includes activities such as devising, testing, and implementing disaster plans; providing training for responders; and communicating with the public and others about disaster vulnerability (Mileti, 1999).

Hurricane Katrina and the flooding associated with the failure of the levees in New Orleans created a new situation for emergency response rescue teams. Katrina and its effects can be considered a catastrophe, based on Quarantelli's (1997) description of catastrophes as a social crisis where there is a complete disruption of social life and the community no longer functions in any normal sense. The widespread devastation caused by the flooding produced an exceptional circumstance in which homes were completely inundated with water, forcing thousands to escape to the roofs and attics of their homes. Because the topography of New Orleans is such that flood waters do not always recede naturally, people stranded in their homes and on their rooftops required assistance. Many of these people were elderly and also faced dangerously hot weather and contaminated flood waters.

In an urban search and rescue environment, the goal is to locate and deliver aid to the victims as soon as possible in a race against a retreating survival window (Lau, Huang, and Gissanayake, 2005). Due to the scale of Katrina and the amount of flooding, many organizations were involved in rescue operations. The rescue efforts, at least in the first hours and days, were not controlled or coordinated and proceeded in such a fashion as to save as many people as possible in the quickest amount of time.

The U.S. Coast Guard, which was a primary actor in the airlift and rescue operations, reported on its Katrina Response Web site (since removed) that more than 29,000 airlift rescues occurred, although it was unclear if this included all citizen movement (including transport to shelters) or multi-agency efforts. The U.S. Coast Guard has a reputation as an expert in search and rescue because of its standardized training at search and rescue school and its extensive use of helicopters for rescue procedures (Noble, 2001). Rooftop rescues, both coordinated and uncoordinated, were performed in boats and helicopters by several different agencies. Rescuing individuals from rooftop was not limited to people who were trapped in their homes, but also included those who needed to be evacuated and rescued from hospitals in New Orleans (Rodrigues, Trainor, and Quarantelli, 2006).

Traditional search and rescue takes place post-event with a controlled method of locating victims and documenting the search results. As the type of disaster changes from terrorist threat to tornado or hurricane, the set of specific tasks and responding agencies also changes to meet with the new challenges of the situation (Drabek, 1985).

Innovations in technology have significantly impacted search and rescue in the mid-twentieth century. One example of a modern technological marvel that was first used in the 1940s as a life saving and rescue device was the helicopter (Nocera, 2000). Some 60 years later in New Orleans, the helicopter played a vital role in saving numerous lives via rooftop rescues after the failure of the levee system. Helicopters are important because of their ability to travel long distances in a short time. Studies have shown that risk of death may be decreased if medical attention is provided within the first six hours after a disaster (Schultz, Koenig, and Noji, 1996). Another technological advance is the tilt wing aircraft, which allows for travelling at twice the speed of a helicopter to transport the critically ill for medical attention (U.S. Coast Guard, 1997). The U.S. Coast Guard also uses other technologies that aid in search and rescue, such as night vision devices and advanced sensors that detect life forms.

Not all rescues involve helicopters, however. During the post-Katrina flooding of New Orleans, boats proved effective for rescues and were especially practical because of hazards that were faced by helicopters in urban areas, such as utility wires and large trees. Flood rescues are high-risk operations; one study by the Centers for Disease Control indicated that 10 percent of the fatalities in the Hurricane Floyd flooding were rescue workers (Glassey, 2006). The traditional use of helicopters for search and rescue has been at sea where there are relatively few hazards, except for the elements of nature.

Another unique element of the Katrina rescue efforts was the involvement of non-traditional agencies with access to boats in search and rescue operations. These included state fish and wildlife agencies and fire fighters with personal fishing boats who volunteered for rescue efforts without being officially mobilized. Problems can arise when well-intentioned and motivated volunteers show up to help without advance planning, thereby creating management problems and diverting resources (Quarantelli, 1997).

In major disaster events, several types of potential responders carry out search and rescue operations. The first set—usually those with a lack of training—are local residents, family members, and other civilians who happen to be in the area. Experience with disasters has shown that the first set of responders will conduct search and rescue whether trained or not, and will continue to do so until told (or forced) not to by authorities. The second set of those conducting search and rescue are local first responders, and may include police, fire, or emergency medical personnel. In most, but not all, cases, these professionals have had training in search and rescue techniques. They will continue to conduct search and rescue operations until directed otherwise. The third set of responders includes the trained search and rescue professionals. The professionally trained rescuer may have an extensive background in rescue, possibly including specialized rescue training (e.g., swift water rescue, mountain rescue, etc.). In the case of large events in the United States, trained Urban Search and Rescue (USAR) units may also respond.

One of the unique characteristics of the Katrina event was the scale—the sheer numbers of individuals needing rescue from rooftops. While many instances of riverine or flash flooding have involved a rooftop (or treetop) rescue, those typically involve just a few cases of airlift response. Following Hurricane Katrina, thousands were stranded on rooftops—a scenario for which few have ever planned.

This report examines the challenges that were faced by search and rescue teams in the aftermath of Hurricane Katrina. Data were gathered using qualitative methods, including document review, on-site observation, and face-to-face interviews of individuals in organizations that participated in the search and rescue operations.

This report is presented in four sections. The first section introduces the issues and examines the research question together with current research in the field. The second segment describes the methodology and components of this study. The third section discusses the findings, and the final section relates the findings of this study to broader issues in disasters and emergency management. Brief recommendations are described, as well as potential areas of future research.

Methodology

Data collection was qualitative in nature and was based on a series of interviews with five organizations that took place over the period of the research study. Emergency response officials from the state of Louisiana who took part in the search and rescue effort were included in the study. The participants had varying levels of contribution to the search and rescue efforts, which ranged from high-level tasks, such as coordinating response, to voluntarily aiding in the search operations. Teams that were interviewed included first responders who had personally performed rescues by boat and helicopter. Agencies who were interviewed included the City of Zachary (Louisiana) Fire Department (ZFD), City of Baton Rouge (Louisiana) Fire Department (BRFD), the Louisiana Department of Wildlife and Fisheries, the Slidell (Louisiana) Fire Department (SFD), and a helicopter rescue unit from the U.S. Coast Guard stationed at the Belle Chase Naval Air Station in New Orleans. The interviews were conducted at the agency headquarters for each of the respective organizations. Research questions framing the investigation included:

- How were searches prioritized and conducted?
- How many people were rescued?
- How were the multiple agencies coordinated?

- What are the implications for disaster planning and response?
- What recommendations are appropriate?

In addition, web sources, reports, news accounts, and related materials were reviewed.

Planning and Coordination

Following Katrina, limited coordination occurred among state and local organizations during rescue operations. Attempts were made by the BRFD to establish some level of coordination with the Louisiana Office of Public Health. However, the first priority of the Office of Public Health was to evacuate University Hospital and Charity Hospital, and according to the Baton Rouge team, the Office of Public Health didn't require the services of BRFD. There was some coordination among the BRFD, State Police, and the New Orleans FD. Members of the ZFD worked under the direction of the Louisiana State University's (LSU) Fire and Emergency Training Institute. Initially, however, individual members went on their own initiative to help with rescue efforts. The Louisiana Department of Wildlife and Fisheries coordinated with several other state wildlife agencies, including Texas, Kentucky, Missouri, Minnesota, Tennessee, and South Carolina to conduct boat rescues.

There was minimal planning for rescue operations, based on our interviews. Preparation was limited because of the enormity, scale, and urgency of the situation. People were stranded in homes throughout New Orleans, and rescue teams had to concentrate efforts on using boats to save people stranded on rooftops and in attics. Urgency was particularly high during the initial period after the storm when the rising flood waters from the failed levees made the situation critical. Many of those who were affected were also the most socially vulnerable, such as the elderly and single mothers. An official from the Louisiana Department of Wildlife and Fisheries offered the following rationale for not planning out a coordinated approach:

> *Our role was not to sit back and assess. A lot of those things were not done; I'm talking about meeting, planning, and laying out framework on the next day. We didn't do all of that. We didn't sit around with two-hour briefings in the morning. Our goal was to get as many boats on water to save as many people as possible.*

This sense of immediacy was shared by many of those who were interviewed. Officials from the ZFD offered similar comments. The U.S. Coast Guard performed with a similar perspective:

> *See people on roofs, get them to safety. Everywhere we flew, you'd see groups of people. The Department of Defense would come in and start taking control and they would have methodical control and started assigning grids. The Coast Guard did not do grid systems. We just looked for people.*

Rescuing people on sight was a common occurrence. Many rescue officials interviewed for this study used this approach. Any person who was visually identified was pulled from the roof tops via boat or helicopter. Members of the BRFD also relied on sound, listening for people who were calling for help. Technology, such global positioning satellites (GPS) or geographic information systems (GIS), were minimally used in these search operations.

Night-vision goggles were useful tools for rescues during evening hours. Rescue crews from the U.S. Coast Guard would search for people at night using their goggles to locate signs of life, such as flashlights, candles, flare guns, or reflective tape. After a few days of this "sight approach," a more planned and coordinated approach evolved. For example, the BRFD began to work with the New Orleans Police Department, using maps to create a grid pattern and mark off areas already covered by either of the departments. According to the ZFD, uncoordinated rescue operations continued for two to three days until the emergency operations command center was able to set up a meeting.

Communications

Multiple issues and concerns were expressed regarding communication among the organizations interviewed. Communication problems were a recurring theme among all interviewees and were recognized as a major shortcoming by the different search and rescue teams. The core problem was that there was little, if any, communication among the organizations taking part in search and rescue, making all of the efforts challenging. In some instances the issue was lack of interoperability. One example that demonstrates this failure was the lack of communication between the U.S. Coast Guard conducting aerial rescues and the Louisiana Department of Wildlife and Fisheries conducting boat rescues. There was no radio communication between the two organizations, and on multiple occasions "prop wash" from the helicopters compromised boat rescue efforts. If there was light, hand signals were the only means of coordination and were insufficient in many instances. Communication problems also existed within organizations. The BRFD reported that when its responders were in the field conducting operations, they were unable to communicate with their command center. Fire department radios are important, but the network was overwhelmed because of demand, which shut the system down.

Effects of the hurricane also impacted communications, as the Slidell Fire Department reported the storm had taken out its antenna. Communications infrastructure could have been disrupted by either the hurricane-force winds or from the storm surge, and in the case of New Orleans, the flooding from the failure of the levees. It is

likely that other emergency service operations experienced similar effects. Personal communication devices, such as cellular phones, proved to be very important in this critical situation.

According to the U.S. Coast Guard, other forms of communications, such as text messaging, were vital to search and rescue operations and often became the only way to establish contact when many of the traditional methods of communications failed. Cell phones worked early on after the storm, but the situation changed quickly as cellular phone operations were disrupted due to overload, and no communications were able to go through. All communications were disrupted, according to the U.S. Coast Guard, as main phone lines and cell and radio towers lost power. Other backup options, such as satellite phones and walkie-talkies, played an important role.

Numbers Involved

Due to the chaotic and severe nature of Hurricane Katrina, it was difficult to gauge the precise number of individuals who were rescued by the search and rescue teams involved this study. The Louisiana Department of Wildlife and Fisheries, along with their partners, estimated that on the first night of the incident more than 1,500 individuals were rescued from their homes, and approximately 21,000 individuals were rescued in total. The BRFD estimated that they rescued close to 500 people on the first day when they went to New Orleans with six boats. After a grid pattern had been established on the following day, they rescued about 250 people.

U.S. Coast Guard helicopters ran continuously for 24 hours for five to six days straight. Crews would work for six or seven hours then switch out with another crew, saving more than 71 people per day (per crew) and several pets. In total, the U.S. Coast Guard web site dedicated to tracking the Katrina response (since removed) reported that there were 12,533 saved by air rescue. Keeping track of the numbers was complicated because there were many organizations involved in the search and rescue, and because things were so chaotic the rescuers themselves lost track of numbers. The ZFD estimated that among all the firefighting organizations that took part in rescue efforts coordinated by LSU's Fire and Emergency Training Institute during the first day, between 400 and 500 people were rescued. The SFD did not keep track of the number of people they helped rescue. The SFD was the only group interviewed for this survey that stayed within its jurisdictional boundary and did not deploy to New Orleans, primarily because it was a small department, the community experienced extensive damage, and the firefighters' homes were affected.

Implications and Recommendations

Communication failure was a critical shortcoming. The Louisiana Department of Wildlife and Fisheries believes that interoperability is a key concept that should be strengthened so that different organizations will be able to coordinate and communicate during a crisis situation. The ability to communicate during a catastrophe is important. One way to achieve this is to increase the capacity of a network so that the system does not fail when there is high load demand. Officials from the ZFD also believed that interoperability should be a main priority for improving operations during a disaster event. Interoperability would allow multiple agencies, such as local firefighting operations, state agencies, and the U.S. Coast Guard, to communicate with one another.

Standardization is a process by which a level of standards is developed for the emergency response community. It should be an important factor when training people for search and rescue. The importance of standardization became apparent during post-Katrina search and rescue operations. U.S. Coast Guard operations functioned smoothly because of unit procedures (standardization), and many people were brought from different Coast Guard installations to work with one another.

Interviewees from the U.S. Coast Guard stated that standardization tests occur every six months, and during rescue operations in New Orleans it was critical to conduct missions "by the book."

The BRFD also recommended standards training, but added that there should be a level of specialization for search and rescue teams for specific areas, such as New Orleans, that have unique characteristics (e.g., being situated below sea level). ZFD officials recommended that disaster response should be systematic, using a standardized approach, similar to a response for a hazardous material case. The Baton Rouge team also believed that a more organized field structure and set standards would improve rescue operations. Standardization, along with a uniform systemic approach in search and rescue, will allow various emergency response officials from across the country to work with one another and understand the process of how things work. The Slidell team recommended that more of its members receive special Urban Search and Rescue training.

In a similar vein, there should be additional efforts to standardize approaches for how volunteers can aid in rescue operations. Several of the groups that were interviewed left their jurisdictions without being officially mobilized. This situation creates problems, as additional resources must be allocated to managing volunteers (Quarantelli, 1997).

An aspect of the response that worked well from the rescuer's perspective was flexibility. The freedom of not sticking to formal procedures and not documenting every step of the rescue operation was cited as being important. Members of the U.S. Coast Guard and the Louisiana Department of Wildlife and Fisheries who were interviewed believed that this freedom allowed many people to be saved. This was the opposite view of the ZFD chief, who recommended a systematic approach to search and rescue.

How are the Findings Useful?

The issue of standardization brought up during the interviews (as well as by multiple other sources) has implications for research and practice in many sectors. Standardization was a factor that worked well for the U.S. Coast Guard because it enabled different teams from across the country to work with one another. Fire teams from both BRFD and ZFD believed that standardization is a desirable goal. Drabek (1985) discussed this issue in the mid-80s, and 20 years later the problem was still evident during operations for Hurricane Katrina. A goal for improving effectiveness in response should direct focus on the development of appropriate standards and procedures for large-scale, multi-agency response events.

It would be advantageous to promote a national dialogue and planning efforts that involve as many stakeholders as possible at all levels, including federal, state, and local organizations, to develop shared approaches to large-scale search and rescue. Communication should be of utmost importance, and the failure of communication during search and rescue efforts for Hurricane Katrina illustrates the need for improvements among the various organizations that respond to a crisis situation. Planning and exercises should be a continual process, keeping in mind that just because plans have been developed for a community, it does not mean operations will run smoothly and successfully (Dynes, 1983). The chain of command and a directional flow of communication must be established at a regional level, and the groups involved with search and rescue need to have worked together. Establishing a prior relationship is particularly important in events such as large-scale floods, because no plan will ensure a successful rescue if personalities collide and people are not able to communicate with one another (Glassey, 2006). There was no incident command during the initial hours and days after Katrina, and people did not communicate. The lack of communication leads to an inefficient method of coordinating the search and rescue efforts.

Recommendations for Future Research

Additional research would assist practitioners in developing the best models of large-scale coordination. The role of drills and exercises, namely those at the regional, state, and multi-state level (of which there are very few), has yet to be fully examined with respect to increasing response effectiveness. Rather than just raising the issue of interoperability, more research is needed on the practical implication of implementing such a system and what the cost structure might be to achieve it.

Conclusion

Search and rescue crews faced many challenges because of the scale and enormity of this catastrophe. Hurricane Katrina has provided some distinct lessons as they apply to large-scale rooftop rescues and the challenges faced in a crisis, such as failures with communication or the importance of standardized procedures. Given the clear need for help in this disaster, many search and rescue teams did not wait to get orders to mobilize to New Orleans. Teams immediately set out on their own initiative with personal equipment, such as fishing boats, to help save as many people as possible with very little direction or command. The organizations involved did this despite media reports of violence in New Orleans. Just as in the case of unorganized citizen volunteers, we must plan for those instances where uncoordinated, but trained, volunteers will arrive to assist those in need.

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